2009 NRC EXAMINATION

Facility: Catawba Nuclear Station Scenario No.: **1** Op-Test No.: 2009 D-1

SNAP 141

Examiners: ______________ Operators: ______________

- Unit 1 is recovering from a reactor trip 2 days ago
- Conditioned power level is 100%
- EFPD is 25 days
- Boron Concentration is 1929 ppm
- Your crew has stabilized the plant in Mode 2 at 1 x 10^{-8} amps and critical data gathering has been completed
- OP/1/A/6100 001 (Controlling Procedure for Unit Startup), Enclosure 4.1, Unit Startup is in progress and has been completed through step 2.166
- Increase power to 1% per OP/1/A/6100/001

Event No.	Malf. No.	Event Type*	Event Description
1	RO	R	Increase power to 1%
2	RO SRO	I TS	I/R N35 Loss of high voltage failure/re-zero SUR
3	BOP SRO	C TS	KC pump 1A2 trips
4	BOP SRO	C TS	Loss of offsite power to 1B essential train/ 1RN-292B fails to open
5	BOP SRO	C TS	NC system leak (DCS)
6	RO	C	Loss of normal feed to S/Gs / 1A CA pump fails to autostart
7	ALL	M	Steam line break on 1A S/G Additional Failures 1BB-56A fails to auto close 1A ND pump fails to autostart

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

SIMULATOR SETUP

Reset to 10-8 amps BOL snap
Roll Charts
Clear EHC alarm and any OAC/ 1.47 bypass alarms
Sign off OP/1/A/6100/001 enclosure 4.1 thru step 2.166 (students start at 2.167)

MALFUNCTIONS, REMOTES, and OVERRIDES

Malfunction #	Description	Value	Event Trigger	Ramp	Delay
ANN-AD11-B03	TRANSFORMER A TROUBLE	ON			
ANN-AD11-E03	TRANSFORMER B TROUBLE	ON			
MAL-DG007B	D/G 1B OUTPUT BREAKER FAILURE	OPEN			
VLV-RN033A	RN292B DSL GEN B HTX INLET ISOL VLV FAIL AUTO ACTIONS				
OVR-KC003D	PMP A2 OFF PB	ON	4		
OVR-FWP019C	CFPT 1A MOP 1A2 AUTO PB	OFF			
VLV-SG007A	BB56A S/G 1A BLDN CONT ISOL INSIDE FAIL AUTO ACTIONS				
MAL-ND001A	ND PUMP A FAILURE	AUTO			
MAL-CA004A	FAILURE OF CA PUMP A TO START	AUTO			
MAL-ENB009A	LOSS OF I/R CH 35 HI VOLT		2		
OVR-EP051D	ETB NORM FDR FRM ATD TRIP PB	ON	4		
MAL-NC013B	NC COLD LEG B LEAK	0.22	5		
OVR-FWP018C	CFPT 1A MOP 1A1 AUTO PB	OFF	6		
MAL-SM008A	STM LINE BRK OUTSIDE CONTAINMENT LOOP A	4.125E6	7		
LOA-NV078	SEAL WATER LOW FLOW LCL REFLASH ACK (AD7,C4)	ACKN	21		180
LOA-CA015	CA66B - CA PMP #1 DISCH TO S/G A ISOL VLV	0	22	120	300

EVENT TRIGGERS (other than manual)

Event Trigger	Description
NONE	

CRITICAL TASKS (See attached documentation)

E-0 H – Manually start at least one low-head ECCS pump before transition out of E-0.

E-2 A – Isolate the faulted S/G before transition out of E-2.

QUALITATIVE ATTRIBUTES

	Required	Actual
Total malfunctions	5 - 8	8
Malfunctions after EOP entry	1 - 2	2
Abnormal events	2 - 4	5
Major transients	1 - 2	1
EOPs entered/requiring substantive actions	1 - 2	2
EOP contingencies requiring substantive actions	0 - 2	0
Critical tasks	2 - 3	2

REFERENCES

OP/1/A/6100/001 (Controlling Procedure for Unit Startup), Enclosure 4.1 revision 217DCS
AP/1/A/5500/016 (Malfunction of Nuclear Instrumentation System) revision 024DCS
AP/1/A/5500/021 (Loss of Component Cooling) revision 036DCS
AP/1/A/5500/007 (Loss of Normal Power) revision 057
AP/1/A/5500/010 (Reactor Coolant Leak) revision 051DCS
AP/1/A/5500/006 (Loss of S/G Feedwater) revision 039
EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) revision 036
EP/1/A/5000/E-2 (Faulted Steam Generator Isolation) revision 012
EP/1/A/5000/ES-1.1 (Safety Injection Termination) revision 025

OTHER NOTES AND INSTRUCTIONS

NOTE: The following steps are GUIDELINES. The NRC lead examiner will direct timing of events unless otherwise noted.

NOTE: Any groups or individuals (IAE, Rx Grp, RP, SOC, SWM) that are called to I/R a problem or for simple notification of a problem, repeat back the information they provide unless otherwise noted.

NOTE: Any operators dispatched should repeat back information provided. Call back items are listed below when necessary for the scenario.

Event 1 – Increase power to 1%

This event will be entered once the crew has taken turnover and evaluated plant conditions. Anytime after a stable positive startup rate is achieved, the next event can be started.

Event 2 – I/R N35 Loss of high voltage failure, SRO Technical Specification

Initiating Cue: 1AD-2, C/1, N35 failed to bottom of scale

When AP/1/A/5500/016 is completed, and the SRO has completed consulting Technical Specifications, the next event can be inserted

TS – 3.3.1 Item 4 Condition F

Event 3 – KC pump 1A2 trips, SRO Technical Specification

Initiating Cues:

- 1AD-6, C/1 - C/4, D/1 - D/4, E/1 - E/4 and others

When AP/1/A/5500/021 is completed and the SRO has completed consulting Technical Specifications, the next event can be inserted.

If an operator is dispatched to checkout 1A2 KC pump and breaker, after a few minutes state **"nothing abnormal was noted"**.

TS - 3.7.7 Condition A

Event 4 – Loss of offsite power to 1B essential train/ 1RN-292B fails to open, SRO Technical Specification

Initiating Cue: Multiple electrical alarms on 1AD-11, UV status lights for 1ETB on 1SI-14

When operator is dispatched to manually open 1RN-292B, after 3 minutes call back and state **"1RN-292B cannot be opened"**.

When called by the crew to open 1EDF-F01F and load shed 1ETB, **RUN SCHEDULE Load_Shed_1ETB.sch** (under Operations folder).
Call back when schedule is complete and state: **"1B D/G Load sequencer has been de-energized and 1ETB has been load shed per Enclosure 9. No lockout relay targets are picked up."**

When step 22 of AP/1/A/5500/007 case 2 is completed and the SRO has completed consulting Technical Specifications, the next event can be inserted.

TS – 3.8.1 Conditions A, B, D, F   3.8.9 Condition A   3.7.8 Condition A

<u>Event 5 – NC system leak, SRO Technical Specification</u>

Initiating Cue: 1AD-13, A/7, F/5

When step 11 of AP/1/A/5500/010 is completed and the SRO has completed consulting Technical Specifications, the next event can be inserted.

If annunciator for seal water low flow comes in and directed by the crew, **insert EVENT 21.** **Call back when alarm is clear**ed and state **"Seal water low flow has been locally acknowledged."**

TS – 3.4.13 Condition A, 3.6.4 Condition A, SLC 16.7-9 Condition A

<u>Event 6 – Loss of normal feed to S/Gs/ 1A CA pump fails to autostart</u>

Initiating cue: 1AD-1 A/6 and 1AD-5 A/1, A/4

When AP/1/A/5500/006 is completed, the next event can be inserted. This will begin the major event.

TS – TS 3.3.2 Item 6a, Condition H

<u>Event 7 – Steam line break on 1A S/G</u>

Initiating cue: 1AD-3, A/1

This is the major event.

<u>Additional failures</u>

- 1BB-56A fails to auto close
- 1A ND pump fails to autostart

In E-2 Step 7.c.3) RNO, when dispatched to close 1CA-66B, **insert EVENT 22**.

Call back when 1CA-66B is closed and state **"1CA-66B is closed."**

In E-2, Step10.c if asked to sample S/Gs for activity state **"I will sample Unit 1 S/Gs for activity and report the results back in about an hour."**

In E-2, Step 10.c if asked to frisk cation columns for activity state **"I will frisk Unit 1 cation columns for activity and report back the results in a few minutes.**

Call back in 5 minutes and state **"Unit 1 cation columns indicate no abnormal activity."**

<u>Scenario End Point</u>

AFTER NV S/I FLOWPATH IS ISOLATED PER STEP 9 of EP/1/5000/ES-1.1.

CREW INFORMATION

- Unit 1 is recovering from a reactor trip 2 days ago
- Conditioned power level is 100%
- EFPD is 25 days
- Boron Concentration is 1929 ppm
- Your crew has stabilized the plant in Mode 2 at 1×10^{-8} amps and critical data gathering has been completed
- OP/1/A/6100 001 (Controlling Procedure for Unit Startup), Enclosure 4.1, Unit Startup is in progress and has been completed through step 2.166
- Increase power to 1% per OP/1/A/6100/001

Duke Energy Catawba Nuclear Station **Controlling Procedure For Unit Startup**	Procedure No. OP/1/A/6100/001
	Revision No. 217 DCS
Continuous Use	Electronic Reference No. CN005FK3

Controlling Procedure For Unit Startup

1. Purpose

1.1 To outline the steps necessary to take the plant from cold shutdown to 15% full power.

1.2 To provide a procedure for startup from any shutdown condition.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can affect core reactivity by changing boron concentration, temperature, steam flow, and power level. (R.M.)

2.2 The following Limits and Precautions are Reactivity Management related: (R.M.)

2.2.1 A stable startup rate of 0.5 dpm is administratively recommended. Do **NOT** exceed a stable startup rate of 1 dpm. When approaching the POAH, a startup rate of < 0.2 dpm is recommended; this rate shall **NOT** be exceeded until the turbine is placed on line.

2.2.2 Overlap between the source and intermediate ranges and between intermediate and the power ranges shall **NOT** be less than 1 decade.

2.2.3 During Modes 1 & 2 and prior to diluting for ECB, the PZR boron concentration shall be within ± 50 ppm of the NC System boron concentration. During Modes 3, 4, 5, 6, or No Mode, PZR boron concentration is **NOT** required to be maintained relative to the NC System provided the following conditions are met:

- PZR outflow can be verified
- NC System boron concentration > 100 ppm over the required SDM

2.2.4 With the reactor critical at low power, steam withdrawal from the S/Gs may be used only for auxiliary uses (i.e., warm steam lines, operate air ejectors, supply gland steam, some turbine warming) or for controlling heatup rate via the steam dumping system. Use caution to ensure the steam drain is slow.

2.2.5 Ensure reactivity management guidance outlined in SOMP 01-02 (Reactivity Management) is followed during reactor startup and power operation.

2.2.6 The Shutdown Margin Monitor/Boron Dilution Mitigation System shall be monitored during heatup and/or when reactivity changes cause the count rate to increase. Failure to reset the "ALARM SETPOINT" prior to the count rate exceeding this setpoint will result in a system activation causing borated water from the FWST to be injected into the NC System.

2.2.7 During any planned boron dilution operations in Mode 3, all shutdown banks shall be fully withdrawn. After refueling, the startup will be controlled by procedures PT/0/A/4150/001 (Controlling Procedure for Startup Physics Testing) and PT/0/A/4150/001J (Zero Power Physics Testing).

2.2.8 When changing reactor power, refer to Unit One R.O.D Section 2.4 (Fuel Maneuvering Limits) for allowable rate changes.

2.2.9 During a power increase, other indications of reactor power shall be observed along with power range and secondary thermal power indications to aid in determining the reactor power level. Using indications like turbine impulse pressure, CF flow rate , NC loop ΔTs, and others may help in detecting the miscalibration of a nuclear instrument.

2.2.10 Control rods shall **NOT** exceed rod withdrawal limits. Prior to changes in boron concentration, reactor power, or control rod position, refer to Unit One R.O.D Section 2.3 (Temporary Rod Withdrawal Limits).

2.2.11 Two positive reactivity additions shall **NOT** be made simultaneously per NSD 304 (Reactivity Management). {PIP 96-0586}

2.3 NC System heatup rate of 50°F in any one hour period is the heatup rate limit for normal operation. Under abnormal or emergency conditions, the Tech Spec NC System heatup limit of 60°F in any one hour period shall **NOT** be exceeded.

2.4 It is recommended that the Heatup rate of the PZR **NOT** exceed 80°F in any one hour period. SLC 16.5-4 heatup limit of 100°F in any one hour period shall **NOT** be exceeded.

2.5 During heatup in Mode 3 it is recommended that the ΔT between the PZR and the NC loops be maintained approximately 100°F to provide adequate subcooling while minimizing PZR and spray fluid ΔT.

2.6 If the temperature difference between the PZR and the spray fluid is greater than 260°F, it is recommended that spray **NOT** be initiated. A ΔT of 320°F shall **NOT** be exceeded. The following control room indications may be used to determine the ΔT between the PZR steam space and the PZR spray fluid:

- OAC C1P1360 (PZR STM TEMP - PZR SPRAY A TEMP D/T)
- OAC C1P1361 (PZR STM TEMP - PZR SPRAY B TEMP D/T)
- OAC C1P1362 (PZR STM TEMP - HX Charging TEMP D/T)
- OAC C1P1363 (PZR STM TEMP - ND PMP B Discharge TEMP D/T)
- OAC C1P1364 (PZR STM TEMP - ND PMP A Discharge TEMP D/T)
- 1NCP5380 (Pressurizer Vapor TEMP) (1MC10)
- 1NCP5390 (PRESS Spray Line Temp Loop A) (1MC10)
- 1NCP5400 (PRESS Spray Line Temp Loop B) (1MC10)
- 1NVP5100 (Regen HX Chrg TEMP) (1MC5)
- 1NDCR5070 (ND HX 1B Inlet & Outlet TEMP) (1MC7)
- 1NDCR5060 (ND HX 1A Inlet & Outlet TEMP) (1MC7)

2.7 Observe the limitations of TS Table 3.4.12-1 (Reactor Coolant Pump Operating Restrictions For Low Temperature Overpressure Protection) for NC pump operation during LTOP conditions.

2.8 It is recommended that the NC System temperature **NOT** exceed 160°F until at least one NC pump is in service during solid operation of the NC System.

2.9 Whenever there is a thermal power change greater than or equal to 15% rated thermal power within a one hour period (OAC point C1P2375 (Max Thermal Power Change in Last 60 Min)):

- Notify Chemistry to take an isotopic analysis for iodine within 2 to 6 hours following the last power change that is greater than or equal to 15% rated thermal power within a one hour period. (TS SR 3.4.16.2)

- When thermal power has stabilized, notify Radiation Protection to sample and analyze gaseous effluents. (S.L.C. 16.11-6)

2.10 This procedure may be entered and exited at various points. To avoid possible omission of valid steps, all procedure steps shall be signed off or indicated as **NOT** applicable.

2.11 When manually operating any motor operated valve, minimize the torque applied to the handwheel.

2.12 After manual operation, maintenance or packing adjustment of any motor operated safety related valve, it shall be cycled electrically to ensure reliable automatic operation.

2.13 It is recommended that S/G reverse purge flow be maintained at all times when the S/Gs are pressurized and CF flow is **NOT** aligned to the main feedwater nozzles. This ensures the main feed containment penetration piping is maintained above brittle fracture temperature of 107°F.

- If the temperature on both sides of the penetration is greater than 107°F during Mode 1, reverse purge flow can be secured, but reverse purge shall be re-established before temperature reaches 107°F (decreasing) to ensure compliance with the commitment to the NRC on 10CFR50 Appendix A GDC51 (temperature greater than 107°F during power operation-Mode 1). The temperature between the feedwater isolation valves and S/Gs shall be greater than 107°F during Mode 1. (C1A0141, C1A0148, C1A0125, C1A0154, C1A0275, C1A0160, C1A0815, C1A0166, OAC Group Display GD OPCFTEMP)
- During Modes 2, 3 and 4 reverse purge can be secured to aid in plant heatup. It is desirable to have reverse purge at all times during plant heatup to prevent a possible delay in entering Mode 1.

2.14 When feeding the S/Gs from a source other than main feedwater, notify the Secondary Chemist of this and specify the feed source so accurate chemistry data may be obtained.

2.15 If the RC System condenser inlet temperature drops to less than or equal to 60°F when the reactor is shutdown or less than or equal to 55°F when the reactor is critical, the RC System shall be aligned as follows:

- One RC pump running (throttled).
- One tower inlet isolated.
- All three riser bypasses open.

2.16 Maintain an outflow on the PZR to minimize PZR thermal stratification. PZR outflow may be confirmed by the following:

- Extra heater capacity energized.
- NC, NV or ND PZR spray indicated by valve positive demand.
- PZR surge line temperature and PZR water space temperatures are approximately equal.
- PZR spray valve for idle NC Pumps closed.

2.17 If situations occur causing PZR liquid space temperature to decrease due to PZR level increase, then the PZR level shall be maintained at the elevated level until PZR liquid space temperature recovers. PZR liquid space temperature is directly affected by PZR level during plant conditions requiring a saturated PZR and cooler NC loop temperatures.

2.18 It is recommended that the NC System and PZR heatup be as linear as possible. Do **NOT** do a step heatup of 25° in 10 minutes, then wait 50 minutes before increasing temperature again.

2.19 If the temperature differential between the PZR and NC loops exceeds 100°F, minimize the cycling of PZR spray or otherwise induced surge line flow.

2.20 To reduce CRDM misstepping due to crud buildup, limit RCCA movement until after all NC Pumps have been started and NC System suspended solids are less than 350 ppb. Maximizing NV letdown prior to Mode 4 (or as soon as possible thereafter) will help clean up the NC System which will reduce stationary gripper delay times. {PIP 98-1200, 99-2054}

2.21 Stroking CF Containment Isolation Valves (CF-33, CF-42, CF-51, CF-60) during heatup may cause them to stick in the closed position during nozzle transfers. To prevent this, it is recommended that these valves **NOT** be cycled unless final feedwater temperature > 250°F and pressure > 1000 psig.

2.22 In accordance with INPO best practices when personnel are accessing areas that could experience significant dose rate changes resulting from increasing power, it is recommended that Operations maintain Reactor Power steady or decreasing.

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Unit Startup

4.2 Operations Pre-Heatup Checklist

4.3 Support Pre-Heatup Checklist

4.4 Operations Mode 4 Checklist

4.5 Support Mode 4 Checklist

4.6 Operations Mode 3 Checklist

4.7 Support Mode 3 Checklist

4.8 Operations Mode 1 & 2 Checklist

4.9 Support Mode 1 & 2 Checklist

4.10 1000 psig Critical Valve Checklist

4.11 Normal Temperature And Pressure Critical Valve Checklist

4.12 Secondary Heatup Checklist

4.13 PZR Spray Bypass Valve Setup

_____ 2.166 Ensure Steps 2.137 - 2.139 have been completed to ensure automatic steam dump control has been established.

NOTE:
1. Control rod withdrawal shall **NOT** exceed the temporary rod withdrawal limits specified in Unit One R.O.D. Section 2.3.
2. Refer to Unit One R.O.D. Section 2.4 for the rate at which reactor power can be changed.
3. The throttling of a S/G bypass reg valve affects the other S/G bypass reg valves. Therefore, SM/CF ΔP needs to be monitored as the unit approaches POAH.
4. If NC boron concentration is greater than 1000 ppmB, T-AVG control may be very sensitive above the POAH due to a positive MTC. Refer to Unit One R.O.D. Section 5.10 for the MTC at the current conditions.
5. When approaching the POAH, a startup rate of < 0.2 dpm is recommended; it is recommended that this rate **NOT** be exceeded until the turbine is placed on line. (SOMP 01-02). (R.M.)

_____ 2.167 Increase reactor power to 1%. (R.M.) Will pull rods to have a positive stable S/U rate

_____ 2.168 Begin reviewing the items listed in Step 2.176 so that Unit 1 will **NOT** enter Mode 1 until all substeps of 2.176 are signed off.

_____ 2.169 **IF** necessary, continue heatup to no load T-AVG (557°F).

_____ 2.170 Increase S/G blowdown flowrate as recommended by Secondary Chemistry for S/G chemistry control and within guidelines of OP/1/A/6250/008 (Steam Generator Blowdown). (R.M.)
Person making recommendation_______________________

_____ 2.171 Coordinate with Chemistry to determine when blowdown flowrate can be subsequently reduced.

Initiating Cue: 1AD-2, C/1, N35 failed to bottom of scale

A. Purpose

- **To verify the proper response in the event of a nuclear instrumentation malfunction.**

B. Symptoms

Case I. Source Range Malfunction

- Indication lost or erratic
- 1AD-2, D/1 "S/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, D/3 "S/R HI FLUX LEVEL AT SHUTDOWN" - LIT
- 1AD-2, D/4 "S/R HI FLUX LEVEL AT SHUTDOWN" - LIT.

Case II. Audio Count Rate Malfunction

- Audible count rate lost.

Case III. Intermediate Range Malfunction

- Indication lost or erratic
- 1AD-2, C/1 "I/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, C/2 "I/R COMPENSATING VOLTAGE FAILURE" - LIT
- 1AD-2, C/3 "I/R HI FLUX LEVEL ROD STOP" - LIT
- S/R failure to re-energize during shutdown.

Case IV. Power Range Malfunction

- Indication lost or erratic
- 1AD-2, A/1 "P/R HI NEUTRON FLUX RATE ALERT" - LIT
- 1AD-2, A/2 "P/R HI NEUTRON FLUX LO SETPOINT ALERT" - LIT
- 1AD-2, A/3 "P/R HI NEUTRON FLUX HI SETPOINT ALERT" - LIT
- 1AD-2, B/3 "COMPARATOR P/R CHANNEL DEVIATION" - LIT
- 1AD-2, B/5 "P/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, E/8 "OVER POWER ROD STOP" - LIT

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
RO __ 1. **Verify reactor power - GREATER THAN 10%.**	__ **Stop any power increase.** Will insert rods to achieve a SUR of 0
RO __ 2. **Verify 1AD-2, C/3 "I/R HI FLUX LEVEL ROD STOP" - DARK.**	__ **Adjust turbine load to maintain T-Avg at T-Ref.**
3. **Identify affected I/R channel:** RO __ • N-35 OR __ • N-36.	

NOTE 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" will actuate in the following step.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 4. **At the affected I/R drawer, perform the following:** __ a. Place the "LEVEL TRIP" switch for affected channel in "BYPASS". __ b. Verify the "LEVEL TRIP BYPASS" light on the affected I/R drawer - LIT.	
BOP __ 5. **Verify the affected I/R channel trip bypass status light (1SI-19) - LIT.**	
BOP __ 6. **Verify 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" - LIT.**	
BOP __ 7. **Ensure the "NIS RECORDER" - ALIGNED TO THE OPERABLE I/R CHANNEL.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 8. BOP **WHEN the operable I/R channel is less than 10^{-10} Amps, THEN ensure S/R channels are reset.**	
__ 9. **Determine and correct cause of I/R malfunction.**	
__ 10. **Ensure compliance with Tech Spec 3.3.1 (Reactor Trip System (RTS) Instrumentation).**	ITEM 4 Condition F
11. **Determine required notifications:**	
__ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency)	None
__ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 12. **Notify Reactor Group Engineer of occurrence.**	

CAUTION **Installing I/R fuses with any P/R channel inoperable or in a tripped condition, may result in a reactor trip on P/R rate trip due to voltage spikes.**

__ 13. **WHEN the affected I/R channel is repaired, THEN ensure IAE returns the channel to service.**

__ 14. **Determine long term plant status. RETURN TO procedure in effect.**

END

Initiating Cues:

- 1AD-6, C/1 - C/4, D/1 - D/4, E/1 - E/4 and others

A. Purpose

- **To verify proper response in the event of a loss of Component Cooling.**

B. Symptoms

- **1AD-10, A/1 "KC SURGE TANK A LO-LO LEVEL" - LIT**
- **1AD-10, A/2 "KC SURGE TANK B LO-LO LEVEL" - LIT**
- **1AD-9, F/5 "KC TRAIN A SINGLE PUMP RUNOUT" - LIT**
- **1AD-9, F/6 "KC TRAIN B SINGLE PUMP RUNOUT" - LIT**
- **1AD-9, F/7 "KC TRAIN A TWO PUMP RUNOUT" - LIT**
- **1AD-9, F/8 "KC TRAIN B TWO PUMP RUNOUT" - LIT**
- **Abnormal KC discharge pressure and flow indications**
- **Low flow alarms on components supplied by KC System**
- **High temperature alarms on components supplied by KC System.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

BOP DOES THIS PROCEDURE

CAUTION **Failure to restore NC pump seal cooling via thermal barrier cooling or NV seal injection within 10 minutes will cause damage to the NC pump seals resulting in NC inventory loss.**

__ 1. **Monitor Enclosure 1 (Foldout Page).**

__ 2. **Verify at least one KC pump - ON.**

Perform the following:

__ a. Start at least one KC pump.

b. **IF** no KC pump can be started, **THEN** perform the following:

__ 1) **IF** S/I has actuated on either unit, **THEN GO TO** Step 4.

CAUTION **YD can only supply one Unit's NV pump at a time.**

__ 2) Determine which unit will receive alternate NV pump cooling from YD.

__ 3) **IF** Unit 2 selected to receive YD cooling to 2A NV pump, **THEN GO TO** Step 4.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
	NOTE • NV pumps may be started without regard to cooling water alignment. • Operating NV Pump will reach high temperature conditions in approximately 15 minutes with no cooling water.
	__ 4) Dispatch operator to align YD cooling to NV pump 1A. **REFER TO** Enclosure 4 (Alternate Cooling To NV Pump 1A).
	__ 5) Maximize NV pump run time. **REFER TO** Enclosure 7 (Maximize NV Pump Run Time).
	__ 6) **IF AT ANY TIME** an S/I occurs on either unit, **THEN** notify dispatched operator to realign NV Pump 1A cooling to normal. **REFER TO** Enclosure 4 (Alternate Cooling To NV Pump 1A).
	__ 7) **GO TO** Step 4.
__ 3. **IF AT ANY TIME all KC pumps are lost, THEN RETURN TO STEP 2.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Uncooled letdown may result in loss of NV pumps within a matter of minutes.

4. **Verify the following:**

__ • 1AD-7, F/3 "LETDN HX OUTLET HI TEMP" - DARK.

AND

__ • At least one KC pump - ON.

IF KC flow unavailable to letdown HX, THEN isolate letdown as follows:

a. Ensure the following valves - CLOSED:

__ • 1NV-10A (Letdn Orif 1B Otlt Cont Isol)
__ • 1NV-11A (Letdn Orif 1C Otlt Cont Isol)
__ • 1NV-13A (Letdn Orif 1A Otlt Cont Isol).

__ b. Control charging to stabilize Pzr level at program level while maintaining seal injection flow.

__ c. Ensure 1NV-153A (Letdn Hx Otlt 3-Way Vlv) - ALIGNED TO VCT.

__ d. Ensure 1NV-172A (3-Way Divert To VCT-RHT) - ALIGNED TO RHT.

__ e. Ensure VCT makeup - IN AUTOMATIC

__ f. **WHEN** time and manpower permit, **THEN REFER TO** AP/1/A/5500/012 (Loss Of Charging Or Letdown).

g. **IF AT ANY TIME** the following conditions exist:

__ • VCT level - LESS THAN 23%

OR

__ • PZR level - GREATER THAN 85% **AND** INCREASING.

__ **THEN GO TO** Enclosure 8 (Rx Trip Sequence).

__ h. **GO TO** Step 6.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 5. **IF AT ANY TIME 1AD-7, F/3 "LETDN HX OUTLET HI TEMP" LIT, THEN perform Step 4 RNO.**	
__ 6. **Verify both KC surge tank levels - 50% - 90% AND STABLE.**	__ **GO TO Step 8.**
__ 7. **Start additional KC pump(s) as necessary to supply any KC loads presently in service.**	__ **IF KC pump(s) damaged by fire, THEN notify IAE to repair cables to pumps needed for recovery. REFER TO IP/1/A/3890/027A (Fire Damage Control Procedure).**

CAUTION **A loss of KC cooling to the NC pumps results in a gradual approach to an overheated condition in approximately 10 minutes which will result in shaft seizure.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Verify KC flow to NC pumps as follows:**	**Perform the following:**
__ • 1AD-20, A/1 "KC SUPPLY HDR FLOW TO NCP BRGS LOW" - DARK	a. Ensure the following valves - OPEN:
__ • 1AD-21, A/1 "KC SUPPLY HDR FLOW TO NCP BRGS LOW" - DARK.	__ • 1KC-425A (NC Pumps Ret Hdr Cont Isol)
	__ • 1KC-338B (NC Pumps Sup Hdr Cont Isol)
	__ • 1KC-424B (NC Pumps Ret Hdr Cont Isol).
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. (Continued)

b. **IF AT ANY TIME** any of the following conditions are met:

__ • Time since loss of KC - GREATER THAN 10 MINUTES

OR

__ • Any NC pump trip criteria from Enclosure 1 (Foldout Page) is met

THEN perform the following:

1) **IF** letdown is isolated, **THEN**:

a) Ensure NV pump suction aligned to FWST as follows:

__ (1) 1NV-252A (NV Pumps Suct From FWST) - OPEN

__ (2) 1NV-253B (NV Pumps Suct From FWST) - OPEN

__ (3) 1NV-188A (VCT Otlt Isol) - CLOSED

__ (4) 1NV-189B (VCT Otlt Isol) - CLOSED.

__ b) **WHEN** Reactor is tripped, **THEN** attempt to establish and maintain a slow cooldown as required to maintain PZR level.

__ 2) Ensure steam dumps - IN PRESSURE MODE.

__ 3) Ensure the Reactor - TRIPPED.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. (Continued)

4) **WHEN** reactor power less than 5%, **THEN** perform the following:

__ a) Trip all NC pumps.

__ b) Ensure the normal spray valve associated with the tripped NC pump(s) - IN MANUAL AND CLOSED.

__ 5) Secure any dilutions in progress.

6) **IF** the reactor trip breakers were closed, **THEN** perform one of the following while continuing with this procedure as time and conditions allow:

__ • **IF** above P-11, **THEN GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

OR

__ • **IF** below P-11, **THEN GO TO** AP/1/A/5500/005 (Reactor Trip Or Inadvertent S/I Below P-11).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **Verify KC available as follows:**	
a. Verify the following Train A KC non-essential header isolation valves - OPEN: __ • 1KC-230A (Rx Bldg Non-Ess Hdr Isol) __ • 1KC-3A (Rx Bldg Non-Ess Ret Hdr Isol) __ • 1KC-50A (Aux Bldg Non-Ess Hdr Isol) __ • 1KC-1A (Aux Bldg Non-Ess Ret Hdr Isol).	**NOTE** The KC non-essential header valves can be reopened when the appropriate train's level switch is reset. This should occur between 40% and 48% KC surge tank level. __ a. **WHEN** OAC alarm C1D2215 (KC Train A Low-Low Level Surge Tank Isol) is "NOT ACTUATED", **THEN** ensure the affected valve(s) are open.
b. Verify the following Train B KC non-essential header isolation valves - OPEN: __ • 1KC-228B (Rx Bldg Non-Ess Hdr Isol) __ • 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol) __ • 1KC-53B (Aux Bldg Non-Ess Hdr Isol) __ • 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol).	**NOTE** The KC non-essential header valves can be reopened when the appropriate train's level switch is reset. This should occur between 40% and 48% KC surge tank level. __ b. **WHEN** OAC alarm C1D2214 (KC Train B Low-Low Level Surge Tank Isol) is "NOT ACTUATED", **THEN** ensure the affected valve(s) are open.
__ c. Start additional KC pump(s) as necessary to supply any KC loads presently in service. none will be needed	__ c. **IF** KC pump(s) damaged by fire, **THEN** notify IAE to repair cables to pumps needed for recovery. **REFER TO** IP/1/A/3890/027A (Fire Damage Control Procedure).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Verify KC surge tank levels normal as follows:**	
__ a. Verify both KC surge tank levels - 50% - 90% AND STABLE.	a. Perform the following: 1) Dispatch operator to initiate makeup to surge tank(s) by opening the appropriate valve(s): __ • 1KC-107 (1A KC Surge Tank YM M/U) (AB-601, PP-59, Rm 500) OR __ • 1KC-111 (1B KC Surge Tank YM M/U) (AB-601, PP-59, Rm 500). __ 2) Dispatch operators to locate and isolate KC System leakage. __ 3) **WHEN** the affected KC surge tank(s) level is greater than or equal to 90%, **THEN** notify dispatched operator to secure makeup. __ 4) **GO TO** Step 11.
__ b. **GO TO** Step 14.	
11. **Verify at least one KC surge tank above lo-lo level as follows:** __ • 1AD-10, A/1 "KC SURGE TANK A LO-LO LEVEL" - DARK OR __ • 1AD-10, A/2 "KC SURGE TANK B LO-LO LEVEL" - DARK.	**Perform the following:** a. Verify the following: __ 1) Both Unit 1 RN Essential Headers - PRESSURIZED. __ 2) **IF** only one RN Essential Header is pressurized, **THEN** use it for surge tank makeup. __ 3) **IF AT ANY TIME** the RN Essential Header being used for makeup becomes depressurized, **THEN** notify dispatched operator to secure makeup from RN.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	

NOTE Preference should be given to the surge tank with the highest stable level and available pumps.

__ b. Dispatch operator to makeup to available train of KC from YM and RN. **REFER TO** Enclosure 5 (Surge Tank Makeup).

__ c. Dispatch operators to locate and isolate KC System leakage.

__ d. Notify Chemistry of RN makeup to KC System.

e. **WHEN** the KC surge tank level is above the lo-lo level setpoint, **THEN**:

__ 1) Ensure the KC pumps on the affected train - ON.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

11. (Continued)

NOTE The KC non-essential header valves can be reopened when the appropriate train's level switch is reset. This should occur between 40% and 48% KC surge tank level.

2) Open the non-essential header isolation valves for the affected train as follows:

- Train A:
  - __ 1KC-230A (Rx Bldg Non-Ess Hdr Isol)
  - __ 1KC-3A (Rx Bldg Non-Ess Ret Hdr Isol)
  - __ 1KC-50A (Aux Bldg Non-Ess Hdr Isol)
  - __ 1KC-1A (Aux Bldg Non-Ess Ret Hdr Isol).

OR

- Train B:
  - __ 1KC-228B (Rx Bldg Non-Ess Hdr Isol)
  - __ 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol)
  - __ 1KC-53B (Aux Bldg Non-Ess Hdr Isol)
  - __ 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol).

__ f. **WHEN** one train's non-essential header isolation valves are opened, **THEN** perform Steps 12 through 13.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	
	__ g. **GO TO** Step 14.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 12. **Verify 1AD-10, A/1 "KC SURGE TANK A LO-LO LEVEL" - DARK.**	**Perform the following:** a. Ensure the following valves - CLOSED: __ • 1KC-230A (Rx Bldg Non-Ess Hdr Isol) __ • 1KC-3A (Rx Bldg Non-Ess Ret Hdr Isol) __ • 1KC-50A (Aux Bldg Non-Ess Hdr Isol) __ • 1KC-1A (Aux Bldg Non-Ess Ret Hdr Isol). __ b. Ensure both Train B KC pumps - ON. c. <u>**IF**</u> KC Surge Tank 1A level continues to decrease <u>**OR**</u> is empty, <u>**THEN**</u>: 1) Ensure the following Train B essential equipment - IN SERVICE AS NEEDED: __ • NV Pump 1B __ • NI Pump 1B __ • ND Pump 1B __ • ND Hx 1B __ • CA Pump 1B __ • NS Pump 1B __ • KF Pump 1B. 2) Ensure the following Train A essential equipment - OFF: __ • NV Pump 1A __ • NI Pump 1A __ • ND Pump 1A __ • CA Pump 1A __ • NS Pump 1A __ • KF Pump 1A. __ 3) Ensure both Train A KC pumps - OFF. __ 4) Locate and isolate leak on Train A essential header.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 13. **Verify 1AD-10, A/2 "KC SURGE TANK B LO-LO LEVEL" - DARK.**	**Perform the following:**

a. Ensure the following valves - CLOSED:

- __ 1KC-228B (Rx Bldg Non-Ess Hdr Isol)
- __ 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol)
- __ 1KC-53B (Aux Bldg Non-Ess Hdr Isol)
- __ 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol).

__ b. Ensure both Train A KC pumps - ON.

c. __IF__ KC Surge Tank 1B level continues to decrease **__OR__** is empty, **__THEN__**:

1) Ensure the following Train A essential equipment - IN SERVICE AS NEEDED:

- __ NV Pump 1A
- __ NI Pump 1A
- __ ND Pump 1A
- __ ND Hx 1A
- __ CA Pump 1A
- __ NS Pump 1A
- __ KF Pump 1A.

2) Ensure the following Train B essential equipment - OFF:

- __ NV Pump 1B
- __ NI Pump 1B
- __ ND Pump 1B
- __ CA Pump 1B
- __ NS Pump 1B
- __ KF Pump 1B.

__ 3) Ensure both Train B KC pumps - OFF.

__ 4) Locate and isolate leak on Train B essential header.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 14. **Ensure KC heat exchanger outlet mode switches - PROPERLY ALIGNED.**	If a B train pump is started instead of the available A train pump, these will need to be swapped.
__ 15. **Determine and correct cause of loss of KC.**	
16. **Ensure compliance with appropriate Tech Specs and Selected Licensee Commitments Manual:**	
__ • SLC 16.9-7 (Boration Systems Flow Path - Shutdown)	TS 3.7.7 Condition A
__ • SLC 16.9-8 (Boration Systems Flow Path - Operating)	
__ • SLC 16.9-9 (Boration Systems Pumps - Shutdown)	
__ • SLC 16.9-10 (Boration Systems Charging Pumps - Operating)	
__ • 3.5.2 (ECCS - Operating)	
__ • 3.5.3 (ECCS - Shutdown)	
__ • 3.6.6 (Containment Spray System)	
__ • 3.7.5 (Auxiliary Feedwater (AFW) System)	
__ • 3.7.7 (Component Cooling Water (CCW) System).	
17. **Determine required notifications:**	None
__ • **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
18. **IF KC Hx leak to RN is suspected, THEN perform the following:**	
__ • Notify Radiation Protection that a potential unmonitored release may have occurred.	
__ • Notify Station Management to evaluate a KC Hx to RN leak.	
19. **Verify KC surge tanks level as follows:**	__ **RETURN TO Step 9.**
__ • Greater than 50%	
__ • Stable or increasing.	
20. **WHEN plant conditions permit, THEN:**	
__ • Return KC pumps to normal operation. **REFER TO** OP/1/A/6400/005 (Component Cooling Water System).	
__ • Return NV Pump 1A to normal cooling as applicable. **REFER TO** Enclosure 4 (Alternate Cooling To NV Pump 1A).	
21. **Verify the following:**	**Perform the following:**
__ • 1AD-7, F/3 "LETDN HX OUTLET HI TEMP" - DARK	__ a. **IF** letdown isolated, **THEN** refer to AP/1/A/5500/012 (Loss Of Charging Or Letdown).
__ • 1AD-7, H/3 "VCT HI TEMP" - DARK	__ b. Do not continue in this procedure until Step 21 conditions are met.
__ • Normal letdown - IN SERVICE.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

22. **Ensure VCT and letdown path aligned as follows:**

    a. <u>IF</u> desired to align NV pump suction to VCT, then perform the following:

    1) Open the following valves:

    __ • 1NV-188A (VCT Otlt Isol)

    __ • 1NV-189B (VCT Otlt Isol).

    2) Close the following valves:

    __ • 1NV-252A (NV Pumps Suct From FWST)

    __ • 1NV-253B (NV Pumps Suct From FWST).

    __ b. **<u>WHEN</u>** NV suction aligned to VCT, **<u>THEN</u>** momentarily place 1NV-172A (3-Way Divert To VCT-RHT) to the "VCT" position and return to "AUTO".

    __ c. <u>IF</u> desired to restore letdown flow through the NV demineralizers, **<u>THEN</u>** momentarily place 1NV-153A (Letdn Hx Otlt 3-Way Vlv) to the "DEMIN" position and return to "AUTO".

__ 23. **Determine long term plant status.**
<u>RETURN</u> <u>TO</u> procedure in affect.

<u>END</u>

Duke Energy Catawba Nuclear Station **Loss of Normal Power** **Continuous Use**	Procedure No. **AP/1/A/5500/007** Revision No. **057** Electronic Reference No. **CN005CEB**

PERFORMANCE

Initiating Cue: Multiple electrical alarms on 1AD-11, UV status lights for 1ETB on 1SI-14

A. **Purpose**

- **To verify proper response in the event of a loss of normal power to an essential train.**
- **To verify proper response in the event of a loss of all power to an essential train.**
- **To verify proper response in the event of a loss of all 6.9KV busses.**

B. **Symptoms**

Case I. Loss of Normal Power to an Essential Train:

- D/G starting or running status lights (1SI-15) - LIT
- "BLACKOUT LOAD SEQ ACTUATED TRN A" status light (1SI-14) - LIT
- "BLACKOUT LOAD SEQ ACTUATED TRN B" status light (1SI-14) - LIT.

Case II. Loss of All Power to an Essential Train:

- 1ETA de-energized
- 1ETB de-energized
- Loss of normally operating components supplied from affected bus
- Affected D/G - OFF
- Affected D/G breaker - OPEN
- Affected sequencer not loading essential loads.

NOTE Case III is normally entered from Case I or II. If both 1ETA and 1ETB are powered from Unit 2 and Unit 1 offsite power only is lost then Case III may be entered directly.

Case III. Loss Of All 6.9KV Busses

- Case I (Loss of Normal Power to an Essential Train), Step 12
- Case II (Loss of All Power to an Essential Train), Step 22
- 1AD-11, F/4 "ZONE G LOCKOUT TRIP" - LIT
- Loss Of Switchyard
- Swgr Tie Bkrs Closed status lights (1SI-14) - LIT
- Emergency lighting - LIT
- Numerous transformer trouble annunciators 1AD-11 - LIT
- "DRPI B ON EMERG POWER" (1SI-3) - LIT
- DRPI indication - DARK
- 1SA-5 failed open.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Monitor Enclosure 1 (Foldout Page).**	
2. **Verify the essential loads powered from energized train as follows:**	
__ a. RN pump(s) - IN SERVICE AS NEEDED.	__ a. Manually start pump(s).
__ b. KC pump(s) - IN SERVICE AS NEEDED. If the crew chose to start a B train KC pump during EVENT 3 they will do the RNO of this step.	b. Perform the following: __ 1) Manually start pump(s). __ 2) Ensure KC Hx outlet mode switches - PROPERLY ALIGNED.
__ c. At least one NV pump - ON.	__ c. **REFER TO** AP/1/A/5500/012 (Loss of Charging or Letdown).
__ d. CA pump - ON.	__ d. **IF** CA pump is required to maintain S/G levels, **THEN** manually start pump.
__ e. VC/YC chiller - ON.	__ e. **REFER TO** OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System).
__ 3. **Verify CA Pump #1 - ON.**	__ **IF CA Pump #1 is required to maintain S/G levels, THEN start CA Pump #1.**
__ 4. **Maintain reactor power less than or equal to 100%.**	
__ 5. **Verify D/G on the affected bus - RUNNING.**	__ **GO TO Step 7.**

The D/G IS running, but the output breaker will not close. Also the cooling water valve will not open and the D/G will be secured eventually.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 6. **Verify RN cooling to the affected D/G.**	**Perform the following for the affected D/G:** • D/G 1A: __ a. Depress and hold the D/G "OFF" pushbutton. __ b. Dispatch operator to open 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496). __ c. **WHEN** 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) is open, **THEN** release the D/G "OFF" pushbutton. OR • D/G 1B: __ a. Depress and hold the D/G "OFF" pushbutton. __ b. Dispatch operator to open 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372). __ c. **WHEN** 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) is open, **THEN** release the D/G "OFF" pushbutton.
7. **Dispatch operator with a screwdriver to load shed the affected essential bus as follows:** __ • **REFER TO** Enclosure 8 (Manual Load Shed Of 1ETA) OR __ • **REFER TO** Enclosure 9 (Manual Load Shed Of 1ETB).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 8. **Verify operating RN pump(s) flow - LESS THAN 23,000 GPM.**	__ **REFER TO AP/0/A/5500/020 (Loss of Nuclear Service Water).**
__ 9. **Stop any dilutions in progress.**	
10. **Verify S/I status as follows:**	
__ a. S/I - HAS ACTUATED.	__ a. **GO TO** Step 11.
__ b. **GO TO** Step 12.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. **Verify ND System status as follows:**	
__ a. ND System - ALIGNED IN RESIDUAL HEAT REMOVAL MODE.	__ a. **GO TO** Step 12.
__ b. At least one ND pump - ON.	__ b. **REFER TO** AP/1/A/5500/019 (Loss of Residual Heat Removal System).
__ c. 1AD-11, K/3 "4KV B/O BUS FTA VOLTAGE LO" - DARK.	c. Perform the following: **NOTE** Both ND Hx Bypass valves fail closed on loss of 1LXI (1FTA). 1) **IF** ND Pump 1A is operating in Residual Heat Removal Mode, **THEN** perform the following: __ a) Place the "PWR DISCON FOR 1NI173A" in "THROT". __ b) Throttle 1NI-173A (ND Hdr 1A To Cold Legs C&D) to stabilize NC temperature. __ c) **WHEN** 1AD-11, K/3 "4KV B/O BUS FTA VOLTAGE LO" dark, **THEN** return 1NI-173A to normal alignment. 2) **IF** ND Pump 1B is operating in Residual Heat Removal Mode, **THEN** perform the following: __ a) Place the "PWR DISCON FOR 1NI178B" in "THROT". __ b) Throttle 1NI-178B (ND Hdr 1B To Cold Legs A&B) to stabilize NC temperature. __ c) **WHEN** 1AD-11, K/3 "4KV B/O BUS FTA VOLTAGE LO" dark, **THEN** return 1NI-178B to normal alignment.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 12. **Ensure CA System - RESET.**	
13. **Control S/G levels as follows:**	
__ a. Verify CF flow - MAINTAINING STABLE S/G LEVELS.	a. Perform the following: __ 1) **<u>REFER</u> <u>TO</u>** Enclosure 16 (S/G Level Control). __ 2) **<u>GO</u> <u>TO</u>** Step 14.
__ b. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** CF flow control to S/Gs is lost, **<u>THEN</u>** perform Step 13.	

<u>CAUTION</u> **Battery depletion may occur as early as two hours. Battery depletion results in affected CA control valves failing full open. Failure to take local control of S/G level prior to battery depletion may result in S/G overfill.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ c. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** any vital or auxiliary control channel battery charger has been de-energized for greater than 1 hour, **<u>THEN</u>** dispatch operators to locally control affected CA flow path. **<u>REFER</u> <u>TO</u>** Enclosure 16 (S/G Level Control).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 14. **Verify "C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT.**	**To prevent overpressurizing the condenser perform the following:** a. Dispatch operator to close the following valves: __ • 1SA-22 (Main Steam To CSAE) (TB1-594, 1M-32) __ • 1SA-27 (Aux Steam To CSAE) (TB-594, 1M-27). b. **WHEN** notified by dispatched operator that the SA supplies are closed, **THEN** perform the following: __ 1) Open "COND A-B-C VAC BKR VLVS". 2) **IF** power not available to operate "COND A-B-C VAC BKR VLVS", **THEN** dispatch operator to open the following valves: __ • 1CM-368 (1A Main Cond Shell Vacuum Bkr) (TB-600,1F-26) (Ladder needed) __ • 1CM-369 (1B Main Cond Shell Vacuum Bkr) (TB-603, 1F-24) (Ladder needed) __ • 1CM-370 (1C Main Cond Shell Vacuum Bkr) (TB-605, 1F-22) (Ladder needed). __ 3) **WHEN** time permits, **THEN** dispatch operator to complete breaking condenser vacuum. **REFER TO** OP/1/B/6300/006 (Main Vacuum). __ 4) Shutdown steam seals. **REFER TO** OP/1/B/6300/005 (Steam Seal System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **Control charging as follows:**	
__ a. Maintain charging flow less than 180 GPM.	
__ b. Adjust charging flow as necessary to maintain Pzr level in program band.	
16. **Control letdown as follows:**	
__ a. Verify normal letdown - IN SERVICE.	a. Perform the following: __ 1) Attempt to restore letdown. **REFER TO** AP/1/A/5500/012 (Loss of Charging or Letdown). __ 2) **WHEN** normal letdown has been established, **THEN** place additional letdown orifice in service as necessary to control Pzr level. __ 3) **GO TO** Step 17.
__ b. Place additional letdown orifice in service as necessary to control Pzr level.	
__ 17. **Determine and correct cause of blackout.**	
__ 18. **Verify VI pressure - GREATER THAN 85 PSIG AND STABLE.**	__ **REFER TO AP/0/A/5500/022 (Loss of Instrument Air).**
__ 19. **IF spent fuel pool instrumentation is failed low, THEN dispatch operator to monitor spent fuel pool conditions. REFER TO Enclosure 14 (Spent Fuel Pool Monitoring).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
20. **Ensure compliance with appropriate Tech Specs:** __ • 3.4.9 (Pressurizer) __ • 3.8.1 (AC Sources - Operating) __ • 3.8.2 (AC Sources - Shutdown) __ • 3.8.4 (DC Sources - Operating) __ • 3.8.5 (DC Sources - Shutdown) __ • 3.8.7 (Inverters - Operating) __ • 3.8.8 (Inverters - Shutdown) __ • 3.8.9 (Distribution Systems - Operating) __ • 3.8.10 (Distribution Systems - Shutdown).	TS 3.8.1 Condition A, B, D, and F TS 3.8.9 Condition A TS 3.7.8 Condition A
21. **Determine required notifications:** __ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency) __ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 22. **Verify 6.9KV busses - ENERGIZED.**	__ **WHEN time and manpower permit, THEN perform applicable portions of Case III. REFER TO Case III (Loss Of All 6.9KV Busses).**
23. **Do not continue in this procedure until the following are satisfied:** __ • The status of all lockout targets have been determined __ • Station management has approved power restoration to the affected bus.	NEXT EVENT

Initiating Cue: 1AD-13, A/7, F/5

A. Purpose

- **To verify proper response in the event of a Steam Generator tube leak within the capability of the normal charging system while in Modes 1, 2 and 3.**
- **To verify proper response in the event of a reactor coolant leak within the capability of the normal charging system.**

B. Symptoms

Case I. Steam Generator Tube Leak:

- Any of the following EMF indications - INCREASING OR IN ALARM:
  - 1EMF-33 (Condenser Air Ejector Exhaust)
  - 1EMF-71 (S/G A Leakage)
  - 1EMF-72 (S/G B Leakage)
  - 1EMF-73 (S/G C Leakage)
  - 1EMF-74 (S/G D Leakage)
  - 1EMF-26 (Steam Line 1A)
  - 1EMF-27 (Steam Line 1B)
  - 1EMF-28 (Steam Line 1C)
  - 1EMF-29 (Steam Line 1D)
  - 1EMF-36 (Unit Vent Gas).
- Any of the following primary to secondary leak rate computer points:
  - C1P0187 (Estimated Total Pri To Sec Leakrate)
  - C1P0189 (Pri To Sec Leakrate 15 Min Running Avg).
- Charging flow indication - INCREASING
- Pzr level - DECREASING
- Pzr pressure - DECREASING
- CF flowrate and CF flow regulating valve position indication - DECREASING ON ANY S/G
- Chemistry Calculation.

Case II. NC System Leak:

- Charging flow indication - INCREASING
- Pzr level - DECREASING
- Pzr pressure - DECREASING
- Any of the following EMF indications - INCREASING OR IN ALARM:
  - EMF-41 (Aux Bldg Ventilation)
  - 1EMF-38 (Containment Particulate)
  - 1EMF-39 (Containment Gas)
  - 1EMF-46A (Component Cooling Train A)
  - 1EMF-46B (Component Cooling Train B).
- Containment floor and equipment sump level(s) - INCREASING.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions BOP DOES THESE ACTIONS	
__ 1. **Monitor Enclosure 2 (Case II NC System Leak Foldout Page).**	
__ 2. **Verify Unit 1 - IN MODE 5.**	__ **GO TO Step 4.**
3. **Ensure containment integrity as required:**	
__ a. **IF** leak known to be in Auxiliary Building, **THEN GO TO** Step 4.	
__ b. Initiate Containment Closure.	
__ c. Initiate additional action as required to ensure Containment Equipment Hatch - CLOSED.	
__ d. Initiate additional action as required to ensure Containment Air Locks - CLOSED.	
__ 4. **Verify Pzr level - STABLE OR INCREASING.**	**Perform the following:**
	__ a. Maintain charging flow less than 180 GPM.
	__ b. Manually throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to stabilize Pzr level.
PZR level will still be decreasing and the crew will have to reduce letdown.	__ c. **IF** Pzr level is stable **OR** increasing, **THEN GO TO** Step 5.
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

d. **<u>IF</u>** Pzr level continues to decrease, **<u>THEN</u>**:

1) Reduce letdown flow to 45 GPM as follows:

a) **<u>IF</u>** 1NV-10A (Letdn Orif 1B Otlt Cont Isol) open, **<u>THEN</u>** perform the following:

__ (1) Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ (2) Throttle 1NV-849 (Letdn Flow Var Orif Ctrl) for 45 GPM letdown flow.

__ (3) **<u>WHEN</u>** 45 GPM letdown flow established, **<u>THEN</u>** adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ (4) **<u>WHEN</u>** letdown pressure is stable at 350 PSIG, **<u>THEN</u>** place 1NV-148 (Letdn Press Control) in auto.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

b) **IF** 1NV-13A (Letdn Orif 1A Otlt Cont Isol) open, **THEN** perform the following:

__ (1) Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 150 - 200 PSIG.

__ (2) Open 1NV-11A (Letdn Orif 1C Otlt Cont Isol).

__ (3) Adjust 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ (4) Close 1NV-13A (Letdn Orif 1A Otlt Cont Isol).

__ (5) Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ (6) **WHEN** letdown pressure is stable at 350 PSIG, **THEN** place 1NV-148 (Letdn Press Control) in auto.

2) **IF** Pzr level continues to decrease, **THEN** ensure the following valves closed:

__ • 1NV-10A (Letdn Orif 1B Otlt Cont Isol)

__ • 1NV-11A (Letdn Orif 1C Otlt Cont Isol)

__ • 1NV-13A (Letdn Orif 1A Otlt Cont Isol).

__ 3) **IF** Pzr level is stable **OR** increasing, **THEN GO TO** Step 5.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
	4) **IF** Pzr level continues to decrease **OR** cannot be maintained greater than 4%, **THEN**: a) **IF** in Modes 1, 2, or 3 with CLAs in service, **THEN** perform the following: __ (1) Manually trip the reactor. __ (2) **WHEN** reactor trip verified, **THEN** manually initiate S/I. __ (3) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection). __ b) **IF** in Mode 3 with CLAs isolated **OR** in Mode 4, **THEN GO TO** AP/1/A/5500/027 (Shutdown LOCA). __ c) **IF** in Mode 5, **THEN GO TO** AP/1/A/5500/019 (Loss of Residual Heat Removal System).
__ 5. **IF AT ANY TIME Pzr level decreases in an uncontrolled manner or cannot be maintained greater than 4%, THEN GO TO Step 4.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 6. **Verify Pzr/NC pressure - TRENDING TO OR STABLE AT DESIRED PRESSURE.**	**Perform the following:** __ a. **IF** Pzr level is greater than 17%, **THEN** ensure Pzr heaters on as required. __ b. Ensure Pzr spray valves - CLOSED. __ c. Ensure all Pzr PORVs - CLOSED. __ d. **IF** any Pzr PORV is leaking or has not reseated, **THEN** close its associated Pzr PORV isolation valve. e. **IF** Pzr/NC pressure is decreasing in an uncontrolled manner, **THEN**: 1) **IF** in Mode 1, 2 or 3 with CLAs in service, **THEN**: __ a) Manually initiate S/I. __ b) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection). __ 2) **IF** in Mode 3 with CLAs isolated **OR** in Mode 4, **THEN GO TO** AP/1/A/5500/027 (Shutdown LOCA). __ 3) **IF** in Mode 5, **THEN GO TO** AP/1/A/5500/019 (Loss of Residual Heat Removal System).
__ 7. **Dispatch operator(s) to locate and isolate NC System leak.**	
__ 8. **Verify proper VC/YC system operation. REFER TO Enclosure 14 (Control Room Ventilation System Verification).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **IF AT ANY TIME 1AD-7, I/1 "VCT LO LVL" alarm - LIT, THEN align NV pump suction to the FWST as follows:**	This wont happen.

__ a. Open 1NV-252A (NV Pumps Suct From FWST).

__ b. Open 1NV-253B (NV Pumps Suct From FWST).

__ c. Close 1NV-188A (VCT Otlt Isol).

__ d. Close 1NV-189B (VCT Otlt Isol).

e. **IF** Reactor trip breakers are closed, **THEN** perform the following:

__ 1) Continue concurrent use of this procedure for the NC leak.

__ 2) Manually trip the reactor.

__ 3) **IF** Unit was in Mode 3 below 1955 PSIG, **THEN GO TO** AP/1/A/5500/005 (Reactor Trip or Inadvertent S/I Below P-11).

__ 4) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. **Determine NC leak rate by any of the following methods:**

__ • Compare charging flow and letdown flow

Leak is approximately 60 gpm

OR

__ • Monitor OAC NV Graphic

OR

__ • Initiate OAC Program "NSNCLEAK"

OR

__ • Monitor OAC point EROPLEAK

OR

__ • Monitor OAC point C1P0976 (Gross NC System Leak Rate, Ten Min Run Avg).

11. **Ensure compliance with appropriate Tech Specs and Selected Licensee Commitments Manual:**

TS 3.4.13 Condition A
TS 3.6.4 Condition A
SLC 16.7-9 Condition A

__ • 3.4.4 RCS Loops-Modes 1 and 2

__ • 3.4.5 RCS Loops-Mode 3

__ • 3.4.6 RCS Loops-Mode 4

__ • 3.4.12 Low Temperature Overpressure Protection (LTOP) System

__ • 3.4.13 (RCS Operational Leakage)

__ • 3.4.14 (RCS Pressure Isolation Valve (PIV) Leakage)

__ • 3.5.5 (Seal Injection Flow)

EVENT 6 can begin here.

__ • 3.6.3 Containment Isolation Valves

__ • 3.7.17 (Secondary Specific Activity)

__ • SLC 16.7-9 (Standby Shutdown System).

Initiating cue: 1AD-1 A/6 and 1AD-5 A/1, A/4

A. Purpose

- **To verify proper response to a loss of feedwater supply to the S/Gs.**
- **To verify proper response to a loss of normal supply of auxiliary feedwater.**

B. Symptoms

Case I. Loss Of CF Supply To S/Gs:

- CFPT A and B - TRIPPED
- 1AD-3, C/6 "CF ISOL TRN A" - LIT
- 1AD-3, D/6 "CF ISOL TRN B" - LIT
- Any S/G lo level alert alarm on 1AD-4 - LIT
- Any S/G flow mismatch lo CF flow alarm on 1AD-4 - LIT.

Case II. Loss Of Normal CA Supply:

- Any CA Auto Start
- 1AD-5, H/4 "CACST LO LEVEL" - LIT
- 1AD-8, B/1 "UST LO LEVEL" - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Verify reactor power - LESS THAN 5%.**

RO

IF AT ANY TIME all CF supply to S/G(s) lost, THEN perform the following:

__ a. Manually trip reactor.

__ b. GO TO EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

__ 2. **Verify all S/G hi-hi level alert alarms (1AD-4) - DARK.**

RO

IF 2/4 S/G N/R levels on any one S/G are greater than 83%, THEN:

__ a. Verify all Feedwater Isolation status lights (1SI-5) - LIT.

b. IF any Feedwater Isolation status light is not lit, THEN:

__ 1) Manually initiate Feedwater Isolation.

__ 2) IF proper status light indication is not obtained, THEN manually close affected valve(s).

__ 3. **Verify total CA flow - GREATER THAN 450 GPM.**

BOP

CAPT #1 should have been secured already and since B train has no power and A CA pump autostart is failed, they will start A CA manually.

Perform the following:

__ a. Manually start CA pumps.

__ b. Manually align CA valve(s) as required to establish flow.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Control S/G levels as follows:**	
RO __ a. Verify all S/G N/R levels - GREATER THAN 11%.	__ a. Maintain total feed flow greater than 450 GPM to intact S/Gs until at least one S/G N/R level greater than 11%.
__ b. **<u>WHEN</u>** at least one S/G N/R level is greater than 11%, **<u>THEN</u>** throttle feed flow to maintain all S/G N/R levels between 11% - 50%.	
__ 5. **<u>REFER TO</u> Case II (Loss of Normal CA Supply).**	NOT REQUIRED
6. **Ensure compliance with appropriate Tech Specs and SLCs:** __ • 3.3.2 (ESFAS Instrumentation) __ • 3.7.5 (Auxiliary Feedwater System) __ • SLC 16-7.1 (AMSAC).	TS 3.3.2 Item 6a, Condition H
7. **Determine required notifications:** __ • **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency) __ • **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 8. **Determine and correct cause of loss of CF supply.**	
__ 9. **Verify at least one CF Pump - ON.**	__ **Perform a hot restart of one CF Pump. <u>REFER TO</u> OP/1/A/6250/001 (Condensate and Feedwater System).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 10. **Determine long term plant status.** **RETURN TO procedure in effect.**	

END

MAJOR EVENT START

Initiating cue: 1AD-3, A/1

A. Purpose

This procedure provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of all Reactor Trips and S/I above P-11, valid S/I below P-11 and to assess plant conditions, and to identify the appropriate recovery procedure.

B. **Symptoms or Entry Conditions**

1. **The following conditions are symptoms that require a Reactor Trip:**

- 1 of 2 S/R channels - GREATER THAN 10^5 CPS WHILE BELOW P-6
- 1 of 2 I/R channels - GREATER THAN 25% FULL POWER AMPS EQUIVALENT WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 25% FULL POWER WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 109% FULL POWER
- 2 of 4 P/R channels - +5% FULL POWER IN 2 SECONDS
- 2 of 4 loop ΔTs - GREATER THAN THE OPΔT SETPOINT
- 2 of 4 loop ΔTs - GREATER THAN THE OTΔT SETPOINT
- 2 of 4 Pzr pressure channels - GREATER THAN 2385 PSIG
- 2 of 4 Pzr pressure channels - LESS THAN 1945 PSIG WHILE ABOVE P-7
- 2 of 3 Pzr level channels - GREATER THAN 92% WHILE ABOVE P-7
- 2 of 4 S/G N/R level channels on 1 of 4 S/Gs - LESS THAN LO-LO SETPOINT
- 2 of 4 NC pump buses - LESS THAN 77% OF NORMAL VOLTAGE (5082 VOLTS) WHILE ABOVE P-7
- 2 of 4 NC pump buses - LESS THAN 56 HERTZ WHILE ABOVE P-7
- 2 of 3 NC flow channels on 2 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-7 AND BELOW P-8
- 2 of 3 NC flow channels on 1 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-8
- 4 of 4 turbine stop valves - CLOSED WHILE ABOVE P-9
- 2 of 4 turbine stop valves EHC pressure - LESS THAN 550 PSIG WHILE ABOVE P-9
- 1 of 2 S/I trains - ACTUATED
- 2 of 2 SSPS trains - GENERAL WARNING ALARM.

2. **The following are symptoms of a Reactor Trip:**
   - Any Reactor Trip annunciator - LIT
   - Neutron level - RAPIDLY DECREASING
   - Rod bottom lights - LIT.

3. **The following are symptoms that require a Reactor Trip and S/I:**
   - 2 of 4 Pzr pressure channels - LESS THAN 1845 PSIG
   - 2 of 3 containment pressure channels - GREATER THAN 1.2 PSIG.

4. **The following are symptoms of a Reactor Trip and S/I:**
   - Any S/I Reactor Trip annunciator - LIT
   - NV, NI, and ND pumps - ON
   - "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT
   - E/S Load Sequencer Actuated status lights (1SI-14) - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions RO DOES THIS PAGE	
__ 1. **Monitor Enclosure 1 (Foldout Page).**	
2. **Verify Reactor Trip:**	**Perform the following:**
__ • All rod bottom lights - LIT	__ a. Manually trip reactor.
__ • All reactor trip and bypass breakers - OPEN	b. **IF** reactor will not trip, **THEN** concurrently:
__ • I/R amps - DECREASING.	__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
	__ • **GO TO** EP/1/A/5000/FR-S.1 (Response To Nuclear Power Generation/ATWS).
3. **Verify Turbine Trip:**	**Perform the following:**
__ • All turbine stop valves - CLOSED	__ a. Manually trip the turbine.
	b. **IF** turbine will not trip, **THEN**:
	__ 1) Depress the "MANUAL" pushbutton on the turbine control panel.
	__ 2) Rapidly unload turbine by simultaneously depressing the "CONTROL VALVE LOWER" and "FAST RATE" pushbuttons.
	3) **IF** turbine will not runback, **THEN** close:
	__ • All MSIVs
	__ • All MSIV bypass valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Verify 1ETA and 1ETB - ENERGIZED.**	**Perform the following:**
BOP DOES THIS PAGE	__ a. **IF** 1ETA **AND** 1ETB are de-energized, **THEN GO TO** EP/1/A/5000/ECA-0.0 (Loss Of All AC Power).
1ETB is NOT energized	__ b. **WHEN** time allows, **THEN** attempt to restore power to de-energized switchgear while continuing with this procedure. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power).
5. **Verify S/I is actuated:**	
__ a. "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT.	a. Perform the following: 1) Verify conditions requiring S/I: __ • Pzr pressure - LESS THAN 1845 PSIG OR __ • Containment pressure - GREATER THAN 1.2 PSIG. __ 2) **IF** S/I is required, **THEN** manually initiate S/I. 3) **IF** S/I is not required, **THEN** concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/ES-0.1 (Reactor Trip Response).
__ b. Both E/S load sequencer actuated status lights (1SI-14) - LIT.	__ b. Manually initiate S/I.
__ 6. **Announce "Unit 1 Safety Injection".**	They may choose to manually initiate S/I but the B sequencer breaker was opened previously and this step will not accomplish anything.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Determine required notifications:**	
__ • **<u>REFER</u> <u>TO</u>** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **<u>REFER</u> <u>TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
RO 8. **Verify all Feedwater Isolation status lights (1SI-5) - LIT.**	**Perform the following:** __ a. Manually initiate Feedwater Isolation. __ b. **<u>IF</u>** proper status light indication is not obtained, **<u>THEN</u>** manually close valves.
BOP 9. **Verify Phase A Containment Isolation status as follows:**	
__ a. Phase A "RESET" lights - DARK.	__ a. Manually initiate Phase A Isolation.
__ b. Monitor Light Panel Group 5 St lights - LIT.	__ b. Manually align valves. 1BB-56A has failed to close and B train BB valve is not closed due to loss of power, so there is a direct path from containment.
BOP 10. **Verify proper Phase B actuation as follows:**	
__ a. Containment pressure - HAS REMAINED LESS THAN 3 PSIG.	a. Perform the following: **<u>NOTE</u>** This time may be used later to determine when to align ND Aux spray. __ 1) Record approximate time of reactor trip. ____________________ __ 2) Verify NS pumps - INDICATING FLOW. __ 3) **<u>IF</u>** flow is not indicated, **<u>THEN</u>** manually initiate Phase B Isolation for affected train(s). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. (Continued)

4) Verify Phase B Isolation has actuated as follows:

__ a) Phase B Isolation "RESET" lights - DARK.

__ b) **IF** Phase B Isolation "RESET" lights are lit, **THEN** manually initiate Phase B Isolation.

c) Verify following monitor light panel lights - LIT:

__ • Group 1 Sp lights

__ • Group 5 Sp lights

__ • Group 5 St lights L/11 and L/12.

__ d) **IF** monitor light panel not in correct alignment, **THEN** ensure correct alignment.

e) **IF** NS pump(s) did not start, **THEN** perform the following for the affected train(s):

__ (1) Reset ECCS.

__ (2) Reset D/G load sequencer.

__ (3) Manually start affected NS pump.

__ (4) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.

__ 5) Stop all NC pumps.

__ 6) Maintain seal injection flow.

__ 7) Energize H2 igniters.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	8) Dispatch operator to perform the following: __ a) Secure all ice condenser air handling units. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units). __ b) Place containment H_2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control Systems). __ 9) **WHEN** 9 minutes has elapsed, **THEN** verify proper VX system operation. **REFER TO** Enclosure 7 (VX System Operation). __ 10) **GO TO** Step 11.
BOP __ b. **IF AT ANY TIME** containment pressure exceeds 3 PSIG while in this procedure, **THEN** perform Step 10.a.	
11. **Verify proper CA pump status as follows:**	
__ a. Motor driven CA pumps - ON. No B train power so should not go to RNO.	a. Perform the following for the affected train(s): __ 1) Reset ECCS. __ 2) Reset D/G load sequencer. __ 3) Manually start affected motor driven CA pump. __ 4) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
__ b. 3 S/G N/R levels - GREATER THAN 11%.	__ b. Ensure CA Pump #1 - RUNNING.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Verify all of the following S/I pumps - ON:** BOP __ • NV pumps __ • ND pumps __ • NI pumps. 1A ND pump must be manually started. CRITICAL TASK!	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. __ d. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.
__ 13. **Verify all KC pumps - ON.** BOP No B train power so should not go to RNO.	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. __ d. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.
BOP __ 14. **Verify all Unit 1 and Unit 2 RN pumps - ON.** No B train power so should not go to RNO.	**Perform the following:** __ a. **<u>IF</u>** any Unit 2 RN pump is off, **<u>THEN</u>** manually start affected pump(s). b. **<u>IF</u>** any Unit 1 RN pump is off, **<u>THEN</u>** perform the following for affected train(s): __ 1) Reset ECCS. __ 2) Reset D/G load sequencer. __ 3) Manually start affected pump. __ 4) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.
BOP 15. **Verify proper ventilation systems operation as follows:** __ • **<u>REFER TO</u>** Enclosure 2 (Ventilation System Verification). __ • Notify Unit 2 operator to perform Enclosure 3 (Opposite Unit Ventilation Verification).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 16. **Verify all S/G pressures - GREATER THAN 775 PSIG.** RO	**Perform the following:** a. Verify the following valves - CLOSED: __ • All MSIVs __ • All MSIV bypass valves __ • All S/G PORVs. b. **IF** any valve is open, **THEN**: __ 1) Manually initiate Main Steam Isolation. __ 2) **IF** any valve is still open, **THEN** manually close valve.
17. **Verify proper S/I flow as follows:** BOP	
__ a. "NV S/I FLOW" - INDICATING FLOW.	__ a. Manually start NV pump(s) and align valves.
__ b. NC pressure - LESS THAN 1620 PSIG.	b. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) **IF** ND pump miniflow valve(s) cannot be opened, **THEN** perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on. __ e) **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart the ND pump. __ 3) **GO TO** Step 18.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
__ c. NI pumps - INDICATING FLOW.	__ c. Manually start NI pump(s) and align valves.
BOP __ d. NC pressure - LESS THAN 285 PSIG.	d. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) **IF** the ND pump miniflow valve(s) cannot be opened, **THEN** perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on. __ e) **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart the ND pump. __ 3) **GO TO** Step 18.
__ e. ND pumps - INDICATING FLOW TO C-LEGS.	__ e. Manually start ND pump(s) and align valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
18. **Control S/G levels as follows:**	
BOP __ a. Verify total CA flow - GREATER THAN 450 GPM.	a. Perform the following: __ 1) **IF** N/R level in all S/Gs is less than 11% (29% ACC), **THEN** manually start CA pumps and ensure correct valve alignment. 2) **IF** N/R level in all S/Gs is less than 11% (29% ACC) **AND** feed flow greater than 450 GPM cannot be established, **THEN** concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink).
__ b. **WHEN** at least one S/G N/R level is greater than 11% (29% ACC), **THEN** throttle feed flow to maintain all S/G N/R levels between 11% (29% ACC) and 50%.	
BOP __ 19. **Verify all CA isolation valves - OPEN.**	__ **Manually open valve(s).**
__ 20. BOP **Verify S/I equipment status based on monitor light panel - IN PROPER ALIGNMENT.**	__ **Manually align equipment.**

NOTE Enclosure 4 (NC Temperature Control) shall remain in effect until subsequent procedures provide alternative NC temperature control guidance.

__ 21. RO **Control NC temperature. REFER TO Enclosure 4 (NC Temperature Control).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

22. **Verify Pzr PORV and Pzr spray valve status as follows:**

BOP

__ a. All Pzr PORVs - CLOSED.

a. **IF** Pzr pressure is less than 2315 PSIG, **THEN**:

__ 1) Manually close Pzr PORV(s).

__ 2) **IF** any Pzr PORV cannot be closed, **THEN** close its isolation valve.

3) **IF** any Pzr PORV cannot be closed **OR** isolated, **THEN** perform the following:

__ a) Energize H_2 igniters.

b) Dispatch operator to perform the following:

__ (1) Secure all ice condenser air handling units. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units).

__ (2) Place containment H2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control Systems).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. (Continued)	
	c) **IF** both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **THEN** start one VX fan. **REFER TO** Enclosure 5 (VX Fan Manual Start).
	d) Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
BOP __ b. Normal Pzr spray valves - CLOSED.	b. **IF** Pzr pressure is less than 2260 PSIG, **THEN**: __ 1) Manually close spray valve(s). 2) **IF** spray valve(s) cannot be closed, **THEN**: __ a) Stop NC pumps 1A and 1B. __ b) **IF** NC pressure continues to decrease, **THEN** stop third NC pump as required.
__ c. At least one Pzr PORV isolation valve - OPEN.	__ c. **IF** power is available, **THEN** open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
RO __ 23. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**	**IF any NV OR NI pump is on, THEN:** __ a. Ensure all NC pumps - OFF. __ b. Maintain seal injection flow.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. **Verify main steamlines are intact as follows:** RO __ • All S/G pressures - STABLE OR INCREASING __ • ALL S/Gs - PRESSURIZED.	**IF pressure in any S/G is decreasing in an uncontrolled manner OR any S/G is depressurized, THEN perform the following:** a. IF both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **THEN** manually start one VX fan. **REFER TO** Enclosure 5 (VX Fan Manual Start). b. Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).
25. **Verify S/G tubes are intact as follows:** • Verify the following EMF trip 1 lights - DARK: __ • 1EMF-33 (Condenser Air Ejector Exhaust) __ • 1EMF-26 (Steamline 1A) __ • 1EMF-27 (Steamline 1B) __ • 1EMF-28 (Steamline 1C) __ • 1EMF-29 (Steamline 1D). __ • All S/G levels - STABLE OR INCREASING IN A CONTROLLED MANNER.	**IF any EMF trip 1 light is lit OR any S/G level is increasing in an uncontrolled manner, THEN concurrently:** __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. **Verify NC System is intact as follows:**	
a. Verify the following NC pump thermal barrier alarms - DARK: __ • 1AD-6, E/1, "NCP A THERMAL BARRIER KC OUTLET HI/LO FLOW" __ • 1AD-6, E/2, "NCP B THERMAL BARRIER KC OUTLET HI/LO FLOW" __ • 1AD-6, E/3, "NCP C THERMAL BARRIER KC OUTLET HI/LO FLOW" __ • 1AD-6, E/4, "NCP D THERMAL BARRIER KC OUTLET HI/LO FLOW".	a. Perform the following: 1) Ensure the valve for the affected NC pump(s) - CLOSED: __ • 1KC-394A (NC Pump 1A Therm Bar Otlt) __ • 1KC-364B (NC Pump 1B Therm Bar Otlt) __ • 1KC-345A (NC Pump 1C Therm Bar Otlt) __ • 1KC-413B (NC Pump 1D Therm Bar Otlt). 2) **IF** the valve for the affected NC pump will not close, **THEN** perform the following: __ a) Trip all NC pumps. (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

26. (Continued)

b) Perform the following:

__ (1) Dispatch operator with radio to standby at 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419) (Ladder needed).

__ (2) Close 1KC-425A (NC Pumps Ret Hdr Cont Isol) from Control Room.

__ (3) **IF** 1KC-425A (NC Pumps Ret Hdr Cont Isol) will not close completely from Control Room, **THEN** have operator locally close 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419).

__ (4) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) has been closed, **THEN** close 1KC-424B (NC Pumps Ret Hdr Cont Isol).

__ (5) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) is closed, **THEN** notify the dispatched operator to return.

(6) Close the following valves:

- __ 1KC-338B (NC Pumps Sup Hdr Cont Isol)
- __ 1KC-430A (Rx Bldg Drn Hdr Cont Isol)
- __ 1KC-429B (Rx Bldg Drn Hdr Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. (Continued)	
b. Verify NC System is intact as follows:	b. Perform the following:
__ • Containment pressure - LESS THAN 1 PSIG.	__ 1) Energize H2 igniters.
__ • **IF** normal off-site power is available, **THEN** verify containment pressure less than 0.3 PSIG.	2) Dispatch operator to perform the following: __ a) Secure all ice condenser air handling units. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units).
• Containment high range EMFs - LESS THAN 3 R/HR: __ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	__ b) Place containment H2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control Systems).
• Containment EMF trip 1 lights - DARK: __ • 1EMF-38 (Containment Particulate) __ • 1EMF-39 (Containment Gas)	3) **IF** both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG
__ • Containment sump level - STABLE.	__ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **THEN** manually start one VX fan. **REFER TO** Enclosure 5 (VX Fan Manual Start). 4) Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
27. **Verify S/I termination criteria as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **GO TO** Step 28.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
b. Verify secondary heat sink as follows:	__ b. **GO TO** Step 28.
__ • N/R level in at least one S/G - GREATER THAN 11%	
OR	
__ • Total feed flow to S/Gs - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR INCREASING.	__ c. **GO TO** Step 28.
__ d. Pzr level - GREATER THAN 11%.	d. Perform the following:
	__ 1) **IF** NC pressure is increasing **AND** normal Pzr spray is available, **THEN** attempt to stabilize NC pressure using normal Pzr spray.
	__ 2) **RETURN TO** Step 27.a.
e. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following:
	__ a) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers.
	__ b) Concurrently implement Enclosure 8 (ECCS Master Reset) while continuing in this procedure.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker:
	__ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496)
	__ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
__ f. Ensure only one NV pump - ON.	
__ g. Verify NC pressure - STABLE OR INCREASING.	g. Perform the following: __ 1) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ 2) **<u>GO TO</u>** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
__ h. Verify VI pressure - GREATER THAN 50 PSIG.	h. In subsequent steps, control room control is lost for the following valves and local operation will be required: __ • 1NV-294 (NV Pmps A&B Disch Flow Ctrl) __ • 1NV-309 (Seal Water Injection Flow).
i. Isolate NV S/I flowpath as follows:	
1) Verify the following valves - OPEN: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol).	1) Perform the following: __ a) Open affected valve(s). __ b) **<u>IF</u>** 1NV-203A **<u>AND</u>** 1NV-202B are open, **<u>THEN</u>** **<u>GO TO</u>** Step 27.i.2. c) Dispatch operator to open affected valve(s): __ • 1NV-203A (NV Pumps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed) __ • 1NV-202B (NV Pmps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed). __ d) Close 1NV-309 (Seal Water Injection Flow). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

e) **IF** control of 1NV-309 is lost from the control room, **THEN** dispatch operator with radio to perform the following:

__ (1) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed).

__ (2) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

f) Open the following valves:

__ • 1NV-312A (Chrg Line Cont Isol)

__ • 1NV-314B (Chrg Line Cont Isol).

g) **IF** 1NV-312A **OR** 1NV-314B cannot be opened, **THEN** dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 10 (Locally Open 1NV-312A)

__ • Enclosure 12 (Locally Open 1NV-314B).

__ h) Do not continue in this procedure until 1NV-312A and 1NV-314B are open.

__ i) **IF** NC pressure is greater than 1950 PSIG, **THEN** throttle 1NV-309 or 1NV-311 to 50% open.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

__ j) Open 1NV-294 (NV Pmps A&B Disch Flow Ctrl).

k) **IF** control of 1NV-294 is lost from the control room, **THEN**:

__ (1) Place the controller for 1NV-294 in the 100% demand position.

__ (2) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to control charging flow as required in subsequent steps.

l) Close the following valves:

__ • 1NI-9A (NV Pmp C/L Inj Isol)

__ • 1NI-10B (NV Pmp C/L Inj Isol).

m) **IF** 1NI-9A **OR** 1NI-10B cannot be closed, **THEN** dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 9 (Locally Close 1NI-9A)

__ • Enclosure 11 (Locally Close 1NI-10B).

n) Throttle charging and seal injection to maintain the following:

__ • Charging line flow between 60 GPM and 180 GPM

__ • NC pump seal injection flow.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
	__ o) **WHEN** 1NV-203A **AND** 1NV-202B are opened, **THEN** charging flow may be reduced below 60 GPM.
	__ p) **GO TO** Step 27.k.
2) Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol).	2) Dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 9 (Locally Close 1NI-9A) __ • Enclosure 11 (Locally Close 1NI-10B).
j. Establish charging as follows:	
__ 1) Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.	1) Perform the following: __ a) Place the controller for 1NV-294 in the 100% demand position. __ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) for 32 GPM charging line flow. __ c) Throttle 1NV-295 to control charging flow as required in subsequent steps.
__ 2) Close 1NV-309 (Seal Water Injection Flow).	2) Dispatch operator with radio to perform the following: __ a) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ b) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
3) Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	3) Dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 10 (Locally Open 1NV-312A) __ • Enclosure 12 (Locally Open 1NV-314B).
__ 4) Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.	__ 4) **<u>GO TO</u>** Step 27.j.6.
__ 5) Place 1NV-309 in auto.	
6) Perform the following: __ • Maintain charging flow less than 180 GPM. __ • Maintain 32 GPM seal water flow.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
k. Control charging as follows:	
__ 1) Control charging flow to maintain Pzr level stable.	
__ 2) Verify Pzr level - STABLE OR INCREASING.	2) **IF** Pzr level is decreasing, **THEN**: a) Open the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). b) Close the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol). __ c) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ d) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
l. Ensure the following containment isolation signals - RESET: __ • Phase A __ • Phase B.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
m. Establish VI to containment as follows:	m. Perform the following:
__ • Ensure 1VI-77B (VI Cont Isol) - OPEN.	1) Align N_2 to the Pzr PORVs by opening the following valves:
__ • Verify VI pressure - GREATER THAN 85 PSIG.	__ • 1NI-438A (Emer N2 From CLA A To 1NC-34A)
	__ • 1NI-439B (Emer N2 From CLA B To 1NC-32B).
	__ 2) IF VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.
n. Concurrently:	
__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
__ • Monitor EP/1/A/5000/ES-1.1 (Safety Injection Termination), Enclosure 1 (Foldout Page)	
__ • **GO TO** EP/1/A/5000/ES-1.1 (Safety Injection Termination), Step 12.	
__ 28. **Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).**	
29. **Control S/G levels as follows:**	
__ a. Verify N/R level in all S/Gs - GREATER THAN 11%.	__ a. Maintain total feed flow greater than 450 GPM until at least one S/G N/R level is greater than 11%.
__ b. Throttle feed flow to maintain all S/G N/R levels between 11% and 50%.	__ b. IF N/R level in any S/G continues to increase in an uncontrolled manner, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. **Verify secondary radiation is normal as follows:**	
a. Ensure the following signals - RESET: __ 1) Phase A Containment Isolations __ 2) CA System valve control __ 3) KC NC NI NM St signals.	
__ b. Align all S/Gs for chemistry sampling.	
c. Perform at least one of the following: __ • Notify Chemistry to sample all S/Gs for activity. OR __ • Notify RP to frisk all cation columns for activity.	
d. Verify the following EMF trip 1 lights - DARK: __ • 1EMF-33 (Condenser Air Ejector Exhaust) __ • 1EMF-26 (Steamline 1A) __ • 1EMF-27 (Steamline 1B) __ • 1EMF-28 (Steamline 1C) __ • 1EMF-29 (Steamline 1D).	__ d. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
__ e. **WHEN** activity results are reported, **THEN** verify all S/Gs indicate no activity.	e. Perform the following: __ 1) Notify station management to evaluate S/G(s) activity results. __ 2) **IF** S/G(s) activity indicate a SGTR, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. **Verify auxiliary building radiation is normal as follows:**	**Evaluate cause of abnormal conditions as follows:**
__ • EMF-41 (Aux Bldg Ventilation) trip 1 light - DARK	__ a. Monitor OAC EMF alarms, OAC VA Graphic, and area monitor EMFs to determine location of activity.
__ • All area monitor EMF trip 1 lights - DARK	__ b. Dispatch operator to locate potential leak.
	__ c. IF cause of alarm is LOCA outside containment, **THEN GO TO** EP/1/A/5000/ECA-1.2 (LOCA Outside Containment).
32. **Verify PRT conditions are normal as follows:**	**Evaluate following possible causes of abnormal PRT conditions:**
__ • PRT pressure - LESS THAN 8 PSIG	__ • Pzr safety temperatures __ • Pzr safety relief flow indicated
__ • PRT level - LESS THAN 89%	__ • Pzr PORVs __ • Rx head vents
__ • PRT temperature - LESS THAN 130°F.	__ • NC pump seal return header relief __ • Letdown orifice header relief.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
33. **Ensure S/I - RESET:**	
__ a. ECCS.	a. <u>IF</u> either reactor trip breaker is closed, <u>**THEN**</u>: __ 1) Ensure reactor trip breakers - OPEN. __ 2) <u>**WHEN**</u> trip breakers open, <u>**THEN**</u> reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. <u>**IF AT ANY TIME**</u> a B/O occurs, <u>**THEN**</u> restart S/I equipment previously on.	
34. **Ensure the following containment isolation signals - RESET:** __ • Phase A __ • Phase B.	
35. **Establish VI to containment as follows:** __ • Ensure 1VI-77B (VI Cont Isol) - OPEN. __ • Verify VI pressure - GREATER THAN 85 PSIG.	**Perform the following:** a. Align N_2 to the Pzr PORVs by opening the following valves: __ • 1NI-438A (Emer N2 From CLA A To 1NC-34A) __ • 1NI-439B (Emer N2 From CLA B To 1NC-32B). __ b. <u>IF</u> VI pressure is less than 85 PSIG, <u>**THEN**</u> dispatch operator to ensure proper VI compressor operation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
36. **Verify criteria to stop operating ND pumps as follows:**	
__ a. NC pressure - GREATER THAN 285 PSIG.	__ a. **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. NC pressure - STABLE OR INCREASING.	__ b. **GO TO** Step 37.
__ c. At least one ND pump - ON.	__ c. **GO TO** Step 36.e.
__ d. Ensure all ND pump(s) with suction aligned to FWST - STOPPED.	
__ e. **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart ND pumps.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
37. **Verify conditions to stop operating D/Gs as follows:**	
__ a. At least one D/G - ON.	__ a. **GO TO** Step 38.
b. Verify 1ETA is energized by offsite power as follows:	b. Perform the following:
__ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	__ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 37.d.
__ c. Dispatch operator to stop 1A D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows:	d. Perform the following:
__ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	__ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 38.
__ e. Dispatch operator to stop 1B D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	
__ 38. **RETURN TO Step 21.**	

END

1. **IF any S/G(s) suspected ruptured, THEN perform the following:**

   - **WHEN** the following conditions met:

     - Total CA flow - GREATER THAN 450 GPM

     AND

     - All intact S/G(s) N/R level - GREATER THAN 11%(29% ACC)

     THEN throttle feed flow to ruptured S/G(s) to maintain ruptured S/G(s) N/R level between 11%(29% ACC) and 39%.

2. **NC Pump Trip Criteria:**

   - **IF** the following conditions are satisfied, **THEN** trip all NC pumps while maintaining seal injection flow:

     - At least one NV or NI pump - ON

     - NC subcooling based on core exit T/Cs - LESS THAN OR EQUAL TO 0°F.

3. **CA Suction Source Switchover Criteria:**

   - **IF** either of the following annunciators are lit, **THEN REFER TO** AP/1/A/5500/006 (Loss of S/G Feedwater):

     - 1AD-5, H/4 "CACST LO LEVEL"

     OR

     - 1AD-8, B/1 "UST LO LEVEL".

4. **Position Criteria for 1NV-202B and 1NV-203A (NV Pumps A&B Recirc Isol):**

   - **IF** NC pressure is less than 1500 PSIG **AND** NV S/I flowpath is aligned, **THEN** close 1NV-202B and 1NV-203A.

   - **IF** NC pressure is greater than 2000 PSIG, **THEN** open 1NV-202B and 1NV-203A.

5. **Cold Leg Recirc Switchover Criterion:**

   - **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **AND** an S/I has occurred, **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify proper VC/YC operation as follows:**	BOP DOES THIS ENCLOSURE
a. Verify one train of the following equipment is in operation: __ • YC chiller __ • CR AHU-1 __ • CRA AHU-1 __ • CRA PFT-1.	a. Perform the following: __ 1) Shift operating VC/YC trains. **REFER TO** Enclosure 6 (Shifting Operating VC/YC Train). 2) **IF** no train can be properly aligned, **THEN** dispatch operator and IAE/Maintenance to restore at least one train of VC/YC. **REFER TO** the following: __ • OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System) __ • EM/0/A/5200/001 (Troubleshooting Cause For Improper Operation of VC/YC System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

b. Verify the following alarms - DARK:

__ • 1AD-18, A/8 "UNIT 1 INTAKE HI CHLORINE 1A"

__ • 1AD-18, B/8 "UNIT 1 INTAKE HI CHLORINE 1B"

__ • 1AD-18, D/8 "UNIT 2 INTAKE HI CHLORINE 2A"

__ • 1AD-18, E/8 "UNIT 2 INTAKE HI CHLORINE 2B".

b. **IF** chlorine odor is detected in the Control Room, **THEN** perform the following based on the status of given alarms:

1) **IF** detectors on both unit intakes are in alarm, **THEN**:

a) Ensure the following VC intake dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet)
__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ b) **GO TO** Step 1.d.

2) **IF** Unit 1 intake HI chlorine detector(s) in alarm, **THEN**:

a) Ensure the following VC dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet).

b) Ensure the following dampers - OPEN:

__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ c) **GO TO** Step 1.d.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. (Continued)	3) <u>**IF**</u> Unit 2 intake Hi chlorine detector(s) in alarm, <u>**THEN**</u>: a) Ensure the following VC dampers - CLOSED: __ • 2VC-5B (CRA Filt Inlet) __ • 2VC-6A (CRA Filt Inlet). b) Ensure the following dampers - OPEN: __ • 1VC-5B (CRA Filt Inlet) __ • 1VC-6A (CRA Filt Inlet). __ c) <u>**GO**</u> <u>**TO**</u> Step 1.d.
c. Ensure the following VC dampers - OPEN: __ • 1VC-5B (CRA Filt Inlet) __ • 1VC-6A (CRA Filt Inlet) __ • 2VC-5B (CRA Filt Inlet) __ • 2VC-6A (CRA Filt Inlet).	
d. Repeat Step 1 of this enclosure until notified by station management as follows: __ • At least once every 8 hours OR __ • Any time VC/YC related annunciators on 1AD-18 actuate.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. **Ensure proper VA System operation as follows:**	
• Ensure the following fans - OFF: __ • ABUXF 1A __ • ABUXF 1B.	1B FXF is off due to no power. 1B FXF off causes 1B UXF to secure.
• Ensure VA System filter is in service as follows: __ • 1ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED __ • 1ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.	
• Ensure the following fans - ON: __ • ABFXF-1A __ • ABFXF 1B.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Verify proper VE System operation as follows:**	
__ a. VE fans - ON.	__ a. Manually start fan(s).
__ b. Annulus pressure - BETWEEN -1.4 IN. WC AND -1.8 IN. WC. This will be correct for A train , no power to B train.	b. Perform the following: 1) **IF** annulus pressure is more positive than -1.4 in. WC, **THEN**: a) Verify flow indicated on the following indications: __ • "VE 1A FLOW TO STACK" __ • "VE 1B FLOW TO STACK". b) **IF** flow is not indicated, **THEN** dispatch operator to verify status of the following dampers based on their local indication or their operating piston rods being extended 4" to 6": __ • 1AVS-D-2 (VE A Trn Recirc Damp) (AB-603, JJ-51, Rm 500) - CLOSED __ • 1AVS-D-7 (VE B Trn Recirc Damp) (AB-603, HH-52, Rm 500) - CLOSED __ • 1AVS-D-3 (VE A Trn Exh Damp) (AB-603, JJ-52, Rm 500) - OPEN __ • 1AVS-D-8 (VE B Trn Exh Damp) (AB-603, HH-52, Rm 500) - OPEN. __ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **REFER TO** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure). __ d) **GO TO** Step 3.c.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	
	2) **IF** annulus pressure is more negative than -1.8 in. WC, **THEN**:
	__ a) Determine which VE train indicates highest discharge flow to stack.
	__ b) Within 2 hours, ensure VE train that indicates highest discharge flow to stack is secured.
	__ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **REFER TO** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure).
__ c. Repeat Step 3.b every 30 minutes until notified by station management.	

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

__ 4. **Record time ventilation systems are verified on following table:**

TIME	SYSTEM (VC, VE)	INITIALS

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. **Ensure proper Unit 2 VA System operation as follows:**

- Ensure the following fans - OFF:

__ • ABUXF-2A
__ • ABUXF-2B.

- Ensure VA System filter is in service as follows:

__ • 2ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED

__ • 2ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.

- Ensure the following fans - ON:

__ • ABFXF-2A
__ • ABFXF-2B.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify at least one NC pump - ON.** RO DOES THIS ENCLOSURE	**Perform the following:** a. Use NC T-Colds to determine NC temperature as required in subsequent steps. b. **GO TO** Step 4.
2. **Use NC T-Avg to determine NC temperature as required in subsequent steps.**	
3. **IF AT ANY TIME NC pumps are tripped, THEN use NC T-Colds to determine NC temperature as required in subsequent steps.**	
4. **Verify one of the following:** • NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F. OR • NC temperature - TRENDING TO 557°F.	**GO TO Step 7.**
5. **Continue to monitor NC temperature.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. **Do not continue in this enclosure until one of the following occurs:**

   - NC temperature - GREATER THAN 557°F AND INCREASING IN AN UNCONTROLLED MANNER.

   OR

   - NC temperature - GREATER THAN 557°F AND STABLE.

   OR

   - NC temperature - LESS THAN 557°F AND DECREASING IN AN UNCONTROLLED MANNER.

7. **Verify NC temperature - LESS THAN 557°F AND DECREASING.**

Perform the following:

a. <u>**IF**</u> NC temperature is greater than 557°F <u>**AND**</u> increasing, <u>**THEN**</u> stabilize NC temperature at 557°F as follows:

   1) <u>**IF**</u> steam dumps are available, <u>**THEN**</u> use steam dumps.

   2) <u>**IF**</u> steam dumps are not available, <u>**THEN**</u> use S/G PORVs.

b. <u>**IF**</u> the following conditions exist:

   - NC temperature is greater than 557°F and stable

   - Time and manpower is available,

   <u>**THEN**</u> stabilize NC temperature at 557°F as follows:

   1) <u>**IF**</u> steam dumps are available, <u>**THEN**</u> use steam dumps.

   2) <u>**IF**</u> steam dumps are not available, <u>**THEN**</u> use S/G PORVs.

c. <u>**GO TO**</u> Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. **Attempt to stop the NC cooldown as follows:**

   a. Ensure all steam dumps - CLOSED.

   b. Ensure all S/G PORVs - CLOSED.

      b. **IF** any S/G PORV cannot be closed, **THEN** close its isolation valve.

   c. Ensure S/G blowdown is isolated.

   d. Close the following valves:

      - 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V)
      - 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V)
      - 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V)
      - 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V).

   e. Depress and hold "S/V BEFORE SEAT DRN" "CLOSE" pushbutton (1MC-3) to close the following valves:

      - 1SM-41 (Stop Vlv #1 Before Seat Drn)
      - 1SM-44 (Stop Vlv #2 Before Seat Drn)
      - 1SM-43 (Stop Vlv #3 Before Seat Drn)
      - 1SM-42 (Stop Vlv #4 Before Seat Drn).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
f. Verify NC cooldown - STOPPED.	f. **<u>IF</u>** cooldown continues, **<u>THEN</u>** throttle feed flow as follows: 1) **<u>IF</u>** S/G N/R level is less than 11% (29% ACC) in all S/G's, **<u>THEN</u>** throttle feed flow to achieve the following: • Minimize cooldown • Maintain total feed flow greater than 450 GPM. 2) **<u>WHEN</u>** N/R level is greater than 11% (29% ACC) in at least one S/G, **<u>THEN</u>** throttle feed flow further to achieve the following: • Minimize cooldown • Maintain at least one S/G N/R level greater than 11% (29% ACC). 3) **<u>IF</u>** cooldown continues, **<u>THEN</u>** close the following valves: • All MSIVs • All MSIV bypass valves.
9. **Continue to perform the actions of this enclosure as required to ensure one of the following:** • NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F. OR • NC temperature - TRENDING TO 557°F.	

Duke Power Company Catawba Nuclear Station **Faulted Steam Generator Isolation**	Procedure No. **EP/1/A/5000/E-2**
	Revision No. **012**
Continuous Use	Electronic Reference No. **CP0094CZ**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

A. Purpose

This procedure provides actions to identify and isolate a faulted S/G.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 24, with the following symptoms:

1) Any S/G pressure decreasing in an uncontrolled manner.

2) Any S/G completely depressurized.

b. EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 2, EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired), Step 11, EP/1/A/5000/ECA-3.2 (SGTR With Loss Of Reactor Coolant - Saturated Recovery Desired), Step 5 with the following symptoms and/or conditions:

1) Any S/G pressure decreasing in an uncontrolled manner.

2) Any S/G completely depressurized.

3) Faulted S/G isolation not verified.

c. EP/1/A/5000/FR-H.5 (Response To Steam Generator Low Level), Step 4, when the affected S/G is identified as faulted.

d. Foldout page of other procedures whenever a faulted S/G is identified.

e. EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators), Enclosure 1 (Foldout Page), if any S/G pressure increases.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Monitor Enclosure 1 (Foldout Page).**	
__ 2. **Maintain any faulted S/G or secondary break isolated during subsequent recovery actions unless needed for NC System cooldown.**	
RO 3. **Verify the following valves - CLOSED:** __ • All MSIVs __ • All MSIV bypass valves.	__ **Manually close valve(s).**
RO __ 4. **Verify at least one S/G pressure - STABLE OR INCREASING.**	__ **<u>IF</u> all S/Gs are faulted, <u>THEN</u> <u>GO</u> <u>TO</u> EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators).**
RO 5. **Identify faulted S/G(s) as follows:** __ • Verify any S/G pressure - DECREASING IN AN UNCONTROLLED MANNER OR __ • Verify any S/G - DEPRESSURIZED.	**Perform the following:** a. Dispatch operators to search for initiating break at the following locations: __ • Main steamlines __ • Main feedlines __ • Other secondary piping. __ b. <u>GO</u> <u>TO</u> Step 8.
RO __ 6. **Verify at least one intact S/G - AVAILABLE FOR NC SYSTEM COOLDOWN.**	__ **Maintain one S/G available for NC System cooldown in subsequent steps.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Isolate all faulted S/G(s) as follows:**	
• S/G 1A:	
RO __ a. Verify S/G 1A Feedwater Isolation status light (1SI-5) - LIT.	a. Perform the following: __ 1) Manually close valve(s). 2) **<u>IF</u>** 1CA-185 (S/G 1A CA Nozz Tempering Isol) cannot be closed, **<u>THEN</u>**: a) Manually close the following valves: __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) __ • 1CF-156 (Byp Valve For 1CF-100). b) **<u>IF</u>** 1CF-100 **<u>OR</u>** 1CF-156 cannot be manually closed, **<u>THEN</u>** dispatch operator to close the affected valve(s): __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) (TB-580, 1H-33) (Ladder needed) __ • 1CF-156 (Byp Valve For 1CF-100) (TB-577, 1H-33) (Ladder needed).
__ b. Verify S/G 1A PORV - CLOSED.	b. Perform the following: __ 1) Manually close S/G PORV. 2) **<u>IF</u>** S/G PORV cannot be closed, **<u>THEN</u>**: __ a) Manually close S/G PORV isolation valve. __ b) **<u>IF</u>** S/G PORV isolation valve cannot be closed, **<u>THEN</u>** dispatch operator to close the valve.

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	7. (Continued)	
	c. Close the following valves:	
RO	__ 1) 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 43-44, Rm 591).
BOP	__ 2) 1CA-62A (CA Pmp A Disch To S/G 1A Isol).	2) Perform the following: __ a) Close 1CA-60 (CA Pump 1A Flow To S/G 1A). __ b) Dispatch operator to close 1CA-62A (CA Pmp A Disch To S/G 1A Isol) (DH-587, DD-EE, 44-45, Rm 591).
BOP	__ 3) 1CA-66B (CA Pmp 1 Disch To S/G 1A Isol).	3) Perform the following: __ a) Close 1CA-64 (CA Pump #1 Flow To S/G 1A). __ b) Dispatch operator to close 1CA-66B (CA Pmp 1 Disch To S/G 1A Isol) (DH-584, DD-EE, 44-45, Rm 591).
	d. Verify the following blowdown isolation valves - CLOSED:	
RO	__ 1) 1BB-56A (S/G 1A Bldwn Cont Isol Insd).	__ 1) Manually close valve.

This should already have been done in E-0 but will be done here if not. CRITICAL TASK!!!

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
RO __ 2) 1BB-148B (S/G 1A Bldwn Cont Isol Byp).	2) Perform the following:
No power last known position was closed	__ a) Manually close valve.
	b) **IF** valve will not close **AND** 1BB-56A is open, **THEN** perform the following:
	__ (1) Ensure "S/G A BLDWN FLOW CTRL" - CLOSED.
	(2) Dispatch operators to ensure the following valves - CLOSED:
	__ • 1BB-148B (S/G 1A Bldwn Cont Isol Byp) (DH-580, EE-FF, 44-45, Rm 591)
	__ • 1BB-81 (1A S/G Blowdown Penetration Valve Test Isol) (DH-583, EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
RO __ 3) 1BB-57B (S/G 1A Bldwn Cont Isol Otsd).	3) Perform the following:
No power last known position was OPEN	__ a) Manually close valve.
	b) **IF** valve will not close **AND** 1BB-56A is open, **THEN** perform the following:
	__ (1) Ensure "S/G A BLDWN FLOW CTRL" - CLOSED.
	(2) Dispatch operators to ensure the following valves - CLOSED:
	__ • 1BB-57B (S/G 1A Bldwn Cont Isol Otsd) (DH-580, EE-FF, 44-45, Rm 591)
	__ • 1BB-81 (1A S/G Blowdown Penetration Valve Test Isol) (DH-583, EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
• S/G 1B:	
__ a. Verify S/G 1B Feedwater Isolation status light (1SI-5) - LIT.	a. Perform the following:
	__ 1) Manually close valve(s).
	2) **IF** 1CA-186 (S/G 1B CA Nozz Tempering Isol) cannot be closed, **THEN**:
	a) Manually close the following valves:
	__ • 1CF-100 (S/G CA Nozz Tempering Ctrl)
	__ • 1CF-156 (Byp Valve For 1CF-100).
	b) **IF** 1CF-100 **OR** 1CF-156 cannot be manually closed, **THEN** dispatch operator to close the affected valve(s):
	__ • 1CF-100 (S/G CA Nozz Tempering Ctrl) (TB-580, 1H-33) (Ladder needed)
	__ • 1CF-156 (Byp Valve For 1CF-100) (TB-577, 1H-33) (Ladder needed).
__ b. Verify S/G 1B PORV - CLOSED.	b. Perform the following:
	__ 1) Manually close S/G PORV.
	2) **IF** S/G PORV cannot be closed, **THEN**:
	__ a) Manually close S/G PORV isolation valve.
	__ b) **IF** S/G PORV isolation valve cannot be closed, **THEN** dispatch operator to close the valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
c. Close the following valves:	
__ 1) 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) (DH-583, FF-53, Rm 572).
__ 2) 1CA-58A (CA Pmp A Disch To S/G 1B Isol).	2) Perform the following: __ a) Close 1CA-56 (CA Pump 1A Flow To S/G 1B). __ b) Dispatch operator to close 1CA-58A (CA Pmp A Disch To S/G 1B Isol) (DH-586, DD-EE, 52-53, Rm 572).
__ 3) 1CA-54B (CA Pmp 1 Disch To S/G 1B Isol).	3) Perform the following: __ a) Close 1CA-52 (CA Pump #1 Flow To S/G 1B). __ b) Dispatch operator to close 1CA-54B (CA Pmp 1 Disch To S/G 1B Isol) (DH-584, DD-EE, 52-53, Rm 572).
__ d. Verify CA Pump 1A or 1B - AVAILABLE.	d. <u>IF</u> CA Pump #1 is the only source of feedwater, **<u>THEN</u>** perform the following: __ 1) Maintain steam flow to the CAPT from at least one S/G. __ 2) <u>IF</u> desired to isolate steam supply to CA Pump #1 from 1B S/G, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 7.e. __ 3) **<u>GO</u> <u>TO</u>** Step 7.f.
__ e. Dispatch operator to unlock and close 1SA-1 (1B S/G Main Steam to CAPT Maintenance Isol) (DH-624, FF-53, Rm 572) (Breakaway lock installed).	__ e. Dispatch operator to unlock and close 1SA-3 (1B S/G Main Steam to CAPT Stop Check) (AB-551, DD-53, Rm 217) (Breakaway lock installed).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
f. Verify the following blowdown isolation valves - CLOSED:	
__ 1) 1BB-19A (S/G 1B Bldwn Cont Isol Insd).	__ 1) Manually close valve.
__ 2) 1BB-150B (S/G 1B Bldwn Cont Isol Byp).	2) Perform the following: __ a) Manually close valve. b) **<u>IF</u>** valve will not close **<u>AND</u>** 1BB-19A is open, **<u>THEN</u>** perform the following: __ (1) Ensure "S/G B BLDWN FLOW CTRL" - CLOSED. (2) Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-150B (S/G 1B Bldwn Cont Isol Byp) (DH-580, FF, 52-53, Rm 572) __ • 1BB-83 (1B S/G Blowdown Penetration Valve Test Isol) (DH-580, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
__ 3) 1BB-21B (S/G 1B Bldwn Cont Isol Otsd).	3) Perform the following: __ a) Manually close valve. b) **<u>IF</u>** valve will not close **<u>AND</u>** 1BB-19A is open, **<u>THEN</u>** perform the following: __ (1) Ensure "S/G B BLDWN FLOW CTRL" - CLOSED. (2) Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-21B (S/G 1B Bldwn Cont Isol Otsd) (DH-580, FF, 52-53, Rm 572) __ • 1BB-83 (1B S/G Blowdown Penetration Valve Test Isol) (DH-580, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
• S/G 1C:	
__ a. Verify S/G 1C Feedwater Isolation status light (1SI-5) - LIT.	a. Perform the following: __ 1) Manually close valve(s). 2) **<u>IF</u>** 1CA-187 (S/G 1C CA Nozz Tempering Isol) cannot be closed, **<u>THEN</u>**: a) Manually close the following valves: __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) __ • 1CF-156 (Byp Valve For 1CF-100). b) **<u>IF</u>** 1CF-100 **<u>OR</u>** 1CF-156 cannot be manually closed, **<u>THEN</u>** dispatch operator to close the affected valve(s): __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) (TB-580, 1H-33) (Ladder needed) __ • 1CF-156 (Byp Valve For 1CF-100) (TB-577, 1H-33) (Ladder needed).
__ b. Verify S/G 1C PORV - CLOSED.	b. Perform the following: __ 1) Manually close S/G PORV. 2) **<u>IF</u>** S/G PORV cannot be closed, **<u>THEN</u>**: __ a) Manually close S/G PORV isolation valve. __ b) **<u>IF</u>** S/G PORV isolation valve cannot be closed, **<u>THEN</u>** dispatch operator to close the valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
c. Close the following valves:	
__ 1) 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V) (DH-580, GG, 52-53, Rm 572).
__ 2) 1CA-46B (CA Pmp B Disch To S/G 1C Isol).	2) Perform the following: __ a) Close 1CA-44 (CA Pump 1B Flow To S/G 1C). __ b) Dispatch operator to close 1CA-46B (CA Pmp B Disch To S/G 1C Isol) (DH-586, DD, 53-54, Rm 572).
__ 3) 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol).	3) Perform the following: __ a) Close 1CA-48 (CA Pump #1 Flow To S/G 1C). __ b) Dispatch operator to close 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol) (DH-584, EE-53, Rm 572).
__ d. Verify CA Pump 1A or 1B - AVAILABLE.	d. **IF** CA Pump #1 is the only source of feedwater, **THEN** perform the following: __ 1) Maintain steam flow to the CAPT from at least one S/G. __ 2) **IF** desired to isolate steam supply to CA Pump #1 from 1C S/G, **THEN GO TO** Step 7.e. __ 3) **GO TO** Step 7.f.
__ e. Dispatch operator to unlock and close 1SA-4 (1C S/G Main Steam to CAPT Maintenance Isol) (DH-624, FF-53, Rm 572) (Breakaway lock installed).	__ e. Dispatch operator to unlock and close 1SA-6 (1C S/G Main Steam to CAPT Stop Check) (AB-551, DD-53, Rm 217) (Breakaway lock installed) (Ladder needed).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
f. Verify the following blowdown isolation valves - CLOSED:	
__ 1) 1BB-60A (S/G 1C Bldwn Cont Isol Insd).	__ 1) Manually close valve.
__ 2) 1BB-149B (S/G 1C Bldwn Cont Isol Byp).	2) Perform the following:
	__ a) Manually close valve.
	b) **<u>IF</u>** valve will not close **<u>AND</u>** 1BB-60A is open, **<u>THEN</u>** perform the following:
	__ (1) Ensure "S/G C BLDWN FLOW CTRL" - CLOSED.
	(2) Dispatch operators to ensure the following valves - CLOSED:
	__ • 1BB-149B (S/G 1C Bldwn Cont Isol Byp) (DH-578, FF-GG, 52, Rm 572)
	__ • 1BB-82 (1C S/G Blowdown Penetration Valve Test Isol) (DH-583, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
__ 3) 1BB-61B (S/G 1C Bldwn Cont Isol Otsd).	3) Perform the following: __ a) Manually close valve. b) **IF** valve will not close **AND** 1BB-60A is open, **THEN** perform the following: __ (1) Ensure "S/G C BLDWN FLOW CTRL" - CLOSED. (2) Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-61B (S/G 1C Bldwn Cont Isol Otsd) (DH-578, FF-GG, 52, Rm 572) __ • 1BB-82 (1C S/G Blowdown Penetration Valve Test Isol) (DH-583, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
• S/G 1D:	
__ a. Verify S/G 1D Feedwater Isolation status light (1SI-5) - LIT.	a. Perform the following: __ 1) Manually close valve(s). 2) **IF** 1CA-188 (S/G 1D CA Nozz Tempering Isol) cannot be closed, **THEN**: a) Manually close the following valves: __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) __ • 1CF-156 (Byp Valve For 1CF-100). b) **IF** 1CF-100 **OR** 1CF-156 cannot be manually closed, **THEN** dispatch operator to close the affected valve(s): __ • 1CF-100 (S/G CA Nozz Tempering Ctrl) (TB-580, 1H-33) (Ladder needed) __ • 1CF-156 (Byp Valve For 1CF-100) (TB-577, 1H-33) (Ladder needed).
__ b. Verify S/G 1D PORV - CLOSED.	b. Perform the following: __ 1) Manually close S/G PORV. 2) **IF** S/G PORV cannot be closed, **THEN**: __ a) Manually close S/G PORV isolation valve. __ b) **IF** S/G PORV isolation valve cannot be closed, **THEN** dispatch operator to close the valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
c. Close the following valves:	
__ 1) 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 44-45, Rm 591).
__ 2) 1CA-42B (CA Pmp B Disch To S/G 1D Isol).	2) Perform the following: __ a) Close 1CA-40 (CA Pump 1B Flow To S/G 1D). __ b) Dispatch operator to close 1CA-42B (CA Pmp B Disch To S/G 1D Isol) (DH-586, DD-EE, 43-44, Rm 591).
__ 3) 1CA-38A (CA Pmp 1 Disch To S/G 1D Isol).	3) Perform the following: __ a) Close 1CA-36 (CA Pump #1 Flow To S/G 1D). __ b) Dispatch operator to close 1CA-38A (CA Pmp 1 Disch To S/G 1D Isol) (DH-584, DD-EE, 43-44, Rm 591).
d. Verify the following blowdown isolation valves - CLOSED:	
__ 1) 1BB-8A (S/G 1D Bldwn Cont Isol Insd).	__ 1) Manually close valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
__ 2) 1BB-147B (S/G 1D Bldwn Cont Isol Byp).	2) Perform the following: __ a) Manually close valve. b) **IF** valve will not close **AND** 1BB-8A is open, **THEN** perform the following: __ (1) Ensure "S/G D BLDWN FLOW CTRL" - CLOSED. (2) Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-147B (S/G 1D Bldwn Cont Isol Byp) (DH-582, EE-FF, 44, Rm 591) __ • 1BB-80 (1D S/G Blowdown Penetration Valve Test Isol) (DH-583,EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
__ 3) 1BB-10B (S/G 1D Bldwn Cont Isol Otsd).	3) Perform the following: __ a) Manually close valve. b) **IF** valve will not close **AND** 1BB-8A is open, **THEN** perform the following: __ (1) Ensure "S/G D BLDWN FLOW CTRL" - CLOSED. (2) Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-10B (S/G 1D Bldwn Cont Isol Otsd) (DH-582, EE-FF, 44, Rm 591) __ • 1BB-80 (1D S/G Blowdown Penetration Valve Test Isol) (DH-583,EE-FF, 44, Rm 591).
__ 8. RO **WHEN NC T-Hots start to increase, THEN dump steam from intact S/G PORVs to stabilize NC T-Hots.**	
9. BOP **Verify the following annunciators - DARK.** __ • 1AD-5, H/4 "CACST LO LEVEL" __ • 1AD-8, B/1 "UST LO LEVEL".	__ **REFER TO AP/1/A/5500/006 (Loss of S/G Feedwater).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Verify secondary radiation is normal as follows:** BOP	
a. Ensure the following signals - RESET:	
__ 1) Phase A Containment Isolations	
__ 2) CA System valve control	
__ 3) KC NC NI NM St signals.	
__ b. Align all S/Gs for chemistry sampling.	
c. Perform at least one of the following:	
__ • Notify Chemistry to periodically sample all S/Gs for activity.	
OR	
__ • Notify RP to periodically frisk all cation columns for activity.	
d. Verify the following EMF trip 1 lights - DARK:	__ d. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
__ • 1EMF-26 (Steamline 1A)	
__ • 1EMF-27 (Steamline 1B)	
__ • 1EMF-28 (Steamline 1C)	
__ • 1EMF-29 (Steamline 1D).	
__ e. Verify the S/G(s) fault - INSIDE CONTAINMENT.	e. Request RP to perform the following: __ 1) Monitor the area of the steam fault for radiation. __ 2) Notify the control room of any abnormal radiation conditions.
__ f. **<u>WHEN</u>** activity results reported, **<u>THEN</u>** verify all S/Gs indicate no activity.	f. Perform the following: __ 1) Notify station management to evaluate S/G(s) activity results. __ 2) **<u>IF</u>** S/G(s) activity indicate a SGTR, **<u>THEN</u> <u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. **Verify S/I termination criteria as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **<u>GO</u> <u>TO</u>** Step 12.
RO/BOP	
b. Verify secondary heat sink as follows:	__ b. **<u>GO</u> <u>TO</u>** Step 12.
__ • N/R level in at least one intact S/G - GREATER THAN 11% (29% ACC)	
OR	
__ • Total feed flow to all intact S/Gs - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR INCREASING.	__ c. **<u>GO</u> <u>TO</u>** Step 12.
__ d. Pzr level - GREATER THAN 11% (20% ACC).	__ d. **<u>GO</u> <u>TO</u>** Step 12.
__ e. **<u>GO TO</u>** EP/1/A/5000/ES-1.1 (Safety Injection Termination).	Termination criteria should be met and the crew should transition to ES-1.1.
__ 12. **<u>GO</u> <u>TO</u> EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).**	

<u>END</u>

1. **Cold Leg Recirc Switchover Criterion:**

__ • **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

2. **Position Criteria for 1NV-202B and 1NV-203A (NV Pumps A&B Recirc Isol):**

__ • **IF** NC pressure is less than 1500 PSIG **AND** NV S/I flowpath is aligned, **THEN** close 1NV-202B and 1NV-203A.

__ • **IF** NC pressure is greater than 2000 PSIG, **THEN** open 1NV-202B and 1NV-203A.

A. Purpose

This procedure provides the necessary instructions to terminate Safety Injection and stabilize plant conditions.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 27, EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 7, and EP/1/A/5000/E-2 (Faulted Steam Generator Isolation), Step 11 when specified termination criteria are satisfied.

b. EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink), Step 48, after secondary heat sink has been re-established and S/I has been terminated.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. <u>Operator Actions</u>	
__ 1. **Monitor Enclosure 1 (Foldout Page).**	
BOP 2. **Ensure S/I - RESET:**	
__ a. ECCS.	a. Perform the following: __ 1) **<u>IF</u>** either reactor trip breaker is closed, **<u>THEN</u>** dispatch operator to open Unit 1 reactor trip breakers. __ 2) Concurrently implement Enclosure 6 (ECCS Master Reset) while continuing in this procedure.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **<u>IF AT ANY TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.	
BOP 3. **Ensure the following containment isolation signals - RESET:** __ • Phase A __ • Phase B.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 4. **Establish VI to containment as follows:**	**Perform the following:**
__ • Ensure 1VI-77B (VI Cont Isol) - OPEN.	a. Align N_2 to the Pzr PORVs by opening the following valves:
__ • Verify VI pressure - GREATER THAN 85 PSIG.	__ • 1NI-438A (Emer N2 From CLA A To 1NC-34A)
	__ • 1NI-439B (Emer N2 From CLA B To 1NC-32B).
	__ b. **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 5. **Verify proper NS pump operation as follows:**	
__ a. Containment pressure - HAS EXCEEDED 3 PSIG.	__ a. **GO TO** Step 6.
b. Verify the following valves - OPEN:	b. Perform the following:
__ • 1FW-27A (ND Pump 1A Suct From FWST)	__ 1) **WHEN** containment pressure is less than 1 PSIG, **THEN** perform Steps 5.d through 5.f.
__ • 1FW-55B (ND Pump 1B Suct From FWST).	__ 2) **GO TO** Step 6.
__ c. Containment pressure - LESS THAN 2.4 PSIG.	c. Perform the following:
	__ 1) **WHEN** containment pressure is less than 2.4 PSIG, **THEN** perform Step 5.
	__ 2) **GO TO** Step 6.
__ d. Reset NS.	
__ e. Stop NS pumps.	
f. Close the following valves:	
__ • 1NS-29A (NS Spray Hdr 1A Cont Isol)	
__ • 1NS-32A (NS Spray Hdr 1A Cont Isol)	
__ • 1NS-15B (NS Spray Hdr 1B Cont Isol)	
__ • 1NS-12B (NS Spray Hdr 1B Cont Isol).	
__ 6. **Ensure only one NV pump - ON.** BOP	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 7. RO **Verify NC pressure - STABLE OR INCREASING.**	**Perform the following:** __ a. Ensure Pzr spray valves - CLOSED. __ b. <u>**IF**</u> NC pressure continues to decrease, <u>**THEN**</u> <u>**GO TO**</u> EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
__ 8. BOP **Verify VI pressure - GREATER THAN 50 PSIG.**	**In subsequent steps, control room control is lost for the following valves and local operation will be required:** __ • 1NV-294 (NV Pmps A&B Disch Flow Ctrl) __ • 1NV-309 (Seal Water Injection Flow).
9. BOP **Isolate NV S/I flowpath as follows:** a. Verify the following valves - OPEN: __ • 1NV-252A (NV Pumps Suct From FWST) __ • 1NV-253B (NV Pumps Suct From FWST).	a. <u>**IF**</u> NV pump suctions are aligned for Cold Leg Recirc, <u>**THEN**</u>: __ 1) Close 1NV-309 (Seal Water Injection Flow). 2) <u>**IF**</u> control of 1NV-309 is lost from the control room, <u>**THEN**</u> dispatch operator with radio to perform the following: __ a) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ b) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to control seal injection flow as required in subsequent steps. 3) Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

4) **IF** 1NV-312A **OR** 1NV-314B cannot be opened, **THEN** dispatch operator to open affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s):

__ • Enclosure 8 (Locally Open 1NV-312A)

__ • Enclosure 10 (Locally Open 1NV-314B).

__ 5) Do not continue in this procedure until 1NV-312A and 1NV-314B are open.

__ 6) **IF** NC pressure is greater than 1950 PSIG, **THEN** throttle 1NV-309 or 1NV-311 to 50% open.

__ 7) Open 1NV-294 (NV Pmps A&B Disch Flow Ctrl).

8) **IF** control of 1NV-294 is lost from the control room, **THEN**:

__ a) Place the controller for 1NV-294 in the 100% demand position.

__ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to control charging flow as required in subsequent steps.

9) Close the following valves:

__ • 1NI-9A (NV Pmp C/L Inj Isol)
__ • 1NI-10B (NV Pmp C/L Inj Isol).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	

10) **IF** 1NI-9A **OR** 1NI-10B cannot be closed, **THEN** dispatch operator to close affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s):

__ • Enclosure 7 (Locally Close 1NI-9A)

__ • Enclosure 9 (Locally Close 1NI-10B).

11) Throttle charging and seal injection to maintain the following:

__ • Charging line flow between 60 GPM and 180 GPM

__ • NC pump seal injection flow.

__ 12) **GO TO** Step 11.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
BOP b. Verify the following valves - OPEN:	b. Perform the following:
__ • 1NV-203A (NV Pumps A&B Recirc Isol)	__ 1) Open affected valve(s).
__ • 1NV-202B (NV Pmps A&B Recirc Isol).	__ 2) **<u>IF</u>** 1NV-203A **<u>AND</u>** 1NV-202B are open, **<u>THEN</u>** **<u>GO</u>** **<u>TO</u>** Step 9.c.
	3) Dispatch operator to open affected valve(s):
	__ • 1NV-203A (NV Pumps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed)
	__ • 1NV-202B (NV Pmps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed).
	__ 4) Close 1NV-309 (Seal Water Injection Flow).
	5) **<u>IF</u>** control of 1NV-309 is lost from the control room, **<u>THEN</u>** dispatch operator with radio to perform the following:
	__ a) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed).
	__ b) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to control seal injection flow as required in subsequent steps.
	6) Open the following valves:
	__ • 1NV-312A (Chrg Line Cont Isol)
	__ • 1NV-314B (Chrg Line Cont Isol).
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

7) **IF** 1NV-312A **OR** 1NV-314B cannot be opened, **THEN** dispatch operator to open affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s):

__ • Enclosure 8 (Locally Open 1NV-312A)

__ • Enclosure 10 (Locally Open 1NV-314B).

__ 8) Do not continue in this procedure until 1NV-312A and 1NV-314B are open.

__ 9) **IF** NC pressure is greater than 1950 PSIG, **THEN** throttle 1NV-309 or 1NV-311 to 50% open.

__ 10) Open 1NV-294 (NV Pmps A&B Disch Flow Ctrl).

11) **IF** control of 1NV-294 is lost from the control room, **THEN**:

__ a) Place the controller for 1NV-294 in the 100% demand position.

__ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to control charging flow as required in subsequent steps.

12) Close the following valves:

__ • 1NI-9A (NV Pmp C/L Inj Isol)

__ • 1NI-10B (NV Pmp C/L Inj Isol).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
	13) **IF** 1NI-9A **OR** 1NI-10B cannot be closed, **THEN** dispatch operator to close affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s): __ • Enclosure 7 (Locally Close 1NI-9A) __ • Enclosure 9 (Locally Close 1NI-10B).
	14) Throttle charging and seal injection to maintain the following: __ • Charging line flow between 60 GPM and 180 GPM __ • NC pump seal injection flow.
	__ 15) **WHEN** 1NV-203A **AND** 1NV-202B are opened, **THEN** charging flow may be reduced below 60 GPM.
	__ 16) **GO TO** Step 11.
BOP c. Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol).	c. Dispatch operator to close affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s): __ • Enclosure 7 (Locally Close 1NI-9A) __ • Enclosure 9 (Locally Close 1NI-10B).

TERMINATE SCENARIO HERE

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. **Establish charging as follows:**

a. Verify all of the following valves - OPEN:

__ • 1NV-44A (NC Pmp A Seal Supply Cont Isol)

__ • 1NV-55A (NC Pmp B Seal Supply Cont Isol)

__ • 1NV-66A (NC Pmp C Seal Supply Cont Isol)

__ • 1NV-77A (NC Pmp D Seal Supply Cont Isol).

a. **IF** all the valves are closed, **THEN** perform the following:

__ 1) Open 1NV-309 (Seal Water Injection Flow).

__ 2) **IF** control of 1NV-309 (Seal Water Injection Flow) is lost from the control room, **THEN** dispatch operator with radio to open 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233).

3) Open the following valves:

__ • 1NV-312A (Chrg Line Cont Isol)
__ • 1NV-314B (Chrg Line Cont Isol).

4) **IF** 1NV-312A **OR** 1NV-314B cannot be opened, **THEN** dispatch operator to open affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s):

__ • Enclosure 8 (Locally Open 1NV-312A)

__ • Enclosure 10 (Locally Open 1NV-314B).

__ 5) Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to maintain charging flow less than 180 GPM.

6) **IF** 1NV-294 cannot be operated from the control room, **THEN**:

__ a) Place the controller for 1NV-294 in the 100% demand position.

__ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to maintain charging line flow less than 180 GPM.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	
	__ 7) **GO TO** Step 11.
__ b. Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.	b. Perform the following: __ 1) Place the controller for 1NV-294 in the 100% demand position. __ 2) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) for 32 GPM charging line flow. __ 3) Throttle 1NV-295 to control charging flow as required in subsequent steps.
__ c. Close 1NV-309 (Seal Water Injection Flow).	c. Dispatch operator with radio to perform the following: __ 1) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ 2) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.
d. Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	d. Dispatch operator to open affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s): __ • Enclosure 8 (Locally Open 1NV-312A) __ • Enclosure 10 (Locally Open 1NV-314B).
__ e. Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.	__ e. **GO TO** Step 10.g.
__ f. Place 1NV-309 in auto.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	
g. Perform the following:	
__ • Maintain charging flow less than 180 GPM.	
__ • Maintain 32 GPM seal water flow.	
11. **Control charging as follows:**	
__ a. Control charging flow to maintain Pzr level stable.	
__ b. Verify Pzr level - STABLE OR INCREASING.	b. Perform the following: __ 1) **IF** any S/G is faulted, **THEN** do not continue until faulted S/G depressurization stops **OR** Pzr level can be maintained stable or increasing. 2) **IF** no S/G is faulted **OR** Pzr level continues to decrease after faulted S/G depressurization stops, **THEN** perform the following: a) Open the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). b) Close the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol). __ c) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Verify conditions are met to stop NI pumps as follows:**	
a. Verify the following conditions are satisfied: __ • NC pressure - STABLE OR INCREASING __ • NC pressure - GREATER THAN 1620 PSIG.	a. Perform the following: __ 1) **IF** any S/G is faulted, **THEN** do not continue until faulted S/G depressurization stops **OR** criteria for stopping NI pumps is met. __ 2) **IF** no S/G is faulted **OR** conditions for stopping NI pumps cannot be satisfied after faulted S/G depressurization stops, **THEN GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
__ b. Stop NI pumps.	
__ 13. **Ensure all ND pump(s) with suction aligned to FWST - STOPPED.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
14. **Verify S/I flow not required as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	a. Perform the following: __ 1) Manually start S/I pumps and align valves as necessary to restore NC subcooling. __ 2) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. Pzr level - GREATER THAN 11% (20% ACC).	b. Perform the following: __ 1) Control charging flow to restore Pzr level to greater than 11% (20% ACC). 2) **<u>IF</u>** Pzr level cannot be maintained greater than 11% (20% ACC), **<u>THEN</u>**: __ a) Manually start S/I pumps and align valves as necessary to restore Pzr level. __ b) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **Transfer condenser steam dump to pressure control mode as follows:**	
a. Verify condenser - AVAILABLE:	a. Perform the following:
__ • "C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT.	__ 1) Dump steam using intact S/G PORV(s) in subsequent steps.
__ • MSIVs on intact S/G(s) - OPEN.	__ 2) **GO TO** Step 16.
__ b. Ensure "STM DUMP CTRL" - SET AT 1090 PSIG STEAM HEADER PRESSURE.	
c. **WHEN** the steam dump valves are closed, **THEN**:	
__ 1) Reset C-7A and C-7B.	
__ 2) Place "STM DUMP CTRL" in manual.	
__ 3) Adjust the "STM DUMP CTRL" to 0% demand.	
__ 4) Place the steam dumps in pressure mode.	
__ 5) Place the "STM DUMP CTRL" in auto.	
__ 16. **Verify all NC T-Hots - STABLE.**	__ **Throttle steam flow and total feed flow as required to maintain NC System temperatures stable.**
17. **Establish normal letdown as follows:**	
__ a. Verify VI pressure - GREATER THAN 35 PSIG.	a. Perform the following:
	__ 1) **WHEN** VI pressure is greater than 35 PSIG, **THEN** perform Steps 17.b through 17.o.
	__ 2) **GO TO** Step 18.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
__ b. Verify Pzr level - GREATER THAN 25% (34% ACC).	b. Perform the following: __ 1) **WHEN** Pzr level increases to greater than 25% (34% ACC), **THEN** perform Steps 17.c through 17.o. __ 2) **GO TO** Step 18.
c. Ensure the following valves - CLOSED: __ • 1KC-56A (KC To ND Hx 1A Sup Isol) __ • 1KC-81B (KC To ND Hx 1B Sup Isol).	
d. Verify the following EMF trip 1 lights - DARK: __ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	d. Perform the following: __ 1) Notify station management to evaluate restoring normal letdown with high NC System activity. __ 2) Establish excess letdown. **REFER TO** Enclosure 2 (Establishing Excess Letdown). __ 3) **WHEN** station management approval to establish normal letdown is obtained, **THEN** perform Steps 17.e through 17.o. __ 4) **GO TO** Step 18.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
e. Verify the following valves for the operating KC train(s) - OPEN: • Train A: __ • 1KC-1A (Aux Bldg Non-Ess Ret Hdr Isol) __ • 1KC-50A (Aux Bldg Non-Ess Hdr Isol). • Train B: __ • 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol) __ • 1KC-53B (Aux Bldg Non-Ess Hdr Isol).	__ e. Manually open valve(s).
__ f. Ensure 1NV-849 (Letdn Flow Var Orif Ctrl) valve demand position - 0%.	
g. Open the following valves: __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol) __ • 1NV-15B (Letdn Cont Isol).	g. Perform the following: 1) Ensure the following valves - CLOSED: __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol) __ • 1NV-15B (Letdn Cont Isol). __ 2) Establish excess letdown. <u>**REFER TO**</u> Enclosure 2 (Establishing Excess Letdown). __ 3) <u>**GO TO**</u> Step 18.
__ h. While performing the following steps, manually adjust charging flow to maintain letdown subcooled.	
__ i. Throttle 1NV-148 (Letdn Press Control) to 45% demand.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
__ j. Open 1NV-10A (Letdn Orif 1B Otlt Cont Isol).	
k. Throttle open 1NV-849 (Letdn Flow Var Orif Ctrl) in 1% to 5% increments until one of the following conditions is met: __ • Letdown flow and letdown pressure increases OR __ • Valve demand position is 60% open.	
__ l. Do not continue until one of the above conditions is met.	
__ m. Verify letdown flow and letdown pressure - HAS INCREASED.	m. Perform the following: 1) Close the following valves: __ • 1NV-849 (Letdn Flow Var Orif Ctrl) __ • 1NV-10A (Letdn Orif 1B Otlt Cont Isol) __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol). __ 2) Establish excess letdown. **REFER TO** Enclosure 2 (Establishing Excess Letdown). __ 3) **GO TO** Step 18.
__ n. Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure between 150 - 200 PSIG.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

17. (Continued)

o. **WHEN** 5 minutes have elapsed, **THEN** perform the following:

__ 1) Adjust 1NV-849 (Letdn Flow Var Orif Ctrl) in 1% increments to desired letdown flow.

2) **WHEN** letdown at desired flow, **THEN** perform the following:

__ a) Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ b) Ensure 1NV-148 (Letdn Press Control) - IN AUTO.

__ 3) **IF AT ANY TIME** additional letdown flow desired, **THEN** establish letdown with the 45 or 75 GPM orifice. **REFER TO** OP/1/A/6200/001 (Chemical and Volume Control System).

18. **Ensure proper operation of VCT Makeup Control System as follows:**

__ a. Determine the required shutdown boron concentration. **REFER TO** ROD Book, Section 5.11.

b. **WHEN** the required shutdown boron concentration is determined, **THEN**:

__ 1) Adjust VCT makeup controls for a boron concentration that is greater than or equal to the required shutdown boron concentration.

__ 2) Ensure "NC MAKEUP MODE SELECT" - IN "AUTO".

__ 3) Place the "NC MAKEUP CONTROL" switch momentarily to the "START" position.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
19. **Align NV pump suction to the VCT as follows:**	
a. Verify at least one of the following NV pump suction valves - OPEN: __ • 1NV-252A (NV Pumps Suct From FWST) OR __ • 1NV-253B (NV Pumps Suct From FWST).	a. Perform the following: __ 1) Notify station management for guidance to restore NV pump suction to the VCT. __ 2) **GO TO** Step 20.
b. Open the following valves: __ • 1NV-188A (VCT Otlt Isol) __ • 1NV-189B (VCT Otlt Isol).	
c. Close the following valves: __ • 1NV-252A (NV Pumps Suct From FWST) __ • 1NV-253B (NV Pumps Suct From FWST).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 20. **Maintain Pzr pressure stable using Pzr heaters and normal Pzr spray.**	**Stabilize Pzr pressure as follows:** a. **IF** normal Pzr spray is not available **AND** letdown is in service, **THEN** control Pzr pressure using NV aux spray as follows: 1) Ensure the following valves - CLOSED: __ • 1NC-27 (Pzr Spray Ctrl Frm Loop A) __ • 1NC-29 (Pzr Spray Ctrl Frm Loop B) __ • 1NV-39A (NV Supply To Loop D Isol) __ • 1NV-32B (NV Supply To Loop A Isol). __ 2) Maintain charging flow less than 180 GPM. __ 3) Throttle 1NV-37A (NV Supply To Pzr Aux Spray) and charging flow as required. __ b. **IF** letdown is isolated **OR** NV aux spray is not available, **THEN** control pressure using one Pzr PORV.
21. **Control intact S/G levels as follows:**	
__ a. Verify N/R level in all intact S/Gs - GREATER THAN 11% (29% ACC).	__ a. Maintain total feed flow greater than 450 GPM until at least one intact S/G N/R level greater than 11% (29% ACC).
__ b. Throttle feed flow to maintain all intact S/Gs N/R levels between 11% (29% ACC) and 50%.	__ b. **IF** N/R level in any S/G continues to increase in an uncontrolled manner, **THEN** stop feed flow to that S/G.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. **Verify NC pump cooling is aligned as follows:**	
a. Verify KC aligned to Reactor Bldg Non Essential Header: • A train __ • 1KC-3A (Rx Bldg Non-Ess Ret Hdr Isol) - OPEN __ • 1KC-230A (Rx Bldg Non-Ess Hdr Isol) - OPEN __ • A train KC pump(s) - ON. OR • B train __ • 1KC-228B (Rx Bldg Non-Ess Hdr Isol) __ • 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol) __ • B train KC pump(s) - ON.	a. Perform one of the following based on seal injection status: __ • **IF** NC pump seal injection flow is greater than 6 GPM to each NC pump, **THEN** manually open the affected valve(s). • **IF** NC pump seal injection flow is less than 6 GPM to any NC pump, **THEN**: **NOTE** NC pump seals will be cooled during NC System cooldown. __ 1) Maintain NC pump seal injection and thermal barrier cooling isolated to the affected NC pump(s). __ 2) **GO TO** Step 23.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

22. (Continued)

b. Verify the following valves - OPEN:

__ • 1KC-394A (NC Pump 1A Therm Bar Otlt)

__ • 1KC-364B (NC Pump 1B Therm Bar Otlt)

__ • 1KC-345A (NC Pump 1C Therm Bar Otlt)

__ • 1KC-413B (NC Pump 1D Therm Bar Otlt)

__ • 1KC-424B (NC Pumps Ret Hdr Cont Isol)

__ • 1KC-425A (NC Pumps Ret Hdr Cont Isol)

__ • 1KC-338B (NC Pumps Sup Hdr Cont Isol).

RESPONSE NOT OBTAINED:

b. Perform one of the following based on seal injection status:

- **IF** NC pump seal injection flow is greater than 6 GPM to each NC pump, **THEN** perform the following:

  __ 1) Manually open the affected valve(s).

  __ 2) Monitor KC surge tank levels for signs of KC leakage.

  3) **IF AT ANY TIME** KC leakage suspected, **THEN** close the following:

     __ • 1KC-424B (NC Pumps Ret Hdr Cont Isol)

     __ • 1KC-425A (NC Pumps Ret Hdr Cont Isol)

     __ • 1KC-338B (NC Pumps Sup Hdr Cont Isol).

- **IF** NC pump seal injection flow is less than 6 GPM to any NC pump, **THEN**:

  NOTE NC pump seals will be cooled during NC System cooldown.

  __ 1) Maintain NC pump seal injection and thermal barrier cooling isolated to the affected NC pump(s).

  __ 2) **GO TO** Step 23.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. (Continued)	
__ c. NC pump seal injection flow - GREATER THAN 6 GPM TO EACH NC PUMP.	c. Perform one of the following based on seal injection status: __ • **<u>IF</u>** seal injection flow exists, **<u>THEN</u>** throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to maintain 32 GPM seal injection flow. OR __ • **<u>IF</u>** seal injection flow has been lost, **<u>THEN</u> <u>REFER</u> <u>TO</u>** AP/1/A/5500/008 (Malfunction of Reactor Coolant Pump), Case II. (Loss of Seal Water Injection).
23. **Establish NC pump seal return flow as follows:**	
__ a. Verify NC pump seal injection flow - GREATER THAN 6 GPM TO EACH NC PUMP.	a. Perform the following: __ 1) **<u>WHEN</u>** NC pump seal injection is restored, **<u>THEN</u>** perform Steps 23.b through 23.g. __ 2) **<u>GO</u> <u>TO</u>** Step 24.
__ b. Verify 1AD-7, D/1 "SEALWATER HX KC HI/LO FLOW" - DARK.	b. Perform the following: __ 1) Notify station management to evaluate restoring NC pump seal return flow. __ 2) **<u>WHEN</u>** notified by station management **<u>OR</u>** 1AD-7, D/1 dark, **<u>THEN</u>** perform Steps 23.c through 23.g. __ 3) **<u>GO</u> <u>TO</u>** Step 24.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
23. (Continued)	
c. Verify the following EMF trip 1 lights - DARK: __ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	c. Perform the following: __ 1) Notify station management to evaluate restoring NC pump seal return with high NC System activity. __ 2) **WHEN** station management approval to establish NC pump seal return is obtained, **THEN** perform Steps 23.d through 23.g. __ 3) **GO TO** Step 24.
__ d. Verify NCDT pressure - LESS THAN VCT PRESSURE.	d. Perform the following: __ 1) Consult with station management to establish normal NCDT pressure. **REFER TO** OP/1/A/6500/014 (Operations Controlled Liquid Waste Systems). __ 2) **WHEN** NCDT pressure is less than VCT pressure, **THEN** perform Steps 23.e through 23.g. __ 3) **GO TO** Step 24.
e. Open the following valves: __ • 1NV-89A (NC Pmps Seal Ret Cont Isol) __ • 1NV-91B (NC Pmps Seal Ret Cont Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
23. (Continued)	
f. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** NCDT pressure is greater than VCT pressure, **<u>THEN</u>** perform the following:	
__ 1) Monitor NC Pump #1 seal ΔP.	
__ 2) Verify excess letdown - ISOLATED.	__ 2) Align 1NV-125B (Excess Letdn Hx Otlt Ctrl) to "NCDT".
3) Close the following valves: __ • 1NV-89A (NC Pmps Seal Ret Cont Isol) __ • 1NV-91B (NC Pmps Seal Ret Cont Isol).	
__ g. Verify excess letdown - ISOLATED.	__ g. Align 1NV-125B (Excess Letdn Hx Otlt Ctrl) to "VCT".
24. **Verify all AC busses are energized by offsite power as follows:** • A Train: __ • "FTA B/O NORM FDR FRM ATC" - CLOSED __ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED. • B Train: __ • "FTB B/O NORM FDR FRM ATD" - CLOSED __ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	**Perform the following:** __ a. Restore offsite power while continuing with this procedure. **<u>REFER</u> <u>TO</u>** AP/1/A/5500/007 (Loss of Normal Power). b. Manually start following equipment: __ • Start all available CRD vent fans. __ • Dispatch operator to start available VI compressors.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Preference should be given to starting 1B NC pump to provide normal Pzr spray capability. If 1B NC pump is not available, then two or three NC pumps may need to be started to provide normal Pzr spray capability.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 25. **Verify 1B NC pump - ON.**	**<u>IF</u> NC pumps need to be started to provide Pzr spray flow, <u>THEN</u> start NC pumps as follows:**
	__ a. Start NC pumps. **<u>REFER</u> <u>TO</u>** Enclosure 3 (NC Pump Start).
	__ b. **<u>IF</u>** all NC pumps are off, **<u>THEN</u>** verify Natural Circulation until an NC pump can be started. **<u>REFER</u> <u>TO</u>** Enclosure 4 (Natural Circulation Monitoring Parameters).
26. **Determine status of N/Is as follows:**	
__ a. Verify I/R channels - LESS THAN 10^{-10} AMPS.	a. Perform the following:
	__ 1) **<u>WHEN</u>** I/R channels are less than 10^{-10} Amps, **<u>THEN</u>** perform Steps 26.b and 26.c.
	__ 2) **<u>GO</u> <u>TO</u>** Step 27.
__ b. Verify S/R channels - ENERGIZED.	__ b. Place S/R select switches in "RESET".
__ c. Transfer one channel of the "NIS RECORDER" to S/R instrumentation.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. **Verify conditions to stop operating D/Gs as follows:**	
__ a. At least one D/G - ON.	__ a. **GO TO** Step 28.
b. Verify 1ETA is energized by offsite power as follows: __ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	b. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 27.d.
__ c. Dispatch operator to stop 1A D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows: __ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	d. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 28.
__ e. Dispatch operator to stop 1B D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

28. **Ensure the following signals - RESET:**

 __ • Containment Ventilation Isolation

 • Temperature control valves:

 __ • "1RN-291 KC HX 1A OTLT T/V Ss RESET"

 __ • "1RN-351 KC HX 1B OTLT T/V Ss RESET"

 __ • "1KC-57A ND HX 1A FLOW CTRL Ss RESET"

 __ • "1KC-82B ND HX 1B FLOW CTRL Ss RESET"

 __ • "1ND-26 ND HX 1A OTLT CTRL Ss RESET"

 __ • "1ND-60 ND HX 1B OTLT CTRL Ss RESET"

 __ • "1ND-27 ND HX 1A BYP CTRL Ss RESET"

 __ • "1ND-61 ND HX 1B BYP CTRL Ss RESET".

 __ • "KC NC NI NM TRAIN A ST VALVES"

 __ • "KC NC NI NM TRAIN B ST VALVES"

 • NW System valves:

 __ • ST reset
 __ • SP reset.

 __ • Boric acid transfer pumps.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
29. **Shutdown unnecessary plant equipment as follows:**	
__ a. Verify turbine generator megawatt output - LESS THAN **<u>OR</u>** EQUAL TO ZERO MW.	a. Perform the following: __ 1) Determine and correct cause of continued turbine generator output. __ 2) **<u>WHEN</u>** turbine generator megawatt output less than or equal to zero MW, **<u>THEN</u>** perform Step 29.b and Step 29.c. __ 3) **<u>GO</u> <u>TO</u>** Step 29.d.
b. Ensure the following breakers and MODs - OPEN: __ • MOD 1BG and 1BT __ • MOD 1AG and 1AT __ • Generator Breakers 1A and 1B.	
__ c. Ensure main generator "EXCITATION" - OFF	
__ d. Verify "MAN/AUTO REG" select switch "MAN" mode light - LIT.	__ d. Transfer to manual mode.
__ e. Dispatch operator to secure NF chillers and pumps.	
__ f. Stop excess condensate booster pumps.	
__ g. Stop excess hotwell pumps.	
__ h. Stop C heater drain pumps.	
__ i. Stop excess RC pumps and cooling tower fans. **<u>REFER</u> <u>TO</u>** OP/1/B/6400/001A (Condenser Circulating Water System).	
__ j. **<u>WHEN</u>** CA is no longer needed to feed S/Gs, **<u>THEN</u>** shutdown the CA System following the automatic start and return CA System to standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6250/002 (Auxiliary Feedwater System).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

29. (Continued)

__ k. Stop unnecessary KC pumps. **REFER TO** OP/1/A/6400/005 (Component Cooling Water System).

__ l. Stop unnecessary RN pumps. **REFER TO** OP/0/A/6400/006C (Nuclear Service Water System).

30. **WHEN station management concurrence is obtained, THEN restore plant equipment to shutdown alignment as follows:**

a. Establish VI to containment airlocks by opening the following valves:

__ • 1IASV5080 (Upper PAL Air Sup C/I)

__ • 1IASV5160 (Lower PAL Air Sup C/I).

b. Isolate NW System as follows:

1) Close the following valves:

__ • 1NW-35A (Cont Vlv Inj Hdr 1A Cont Isol)

__ • 1NW-105B (Cont Vlv Inj Hdr 1B Cont Isol).

__ 2) Restore NW System to standby readiness. **REFER TO** OP/1/A/6200/019 (Containment Valve Injection Water System).

c. Reset the following switches:

__ • "ND & NS ROOM SMP PMP 1A"
__ • "ND & NS ROOM SMP PMP 1B"
__ • "ND & NS ROOM SMP PMP 2A" (2MC11)
__ • "ND & NS ROOM SMP PMP 2B" (2MC11).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

d. Depress the "DEFEAT" pushbuttons on the following switches:

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A"

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".

e. Restore cooling to NCDT Hx by opening the following valves:

__ • 1KC-320A (NCDT Hx Cool Supply Cont Isol)

__ • 1KC-333A (NCDT Hx Cool Ret Cont Isol)

__ • 1KC-332B (NCDT Hx Cool Ret Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

f. Open the following valves:

- __ • 1RF-457B (RF Cont Isol)
- __ • 1VI-312A (VI To VP Cont Isol)
- __ • 1YM-119B (YM Cont Isol)
- __ • 1WL-867A (VUCDT Cont Isol)
- __ • 1WL-805A (NCDT Pump Disch Cont Isol)
- __ • 1WL-450A (NCDT Vent Cont Isol)
- __ • 1WL-825A (Cont Smp Pmps Disch Cont Isol)
- __ • 1WL-869B (VUCDT Cont Isol)
- __ • 1WL-807B (NCDT Pumps Disch Cont Isol)
- __ • 1WL-451B (NCDT Vent Cont Isol)
- __ • 1WL-827B (Cont Smp Pmps Disch Cont Isol)
- __ • 1RN-839A (AB Sup Unit YV/RN Sup Isol)
- __ • 1RN-841B (AB Sup Unit YV/RN Ret Isol)
- __ • 1KC-430A (Rx Bldg Drn Hdr Cont Isol)
- __ • 1KC-429B (Rx Bldg Drn Hdr Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

g. Restore FWST to normal as follows:

__ 1) Open 1FW-33A (FWST Recirc Loop Isol).

__ 2) Open 1FW-49B (FWST Recirc Loop Isol).

__ 3) Start one FW recirc pump.

__ 4) Align to refill the FWST. **REFER TO** OP/1/A/6200/014 (Refueling Water System).

__ h. Restore KF System to normal. **REFER TO** OP/1/A/6200/005 (Spent Fuel Cooling System).

i. Restore containment EMFs to normal by opening the following valves:

__ • 1MISV5230 (Cont EMF Sup Otsd Cont Isol)

__ • 1MISV5232 (Cont EMF Ret Otsd Cont Isol)

__ • 1MISV5231 (Cont EMF Sup Insd Cont Isol)

__ • 1MISV5233 (Cont EMF Ret Insd Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

j. Restore the NM System to normal by opening the following valves:

__ • 1NM-191B (S/G 1A Smpl Hdr Cont Isol)

__ • 1NM-201A (S/G 1B Smpl Hdr Cont Isol)

__ • 1NM-211B (S/G 1C Smpl Hdr Cont Isol)

__ • 1NM-221A (S/G 1D Smpl Hdr Cont Isol)

__ • 1NM-190A (S/G 1A Bldwn Smpl Cont Isol)

__ • 1NM-200B (S/G 1B Bldwn Smpl Cont Isol)

__ • 1NM-210A (S/G 1C Bldwn Smpl Cont Isol)

__ • 1NM-220B (S/G 1D Bldwn Smpl Cont Isol)

__ • 1NM-22A (Hot Leg A Smpl Cont Isol)

__ • 1NM-26B (Hot Leg Smpl Hdr Cont Isol).

__ k. Restore VE System to normal. **REFER TO** OP/1/A/6450/002 (Annulus Ventilation System).

__ l. Restore NF System to normal. **REFER TO** OP/0/A/6200/008 (Ice Condenser Refrigeration System).

__ m. Restore VF System to normal. **REFER TO** OP/1/A/6450/004 (Fuel Pool Ventilation System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

__ n. Restore Containment Ventilation System to normal. **REFER TO** OP/1/A/6450/001 (Containment Ventilation System).

__ o. Restore VA System to normal. **REFER TO** OP/0/A/6450/003 (Auxiliary Building Ventilation System).

__ p. Restore VC/YC to normal. **REFER TO** OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System).

__ q. Dispatch operator to restore Technical Support Center Ventilation System to normal. **REFER TO** OP/0/B/6450/024 (Technical Support Center Ventilation System).

__ r. Perform required steps in OP/1/A/6100/003 (Controlling Procedure For Unit Operation).

__ s. **WHEN** the required steps of OP/1/A/6100/003 (Controlling Procedure For Unit Operation) are completed, **THEN** perform the required steps in OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown).

__ t. Restore BB System to normal. **REFER TO** OP/1/A/6250/008 (Steam Generator Blowdown).

__ u. Notify Reactor Group Duty Engineer to investigate the cause of Reactor Trip. **REFER TO** PT/0/A/4150/002 A (Transient Investigation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. (Continued)	
v. Reset automatic S/I initiation logic as follows:	
__ 1) Ensure all automatic S/I and Reactor Trip initiation signals - CLEARED.	1) Perform the following: __ a) **WHEN** all S/I **AND** Reactor Trip signals are clear, **THEN** perform Step 30.v. __ b) **GO TO** Step 30.w.
__ 2) Dispatch operator to shutdown the CRD M/G sets. **REFER TO** OP/1/A/6150/008 (Rod Control).	
3) **WHEN** the CRD M/G sets are shutdown, **THEN**: __ a) Close the Reactor Trip Breakers. __ b) Verify the "AUTO S/I BLOCKED" status light (1SI-13) - DARK. c) Perform the following steps simultaneously: __ • Depress the Feedwater Isolation "RESET" pushbuttons. __ • Open the Reactor Trip Breakers.	
__ w. Verify power change - GREATER THAN OR EQUAL TO 15% RATED THERMAL POWER WITHIN 1 HOUR PERIOD.	__ w. **GO TO** Step 31.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. (Continued)	
x. Notify the following sections to take appropriate samples:	
__ • Radiation Protection to sample and analyze gaseous effluents. **<u>REFER TO</u>** Selected Licensee Commitments Manual, Section 16.11-6.	
__ • Primary Chemistry to sample for isotopic analysis of iodine. **<u>REFER TO</u>** Tech Spec 3.4.16.2 (Sample must be taken between 2 hours and 6 hours following last power change greater than or equal to 15% rated thermal power within a 1 hour period).	
31. **Maintain the following plant conditions stable:**	
__ • Pzr pressure __ • Pzr level __ • NC temperatures __ • All intact S/G levels.	
__ 32. **Verify MSIVs on all intact S/Gs - OPEN.**	**Perform the following:**
	__ a. **<u>IF</u>** MSIVs are closed to isolate a break downstream of the MSIVs, **<u>THEN GO TO</u>** Step 33.
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

32. (Continued)

b. Reset Main Steam Isolation signal as follows:

1) **IF** any S/G pressure less than 775 PSIG, **THEN** perform the following:

__ a) **IF** "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) is dark, **THEN GO TO** Step 33.

b) **IF** "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) is lit, **THEN**:

__ (1) Depress ECCS steam pressure "BLOCK" pushbuttons.

__ (2) Verify main steam isolation blocked status lights (1SI-13) - LIT.

__ 2) Ensure manual loaders for all MSIV bypass valves - ADJUSTED TO 0%.

__ 3) Reset SM Isolation.

__ 4) Reset S/G PORVs.

__ c. Place "STM DUMP CTRL" in manual.

__ d. Adjust the "STM DUMP CTRL" to 0% demand.

__ e. Place the steam dumps in pressure mode.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
32. (Continued)	
	f. Perform the following to equalize pressure across MSIVs on intact S/Gs:
	__ 1) Open MSIV bypass valve on intact S/Gs.
	__ 2) **IF AT ANY TIME** pressure does not equalize as required, **THEN** isolate steam loads off main steam header. **REFER TO** Enclosure 5 (Equalizing Across MSIVs).
	g. **WHEN** all intact S/Gs pressure is within 50 psig of steam header pressure, **THEN**:
	__ 1) Open MSIVs on all intact S/Gs.
	__ 2) Close all MSIV bypass valves.
	__ 3) **IF** "P-12 LO-LO TAVG" status light (1SI-18) is lit, **THEN** place the steam dump interlock bypass switches in "BYP INTLK."
	__ 4) Control steam dumps to maintain NC T-Hots - STABLE.
	__ h. **GO TO** Step 33.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
33. **Verify S/I flow not required as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	a. Perform the following: __ 1) Manually start S/I pumps and align valves as necessary to restore NC subcooling. __ 2) **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. Pzr level - GREATER THAN 11% (20% ACC).	b. Perform the following: __ 1) Control charging flow to restore Pzr level to greater than 11% (20% ACC). 2) **IF** Pzr level cannot be maintained greater than 11% (20% ACC), **THEN**: __ a) Manually start S/I pumps and align valves as necessary to restore Pzr level. __ b) **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
34. **Determine required plant recovery procedure as follows:**	
__ a. Verify NC cooldown - REQUIRED.	__ a. **GO TO** OP/1/A/6100/005 (Unit Fast Recovery).
__ b. Verify all NC pumps - OFF.	__ b. **GO TO** OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown).
__ c. **GO TO** EP/1/A/5000/ES-0.2 (Natural Circulation Cooldown).	

END

1. **S/I Reinitiation Criteria:**

   - **IF** NC subcooling based on core exit T/Cs is less than 0°F **OR** Pzr level cannot be maintained greater than 11% (20% ACC), **THEN**:

   __ a. Manually start S/I pumps and align valves as required to restore subcooling and Pzr level.

   __ b. **IF** Step 13 has been completed, **THEN GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).

2. **Secondary Integrity Criteria:**

   __ • **IF** pressure in any unisolated S/G is decreasing in an uncontrolled manner **OR** any unisolated S/G has completely depressurized, **THEN GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).

3. **SGTR Transition Criteria:**

   - **IF** level in any S/G is increasing in an uncontrolled manner **OR** any S/G has abnormal radiation, **THEN**:

   __ a. Manually start S/I pumps and align valves.

   __ b. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

4. **Cold Leg Recirc Switchover Criterion:**

   __ • **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

5. **CA Suction Source Switchover Criteria:**

   - **IF** either of the following annunciators are lit, **THEN REFER TO** AP/1/A/5500/006 (Loss of S/G Feedwater):

   __ • 1AD-5, H/4 "CACST LO LEVEL"

   OR

   __ • 1AD-8, B/1 "UST LO LEVEL".

6. **Loss of Emergency Coolant Recirculation Criteria:**

__ • **IF** emergency coolant recirculation has been established and is subsequently lost, **THEN GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

2009 NRC EXAMINATION

Facility: Catawba Nuclear Station Scenario No.: **2** Op-Test No.: 2009 D-1

SNAP 142

Examiners: ______ Operators: ______

Initial Conditions:

- 100% power
- EFPD = 25 days
- Boron Concentration is 1348 ppm

Turnover:

- 1A D/G was placed in Maintenance Mode and red tagged 2 hours ago for PMs and is expected back in 6 hours.
- Reduce power for control valve movement test to be done by the next shift per OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.3, Unit Operation Between 85% and 100% Power.

Event No.	Malf. No.	Event Type*	Event Description
1	BOP	N	Borate for power decrease (DCS)
2	RO	R	Power reduction using turbine in auto /rods as necessary
3	BOP SRO	C TS	RN Strainer 1A high D/P
4	RO	C	Steam dump valve 1SB-12 fails open
5	RO	C	Loss of condenser vacuum/ reduce load with turbine in manual
6	BOP SRO	C TS	PZR Spray valve 1NC-27 fails open with no manual control
7	ALL	M	Tube rupture on 1A S/G Additional Failures Failure of automatic feedwater (CF) isolation Failure of 1NI-9 and 1NI-10 to automatically position S/G PORV 1SV-19 fails open

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

SIMULATOR SETUP

Reset to 100% BOL snap
Roll Charts
Provide a boration/dilution plan
Clear EHC alarm and any OAC/ 1.47 bypass alarms
Ensure SM is supplying steam seals
Sign off OP/1/A/6100/003 enclosure 4.3 thru step 2.13 (students start at 2.14)

MALFUNCTIONS, REMOTES, and OVERRIDES

Malfunction #	Description	Value	Event Trigger	Ramp	Delay
VLV-NI001A	NI9A B.I.T. DISCHARGE ISOL VLV FAIL AUTO ACTIONS				
VLV-NI002A	NI10B B.I.T. DISCHARGE ISOL VLV FAIL AUTO ACTIONS				
MAL-ISE007A	AUTO CF ISOL SIGNAL TRN A	BLOCK			
MAL-ISE007B	AUTO CF ISOL SIGNAL TRN B	BLOCK			
OVR-CM001B	COND A-B-C VAC BKR VLVS OPEN LT	OFF			
OVR-DG047	*DG-PNL* MAINTENANCE MODE PB BLACK PB	ON			
OVR-DG015B	D/G 1B MAINT MODE PB (11/378) INITIATE PB	ON			
OVR-DG048A	*DG-PNL* MODE SEL 2 POS LOCKOUT RELAY SW TRIP POS	ON			
MAL-RN002A	RN STRNER 1A HI D/P	100	3	60	
MAL-IDE003D	STEAM DUMP VLV SB12 FAIL TO POSITION	50	4		
MAL-IPE003B	PZR SPRAY VLV NC-27 FAIL, NO MAN CTRL	100	6	60	
MAL-MT003	LOSS OF CONDENSER VACUUM (VLV LEAK)	30	5		
MAL-MT003	LOSS OF CONDENSER VACUUM (VLV LEAK)	0	11	300	
VLV-CM010F	CM368 COND A VACUUM BRKR VLV FAIL TO POSITION	1	8		
VLV-CM011F	CM369 COND B VACUUM BRKR VLV FAIL TO POSITION	1	8		
VLV-CM012F	CM370 COND C VACUUM BRKR VLV FAIL TO POSITION	1	8		
MAL-SG001A	S/G A TUBE LEAK	650	7		
MAL-SM002A	S/G PORV SV19 FAILURE	100	8		5
LOA-IDE004	SB11 - INLET ISOL	0	21	120	180
OVR-CM001A	COND A-B-C VAC BKR VLVS CLSD LT	ON			

BST-JPB7500H	RN PMP A STRAINER HI D/P	SET	3		
MAL-RN002A	RN STRNER 1A HI D/P	50	12	180	Del in 1
OVR-RN013A	1RN30A RN STRNER 1A BACKFLUSH ISOL SEL SW CLSD LT	OFF	12	7	7 Del in 195
OVR-RN013B	1RN30A RN STRNER 1A BACKFLUSH ISOL SEL SW OPEN LT	ON	12	1	1 Del in 185

EVENT TRIGGERS (other than manual)

Event Trigger	Description
8	Reactor Trip either train [jpplp4(1) | jpplp4(2)]
11	SMSS < 1130.0 (TRUE when turbine MW meter reads less than 1135 MW)
12	X11i040n (TRUE when 1A Strainer switch is taken to ON)

CRITICAL TASKS (See attached documentation)

E-0 I – Establish flow from at least one high-head ECCS pump before transition out of E-0.

E-3 A – Isolate feedwater flow into and steam flow from the ruptured S/G before a transition to ECA-3.1 occurs.

QUALITATIVE ATTRIBUTES

	Required	Actual
Total malfunctions	5 - 8	8
Malfunctions after EOP entry	1 - 2	3
Abnormal events	2 - 4	4
Major transients	1 - 2	1
EOPs entered/requiring substantive actions	1 - 2	1
EOP contingencies requiring substantive actions	0 - 2	0
Critical tasks	2 - 3	2

REFERENCES

OP/1/A/6150/009 (Boron Concentration Control) revision 068DCS
OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.3 revision 106DCS
OP/1/B/6300/001 (Turbine Generator) revision 091
AP/0/A/5500/020 (Loss of Nuclear Service Water) revision 037DCS
AP/1/A/5500/028 (Secondary Steam Leak) revision 005DCS
AP/1/A/5500/011 (Pressurizer Pressure Anomalies) revision 022DCS
AP/1/A/5500/023 (Loss of Condenser Vacuum) revision 018
EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) revision 036DCS
EP/1/A/5000/E-3 (Steam Generator Tube Rupture) revision 034DCS
OP/0/A/6400/006C (Nuclear Service Water) revision 266

NOTES AND INSTRUCTIONS

NOTE: The following steps are GUIDELINES. The NRC lead examiner will direct timing of events unless otherwise noted.

NOTE: Any groups or individuals (IAE, RxGrp, RP, SOC, SWM) that are called to I/R a problem or for simple notification of a problem, repeat back the information they provide unless otherwise noted.

NOTE: Any operators dispatched should repeat back information provided. Call back items are listed below when necessary for the scenario.

Event 1 – Borate for power decrease

This event will be entered once the crew has taken turnover and evaluated plant conditions. When the first boration batch has been completed, the next event can be started.

Event 2 – Power reduction using turbine/rods as necessary

When turbine power has been reduced by 3-5 MW, the next event can be inserted.

Event 3 – RN Strainer 1A high D/P, SRO Technical Specification

Initiating Cues:

- 1AD-12 alarms A/1, A/2, A/5, C/2

When AP/0/A/5500/020 is completed and the SRO has completed consulting Technical Specifications, the next event can be inserted.

TS 3.7.8 Condition A

If asked to check out RN pump 1A and/or breaker state, after 10 minutes state **"Nothing unusual was noted."**

If asked to check on RN pump 1B following the state, state **"It appears to be operating normally."**

Event 4 – Steam dump valve 1SB-12 fails open

Initiating Cues:

- 1SB-12 indicating lights intermediate on 1MC-2
- OAC alarm C1Q0966 (SB-12 Mn Stm Bypass to Cond Control #12)
- Turbine MW decreasing

At Step 9.d RNO, when an operator is dispatched to manually close the condenser dump valve isolation valve, **insert EVENT 21**

Call back when the valve reaches full closed and state "**1SB-12 is closed.**"

.

When step 18 of AP/1/A/5500/028 is completed and 1SB-12 has been isolated, the next event can be entered.

TS – 3.4.1 Condition A (based on NC pressure at the time)

<u>Event 5 – Loss of condenser vacuum</u>

Initiating Cues:

- 1AD1, F/7
- OAC alarm C1A0734 (Condenser C absolute backpressure)
- Turbine MW decreasing

When load has been reduced to stop the loss of vacuum (See EVENT 11) and step 10 of AP/1/A/5500/023 has been completed, the next event can be inserted.

When EVENT 11 actuates, call as the NLO sent out to evaluate the turbine building for vacuum leaks and state **"Maintenance breached a system boundary that was isolated for work and air was being sucked in. It appears one of the isolation valve was not fully seated. It has been adjusted and the leak appears to have stopped."**

TS - TS – 3.4.1 Condition A (based on NC pressure at the time)

<u>Event 6 – PZR Spray valve 1NC-27 fails intermediate with no manual control</u>

NOTE: If the spray valve failure is not dealt with quickly, the reactor will trip and in that case, EVENT 7 should be immediately triggered.

Initiating Cues:

- 1AD-6, F/8
- OAC alarm C1L4455 (Normal Pressurizer Spray Flow Activated)

When AP/1/A/5500/011 is completed and the SRO has completed consulting Technical Specifications, the next event can be inserted. This will begin the major event.

TS – 3.4.1 Condition A (based on NC pressure at the time)

Event 7 – Tube rupture on 1A S/G

Initiating Cues:

- 1RAD-1, B/1, B/4, E/5
- 1RAD-3, E/5

This is the major event.

Additional failures

- Failure of automatic feedwater (CF) isolation
- Failure of 1NI-9 and 1NI-10 to automatically position
- S/G PORV 1SV-19 fails open

Scenario End Point

AFTER SAFETY INJECTION IS TERMINATED PER EP/1/A/5000/E-3 Step 25.c.

CREW TURNOVER INFORMATION

Initial Conditions:

- 100% power
- EFPD = 25 days
- Boron Concentration is 1348 ppm

Turnover:

- 1A D/G was placed in Maintenance Mode and red tagged 2 hours ago for PMs and is expected back in 6 hours.
- Reduce power for control valve movement test to be done by the next shift per OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.3, Unit Operation Between 85% and 100% Power.

Duke Energy Catawba Nuclear Station **Boron Concentration Control** **Continuous Use**	Procedure No. OP/1/A/6150/009 Revision No. DCS 068 Electronic Reference No. CN005FKT

Boron Concentration Control

1. Purpose

To describe the operation of the Boron Concentration Control System.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can affect core reactivity by changing boron concentration. (R.M.)

2.2 The following Limits and Precautions are Reactivity Management related: (R.M.)

2.2.1 When changing the boron concentration of the NC System, closely monitor the following for expected indication:

- Rod motion
- T-AVG
- Nuclear instrumentation

2.2.2 When performing dilutions at or near 100% power, batch additions to the VCT (instead of continuous dilution at low flow rates) are the preferred method. {PIP C99-0587}

2.2.3 If the NC System is filled and vented and the boron concentration is being reduced in the NC System, at least one NC pump shall be in operation, recirculating the NC System. {PIP C99-2510}

2.2.4 If the boron concentration is being increased in the NC System, at least one NC pump or one ND pump shall be in operation, recirculating the NC System.

2.2.5 Following an increase or decrease of the NC System boron concentration of $\geq$ 50 ppm, pressurizer spray shall be operated to equalize the boron concentration throughout the system.

2.2.6 When the reactor is subcritical and dilution is in progress, if the Nuclear Instrumentation increases by a factor of two, secure the operation immediately and evaluate the cause.

2.2.7 If the unit has operated continuously for several months, significant Boron 10 depletion may have occurred. The effective boron concentration of the NC System may be lower than indicated by Chemistry samples. NC temperature shall be carefully monitored following VCT makeup.

2.3 During continuous dilution operations, sample the NC System H_2 concentration every eight hours.

2.4 When manually operating any motor operated valve, minimize the torque applied to the handwheel.

2.5 After manual operation, maintenance or packing adjustment of any motor operated safety related valve, it shall be cycled electrically to ensure reliable automatic operation.

2.6 With the "NC MAKEUP MODE SELECT" switch in the "DILUTE" position, the makeup flow rate is limited by letdown flow, the VCT spray nozzle, and VCT pressure. The maximum expected makeup flow rate is approximately 95 gpm.

2.7 With the "NC MAKEUP MODE SELECT" switch in the "ALTERNATE DILUTE" position, the maximum expected makeup flow rate is approximately 130 gpm.

2.8 With BAT boron concentration greater than or equal to 7200 ppm, it is recommended that only manual makeup be performed when the NC System boron concentration is ≥1300 ppm. Automatic or manual makeup can be used when NC System boron concentration is < 1300 ppm. {PIP 03-7305}

2.9 With BAT boron concentration less than 7200 ppm, it is recommended that only manual makeup be performed when the NC System boron concentration is ≥ 1250 ppm. Automatic or manual makeup can be used when NC System boron concentration is < 1250 ppm. {PIP 03-7305}

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Automatic Makeup

4.2 Boration

4.3 Dilution

4.4 Alternate Dilution

4.5 Manual Operation Of The Makeup Controls

4.6 Operation Of The Boric Acid Transfer Pumps In Miniflow

4.7 Placing Boric Acid Tank #2 In Service For Unit #1

4.8 Valve Checklist

4.9 Rapid Boration

4.10 Deboration Of The NC System Using A Mixed Bed Demineralizer

4.11 Unit # 1 Boric Acid Tank Cleanup

4.12 Boric Acid Addition To NCP Seals

4.13 Recirculation Of The Boric Acid Tank With The BAT Recirc Pump

4.14 Blend Control Verification

1. Initial Conditions

☐ 1.1 Review the Limits and Precautions.

_____ 1.2 **IF** in Mode 1 or 2, ensure R2 reactivity management controls established per SOMP 01-02 (Reactivity Management). (R.M.)

☐ 1.3 Verify the NV System is in operation per OP/1/A/6200/001 (Chemical and Volume Control System).

☐ 1.4 Verify sufficient RHT volume is available to receive the reactor coolant displaced during the planned boration operation.

2. Procedure

NOTE:	This enclosure will affect reactivity of the core and is therefore designated important to Reactivity Management per the guidelines of NSD 304 (Reactivity Management). (R.M.)

☐ 2.1 Ensure valves are aligned per Enclosure 4.8 (Valve Checklist).

2.2 Ensure the following valve control switches in "AUTO":

☐ 1NV-238A (B/A Xfer Pmp To Blender Ctrl)
☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

☐ 2.3 Ensure 1NV-238A (B/A Xfer Pmp To Blender Ctrl) controller in auto.

☐ 2.4 Ensure at least one boric acid transfer pump is in "AUTO" or "ON".

☐ 2.5 Adjust the boric acid batch counter to the desired volume of boric acid to be added. (R.M.)

_____ 2.6 **IF** the blender is set up for automatic makeup per Enclosure 4.1 (Automatic Makeup), record the setpoint of the controller for 1NV-238A (B/A Xfer Pmp To Blender Ctrl). ________gpm

☐ 2.7 Place the "NC MAKEUP MODE SELECT" switch in "BORATE".

NOTE:	Boric Acid flow rates > 32 gpm may result in a boric acid flow deviation annunciator.

☐ 2.8 Adjust the controller for 1NV-238A (B/A Xfer Pmp To Blender Ctrl) to the desired flow.

NOTE:	If necessary, boration can be manually secured at any time by placing the "NC MAKEUP CONTROL" switch to the "STOP" position.

☐ 2.9 Place the "NC MAKEUP CONTROL" switch to the "START" position. (R.M.)

2.10 Verify the following valves open:

- ☐ 1NV-238A (B/A Xfer Pmp To Blender Ctrl)
- ☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

_____ 2.11 **IF** in "AUTO", verify the boric acid transfer pump starts.

NOTE:	The total makeup flow totalizer is inaccurate at low flow rates.

☐ 2.12 Verify proper flow by observing the boric acid flow totalizer. {PIP 96-0137}

2.13 **WHEN** the desired volume of boric acid is reached on the boric acid batch counter, ensure the following valves close: (R.M.)

- ☐ 1NV-238A (B/A Xfer Pmp To Blender Ctrl)
- ☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

NOTE:	If additional borations will be performed over the course of the shift, flushing the makeup line is **NOT** recommended.

_____ 2.14 **IF** desired, flush the makeup line as follows:

Flushing should not be desired at this time.

2.14.1 Open the following valves:

- ☐ 1NV-242A (RMWST To B/A Blender Ctrl)
- ☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

☐ 2.14.2 Ensure one reactor makeup water pump is in "ON".

2.14.3 **WHEN** ~ 20 gallons of makeup water have been flushed through the makeup line, close the following valves:

- ☐ 1NV-242A (RMWST To B/A Blender Ctrl)
- ☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

2.14.4 Place the following valve control switches in "AUTO":

- ☐ 1NV-242A (RMWST To B/A Blender Ctrl)
- ☐ 1NV-186A (B/A Blender Otlt To VCT Otlt)

_____ 2.14.5 **IF NOT** required for current plant operation, place the reactor makeup water pump started in Step 2.14.2 in "AUTO".

_____ 2.15 **IF** automatic makeup is desired, perform one of the following:

_____ 2.15.1 **IF** it is desired to change the blender outlet boron concentration, refer to Enclosure 4.1 (Automatic Makeup).

OR

_____ 2.15.2 **IF** makeup at the previous concentration is acceptable **AND** the system was previously aligned per Enclosure 4.1 (Automatic Makeup), perform the following:

☐ 2.15.2.1 Ensure the controller for 1NV-238A (B/A Xfer Pmp To Blender Ctrl) is set to the value recorded in Step 2.6. (R.M.)

☐ 2.15.2.2 Place the "NC MAKEUP MODE SELECT" switch in "AUTO".

☐ 2.15.2.3 Place the "NC MAKEUP CONTROL" switch to the "START" position. (R.M.)

2.16 Do **NOT** file this enclosure in the Control Copy folder of this procedure.

Duke Energy Catawba Nuclear Station **Controlling Procedure For Unit Operation**	Procedure No. OP/1/A/6100/003
	Revision No. 106 DCS
Continuous Use	Electronic Reference No. CN005FK5

Controlling Procedure For Unit Operation

1. Purpose

To describe the operation of the unit between approximately 15% and 100% full power.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can effect core reactivity by the following: (R.M.)

- Control rod movement
- Turbine load changes
- Feedwater manipulations
- Reactor power changes

2.2 The following Limits and Precautions are Reactivity Management related: (R.M.)

2.2.1 Before returning reactor control to automatic, T-AVG shall be within ± 1°F of T-REF.

2.2.2 Do **<u>NOT</u>** exceed rod insertion limits or temporary rod withdrawal limits.

2.2.3 Automatic control rod withdrawal is blocked when Control Bank D ≥ 200 steps withdrawn.

2.2.4 The difference in boron concentration between the PZR and NC System is desired to be maintained within ± 50 ppm.

2.2.5 Axial Flux Difference (AFD) shall be maintained within the allowable limits as defined in the ROD manual at all power levels above 50% reactor power. (Tech Spec 3.2.3)

2.2.6 During a power change, other indications of reactor power shall be observed along with power range and secondary thermal power indications to aid in determining the reactor power level. Using indications like turbine impulse pressure, CF flow rate, NC loop ΔTs, and others may help in detecting the miscalibration of a nuclear instrument.

2.3 In the event of an inadvertent power reduction, it is recommended that the power level **<u>NOT</u>** be increased until an investigation has been conducted and corrective action taken.

2.4 If reactor control is in manual, maintain T-AVG within ± 2°F of T-REF to prevent receiving "T-REF/T-AUCT HI/LO" alarm.

2.5 Whenever there is a thermal power change greater than or equal to 15% rated thermal power within a one hour period: (OAC point C1L4790 in alarm)

- Notify Chemistry to take an isotopic analysis for iodine within 2 to 6 hours following the last power change that is greater than or equal to 15% rated thermal power within a one hour period. (T.S. SR 3.4.16.2)

- When thermal power has stabilized, notify Radiation Protection to sample and analyze gaseous effluents. (S.L.C. 16.11-6)

2.6 S/G blowdown flowrate shall **NOT** exceed a maximum of 200 GPM per S/G.

2.7 After a thermal power change when plant conditions stabilize, 1EMF-39 setpoints shall be adjusted so the Trip 2 setpoint is set at three times the containment activity and Trip 1 setpoint is set at 70% of Trip 2 setpoint.

2.8 If the RC System condenser inlet temperature drops to less than or equal to 60°F when the Rx is shutdown or less than or equal to 55°F when the Rx is critical, the system shall be configured as follows:

- One RC pump running (throttled).
- One tower inlet isolated.
- All three riser bypasses open.

2.9 OAC point C1K0628 (CF Flow Venturi Correction Factor) shall be reset to 1.0 when either of the following conditions are met:

- A step load change such as a load rejection greater than 10% rated thermal power,
- A ramp load change of greater than 15% rated thermal power in a one hour period.

2.10 When the unit is engaged in a power maneuver resulting in a mismatch between OAC point C1P1385 (Reactor Thermal Power, Best) and any excore power channel in excess of 2% refer to Tech Spec Basis for SR 3.3.1.2.

2.11 The insertion of Control Bank D will affect mismatch between OAC point C1P1385 (Reactor Thermal Power, Best) and the excore power range channels. This is due to shielding of the power range detectors by Control Bank D. Therefore, refer to Tech Spec Basis for SR 3.3.1.2 when mismatch between Reactor Thermal Power (Best Estimate) and the excore power range channels shall be observed to be exceeding 2%.

2.12 The Reactor Engineering Group normally provides information for planned power maneuvers. The OAC xenon predict program can be used to help anticipate dilution and boration requirements. {PIP C99-0587}

2.13 The Steamline N-16 Radiation Monitors (EMF-71, 72, 73, 74) become inaccurate at power levels below 40% due to inaccuracies in the algorithm used to calculate the output of these monitors. {PIP 99-3980}

2.14 It is recommended that Primary Chemistry be notified prior to all significant boric acid additions or dilutions to the NC System such that proper pH control may be maintained. Normal boric acid additions and dilutions should be communicated at the Control Room shift briefing. {PIP C-01-665}

2.15 In accordance with INPO best practices when personnel are accessing areas that could experience significant dose rate changes resulting from increasing power, Operations shall maintain Reactor power steady or decreasing.

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Power Increase

4.2 Power Decrease

4.3 Unit Operation Between 85% and 100% Power

4.4 T-AVG Coastdown

4.4.1 T-AVG Coastdown Data

4.4.2 Adjustment Of DCS ACCEPTED VALUE For T AVG

4.4.3 T-AVG Coastdown Tracking Data (Phase 1 and Phase 2)

4.5 Power Escalation Guideline

1. Initial Conditions

_____ 1.1 Ensure the proper reactivity management controls established per SOMP 01-02 (Reactivity Management) (R.M.)

_____ 1.2 Review the Limits and Precautions.

_____ 1.3 Verify unit is currently operating at greater than or equal to 85% turbine power.

2. Procedure

NOTE:	This enclosure will affect reactivity of the core and is therefore designated important to Reactivity Management per the guidelines of NSD 304 (Reactivity Management). (R.M.)

_____ 2.1 Notify the SOC of the unit load increase per OP/1/B/6300/001 (Turbine-Generator).

_____ 2.2 Continue with the load increase to the desired power level.

NOTE:	The procedure may continue while performing Step 2.3 if required.

_____ 2.3 **IF** required due to previous plant conditions at approximately 85% power, align feedwater heater vents as directed by the Startup enclosure of OP/1/B/6250/004 (Feedwater Heaters, Vents, Drains and Bleed System).

NOTE:	When aligned to BYPASS, the Manual Bypass Selector Valves will align air directly to the drain valve actuator to maintain the valve closed. When aligned to ENABLE, the Manual Bypass Selector Valves will align air through the level switch solenoid valve to allow the valve to cycle based on level.

_____ 2.4 At approximately 90% reactor thermal power, ensure the following Manual Bypass Selector Valves are in the BYPASS position:

- ☐ 1SPMV0290 (1SP29 Manual Bypass Selector Valve) (TB-597, 1D-21)
- ☐ 1SPMV0330 (1SP33 Manual Bypass Selector Valve) (TB-598, 1C-19)
- ☐ 1SPMV0400 (1SP40 Manual Bypass Selector Valve) (TB-600, 1C-33)
- ☐ 1SPMV0990 (1SP99 Manual Bypass Selector Valve) (TB-598, 1C-23)
- ☐ 1SPMV1230 (1SP123 Manual Bypass Selector Valve) (TB-606, 1B-22)

_____ 2.5 At approximately 90% reactor thermal power, perform the following to ensure the primary to secondary leakage program inputs are current:

☐ Notify RP to ensure EMF-33 background counts in the EMF-33 Background Spreadsheet is current.

Person Notified ____________________

☐ Notify Primary Chemistry to ensure the NC Xenon Equivalent in the Chemistry Database is current.

Person Notified ____________________

☐ Record current air ejector off gas flowrate. ____________________

☐ Update "EMF33 Prim/Sec Leakage" program on the OAC.

_____ 2.6 **<u>IF</u>** required due to Generator/Automatic Voltage Regulator (AVR) testing at approximately 95% turbine power (~1021 MWe), perform the following:

_____ 2.6.1 **<u>IF</u>** performing Generator/Automatic Voltage Regulator (AVR) testing, **<u>HOLD</u>** until Generator/AVR personnel are ready for Operations to continue with Unit 1 power increase.

☐ 2.6.2 Once notified by AVR personnel that AVR testing is complete, at this power, begin power increase.

Person making notification ____________________

NOTE:	Refer to Unit One R.O.D., Section 2.4 (Fuel Maneuvering Limits) for rate at which power level can be changed.

_____ 2.7 Prior to exceeding 98% thermal power on OAC point C1P1385 (Reactor Thermal Power, Best), verify OAC point C1K0628 (CF Flow Venturi Correction Factor) has been reset to 1.0 if either of the following conditions have been met since the point has been reset:

- A step load change such as a load rejection of greater than 10% rated thermal power.
- A ramp load change of greater than 15% rated thermal power in a one hour period.

_____ 2.8 Prior to exceeding 98% thermal power on OAC point C1P1385 (Reactor Thermal Power, Best) ensure the rate of power escalation is no greater than 2%/hr to help prevent an inadvertent overpower condition.

NOTE:	The intent of the following step is to have a more controlled final approach to 100% power.

_____ 2.9 **WHEN** at 99.5% reactor power on C1P1385 (U1 Reactor Thermal Power Best), perform the following:

_____ 2.9.1 **HOLD** power escalation for at least 10 minutes to allow for Xenon and AFD oscillations to be seen.

_____ 2.9.2 **WHEN** at least 10 minutes have elapsed, continue the power increase.

CAUTION:	Alternate indications of reactor power shall be monitored to verify reactor power level and help prevent NI miscalibration.

_____ 2.10 At 100% thermal power (3411 MWt), compare OAC heat balance point C1P1385 (Reactor Thermal Power, Best) with nuclear instrumentation.

_____ 2.11 **IF** this power increase is from Mode 3, notify Secondary Chemistry to perform a primary to secondary leak rate calculation per PT/1/B/4600/028 (Determination of Steam Generator Tube Leak Rate for Unit 1) within 24 hours of reaching 100% power. (NSD 513)
Person notified ______________________________

_____ 2.12 **IF** required, notify IAE to adjust nuclear instrumentation per Model W/O #00874628.
Person notified ______________________________

NOTE:	1. The unit is now operating at 100% power. The following steps reduce power to 85% power. 2. If the desired power reduction rate is ≥ 15%/hr (3.33 MW/Min), consider using AP/1/A/5500/009 (Rapid Downpower).

_____ 2.13 **IF** this is a T-AVG Coastdown, maintain T-AVG ≥ Limiting Curve for Phases 2 and 3 (Enclosure 4.4.1).

_____ SRO 2.14 **IF** shutdown is due to Tech Spec, ensure the NRC has been notified per RP/0/B/5000/013 (NRC Notification Requirements).

NOTE:	The procedure may continue while performing Step 2.15.

_____ 2.15 **IF** initiating a shutdown for a refueling outage, perform the following to isolate 1EMF-48:

_____ 2.15.1 Declare 1EMF-48 inoperable.

_____ 2.15.2 Close 1NM-26B (Hot Leg Smpl Hdr Cont Isol).
Record time ____________

_____ 2.15.3 Notify Primary Chemistry and RP Shift that 1EMF-48 has been isolated:

RP Shift person notified ____________________
Primary Chemistry person notified ____________________

NOTE:	During a T-AVG Coastdown when a turbine load reduction or steam pressure increase (safety valve testing) is requested with the turbine control valves at or near wide open, the load decrease will **NOT** be linear with valve reference (demand) decrease. This is due to the flow characteristic of the turbine control valves. Load increase/decrease is linear with demand increase/decrease from approximately 10% to 90% valve reference. AFD oscillations should be expected. (02-3529)

SIGNED OFF TO HERE

_____ 2.16 Notify the SOC prior to reducing load per OP/1/B/6300/001 (Turbine-Generator).

RO/BOP _____ 2.17 Begin the load reduction to the desired power level.

CAUTION:	1. When the unit is engaged in a power maneuver resulting in a mismatch between OAC point C1P1385 (Reactor Thermal Power, Best) and any excore power channel in excess of 2%, refer to Tech Spec Basis for SR 3.3.1.2. 2. Alternate indications of reactor power shall be monitored to verify reactor power level and help prevent NI miscalibration.

_____ 2.18 **IF** a power decrease of more than 20% reactor power is planned, issue Model W/O #00874628 to IAE to prevent the mismatch between OAC heat balance point C1P1385 (Reactor Thermal Power, Best) and any excore power channel exceeding 2%.

NOTE:	The following radiochemistry samples are being requested due to suspected failed fuel. This will be used to determine the extent of the damage and will allow vendor support to be scheduled during the refueling outage, if required. This step may be N/A'd with concurrence from Reactor Engineering. {PIP 04-0879}

_____ 2.19 **IF** failed fuel is suspected **AND** a power decrease of more than 5% reactor power is planned **AND** Reactor Engineering concurs, notify Primary Chemistry to take NC gamma isotopic samples at one, three, and five hour increments after the Unit has stabilized at the lower power level following the power change.

Chemistry person notified ________________

Reactor Engineering contact _______________

NOTE:	The following radiochemistry samples are performed to detect potential fuel defects. This will allow vendor support to be scheduled during the refueling outage, if required. This sample will typically be obtained prior to the shutdown for the refueling outage. This step shall be N/A'd if the sample was obtained during a previous power reduction.

_____ 2.20 **IF** a power decrease of more than 10% is planned **AND** the next scheduled Refueling Outage ≤ 120 days away, notify Primary Chemistry to take an isotopic analysis for iodine within 2 to 6 hours following the last power change.

Chemistry person notified _______________

NOTE:	During a unit coastdown at EOL, AFD shall be maintained as directed by the Reactor Group.

_____ 2.21 **WHILE** reducing power maintain control rods above insertion limit and AFD within its target band by boration or dilution per OP/1/A/6150/009 (Boron Concentration Control).

NOTE:	The procedure may continue while performing Step 2.22.

_____ 2.22 **IF** shutting down for an outage where condenser vacuum will be broken, at approximately 85% turbine power (~1003 MWe) complete the Heater Vent Orifice Return to Service Valve Alignment enclosure of OP/1/B/6250/004 (Feedwater Heaters, Vents, Drains and Bleed System).

CAUTION: Actuation of steam trap drain valves will result in a power change.

NOTE: When aligned to BYPASS, the Manual Bypass Selector Valves will align air directly to the drain valve actuator to maintain the valve closed. When aligned to ENABLE, the Manual Bypass Selector Valves will align air through the level switch solenoid valve to allow the valve to cycle based on level.

_____ 2.23 **IF** reducing power to less than 85% thermal power, ensure the following Manual Bypass Selector Valves are in the ENABLE position:

- ☐ 1SPMV0190 (1SP19 Manual Bypass Selector Valve) (TB-599, 1C-22)
- ☐ 1SPMV0230 (1SP23 Manual Bypass Selector Valve) (TB-598, 1C-20)
- ☐ 1SPMV0290 (1SP29 Manual Bypass Selector Valve) (TB-597, 1D-21)
- ☐ 1SPMV0330 (1SP33 Manual Bypass Selector Valve) (TB-598, 1C-19)
- ☐ 1SPMV0370 (1SP37 Manual Bypass Selector Valve) (TB-598, 1G-22)
- ☐ 1SPMV0400 (1SP40 Manual Bypass Selector Valve) (TB-600, 1C-33)
- ☐ 1SPMV0990 (1SP99 Manual Bypass Selector Valve) (TB-598, 1C-23)
- ☐ 1SPMV1230 (1SP123 Manual Bypass Selector Valve) (TB-606, 1B-22)

_____ 2.24 **IF** reducing power to less than 85% thermal power, go to Enclosure 4.2 (Power Decrease).

_____ 2.25 **IF** return to 100% thermal power desired, start a new Enclosure 4.3 (Unit Operation Between 85% and 100% Power).

2.26 File this enclosure in the Control Copy folder of this procedure.

Duke Energy Catawba Nuclear Station **Turbine Generator** **Multiple Use**	Procedure No. **OP/1/B/6300/001** Revision No. **091** Electronic Reference No. **CN005FO7**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Turbine Generator

1. Purpose

To describe the proper method for operating the Turbine-Generator.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can effect reactivity. (R.M.)

2.2 Low load operation limits:

2.2.1 The unit can be operated continuously at low loads when exhaust hood temperature is < 175°F. The load shall, however, be increased slowly until the temperature decreases below 125°F before increasing load at normal rate (Multipoint Recorder on 1MC3).

2.2.2 Limit turbine/generator operation below 5% load to 1 hour to prevent moisture erosion unless directed by the Turbine Engineer for testing

2.2.3 Motoring of the unit is to be avoided.

2.2.4 Excessive use of the exhaust hood sprays shall be avoided to prevent accelerated blade erosion.

2.3 Journal bearings shall **NOT** be operated with metal temperatures above 250°F (OAC Turbine Bearings graphic (TGBRG)).

2.4 Lube oil cooler discharge temperatures shall be 100°F to 120°F when at rated speed.

2.5 The lube oil temperature rise shall **NOT** exceed 50°F on the main bearings and 45°F on the thrust bearing.

2.6 Under no conditions shall the thrust bearing be operated above 190°F metal temperature (OAC Turbine Bearings graphic (TGBRG)).

2.7 Never allow a hot rotor to stand without rolling. If and when a hot rotor was allowed to stand still, when possible rotate the shaft 180° and allow to stand still again for one-half the time it first stood still, and then put the turbine on turning gear.

2.8 The minimum allowed cold gas temperature is 86°F for operation. The maximum cold gas temperature is 122°F. (OAC points C1A0522 (Cold Gas from Hydrogen Cooler Turbine End) and C1A0528 (Cold Gas from Hydrogen Cooler Exciter End), Main Generator graphic (MAINGEN)).

2.9 Do **NOT** exceed the load, hydrogen pressure, and power factor limits per the Unit One Revised Data Book Figure 43.

2.10 If the limits of the Unit One Revised Data Book Figure 43 (Generator Capability Curves) are exceeded, the Turbine Generator shall be tripped.

2.11 The generator shall **NOT** be operated without excitation. If the generator is operated without field, the unit shall be immediately tripped off the line and shutdown for inspection.

2.12 Following a trip-out due to differential phase relays, both the armature and field windings shall be meggered and inspected before attempting to resynchronize.

2.13 Do **NOT** allow turbine generator speed to exceed 2000 rpm on overspeed tests.

2.14 The turbine shall **NOT** be operated with condenser vacuum less than 24.3 inches Hg.

2.15 The maximum differential pressure between adjacent LP shell pressures shall **NOT** exceed 2.0 inches Hg. (main condenser vacuum gauges on 1MC13, OAC points C1P1669 (D/P between A & B Condensers) and C1P1670 (D/P between B & C Condensers) or Main Condenser graphic (CMCOND)).

2.16 Do **NOT** hold the turbine at speeds < 800 rpm for more than 5 minutes.

2.17 When steam seals are on the turbine, the steam packing exhauster shall be operating, and the turbine shall be on turning gear. The turbine may be taken off gear with steam seals established with concurrence from the Turbine Engineer.

2.18 When a condition arises that is serious enough to make a reduction in speed necessary, it shall be initiated by selecting "MANUAL" and "CONTROL VALVE LOWER" or by tripping the turbine.

2.19 Temperature of the LH System reservoir shall be ≥ 90°F prior to turbine start (OAC point C1A0188 (LH TEMP)).

2.20 A sudden downward trend on an LP turbine's lower extraction temperature shall be investigated as a possible indication of water induction into the turbine. This is indicated on the recorder on the rear of 1MC8 labeled "TURBINE WATER DETECTION", using any of the LP 8th stage lower temperatures.

2.21 The time the turbine generator is on turning gear shall be kept to a minimum to prevent the buildup of copper dust in the generator coil slots.

2.22 When system is in "EMERG MANUAL" runbacks and limit circuits may **NOT** be available.

2.23 Control rods shall **NOT** exceed rod withdrawal limits. Prior to changing power, refer to Reactor Operating Data Book, Temporary Control Rod Withdrawal Limits.

2.24 A "LOAD RATE" > "6.2 MW/MIN" shall **NOT** be used during normal load changes.

2.25 The main turbine oil temperature limit of 80 to 90°F shall be maintained when the turbine is on the turning gear.

2.26 Differential temperature between adjacent exhaust hoods shall **NOT** exceed 30°F unless evaluated and approved by the responsible engineer (Turbine Generator System Expert). (OAC points C1P1667 (A & B Exhaust Hoods Metal Delta Temp) and C1P1668 (B & C Exhaust Hoods Metal Delta Temp) or Main Condenser graphic (CMCOND)).

2.27 During turbine acceleration, the heat up rate of the first stage bowl inner surface (OAC Point C1P1283 (First Stage Metal Temp Rate)) shall be < 150°F/hr.

2.28 During turbine acceleration, the rate of change of the reheat steam temperature (OAC points C1P1287 to C1P1292 (CIV No. 1 (to 6) Inlet Temp Rate) or Turbine Generator graphic (TG)) shall be < 125°F/hr.

2.29 Any deviations from this procedure that could affect steam admission rates shall require an engineering evaluation to be performed which specifically addresses partial arc admission.

2.30 The 6.9KV Switchgear Automatic Fast Transfer Switches are placed in the ENABLE position whenever the generator breakers are closed and in the DEFEAT position whenever the generator breakers are open. If an autoswap of the tie breaker occurs when in the DEFEAT position, equipment being supplied by the 6.9KV Switchgear is more likely to trip than when the switch in ENABLE.{PIP 98-4093, PIP 98-3589}

2.31 Feedback loops shall **NOT** be taken in/out of service during turbine control valve movement. Following turbine control valve movement, DEHC shall be allowed to stabilize prior to placing feedback loops in/out of service to prevent unexpected load changes. (PIP 03-5660)

2.32 The Main Turbine OIU Work Station has the capability to perform control functions for the Main Turbine, including tripping and resetting of the turbine. If a control function window is inadvertently selected while manipulating the Main Turbine OIU Work Station, the window shall be closed to prevent actuation of the control function.

2.33 The Main Turbine shall **NOT** be run more than 3 hours at 1800 RPM, no load, unless directed by the Turbine Engineer for testing.

2.34 The Excitation System can affect the functioning of heart pacemakers. Personnel with pacemaker devices shall **NOT** enter the AVR enclosure/building during operation or testing. If the AVR enclosure/building is **NOT** installed, personnel with pacemaker devices shall remain at least 20 feet away from the AVR during operation or testing.

2.35 Failure to confirm steam isolation to the turbine prior to opening the generator breaker may result in destructive overspeed of the steam turbine power train. {PIP C-08-5018}

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Turbine Generator Startup

4.2 Load Changing

4.3 Transfer Turbine From Auto Control To Manual Control And Transfer Turbine From Manual Control To Auto Control

4.4 Turbine Generator Shutdown

4.5 Placing (Removing) Core Monitor And Pyrolysate Collector In (From) Service

4.6 Valve Checklist

4.7 Generator Operating Limits

4.8 Turbine Generator Roll Computer Points

4.9 Lamp Verification

4.10 Operation of Turbine TSI Panel

4.11 Reboot of the Main Turbine OIU Computer

4.12 Transfer of the Main Turbine OIU Computer Alarm Switch That Drives the "EHC Fault Annunciator"

4.13 Voltage Regulator Operation From Control Room

4.14 Voltage Regulator Operation From U1 Gen Voltage Reg Local Control Panel

1. Initial Conditions

_____ 1.1 Ensure R2 reactivity management controls established per SOMP 01-02 (Reactivity Management). (R.M.)

_____ 1.2 Review the Limits and Precautions.

_____ 1.3 Verify turbine generator is operating per Enclosure 4.1 (Turbine Generator Startup) of this procedure.

2. Procedure

CAUTION:	The load, hydrogen pressure and power factor limits per the Unit One Revised Data Book Figure 43 shall **NOT** be exceeded.

NOTE:	Several of the parameters required for this procedure can be found on OAC graphics, and a list of all OAC points are found on Enclosure 4.8 (Turbine Generator Roll Computer Points).

_____ 2.1 **IF** increasing turbine generator load, perform the following:

_____ 2.1.1 Increase turbine generator load to rated load within the following limitations:

☐ 2.1.1.1 Control valve casing difference, OAC point C1A0961 (Turb Valve Chest Inner Surface Metal Temp) minus C1A0967 (Turb Valve Chest Outer Surface Metal Temp), shall **NOT** exceed curve "Allowable Temp Difference on Control Valve Casing" in the Unit 1 OAC Databook.

_____ 2.1.1.2 **WHEN** exhaust hood temperature is > 125°F, the load shall be increased slowly until the temperature falls to ≤ 125°F; then the load may be increased in accordance per the normal procedure.

☐ 2.1.1.3 "Rate Of Change" of First-Stage Bowl inner surface temperature shall **NOT** exceed 150°F/hr (OAC point C1P1283 (First Stage Metal Temp Rate).

☐ 2.1.1.4 OAC point C1A1140 (Turbine Lower Inner Shell Temp) vs. Percent Steam Flow (OAC point C1P1588 (Design Total Main Steam Flow, Measured (%))) shall be maintained above and to the left of the curve in the Unit One OAC Databook "Load-Changing Recommendations".

☐ 2.1.1.5 Verify Groups B and C valves on Enclosure 4.6 (Valve Checklist) close at 15% of full load (181 MW, 105 psig Turbine Impulse Pressure).

☐ 2.1.1.6 Verify the following valves close at 15% of full load (181 MW, 105 psig Turbine Impulse Pressure):

- 1SM-21 (Ctrl Vlv #2 Stm Lead Drn)
- 1SM-29 (Ctrl Vlv #1 Stm Lead Drn)

_____ 2.1.1.7 **WHEN** CV3 comes off of its fully closed seat (65% of full load, 783 MW), verify 1SM-25 (Ctrl Vlv #3 Stm Lead Drn) closes.

_____ 2.1.1.8 **WHEN** CV4 comes off of its fully closed seat (92% of full load, 1109 MW), verify 1SM-33 (Ctrl Vlv #4 Stm Lead Drn) closes.

☐ 2.1.1.9 S/G blowdown flowrates shall be adjusted to obtain maximum blowdown for the appropriate load.

CAUTION:

1. Until it is recognized that the first stage shell metal temperature change rate stays below the allowable limit (150°F/hr), the following loading rate shall **NOT** be exceeded:

   - 1/2%/min - First Stage Inner Shell Temperature (1MC3 or OAC point C1A1140 (Turbine Lower Inner Shell Temp)) ≤ 350°F

   - 1%/min - First Stage Inner Shell Temperature (1MC3 or OAC point C1A1140 (Turbine Lower Inner Shell Temp)) > 350°F

2. Normal steady-state load changes shall be made without exceeding the limits shown on Enclosure 4.7 (Generator Operating Limits) and in the Unit One OAC Databook "Recommended Startup and Loading Curves".

3. Unit One Reactor Operating Data, Section 2.4 shall be referred to for allowable ramp rates. A "LOAD RATE" > 6.2 MW/MIN shall **NOT** be used during normal load changes.

_____ 2.1.2 Increase turbine generator load by performing the following:

☐ 2.1.2.1 Select "LOAD RATE" and verify it illuminates.

☐ 2.1.2.2 Input the desired load rate.

☐ 2.1.2.3 Select "ENTER" or "OK" and verify "LOAD RATE" goes dark.

☐ 2.1.2.4 Select "TARGET" and verify it illuminates.

☐ 2.1.2.5 Input the desired load target.

☐ 2.1.2.6 Select "ENTER" and verify " TARGET " goes dark.

☐ 2.1.2.7 Verify new load target appears on Target Display.

☐ 2.1.2.8 Select "GO" and verify it illuminates to start load increase.

☐ 2.1.2.9 S/G blowdown changes shall be coordinated with Secondary Chemistry.

CAUTION:	The load, hydrogen pressure and power factor limits per the Unit One Revised Data Book Figure 43 shall **NOT** be exceeded.

RO ____ 2.2 **IF** decreasing turbine generator load, perform the following:

____ 2.2.1 Decrease turbine generator load within the following limitations:

☐ 2.2.1.1 Rate of change of First-Stage Bowl Inner Surface Temperature shall **NOT** exceed 150°F/hr (OAC point C1P1283 (First Stage Metal Temp Rate)).

☐ 2.2.1.2 OAC point C1A1140 (Turbine Lower Inner Shell Temp) vs. Percent Steam Flow (OAC point C1P1588 (Design Total Main Steam Flow, Measured (%)) shall be maintained above and to the left of curve in the Unit One OAC Databook "Load-Changing Recommendations".

☐ 2.2.1.3 Control valve casing difference, OAC point C1A0961 (Turb Valve Chest Inner Surface Metal Temp) minus C1A0967 (Turb Valve Chest Outer Surface Metal Temp), shall **NOT** exceed curve "Allowable Temp Difference on Control Valve Casing" in the Unit 1 OAC Databook.

☐ 2.2.1.4 S/G blowdown flowrates shall be adjusted to obtain maximum blowdown for the appropriate load.

____ 2.2.1.5 **IF** CV4 fully closes (92% of full load, 1109 MWE), verify 1SM-33 (Ctrl Vlv #4 Stm Lead Drn) opens.

____ 2.2.1.6 **IF** CV3 fully closes (65% of full load, 783 MWE), verify 1SM-25 (Ctrl Vlv #3 Stm Lead Drn) opens.

CAUTION:	1.	Normal steady-state load change shall be made without exceeding limits shown on Enclosure 4.7 (Generator Operating Limits) and in the Unit One OAC Databook "Recommended Starting and Loading Curves".
	2.	Unit One Reactor Operating Data, Section 2.4 shall be referred to for allowable ramp rates.

_____ 2.2.2 Decrease turbine generator load by performing the following:

- ☐ 2.2.2.1 Select "LOAD RATE" and verify it illuminates.
- ☐ 2.2.2.2 Input the desired load rate.
- ☐ 2.2.2.3 Select "ENTER" and verify " LOAD RATE " goes dark
- ☐ 2.2.2.4 Select "TARGET" and verify it illuminates.
- ☐ 2.2.2.5 Input the desired load target.
- ☐ 2.2.2.6 Select "ENTER" and verify " TARGET " goes dark.
- ☐ 2.2.2.7 Verify new load target appears on Target Display.
- ☐ 2.2.2.8 Select "GO" and verify it illuminates to start load decrease.
- ☐ 2.2.2.9 S/G blowdown changes shall be coordinated with Secondary Chemistry.

2.3 Do **NOT** file this enclosure in the Control Copy folder of this procedure.

Initiating Cues:

- 1AD-12 alarms A/1, A/2, A/5, C/2

ALL STEPS PERFORMED BY BOP

A. <u>Purpose</u>

- **To verify proper response in the event of a loss of RN train or normal suction.**

B. **Symptoms**

- **Case I. Loss of RN Train:**
  - 1AD-12, A/1 or 2AD-12, A/1 "RN PUMP A FLOW HI/LO" - LIT
  - 1AD-12, A/2 or 2AD-12, A/2 "RN ESSENTIAL HDR A PRESSURE - LO" - LIT
  - 1AD-12, A/4 or 2AD-12, A/4 "RN PUMP B FLOW HI/LO" - LIT
  - 1AD-12, A/5 or 2AD-12, A/5 "RN ESSENTIAL HDR B PRESSURE - LO" - LIT
  - 1AD-12, C/2 or 2AD-12, C/2 "RN PMP A STRAINER HI D/P" - LIT
  - 1AD-12, C/5 or 2AD-12, C/5 "RN PMP B STRAINER HI D/P" - LIT
  - RN PUMP 1A or 1B - TRIPPED
  - RN PUMP 2A or 2B - TRIPPED.
- **Case II. Loss of RN Pit Level:**
  - 1AD-12, B/2 "RN PIT A SCREEN HI D/P" - LIT
  - 1AD-12, B/5 "RN PIT B SCREEN HI D/P" - LIT
  - 1AD-12, B/1 or 2AD-12, B/1 "RN PUMP INTAKE PIT A LEVEL - LO" - LIT
  - 1AD-12, B/4 or 2AD-12, B/4 "RN PUMP INTAKE PIT B LEVEL - LO" - LIT
  - 1AD-12, E/2 or 2AD-12, E/2 "RN PIT A SWAP TO SNSWP" - LIT
  - 1AD-12, E/5 or 2AD-12, E/5 "RN PIT B SWAP TO SNSWP" - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Start idle RN pump(s) as required.**

__ 2. **Ensure Unit 1 and Unit 2 OATC monitors Enclosure 1 (Foldout Page).**

__ 3. **Verify each operating RN pump discharge flow - GREATER THAN 8,600 GPM.**

Should secure 1A RN pump due to another pump running.

Perform the following:

__ a. Stop any RN pump(s) not required to support system operation.

b. Ensure the following suction valves to lake - OPEN:

- __ 1RN-1A (RN P/H Pit A Isol From Lake)
- __ 1RN-2B (RN P/H Pit A Isol From Lake)
- __ 1RN-5A (RN P/H Pit B Isol From Lake)
- __ 1RN-6B (RN P/H Pit B Isol From Lake).

c. Ensure the following essential header isolation valves for required trains - OPEN:

- __ 1RN-67A (RN Hdr 1A Supply Isol)
- __ 1RN-69B (RN Hdr 1B Supply Isol)
- __ 2RN-67A (RN Hdr 2A Supply Isol)
- __ 2RN-69B (RN Hdr 2B Supply Isol).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. (Continued)

d. Ensure the following RN to RL discharge valves - OPEN:

__ • 1RN-57A (Station RN Disch To RL Sys)

__ • 1RN-843B (Station RN Disch To RL Sys).

e. Ensure one of the following RL discharge valves - OPEN:

__ • 1RL-54 (RN Sys Disch To RL Hdr A)

OR

__ • 1RL-62 (RN Sys Disch To RL Hdr B).

f. Ensure the following station RN discharge header crossover valves - OPEN:

__ • 1RN-54A (Station RN Disch Hdr X-Over)

__ • 1RN-53B (Station RN Disch Hdr X-Over).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. (Continued)

g. **IF** either of the following conditions is met:

__ • RN cannot be aligned to the lake

OR

__ • No flow indicated on operating RN pump(s).

THEN align RN to SNSWP as follows:

__ 1) Align valves for RN swap to SNSWP. **REFER TO** Enclosure 2 (RN Valve Alignment for RN Swap to SNSWP).

__ 2) **IF** WL discharge in progress, **THEN** coordinate with Radwaste Chemistry to secure all controlled WL discharges.

__ 3) **IF** any RN chemical addition is in progress, **THEN** have Chemistry secure it.

__ 4) **WHEN** corrective action has been taken, **THEN** restore RN to normal alignment. **REFER TO** Enclosure 3 (Returning RN alignment To Normal After Transfer To SNSWP).

h. Verify the following alarms - DARK:

__ • 1AD-12, C/2 "RN PMP A STRAINER HI D/P"
__ • 1AD-12, C/5 "RN PMP B STRAINER HI D/P"
__ • 2AD-12, C/2 "RN PMP A STRAINER HI D/P"
__ • 2AD-12, C/5 "RN PMP B STRAINER HI D/P".

__ i. **IF** any of the previous alarms lit, **THEN** manually backflush affected strainer. **REFER TO** OP/0/A/6400/006C (Nuclear Service Water System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Verify each operating RN pump discharge flow - LESS THAN 23,000 GPM.**	**Perform the following:** **<u>CAUTION</u>** **Closing of the RN supply x-over isolation valves may result in the momentary isolation of an essential header.** **<u>NOTE</u>** Isolating the Unit 1 or 2 non-essential header will result in loss of cooling supply to the following unit related equipment: • VA Supply Vent Units • VF Supply Vent Unit. a. Ensure the following RN supply X-Over isolation valves - CLOSED: __ • 1RN-47A (RN Supply X-Over Isol) __ • 1RN-48B (RN Supply X-Over Isol) __ • 2RN-47A (RN Supply X-Over Isol) __ • 2RN-48B (RN Supply X-Over Isol). __ b. **<u>IF</u>** flow is returning to normal, **<u>THEN GO TO</u>** Step 5. c. **<u>IF</u>** flow is still excessive, **<u>THEN</u>**: __ 1) Ensure both RN pump(s) on the affected train - OFF. __ 2) Dispatch operators to locate any piping leaks. **<u>REFER TO</u>** AP/0/A/5500/030 (Plant Flooding).
__ 5. **Ensure RN pumps - IN OPERATION AS NEEDED.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **Ensure proper alignment of RN to KC Hxs as follows:**	
__ a. Verify RN - ALIGNED TO IN SERVICE KC HX(S).	a. Shift KC train in service as needed. <u>**REFER**</u> <u>**TO**</u>: __ • OP/1/A/6400/005 (Component Cooling Water System) __ • OP/2/A/6400/005 (Component Cooling Water System).
__ b. Ensure KC Hx Otlt Mode switches - PROPERLY ALIGNED.	
__ 7. **Verify each operating RN pump discharge flow - GREATER THAN 8,600 GPM.**	**Perform the following:** __ a. Do not exceed 4650 GPM through an NS Hx. __ b. Align RN flow through NS Hx(s) as needed to increase each operating RN pump's discharge flow to greater than 8,600 GPM. <u>**REFER**</u> <u>**TO**</u> OP/0/A/6400/006F (Nuclear Service Water System Flush Procedure).
__ 8. **Verify RN - AVAILABLE TO ALL UNIT 1 AND UNIT 2 D/G(S).**	**Dispatch operator to locally remove any D/G(s) without a cooling water supply from standby readiness. <u>REFER</u> <u>TO</u>:** __ • OP/1/A/6350/002 (Diesel Generator Operation) __ • OP/2/A/6350/002 (Diesel Generator Operation).
9. **Determine VC/YC status as follows:** __ • Verify VC/YC - ALIGNED TO OPERATING RN TRAIN. __ • Verify YC Chiller - RUNNING.	__ **Align VC/YC to operating RN train. <u>REFER</u> <u>TO</u> OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 10. **Determine and correct cause of loss of RN train.**	
11. **Ensure compliance with appropriate Tech Specs and Selected Licensee Commitments Manual:** __ • SLC 16.7-6 (RN Discharge Instrumentation) __ • 3.6.5 (Containment Air Temperature) __ • 3.6.6 (Containment Spray System) __ • 3.6.17 (Containment Valve Injection Water System (CVIWS)) __ • 3.7.5 (Auxiliary Feedwater (AFW) System) __ • 3.7.7 (Component Cooling Water (CCW) System) __ • 3.7.8 (Nuclear Service Water System (NSWS)) __ • 3.7.10 (Control Room Area Ventilation System (CRAVS)) __ • 3.7.11 (Control Room Area Chilled Water System (CRACWS)) __ • 3.8.1 (A.C. Sources - Operating) __ • 3.8.2 (A.C. Sources - Shutdown).	TS 3.7.8 Condition A
12. **Determine required notifications:** __ • **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency) __ • **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 13. **Notify Environmental Chemistry of any RN pump shifts that have occurred.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 14. **Determine long term plant status.** **<u>RETURN TO</u> procedure in effect.**	

END

Initiating Cues:

- 1SB-12 indicating lights intermediate on 1MC-2
- OAC alarm C1Q0966 (SB-12 Mn Stm Bypass to Cond Control #12)
- Turbine MW decreasing

A. Purpose

To provide proper response for operator actions for a secondary steam leak when a Reactor Trip or Safety Injection has not occurred.

B. Symptoms

- **Reactor power greater than turbine power**
- **Reactor power greater than 100%**
- **NC T-Avg decreasing in an unexpected manner**
- **Steam pressure decreasing in an unexpected manner**
- **1AD-2, E/8 "OVER POWER ROD STOP" - LIT**
- **1AD-13, A/7 "ICE COND LOWER INLET DOORS OPEN" - LIT**
- **One or all of the following increasing without abnormal containment radiation:**
  - Containment pressure
  - Containment temperature
  - Containment humidity
  - Containment floor & equipment sump level
- **Loss of secondary condensate inventory**
- **Observed secondary steam leak.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. <u>Operator Actions</u> RO DOES THIS PAGE EXCEPT 6	
__ 1. **Monitor Enclosure 1 (Foldout Page).**	
__ 2. **Verify turbine - ONLINE.**	__ **<u>GO</u> <u>TO</u> Step 6.**
3. **Verify the following:** __ • Reactor power - LESS THAN OR EQUAL TO 100% POWER __ • T-Avg - WITHIN 1.5°F OF T-Ref. Depending on timing reactor power will likely exceed 100%.	**Perform the following:** __ a. Select "MANUAL" on turbine control panel. b. Depress "CONTROL VALVES LOWER" pushbutton and reduce turbine load to maintain: __ • Reactor power - LESS THAN OR EQUAL TO 100% POWER __ • T-Avg - WITHIN 1.5°F OF T-Ref.
4. **Verify proper reactor response as follows:** __ • Control rods - IN "AUTO" AND STEPPING IN __ • P/R neutron flux - DECREASING.	__ **<u>IF</u> T-Avg is greater than 1.5°F higher than T-Ref, <u>THEN</u> manually insert control rods as required to maintain T-Avg within 1°F of T-Ref.**
__ 5. **<u>IF AT ANY TIME</u> reactor power is greater than 100%, <u>THEN</u> perform Step 3 RNO.**	
BOP __ 6. **Verify Pzr level - STABLE OR INCREASING.**	**Perform the following:** __ a. Maintain charging flow less than 180 GPM. __ b. Manually throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to stabilize Pzr level. __ c. <u>**IF**</u> Pzr level is stable <u>**OR**</u> increasing, <u>**THEN**</u> <u>**GO**</u> <u>**TO**</u> Step 7. (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. (Continued)

d. **IF** Pzr level continues to decrease, **THEN** perform the following:

1) Reduce letdown flow to 45 GPM as follows:

a) **IF** 1NV-10A (Letdn Orif 1B Otlt Cont Isol) open, **THEN** perform the following:

__ (1) Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ (2) Throttle 1NV-849 (Letdn Flow Var Orif Ctrl) for 45 GPM letdown flow.

__ (3) **WHEN** 45 GPM letdown flow established, **THEN** adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ (4) **WHEN** letdown pressure is stable at 350 PSIG, **THEN** place 1NV-148 (Letdn Press Control) in auto.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. (Continued)

b) **IF** 1NV-13A (Letdn Orif 1A Otlt Cont Isol) open, **THEN** perform the following:

__ (1) Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 150 - 200 PSIG.

__ (2) Open 1NV-11A (Letdn Orif 1C Otlt Cont Isol).

__ (3) Adjust 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ (4) Close 1NV-13A (Letdn Orif 1A Otlt Cont Isol).

__ (5) Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ (6) **WHEN** letdown pressure is stable at 350 PSIG, **THEN** place 1NV-148 (Letdn Press Control) in auto.

__ 2) **IF** Pzr level is stable **OR** increasing, **THEN GO TO** Step 7.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. (Continued)

3) **IF** Pzr level continues to decrease **OR** Pzr level cannot be maintained greater than 11%, **THEN**:

__ a) Trip reactor.

b) Close the following valves:

__ • All MSIVs

__ • All MSIV bypass valves.

__ c) Initiate S/I.

__ d) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

BOP

__ 7. **IF AT ANY TIME while in this procedure Pzr level is decreasing in an uncontrolled manner, THEN RETURN TO Step 6.**

BOP

8. **IF AT ANY TIME VCT level goes below 23%, THEN align NV pump suction to FWST as follows:**

a. Open the following valves:

__ • 1NV-252A (NV Pumps Suct From FWST)

__ • 1NV-253B (NV Pumps Suct From FWST).

b. Close the following valves:

__ • 1NV-188A (VCT Otlt Isol)

__ • 1NV-189B (VCT Otlt Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **Attempt to identify and isolate leak as follows:** BOP	
a. Verify the following conditions - NORMAL: __ • Containment temperature __ • Containment pressure __ • Containment humidity __ • Containment floor & equipment sump level.	a. Perform the following: __ 1) Evacuate containment. 2) Perform the following: __ a) Start all lower containment ventilation units in low speed. __ b) Start all upper containment ventilation units. __ c) Place all upper and lower containment ventilation units in "MAX" cooling. 3) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** containment pressure reaches 1.2 PSIG, **<u>THEN</u>**: __ a) Ensure reactor tripped. __ b) Ensure S/I initiated. c) Close the following valves: __ • All MSIVs __ • All MSIV bypass valves. __ d) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection). __ 4) **<u>GO</u> <u>TO</u>** Step 10.
BOP __ b. Dispatch operators to locate and identify source of steam leak.	

Crew should already have noted that its a condenser dump valve and there is no need to send anyone to check for external leaks.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
RO __ c. Verify S/G PORVs - CLOSED.	c. **IF** S/G pressure is less than 1090 PSIG, **THEN** perform the following: __ 1) Close affected S/G PORV. 2) **IF** S/G PORV is still open, **THEN**: __ a) Close affected S/G PORV isolation valve. __ b) **IF** S/G PORV isolation valve still open, **THEN** dispatch operator to close S/G PORV isolation valve.
RO __ d. Verify condenser dump valves - CLOSED.	d. Perform the following: 1) Select "OFF RESET" on the following switches: __ • "STEAM DUMP INTLK BYP TRN A" __ • "STEAM DUMP INTLK BYP TRN B". __ 2) **IF** valve will not close, **THEN** dispatch operator to close affected condenser dump valve isolation valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
RO __ e. Verify atmospheric dump valves - CLOSED.	e. Perform the following: 1) Select "OFF RESET" on the following switches: __ • "STEAM DUMP INTLK BYP TRN A" __ • "STEAM DUMP INTLK BYP TRN B". __ 2) **IF** valve will not close, **THEN** close affected atmospheric dump valve isolation valve. __ 3) **IF** isolation valve will not close, **THEN** dispatch operator to fail air to affected atmospheric dump valve.
BOP __ f. Verify CA PMP #1 - OFF.	__ f. **IF** operation of CA PMP #1 is causing uncontrolled cooldown **AND** flow from CA PMP #1 not required, **THEN** stop CA PMP #1.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
g. **IF** leak is suspected to be in a doghouse, **THEN** close the following valves: • Outside DH: __ • 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V) __ • 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V). OR • Inside DH: __ • 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) __ • 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V).	
10. **Determine required notifications:** __ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency) __ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	Leak will likely not be isolated at this time.
__ 11. **Notify RP of leak.**	
__ 12. **Verify - LEAK ISOLATED.**	__ **GO TO Step 14.**
__ 13. **Determine long term plant status. RETURN TO procedure and step in effect.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 14. **Verify UST level - STABLE OR INCREASING.** BOP	**Perform the following:** __ a. Initiate makeup to UST. __ b. Notify Secondary Chemistry of increased makeup.
RO __ 15. **Verify - REACTOR CRITICAL.**	__ **<u>GO</u> <u>TO</u> Step 22.**
RO 16. **Determine approximate steam leak size as follows:**	
__ a. Verify - TURBINE ONLINE.	a. Perform the following: __ 1) Determine leak size from observed increase in reactor power. 2) **<u>IF</u>** leak size is less than 5%, **<u>THEN</u>** perform the following: __ a) Notify RP of leak size. __ b) **<u>GO</u> <u>TO</u>** Step 17. 3) **<u>IF</u>** leak size is greater than or equal to 5%, **<u>THEN</u>**: __ a) Notify RP of leak size. __ b) Trip reactor. c) Close the following valves: __ • All MSIVs __ • All MSIV bypass valves. __ d) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16. (Continued)	
RO b. Ensure stable plant conditions:	b. Perform the following:
__ • Stable T-Avg	__ 1) **WHEN** stable plant conditions exist, **THEN** perform Steps 16.c through 16.e.
__ • Condenser dump valves closed.	__ 2) **GO TO** Step 17.

NOTE Secondary plant configuration can affect Thermal Power Best Estimate. Diverse reactor power indications should be used to determine reactor power.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
c. Determine percent turbine power as follows:	
__ 1) Divide turbine impulse pressure by 100% power value for turbine impulse pressure. **REFER TO** OAC Data Book for 100 % power value for turbine impulse pressure.	
__ 2) Multiply result by 100.	
__ d. Verify difference between reactor power and turbine power - LESS THAN 5%.	d. Perform the following: __ 1) Notify RP of leak size. __ 2) **GO TO** Step 19.
__ e. Notify RP of leak size.	
__ 17. RO **Verify reactor power - GREATER THAN 1%.**	__ **GO TO Step 22.**

Once the valve is closed, the next event can be entered.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
18. **Evaluate unit shutdown as follows:**	
a. Verify unit shutdown required based on either of the following:	a. Perform the following:
__ • Steam leak cannot be isolated or repaired at power **<u>OR</u>** __ • OSM judgement.	__ 1) Maintain present plant conditions until leak can be isolated or repaired. __ 2) **<u>RETURN TO</u>** procedure and step in effect.
b. Initiate unit shutdown. **<u>REFER TO</u>** one of the following: __ • OP/1/A/6100/003 (Controlling Procedure For Unit Operation) OR __ • OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown) OR __ • AP/1/A/5500/009 (Rapid Downpower).	
__ c. **<u>GO TO</u>** Step 20.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
19. **Perform the following:**	
__ a. Verify steam leak - KNOWN TO BE ISOLABLE BY TURBINE TRIP.	a. Perform the following: __ 1) Trip reactor. 2) Close the following valves: __ • All MSIVs __ • All MSIV bypass valves. __ 3) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).
__ b. Verify reactor power - GREATER THAN 69%.	b. Perform the following: __ 1) Trip turbine. __ 2) **<u>GO</u> <u>TO</u>** AP/1/A/5500/002 (Turbine Generator Trip).
__ c. Trip reactor.	
__ d. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).	
__ 20. **<u>WHEN</u> turbine is tripped, <u>THEN</u> verify T-Avg can be controlled within 5°F of T-Ref while shutting down reactor to 1%.**	**Perform the following:** __ a. Trip reactor. b. Close the following valves: __ • All MSIVs __ • All MSIV bypass valves. __ c. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).
__ 21. **Verify reactor power - LESS THAN 1%.**	__ **<u>RETURN</u> <u>TO</u> Step 18.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

22. **Verify NC temperature under operator control as follows:**

a. Verify one of the following:

__ • **IF** any NC pump on, **THEN** verify NC T-Avg - TRENDING TO PROGRAMMED TEMPERATURE

OR

__ • **IF** all NC pumps off, **THEN** verify NC T-Colds - STABLE AT OR TRENDING TO 557°F.

RESPONSE NOT OBTAINED:

a. Perform the following as required:

__ 1) Ensure steam dumps - CLOSED.

2) Ensure the following valves - CLOSED:

__ • 1HM-1 (MSRH 1A&1B SSRH Stm Source)

__ • 1HM-2 (MSRH 1C&1D SSRH Stm Source).

__ 3) Ensure S/G PORVs - CLOSED.

4) **IF** any S/G PORV can not be closed, **THEN**:

__ a) Close affected S/G PORV isolation valve(s).

__ b) **IF** affected S/G PORV isolation valve(s) can not be closed, **THEN** dispatch operator to close valve.

5) Close the following controllers:

__ • "S/G A BLDWN FLOW CTRL"
__ • "S/G B BLDWN FLOW CTRL"
__ • "S/G C BLDWN FLOW CTRL"
__ • "S/G D BLDWN FLOW CTRL".

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

22. (Continued)

6) Depress and hold "S/V BEFORE SEAT DRN" "CLOSE" pushbutton (1MC-3) to close the following valves:

__ • 1SM-41 (Stop Vlv #1 Before Seat Drn)

__ • 1SM-44 (Stop Vlv #2 Before Seat Drn)

__ • 1SM-43 (Stop Vlv #3 Before Seat Drn)

__ • 1SM-42 (Stop Vlv #4 Before Seat Drn).

7) **IF** cooldown continues, **THEN** control total feed flow as follows:

__ a) Maintain total feed flow greater than 450 GPM until at least one S/G N/R level greater than 11%.

b) **WHEN** N/R level greater than 11% in at least one S/G , **THEN** throttle feed flow to:

__ • Minimize cooldown

__ • Maintain at least one S/G N/R level greater than 11%.

8) **IF** cooldown continues, **THEN** close:

__ • All MSIVs

__ • All MSIV bypass valves.

__ 9) **IF** uncontrolled cooldown continues, **THEN GO TO** Step 23.

__ 10) **IF** uncontrolled cooldown stopped, **THEN GO TO** Step 24.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. (Continued)	
__ b. **IF AT ANY TIME** while in this procedure NC temperature is decreasing in an uncontrolled manner, **THEN RETURN TO** Step 22.	
__ c. **GO TO** Step 24.	
23. **Complete the following for an unisolable steam leak that is causing uncontrolled cooldown:**	
__ a. Verify all rod bottom lights - LIT.	a. Perform the following: __ 1) Trip reactor. __ 2) Direct RO to concurrently isolate S/Gs with steam leak. **REFER TO** Enclosure 2 (S/G Steam Leak Isolation). __ 3) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).
__ b. Isolate S/G with steam leak. **REFER TO** Enclosure 2 (S/G Steam Leak Isolation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

23. (Continued)

__ c. Verify Pzr level - TRENDING TO OR STABLE AT PROGRAMMED LEVEL.

c. Perform the following as required to maintain level:

__ 1) Discontinue monitoring Pzr level per Step 7.

__ 2) Maintain charging flow less than 180 GPM at all times in subsequent steps.

__ 3) Manually throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to stabilize Pzr level.

__ 4) **IF** Pzr level is stable **OR** increasing, **THEN** **GO** **TO** Step 23.d.

5) **IF** Pzr level continues to decrease, **THEN** perform the following:

a) Reduce letdown flow to 45 GPM as follows:

(1) **IF** 1NV-10A (Letdn Orif 1B Otlt Cont Isol) open, **THEN** perform the following:

__ 1. Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ 2. Throttle 1NV-849 (Letdn Flow Var Orif Ctrl) for 45 GPM letdown flow.

__ 3. **WHEN** 45 GPM letdown flow established, **THEN** adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

23. (Continued)

__ 4. **<u>WHEN</u>** letdown pressure is stable at 350 PSIG, **<u>THEN</u>** place 1NV-148 (Letdn Press Control) in auto.

(2) **<u>IF</u>** 1NV-13A (Letdn Orif 1A Otlt Cont Isol) open, **<u>THEN</u>** perform the following:

__ 1. Manually control 1NV-148 (Letdn Press Control) to establish letdown pressure between 150 - 200 PSIG.

__ 2. Open 1NV-11A (Letdn Orif 1C Otlt Cont Isol).

__ 3. Adjust 1NV-148 (Letdn Press Control) to establish letdown pressure between 375 - 400 PSIG.

__ 4. Close 1NV-13A (Letdn Orif 1A Otlt Cont Isol).

__ 5. Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ 6. **<u>WHEN</u>** letdown pressure is stable at 350 PSIG, **<u>THEN</u>** place 1NV-148 (Letdn Press Control) in auto.

__ b) **<u>IF</u>** Pzr level is stable **<u>OR</u>** increasing, **<u>THEN</u> <u>GO TO</u>** Step 23.d.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

23. (Continued)

6) **IF** Pzr level continues to decrease, **THEN**:

a) Start an additional NV pump as follows:

__ (1) Open 1NV-252A (NV Pumps Suct From FWST).

__ (2) Open 1NV-253B (NV Pumps Suct From FWST).

__ (3) Close 1NV-188A (VCT Otlt Isol).

__ (4) Close 1NV-189B (VCT Otlt Isol).

__ (5) Start the desired NV Pump.

__ b) **IF** Pzr level is stable **OR** increasing, **THEN GO TO** Step 23.d.6.

c) **IF** Pzr level continues to decrease **OR** Pzr level cannot be maintained greater than 11%, **THEN**:

__ (1) Initiate S/I.

__ (2) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
23. (Continued)	
d. Initiate boration of NC System as follows:	
__ 1) Ensure at least one NV pump - ON.	
__ 2) Open 1NV-236B (Boric Acid To NV Pumps Suct).	
__ 3) Start boric acid transfer pumps.	
__ 4) Verify boration flow - GREATER THAN OR EQUAL TO 30 GPM.	4) Align NV pump suction to the FWST as follows: a) Open the following valves: __ • 1NV-252A (NV Pumps Suct From FWST) __ • 1NV-253B (NV Pumps Suct From FWST) b) Close the following valves: __ • 1NV-188A (VCT Otlt Isol) __ • 1NV-189B (VCT Otlt Isol).
5) Ensure the following charging line isolation valves - OPEN: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	
__ 6) Verify Pzr pressure - LESS THAN 2335 PSIG.	6) Perform the following: a) Verify the following valves - OPEN. __ • All Pzr PORVs __ • All Pzr PORV isolation valves. __ b) **IF** any Pzr PORV(s) **OR** isolation valves closed, **THEN** manually open Pzr PORV(s) and isolation valves as required to reduce Pzr pressure to less than 2315 PSIG.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

23. (Continued)

__ e. Ensure adequate shutdown margin is maintained. **REFER TO** ROD Book, Section 5.11.

__ f. Maintain S/G NR levels greater than 11%.

g. Continue plant shutdown. **REFER TO** one of the following:

__ • OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown)

OR

__ • AP/1/A/5500/009 (Rapid Downpower).

__ h. **IF** intact S/G MSIVs must remain closed to isolate leak, **THEN RETURN TO** procedure in effect.

__ i. **WHEN** cooldown stops, **THEN** open intact S/G MSIVs. **REFER TO** OP/1/A/6250/006 (Main Steam).

__ j. **RETURN TO** procedure in effect.

__ 24. **Verify - LEAK ISOLATED.**

Perform the following:

a. **IF** leak downstream of MSIVs, **THEN** perform the following:

1) Evaluate closing MSIVs using the following criteria:

__ • Location of leak

__ • Ability to isolate leak

__ • Secondary condensate inventory

__ • Size of leak.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

24. (Continued)

2) **IF** determined that closing MSIVs is required, **THEN**:

a) Close the following valves:

__ • All MSIVs

__ • All MSIV bypass valves.

b) Control NC temperature at program temperature using one of the following:

__ • Dump steam using S/G PORVs.

OR

__ • Establish S/G blowdown. **REFER TO** OP/1/A/6250/008 (Steam Generator Blowdown).

__ 3) **IF** closing MSIVs is not required, **THEN** maintain present plant conditions until leak can be isolated or repaired.

b. **IF** leak is upstream of MSIVs, **THEN**:

__ • Maintain S/G NR levels greater than 11%.

• Continue plant shutdown. **REFER TO** one of the following:

__ • OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown)

OR

__ • AP/1/A/5500/009 (Rapid Downpower).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 25. **Determine long term plant status.**
RETURN TO procedure in affect.

END

1. **Reactor trip criteria:**

   IF any of the following conditions exist:

__ • Steam leak is endangering personnel or jeopardizing plant equipment

__ • S/G levels - DECREASING IN AN UNCONTROLLED MANNER

__ • Tavg 5°F less than T-Ref **AND** decreasing in an uncontrolled manner

__ • Reactor power - INCREASING IN AN UNCONTROLLED MANNER

__ • Secondary condensate inventory - DECREASING IN AN UNCONTROLLED MANNER.

   THEN:

__ a. Trip reactor.

   b. Close the following valves:

   __ • All MSIVs

   __ • All MSIV bypass valves.

__ c. **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

Duke Energy Catawba Nuclear Station **Loss of Condenser Vacuum**	Procedure No. **AP/1/A/5500/023**
	Revision No. **018**
Continuous Use	Electronic Reference No. **CN005CER**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Initiating Cues:
- 1AD1, F/7
- OAC alarm C1A0734 (Condenser C absolute backpressure)
- Turbine MW decreasing

A. Purpose

- **To verify proper response in the event of a loss of condenser vacuum.**

B. Symptoms

- **Condenser vacuum indication - DECREASING**
- **Hotwell temperature - INCREASING**
- **1AD-1, F/7 "CONDENSER LO VACUUM" - LIT**
- **1AD-1, F/8 "EXH HOOD HI TEMP (PRE-TRIP)" - LIT**
- **1AD-5, A/4 "CFPT A LO EXHAUST VACUUM" - LIT**
- **1AD-5, C/4 "CFPT B LO EXHAUST VACUUM" - LIT**
- **OAC point C1P1493 (Unit 1 C1&C2 Average RC Inlet Temp) - IN ALARM HI.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. **Operator Actions**

__ 1. **Monitor Enclosure 1 (Foldout Page).**

2. **Decrease turbine load as required to stabilize vacuum as follows:**

RO

a. **IF** rapid power reduction required, **THEN** perform the following:

NOTE In "MANUAL" mode, the control valves are capable of full travel within 3 minutes.

__ 1) Select "MANUAL" and "CONTROL VALVE LOWER" to reduce turbine load as required.

Crew should stay in this AP at this time.

__ 2) **REFER TO** AP/1/A/5500/009 (Rapid Downpower).

__ 3) **GO TO** Step 3.

b. Perform the appropriate controlling procedure to reduce power:

When turbine load has been reduced to approximately 1135 MW, the leak will get smaller and vacuum will recover.

__ • OP/1/A/6100/003 (Controlling Procedure For Unit Operation)

OR

__ • OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Verify proper RC System operation as follows:**	
BOP __ a. Verify average condenser inlet temperature OAC point C1P1493 (Unit 1 C1 & C2 Average RC Inlet Temp) - LESS THAN 90°F.	a. Perform the following: __ 1) Start additional cooling tower fans as necessary to maintain condenser inlet temperature less than 90°F. **REFER TO** OP/1/B/6400/001A (Condenser Circulating Water System). __ 2) Start additional RC pump(s) as necessary to maintain condenser inlet temperature less than 90°F. **REFER TO** OP/1/B/6400/001A (Condenser Circulating Water System).
__ b. Verify 1AD-8, B/4 "COOLING TOWER BASIN HI/LO LEVEL" - DARK.	b. **IF** cooling tower level is low, **THEN** perform the following: __ 1) Ensure 1RL-853 (Train A RL To RC Makeup Control) (1MC-13) - RESTORING NORMAL COOLING TOWER LEVEL. 2) **IF** 1RL-853 is not maintaining cooling tower level, **THEN** perform the following: __ a) Contact Environmental Chemistry to secure cooling tower blowdown. __ b) Throttle open 1RL-855 (Train A RL To RC M/U Valve Bypass) (1MC-13) to maintain cooling tower level. __ c) Start additional RL pumps as needed. **REFER TO** OP/0/B/6400/003 (Low Pressure Service Water System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Verify "STM PRESS TO CSAE" - GREATER THAN 110 PSIG.** BOP	**Perform the following:** __ a. Adjust 1AS-2 (Main Stm To Aux Steam) setpoint to maintain AS header pressure 165 PSIG. __ b. <u>IF</u> 1AS-2 will not control in automatic, **<u>THEN</u>** manually adjust 1AS-2 to maintain AS header pressure 165 PSIG. __ c. <u>IF</u> 1AS-2 is functional, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 5. **<u>CAUTION</u>** **Aligning the Unit 2 AS system to supply Unit 1 AS headers may cause small reactivity changes on Unit 2.** d. <u>IF</u> Unit 2 available to supply Unit 1 AS header, **<u>THEN</u>** perform the following: __ 1) Adjust 2AS-2 (Main Stm To Aux Stm) to maintain AS header pressure 165 PSIG. 2) Dispatch operator to align Unit 2 AS as follows: __ a) Ensure 1AS-33 (Unit 1 AS Hdr Isol) (TB-590, 1M-26) - OPEN. __ b) Open 1AS-59 (Unit 2 AS Hdr Isol) (TB-584, 2N-26). __ 3) **<u>WHEN</u>** 1AS-59 is open, **<u>THEN</u>** slowly close 1AS-2 (Main Stm To Aux Steam).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
RO 5. **Verify steam seal header conditions as follows:**	
a. Ensure at least one of the following valves - OPEN: __ • 1TL-2 (Main Stm To Stm Seal Reg) __ • 1TL-8 (Aux Stm To Stm Seal Reg).	__ a. **<u>GO</u> <u>TO</u>** Step 7.
__ b. Adjust 1TL-4 (Stm Seal Reg Byp) as required to obtain steam seal header pressure between 4 psig and 6 psig.	
__ c. Verify OAC - AVAILABLE.	__ c. **<u>GO</u> <u>TO</u>** Step 6 RNO.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Most TL valve positions can be displayed by OAC turn on code "TL-TF".

6. **Verify supplemental steam flow into the steam seal header by at least one of the following:**

BOP

__ • Verify 1TL-3 (Steam Seal Reg Valve) - **NOT** CLOSED

OR

• Verify both the following:

__ • Unit 1 - ON LINE.

__ • 1TL-10 (E Bleed Steam Seal Reg Valve) - **NOT** CLOSED.

Ensure 1TL-9 (Steam Seal Packing Unloader Reg Valve) is partially open by performing at least one of the following:

• Observe indirect indication of 1TL-9 position as follows:

__ a. Observe current steam seal header pressure.

b. Throttle open 1TL-4 (Stm Seal Reg Byp) until one of the following conditions are met:

__ • Steam seal pressure - GREATER THAN 6 PSIG.

OR

__ • Steam seal pressure - **NOT** INCREASING IN RESPONSE TO 1TL-4 POSITION.

OR

• Coordinate local observation of 1TL-9 position as follows:

__ a. Dispatch operator to locally observe 1TL-9 (Steam Seal Packing Unloader Reg Valve) (TB-594, 1G-31).

b. Throttle open 1TL-4 (Stm Seal Reg Byp) until one of the following conditions are met:

__ • Steam seal pressure - GREATER THAN 6 PSIG.

OR

__ • Dispatched operator reports 1TL-9 - **NOT** CLOSED.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
NOTE Starting additional air ejectors or vacuum pump will not restore vacuum when high RC temperature is the reason for loss of vacuum.	
7. **Verify condenser vacuum status as follows:**	
BOP __ a. Condenser vacuum - STABLE OR INCREASING.	a. Perform the following: 1) **IF** additional air removal will increase vacuum, **THEN** perform the following: a) Dispatch operators to perform the following: __ • Align main vacuum pump(s) for service. **REFER TO** Enclosure 4 (Placing Main Vacuum Pumps in Service). __ • Align idle set of CSAE jet(s) for service. **REFER TO** OP/1/B/6300/006 (Main Vacuum). __ b) **WHEN** condenser vacuum decreases to less than 24 in. Hg., **THEN** align main vacuum pump(s) to the condenser. **REFER TO** Enclosure 4 (Placing Main Vacuum Pumps in Service). __ 2) **GO TO** Step 8.
__ b. **IF AT ANY TIME** condenser vacuum decreases, **THEN** observe Note prior to Step 7 and perform Step 7.	
BOP __ 8. **Ensure proper operation of ZP System. REFER TO OP/0/B/6250/011 (Vacuum Priming System).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 9. **Dispatch operator(s) to verify proper seal trough flows. <u>REFER TO</u> Enclosure 2 (Verification Of Seal Flows).** BOP	
__ 10. **Dispatch operator to ensure CFPT seal system and waterboxes operating properly. <u>REFER TO</u> Enclosure 3 (CFPT Stm Seal And Waterbox Vent Verification).** BOP	
__ 11. **Determine and correct cause of loss of vacuum.**	
12. **Determine required notifications:**	
__ • **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 13. **Verify Steam Seal System - IN NORMAL ALIGNMENT.**	__ **<u>WHEN</u> conditions permit, <u>THEN</u> align steam seal system as required for current plant conditions. <u>REFER TO</u> OP/1/B/6300/005 (Steam Seal System).**
__ 14. **Determine long term plant status. <u>RETURN TO</u> procedure in affect.**	

END

Initiating Cues:
- 1AD-6, F/8
- OAC alarm C1L4455 (Normal Pressurizer Spray Flow Activated)

A. Purpose

To ensure proper response in the event of abnormal Pressurizer pressure, assess plant conditions, and identify the appropriate steps for the following cases:

Case I Pressurizer Pressure Decreasing

Case II Pressurizer Pressure Increasing.

B. Symptoms

Case I. Pressurizer Pressure Decreasing:

- 1AD-6, E/10 "PZR PORV DISCH HI TEMP" - LIT
- 1AD-6, E/11 "PZR SAFETY DISCHARGE HI TEMP" - LIT
- 1AD-6, F/8 "PZR LO PRESS CONTROL" - LIT
- 1AD-6, A/8 "PZR HI PRESS ALERT" - LIT
- All Pzr heaters - ENERGIZED
- 1AD-6, D/11 "PZR LO PRESS PORV NC34 BLOCKED" - LIT
- 1AD-6, D/10 "PZR LO PRESS PORV NC32 & 36 BLOCKED" - LIT
- Pressurizer pressure less than 2235 PSIG and decreasing

Case II. Pressurizer Pressure Increasing:

- 1AD-6, D/8 "PZR LO PRESS ALERT" - LIT
- 1AD-6, C/8 "PZR HI PRESS DEV CONTROL" - LIT
- 1AD-6, B/8 "PZR HI PRESS" - LIT
- Pressurizer pressure greater than 2235 PSIG and increasing
- All Pzr heaters - ENERGIZED.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions BOP DOES THIS PAGE	
__ 1. **Verify all Pzr PORVs - CLOSED.**	**Perform the following:** __ a. Manually close Pzr PORV(s). b. **IF** any Pzr PORV cannot be closed, **THEN**: __ 1) Close the affected PORV(s) isolation valve. 2) **IF** the Pzr PORV isolation valve cannot be closed, **THEN** perform the following: __ a) **IF** in Mode 3 with CLAs isolated **OR** in Mode 4, **THEN GO TO** AP/1/A/5500/027 (Shutdown LOCA). __ b) Trip reactor. __ c) **WHEN** reactor tripped **OR** S/I setpoint reached, **THEN** ensure S/I initiated. __ d) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

BOP DOES THIS PAGE

NOTE Control rods may withdraw on decreasing NC pressure.

__ 2. **Verify Pzr spray valve(s) - CLOSED.**

It is possible that the crew may feel a need to trip the reactor and SI or it may occur automatically if the crew is slow to respond.

Perform the following:

__ a. Manually close affected spray valve(s).

b. **IF** affected spray valve(s) will not close, **THEN** perform the following:

1) **IF AT ANY TIME** the Control Room Supervisor determines that a reactor trip is required, **THEN**:

__ a) Trip reactor.

__ b) **WHEN** reactor power less than 5%, **THEN** stop NC Pumps 1A and 1B.

__ c) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

2) Select "FAIL CLOSED" for affected spray valve(s) mode select switch:

__ • "1 NC-27 PZR SPRAY VLV MODE SELECT"

__ • "1 NC-29 PZR SPRAY VLV MODE SELECT".

__ 3) **IF** NC pressure is stable **OR** increasing, **THEN GO TO** Step 3.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued) BOP DOES THIS PAGE	
	4) **IF** NC pressure continues to decrease, **THEN**: a) **IF** in Modes 1 or 2, **THEN**: __ (1) Trip reactor. __ (2) **WHEN** reactor power less than 5%, **THEN** stop NC Pumps 1A and 1B. __ (3) **GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection). __ b) Stop NC Pumps 1A and 1B. __ c) **IF** NC pressure continues to decrease, **THEN** stop additional NC pumps as required. __ d) **REFER TO** AP/1/A/5500/004 (Loss of Reactor Coolant Pump).
__ 3. **Verify all Pzr heaters - ENERGIZED.**	__ **IF Pzr pressure is less than 2220 PSIG, THEN ensure all Pzr heaters are energized.**
__ 4. **Ensure 1NV-37A (NV Supply To Pzr Aux Spray) - CLOSED.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

RO DOES THIS PAGE

NOTE Positive reactivity is inserted during an increase in NC pressure which may cause auto rod insertion.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 5. **Verify NC pressure - STABLE OR INCREASING.**	__ **<u>IF</u> pressure continues to decrease, <u>THEN</u> <u>REFER</u> <u>TO</u> AP/1/A/5500/010 (Reactor Coolant Leak).**
6. **<u>WHEN</u> NC pressure is stable, <u>THEN</u>:** __ • Stabilize unit at appropriate power level. • Adjust the following as required to maintain T-Avg within 1°F of T-Ref: __ • Turbine load __ • Control rods __ • Boron concentration.	
7. **<u>IF</u> a Pzr pressure channel failed, <u>THEN</u> perform following:**	
__ a. Verify "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) in required state for unit conditions.	__ a. Ensure compliance with Tech Spec 3.3.2 (Engineered Safety Features Actuation System (ESFAS) Instrumentation).
b. Notify IAE to fail following bistables for affected channel per Model W/O #00874531. Bistables shall be tripped within 72 hours: __ • Pzr low pressure S/I __ • OT Delta T __ • Pzr high pressure Reactor Trip __ • Pzr low pressure Reactor Trip.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Ensure compliance with appropriate Tech Specs:** __ • 3.3.1 (Reactor Trip System (RTS) Instrumentation) __ • 3.3.2 (Engineered Safety Features Actuation System (ESFAS) Instrumentation) __ • 3.3.3 (Post Accident Monitoring (PAM) Instrumentation) __ • 3.3.4 (Remote Shutdown System) __ • 3.4.1 (RCS Pressure, Temperature, and Flow Departure From Nucleate Boiling (DNB) Limits) __ • 3.4.4 (RCS Loops - MODES 1 and 2) __ • 3.4.5 (RCS Loops - MODE 3) __ • 3.4.6 (RCS Loops - MODE 4) __ • 3.4.9 (Pressurizer) __ • 3.4.10 (Pressurizer Safety Valves) __ • 3.4.11 (Pressurizer Power Operated Relief Valves (PORVs)) __ • 3.4.13 (RCS Operational Leakage).	TS - 3.4.1 Condition A (based on NC pressure at the time)
__ 9. **Determine long term plant status.** **<u>RETURN</u> <u>TO</u> procedure in effect.**	

<u>END</u>

A. Purpose

This procedure provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of all Reactor Trips and S/I above P-11, valid S/I below P-11 and to assess plant conditions, and to identify the appropriate recovery procedure.

B. Symptoms or Entry Conditions

1. **The following conditions are symptoms that require a Reactor Trip:**

- 1 of 2 S/R channels - GREATER THAN 10^5 CPS WHILE BELOW P-6
- 1 of 2 I/R channels - GREATER THAN 25% FULL POWER AMPS EQUIVALENT WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 25% FULL POWER WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 109% FULL POWER
- 2 of 4 P/R channels - +5% FULL POWER IN 2 SECONDS
- 2 of 4 loop ΔTs - GREATER THAN THE OPΔT SETPOINT
- 2 of 4 loop ΔTs - GREATER THAN THE OTΔT SETPOINT
- 2 of 4 Pzr pressure channels - GREATER THAN 2385 PSIG
- 2 of 4 Pzr pressure channels - LESS THAN 1945 PSIG WHILE ABOVE P-7
- 2 of 3 Pzr level channels - GREATER THAN 92% WHILE ABOVE P-7
- 2 of 4 S/G N/R level channels on 1 of 4 S/Gs - LESS THAN LO-LO SETPOINT
- 2 of 4 NC pump buses - LESS THAN 77% OF NORMAL VOLTAGE (5082 VOLTS) WHILE ABOVE P-7
- 2 of 4 NC pump buses - LESS THAN 56 HERTZ WHILE ABOVE P-7
- 2 of 3 NC flow channels on 2 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-7 AND BELOW P-8
- 2 of 3 NC flow channels on 1 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-8
- 4 of 4 turbine stop valves - CLOSED WHILE ABOVE P-9
- 2 of 4 turbine stop valves EHC pressure - LESS THAN 550 PSIG WHILE ABOVE P-9
- 1 of 2 S/I trains - ACTUATED
- 2 of 2 SSPS trains - GENERAL WARNING ALARM.

2. **The following are symptoms of a Reactor Trip:**
   - Any Reactor Trip annunciator - LIT
   - Neutron level - RAPIDLY DECREASING
   - Rod bottom lights - LIT.

3. **The following are symptoms that require a Reactor Trip and S/I:**
   - 2 of 4 Pzr pressure channels - LESS THAN 1845 PSIG
   - 2 of 3 containment pressure channels - GREATER THAN 1.2 PSIG.

4. **The following are symptoms of a Reactor Trip and S/I:**
   - Any S/I Reactor Trip annunciator - LIT
   - NV, NI, and ND pumps - ON
   - "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT
   - E/S Load Sequencer Actuated status lights (1SI-14) - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. <u>Operator Actions</u>

RO DOES THIS PAGE

__ 1. **Monitor Enclosure 1 (Foldout Page).**

2. **Verify Reactor Trip:**

- __ All rod bottom lights - LIT
- __ All reactor trip and bypass breakers - OPEN
- __ I/R amps - DECREASING.

Perform the following:

__ a. Manually trip reactor.

b. **<u>IF</u>** reactor will not trip, **<u>THEN</u>** concurrently:

- __ Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
- __ **<u>GO</u> <u>TO</u>** EP/1/A/5000/FR-S.1 (Response To Nuclear Power Generation/ATWS).

3. **Verify Turbine Trip:**

- __ All turbine stop valves - CLOSED

Perform the following:

__ a. Manually trip the turbine.

b. **<u>IF</u>** turbine will not trip, **<u>THEN</u>**:

__ 1) Depress the "MANUAL" pushbutton on the turbine control panel.

__ 2) Rapidly unload turbine by simultaneously depressing the "CONTROL VALVE LOWER" and "FAST RATE" pushbuttons.

3) **<u>IF</u>** turbine will not runback, **<u>THEN</u>** close:

- __ All MSIVs
- __ All MSIV bypass valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Verify 1ETA and 1ETB - ENERGIZED.**	**Perform the following:**
BOP DOES THIS PAGE	__ a. <u>IF</u> 1ETA <u>AND</u> 1ETB are de-energized, <u>THEN</u> <u>GO</u> <u>TO</u> EP/1/A/5000/ECA-0.0 (Loss Of All AC Power).
	__ b. <u>WHEN</u> time allows, <u>THEN</u> attempt to restore power to de-energized switchgear while continuing with this procedure. <u>REFER</u> <u>TO</u> AP/1/A/5500/007 (Loss of Normal Power).
5. **Verify S/I is actuated:**	
__ a. "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT.	a. Perform the following: 1) Verify conditions requiring S/I: __ • Pzr pressure - LESS THAN 1845 PSIG OR __ • Containment pressure - GREATER THAN 1.2 PSIG. __ 2) <u>IF</u> S/I is required, <u>THEN</u> manually initiate S/I. 3) <u>IF</u> S/I is not required, <u>THEN</u> concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • <u>GO</u> <u>TO</u> EP/1/A/5000/ES-0.1 (Reactor Trip Response).
__ b. Both E/S load sequencer actuated status lights (1SI-14) - LIT.	__ b. Manually initiate S/I.
__ 6. **Announce "Unit 1 Safety Injection".**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Determine required notifications:**	
__ • **<u>REFER</u> <u>TO</u>** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **<u>REFER</u> <u>TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 8. **Verify all Feedwater Isolation status lights (1SI-5) - LIT.** RO	**Perform the following:**
	__ a. Manually initiate Feedwater Isolation.
	__ b. **<u>IF</u>** proper status light indication is not obtained, **<u>THEN</u>** manually close valves.
BOP 9. **Verify Phase A Containment Isolation status as follows:**	
__ a. Phase A "RESET" lights - DARK.	__ a. Manually initiate Phase A Isolation.
__ b. Monitor Light Panel Group 5 St lights - LIT.	__ b. Manually align valves.
BOP 10. **Verify proper Phase B actuation as follows:**	
__ a. Containment pressure - HAS REMAINED LESS THAN 3 PSIG.	a. Perform the following:
	<u>NOTE</u> This time may be used later to determine when to align ND Aux spray.
	__ 1) Record approximate time of reactor trip. ______________________________
	__ 2) Verify NS pumps - INDICATING FLOW.
	__ 3) **<u>IF</u>** flow is not indicated, **<u>THEN</u>** manually initiate Phase B Isolation for affected train(s).
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. (Continued)

4) Verify Phase B Isolation has actuated as follows:

__ a) Phase B Isolation "RESET" lights - DARK.

__ b) **<u>IF</u>** Phase B Isolation "RESET" lights are lit, **<u>THEN</u>** manually initiate Phase B Isolation.

c) Verify following monitor light panel lights - LIT:

__ • Group 1 Sp lights

__ • Group 5 Sp lights

__ • Group 5 St lights L/11 and L/12.

__ d) **<u>IF</u>** monitor light panel not in correct alignment, **<u>THEN</u>** ensure correct alignment.

e) **<u>IF</u>** NS pump(s) did not start, **<u>THEN</u>** perform the following for the affected train(s):

__ (1) Reset ECCS.

__ (2) Reset D/G load sequencer.

__ (3) Manually start affected NS pump.

__ (4) **<u>IF AT ANY TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.

__ 5) Stop all NC pumps.

__ 6) Maintain seal injection flow.

__ 7) Energize H2 igniters.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	8) Dispatch operator to perform the following:
	__ a) Secure all ice condenser air handling units. **<u>REFER</u> <u>TO</u>** Enclosure 13 (Securing All Ice Condenser Air Handling Units).
	__ b) Place containment H_2 analyzers in service. **<u>REFER</u> <u>TO</u>** OP/1/A/6450/010 (Containment Hydrogen Control Systems).
	__ 9) **<u>WHEN</u>** 9 minutes has elapsed, **<u>THEN</u>** verify proper VX system operation. **<u>REFER</u> <u>TO</u>** Enclosure 7 (VX System Operation).
	__ 10) **<u>GO</u> <u>TO</u>** Step 11.
__ b. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** containment pressure exceeds 3 PSIG while in this procedure, **<u>THEN</u>** perform Step 10.a.	
BOP 11. **Verify proper CA pump status as follows:**	
__ a. Motor driven CA pumps - ON.	a. Perform the following for the affected train(s):
	__ 1) Reset ECCS.
	__ 2) Reset D/G load sequencer.
	__ 3) Manually start affected motor driven CA pump.
	__ 4) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.
__ b. 3 S/G N/R levels - GREATER THAN 11%.	__ b. Ensure CA Pump #1 - RUNNING.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Verify all of the following S/I pumps - ON:** BOP __ • NV pumps __ • ND pumps __ • NI pumps.	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. BOP __ d. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
__ 13. **Verify all KC pumps - ON.**	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. BOP __ d. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
__ 14. **Verify all Unit 1 and Unit 2 RN pumps - ON.**	**Perform the following:** __ a. **IF** any Unit 2 RN pump is off, **THEN** manually start affected pump(s). b. **IF** any Unit 1 RN pump is off, **THEN** perform the following for affected train(s): __ 1) Reset ECCS. __ 2) Reset D/G load sequencer. __ 3) Manually start affected pump. BOP __ 4) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
15. **Verify proper ventilation systems operation as follows:** __ • **REFER TO** Enclosure 2 (Ventilation System Verification). __ • Notify Unit 2 operator to perform Enclosure 3 (Opposite Unit Ventilation Verification).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 16. **Verify all S/G pressures - GREATER THAN 775 PSIG.** RO	**Perform the following:** a. Verify the following valves - CLOSED: __ • All MSIVs __ • All MSIV bypass valves __ • All S/G PORVs. b. <u>**IF**</u> any valve is open, <u>**THEN**</u>: __ 1) Manually initiate Main Steam Isolation. __ 2) <u>**IF**</u> any valve is still open, <u>**THEN**</u> manually close valve.
BOP 17. **Verify proper S/I flow as follows:**	
__ a. "NV S/I FLOW" - INDICATING FLOW.	__ a. Manually start NV pump(s) and align valves.
__ b. NC pressure - LESS THAN 1620 PSIG. 1NI-9A and 1NV-10B do not automatically position and the BOP should note and manually open these valves. CRITICAL TASK !	b. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) <u>**IF**</u> ND pump miniflow valve(s) cannot be opened, <u>**THEN**</u> perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) <u>**IF AT ANY TIME**</u> a B/O occurs, <u>**THEN**</u> restart S/I equipment previously on. __ e) <u>**IF AT ANY TIME**</u> NC pressure decreases to less than 285 PSIG in an uncontrolled manner, <u>**THEN**</u> restart the ND pump. __ 3) <u>**GO TO**</u> Step 18.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
__ c. NI pumps - INDICATING FLOW.	__ c. Manually start NI pump(s) and align valves.
BOP	
__ d. NC pressure - LESS THAN 285 PSIG.	d. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) **IF** the ND pump miniflow valve(s) cannot be opened, **THEN** perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on. __ e) **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart the ND pump. __ 3) **GO TO** Step 18.
__ e. ND pumps - INDICATING FLOW TO C-LEGS.	__ e. Manually start ND pump(s) and align valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
18. **Control S/G levels as follows:**	
__ a. Verify total CA flow - GREATER THAN 450 GPM. BOP	a. Perform the following: __ 1) **IF** N/R level in all S/Gs is less than 11% (29% ACC), **THEN** manually start CA pumps and ensure correct valve alignment. 2) **IF** N/R level in all S/Gs is less than 11% (29% ACC) **AND** feed flow greater than 450 GPM cannot be established, **THEN** concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink).
__ b. **WHEN** at least one S/G N/R level is greater than 11% (29% ACC), **THEN** throttle feed flow to maintain all S/G N/R levels between 11% (29% ACC) and 50%.	
__ 19. **Verify all CA isolation valves - OPEN.** BOP	__ **Manually open valve(s).**
__ 20. **Verify S/I equipment status based on monitor light panel - IN PROPER ALIGNMENT.** BOP	__ **Manually align equipment.**

NOTE Enclosure 4 (NC Temperature Control) shall remain in effect until subsequent procedures provide alternative NC temperature control guidance.

__ 21. **Control NC temperature. REFER TO Enclosure 4 (NC Temperature Control).** RO

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. **Verify Pzr PORV and Pzr spray valve status as follows:**	
BOP __ a. All Pzr PORVs - CLOSED.	a. **<u>IF</u>** Pzr pressure is less than 2315 PSIG, **<u>THEN</u>**: __ 1) Manually close Pzr PORV(s). __ 2) **<u>IF</u>** any Pzr PORV cannot be closed, **<u>THEN</u>** close its isolation valve. 3) **<u>IF</u>** any Pzr PORV cannot be closed **<u>OR</u>** isolated, **<u>THEN</u>** perform the following: __ a) Energize H_2 igniters. b) Dispatch operator to perform the following: __ (1) Secure all ice condenser air handling units. **<u>REFER TO</u>** Enclosure 13 (Securing All Ice Condenser Air Handling Units). __ (2) Place containment H2 analyzers in service. **<u>REFER TO</u>** OP/1/A/6450/010 (Containment Hydrogen Control Systems). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. (Continued)	
	c) IF both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ THEN start one VX fan. REFER TO Enclosure 5 (VX Fan Manual Start). d) Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • GO TO EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
BOP __ b. Normal Pzr spray valves - CLOSED.	b. IF Pzr pressure is less than 2260 PSIG, THEN: __ 1) Manually close spray valve(s). 2) IF spray valve(s) cannot be closed, THEN: __ a) Stop NC pumps 1A and 1B. __ b) IF NC pressure continues to decrease, THEN stop third NC pump as required.
__ c. At least one Pzr PORV isolation valve - OPEN.	__ c. IF power is available, THEN open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
BOP __ 23. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**	**IF any NV OR NI pump is on, THEN:** __ a. Ensure all NC pumps - OFF. __ b. Maintain seal injection flow.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. **Verify main steamlines are intact as follows:** BOP __ • All S/G pressures - STABLE OR INCREASING __ • ALL S/Gs - PRESSURIZED.	**<u>IF</u> pressure in any S/G is decreasing in an uncontrolled manner <u>OR</u> any S/G is depressurized, <u>THEN</u> perform the following:** a. <u>IF</u> both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **<u>THEN</u>** manually start one VX fan. **<u>REFER</u> <u>TO</u>** Enclosure 5 (VX Fan Manual Start). b. Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).
25. **Verify S/G tubes are intact as follows:** BOP • Verify the following EMF trip 1 lights - DARK: __ • 1EMF-33 (Condenser Air Ejector Exhaust) __ • 1EMF-26 (Steamline 1A) __ • 1EMF-27 (Steamline 1B) __ • 1EMF-28 (Steamline 1C) __ • 1EMF-29 (Steamline 1D). __ • All S/G levels - STABLE OR INCREASING IN A CONTROLLED MANNER.	**<u>IF</u> any EMF trip 1 light is lit <u>OR</u> any S/G level is increasing in an uncontrolled manner, <u>THEN</u> concurrently:** __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

26. **Verify NC System is intact as follows:**

a. Verify the following NC pump thermal barrier alarms - DARK:

__ • 1AD-6, E/1, "NCP A THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/2, "NCP B THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/3, "NCP C THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/4, "NCP D THERMAL BARRIER KC OUTLET HI/LO FLOW".

RNO:

a. Perform the following:

1) Ensure the valve for the affected NC pump(s) - CLOSED:

__ • 1KC-394A (NC Pump 1A Therm Bar Otlt)

__ • 1KC-364B (NC Pump 1B Therm Bar Otlt)

__ • 1KC-345A (NC Pump 1C Therm Bar Otlt)

__ • 1KC-413B (NC Pump 1D Therm Bar Otlt).

2) **IF** the valve for the affected NC pump will not close, **THEN** perform the following:

__ a) Trip all NC pumps.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

26. (Continued)

b) Perform the following:

__ (1) Dispatch operator with radio to standby at 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419) (Ladder needed).

__ (2) Close 1KC-425A (NC Pumps Ret Hdr Cont Isol) from Control Room.

__ (3) **IF** 1KC-425A (NC Pumps Ret Hdr Cont Isol) will not close completely from Control Room, **THEN** have operator locally close 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419).

__ (4) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) has been closed, **THEN** close 1KC-424B (NC Pumps Ret Hdr Cont Isol).

__ (5) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) is closed, **THEN** notify the dispatched operator to return.

(6) Close the following valves:

__ • 1KC-338B (NC Pumps Sup Hdr Cont Isol)

__ • 1KC-430A (Rx Bldg Drn Hdr Cont Isol)

__ • 1KC-429B (Rx Bldg Drn Hdr Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. (Continued)	
b. Verify NC System is intact as follows:	b. Perform the following:
__ • Containment pressure - LESS THAN 1 PSIG.	__ 1) Energize H2 igniters.
__ • **IF** normal off-site power is available, **THEN** verify containment pressure less than 0.3 PSIG.	2) Dispatch operator to perform the following:
• Containment high range EMFs - LESS THAN 3 R/HR:	__ a) Secure all ice condenser air handling units. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units).
__ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	__ b) Place containment H2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control Systems).
• Containment EMF trip 1 lights - DARK:	3) **IF** both the following conditions exist,
__ • 1EMF-38 (Containment Particulate) __ • 1EMF-39 (Containment Gas)	__ • Containment pressure - GREATER THAN 1 PSIG
__ • Containment sump level - STABLE.	__ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG
	__ **THEN** manually start one VX fan. **REFER TO** Enclosure 5 (VX Fan Manual Start).
	4) Concurrently:
	__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
	__ • **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
27. **Verify S/I termination criteria as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **GO TO** Step 28.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
b. Verify secondary heat sink as follows:	__ b. **GO TO** Step 28.
__ • N/R level in at least one S/G - GREATER THAN 11%	
OR	
__ • Total feed flow to S/Gs - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR INCREASING.	__ c. **GO TO** Step 28.
__ d. Pzr level - GREATER THAN 11%.	d. Perform the following:
	__ 1) **IF** NC pressure is increasing **AND** normal Pzr spray is available, **THEN** attempt to stabilize NC pressure using normal Pzr spray.
	__ 2) **RETURN TO** Step 27.a.
e. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following:
	__ a) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers.
	__ b) Concurrently implement Enclosure 8 (ECCS Master Reset) while continuing in this procedure.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker:
	__ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496)
	__ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
__ f. Ensure only one NV pump - ON.	
__ g. Verify NC pressure - STABLE OR INCREASING.	g. Perform the following: __ 1) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ 2) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
__ h. Verify VI pressure - GREATER THAN 50 PSIG.	h. In subsequent steps, control room control is lost for the following valves and local operation will be required: __ • 1NV-294 (NV Pmps A&B Disch Flow Ctrl) __ • 1NV-309 (Seal Water Injection Flow).
i. Isolate NV S/I flowpath as follows:	
1) Verify the following valves - OPEN: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol).	1) Perform the following: __ a) Open affected valve(s). __ b) **IF** 1NV-203A **AND** 1NV-202B are open, **THEN GO TO** Step 27.i.2. c) Dispatch operator to open affected valve(s): __ • 1NV-203A (NV Pumps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed) __ • 1NV-202B (NV Pmps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed). __ d) Close 1NV-309 (Seal Water Injection Flow). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

e) **<u>IF</u>** control of 1NV-309 is lost from the control room, **<u>THEN</u>** dispatch operator with radio to perform the following:

__ (1) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed).

__ (2) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

f) Open the following valves:

__ • 1NV-312A (Chrg Line Cont Isol)

__ • 1NV-314B (Chrg Line Cont Isol).

g) **<u>IF</u>** 1NV-312A **<u>OR</u>** 1NV-314B cannot be opened, **<u>THEN</u>** dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 10 (Locally Open 1NV-312A)

__ • Enclosure 12 (Locally Open 1NV-314B).

__ h) Do not continue in this procedure until 1NV-312A and 1NV-314B are open.

__ i) **<u>IF</u>** NC pressure is greater than 1950 PSIG, **<u>THEN</u>** throttle 1NV-309 or 1NV-311 to 50% open.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

__ j) Open 1NV-294 (NV Pmps A&B Disch Flow Ctrl).

k) **IF** control of 1NV-294 is lost from the control room, **THEN**:

__ (1) Place the controller for 1NV-294 in the 100% demand position.

__ (2) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to control charging flow as required in subsequent steps.

l) Close the following valves:

__ • 1NI-9A (NV Pmp C/L Inj Isol)

__ • 1NI-10B (NV Pmp C/L Inj Isol).

m) **IF** 1NI-9A **OR** 1NI-10B cannot be closed, **THEN** dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 9 (Locally Close 1NI-9A)

__ • Enclosure 11 (Locally Close 1NI-10B).

n) Throttle charging and seal injection to maintain the following:

__ • Charging line flow between 60 GPM and 180 GPM

__ • NC pump seal injection flow.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	__ o) **WHEN** 1NV-203A **AND** 1NV-202B are opened, **THEN** charging flow may be reduced below 60 GPM.
	__ p) **GO TO** Step 27.k.
2) Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol).	2) Dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 9 (Locally Close 1NI-9A) __ • Enclosure 11 (Locally Close 1NI-10B).
j. Establish charging as follows:	
__ 1) Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.	1) Perform the following: __ a) Place the controller for 1NV-294 in the 100% demand position. __ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) for 32 GPM charging line flow. __ c) Throttle 1NV-295 to control charging flow as required in subsequent steps.
__ 2) Close 1NV-309 (Seal Water Injection Flow).	2) Dispatch operator with radio to perform the following: __ a) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ b) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
3) Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	3) Dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 10 (Locally Open 1NV-312A) __ • Enclosure 12 (Locally Open 1NV-314B).
__ 4) Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.	__ 4) **GO TO** Step 27.j.6.
__ 5) Place 1NV-309 in auto.	
6) Perform the following: __ • Maintain charging flow less than 180 GPM. __ • Maintain 32 GPM seal water flow.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
k. Control charging as follows:	
__ 1) Control charging flow to maintain Pzr level stable.	
__ 2) Verify Pzr level - STABLE OR INCREASING.	2) **IF** Pzr level is decreasing, **THEN**: a) Open the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). b) Close the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol). __ c) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ d) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
l. Ensure the following containment isolation signals - RESET: __ • Phase A __ • Phase B.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
m. Establish VI to containment as follows:	m. Perform the following:
__ • Ensure 1VI-77B (VI Cont Isol) - OPEN.	1) Align N_2 to the Pzr PORVs by opening the following valves:
__ • Verify VI pressure - GREATER THAN 85 PSIG.	__ • 1NI-438A (Emer N2 From CLA A To 1NC-34A)
	__ • 1NI-439B (Emer N2 From CLA B To 1NC-32B).
	__ 2) **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.
n. Concurrently:	
__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
__ • Monitor EP/1/A/5000/ES-1.1 (Safety Injection Termination), Enclosure 1 (Foldout Page)	
__ • **GO TO** EP/1/A/5000/ES-1.1 (Safety Injection Termination), Step 12.	
__ 28. **Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).**	
29. **Control S/G levels as follows:**	
__ a. Verify N/R level in all S/Gs - GREATER THAN 11%.	__ a. Maintain total feed flow greater than 450 GPM until at least one S/G N/R level is greater than 11%.
__ b. Throttle feed flow to maintain all S/G N/R levels between 11% and 50%.	__ b. **IF** N/R level in any S/G continues to increase in an uncontrolled manner, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. **Verify secondary radiation is normal as follows:**	
a. Ensure the following signals - RESET:	
__ 1) Phase A Containment Isolations	
__ 2) CA System valve control	
__ 3) KC NC NI NM St signals.	
__ b. Align all S/Gs for chemistry sampling.	
c. Perform at least one of the following:	
__ • Notify Chemistry to sample all S/Gs for activity.	
OR	
__ • Notify RP to frisk all cation columns for activity.	
d. Verify the following EMF trip 1 lights - DARK:	__ d. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
__ • 1EMF-33 (Condenser Air Ejector Exhaust)	
__ • 1EMF-26 (Steamline 1A)	
__ • 1EMF-27 (Steamline 1B)	
__ • 1EMF-28 (Steamline 1C)	
__ • 1EMF-29 (Steamline 1D).	
__ e. **WHEN** activity results are reported, **THEN** verify all S/Gs indicate no activity.	e. Perform the following:
	__ 1) Notify station management to evaluate S/G(s) activity results.
	__ 2) **IF** S/G(s) activity indicate a SGTR, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. **Verify auxiliary building radiation is normal as follows:** __ • EMF-41 (Aux Bldg Ventilation) trip 1 light - DARK __ • All area monitor EMF trip 1 lights - DARK	**Evaluate cause of abnormal conditions as follows:** __ a. Monitor OAC EMF alarms, OAC VA Graphic, and area monitor EMFs to determine location of activity. __ b. Dispatch operator to locate potential leak. __ c. <u>IF</u> cause of alarm is LOCA outside containment, **THEN <u>GO</u> TO** EP/1/A/5000/ECA-1.2 (LOCA Outside Containment).
32. **Verify PRT conditions are normal as follows:** __ • PRT pressure - LESS THAN 8 PSIG __ • PRT level - LESS THAN 89% __ • PRT temperature - LESS THAN 130°F.	**Evaluate following possible causes of abnormal PRT conditions:** __ • Pzr safety temperatures __ • Pzr safety relief flow indicated __ • Pzr PORVs __ • Rx head vents __ • NC pump seal return header relief __ • Letdown orifice header relief.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
33. **Ensure S/I - RESET:**	
__ a. ECCS.	a. **IF** either reactor trip breaker is closed, **THEN**: __ 1) Ensure reactor trip breakers - OPEN. __ 2) **WHEN** trip breakers open, **THEN** reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	
34. **Ensure the following containment isolation signals - RESET:** __ • Phase A __ • Phase B.	
35. **Establish VI to containment as follows:**	**Perform the following:**
__ • Ensure 1VI-77B (VI Cont Isol) - OPEN. __ • Verify VI pressure - GREATER THAN 85 PSIG.	a. Align N_2 to the Pzr PORVs by opening the following valves: __ • 1NI-438A (Emer N2 From CLA A To 1NC-34A) __ • 1NI-439B (Emer N2 From CLA B To 1NC-32B). __ b. **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
36. **Verify criteria to stop operating ND pumps as follows:**	
__ a. NC pressure - GREATER THAN 285 PSIG.	__ a. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. NC pressure - STABLE OR INCREASING.	__ b. **<u>GO</u> <u>TO</u>** Step 37.
__ c. At least one ND pump - ON.	__ c. **<u>GO</u> <u>TO</u>** Step 36.e.
__ d. Ensure all ND pump(s) with suction aligned to FWST - STOPPED.	
__ e. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **<u>THEN</u>** restart ND pumps.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
37. **Verify conditions to stop operating D/Gs as follows:**	
__ a. At least one D/G - ON.	__ a. **<u>GO</u> <u>TO</u>** Step 38.
b. Verify 1ETA is energized by offsite power as follows: __ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	b. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **<u>REFER</u> <u>TO</u>** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **<u>GO</u> <u>TO</u>** Step 37.d.
__ c. Dispatch operator to stop 1A D/G and place in standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows: __ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	d. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **<u>REFER</u> <u>TO</u>** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **<u>GO</u> <u>TO</u>** Step 38.
__ e. Dispatch operator to stop 1B D/G and place in standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6350/002 (Diesel Generator Operation).	
__ 38. **<u>RETURN</u> <u>TO</u> Step 21.**	

<u>END</u>

1. **IF any S/G(s) suspected ruptured, THEN perform the following:**
   - **WHEN** the following conditions met:
     - Total CA flow - GREATER THAN 450 GPM

     AND

     - All intact S/G(s) N/R level - GREATER THAN 11%(29% ACC)

     THEN throttle feed flow to ruptured S/G(s) to maintain ruptured S/G(s) N/R level between 11%(29% ACC) and 39%.

2. **NC Pump Trip Criteria:**
   - **IF** the following conditions are satisfied, **THEN** trip all NC pumps while maintaining seal injection flow:
     - At least one NV or NI pump - ON
     - NC subcooling based on core exit T/Cs - LESS THAN OR EQUAL TO 0°F.

3. **CA Suction Source Switchover Criteria:**
   - **IF** either of the following annunciators are lit, **THEN REFER TO** AP/1/A/5500/006 (Loss of S/G Feedwater):
     - 1AD-5, H/4 "CACST LO LEVEL"

     OR

     - 1AD-8, B/1 "UST LO LEVEL".

4. **Position Criteria for 1NV-202B and 1NV-203A (NV Pumps A&B Recirc Isol):**
   - **IF** NC pressure is less than 1500 PSIG **AND** NV S/I flowpath is aligned, **THEN** close 1NV-202B and 1NV-203A.
   - **IF** NC pressure is greater than 2000 PSIG, **THEN** open 1NV-202B and 1NV-203A.

5. **Cold Leg Recirc Switchover Criterion:**
   - **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **AND** an S/I has occurred, **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify proper VC/YC operation as follows:**	BOP DOES THIS ENCLOSURE
a. Verify one train of the following equipment is in operation: __ • YC chiller __ • CR AHU-1 __ • CRA AHU-1 __ • CRA PFT-1.	a. Perform the following: __ 1) Shift operating VC/YC trains. **REFER TO** Enclosure 6 (Shifting Operating VC/YC Train). 2) **IF** no train can be properly aligned, **THEN** dispatch operator and IAE/Maintenance to restore at least one train of VC/YC. **REFER TO** the following: __ • OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System) __ • EM/0/A/5200/001 (Troubleshooting Cause For Improper Operation of VC/YC System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

b. Verify the following alarms - DARK:

__ • 1AD-18, A/8 "UNIT 1 INTAKE HI CHLORINE 1A"

__ • 1AD-18, B/8 "UNIT 1 INTAKE HI CHLORINE 1B"

__ • 1AD-18, D/8 "UNIT 2 INTAKE HI CHLORINE 2A"

__ • 1AD-18, E/8 "UNIT 2 INTAKE HI CHLORINE 2B".

RESPONSE NOT OBTAINED:

b. **IF** chlorine odor is detected in the Control Room, **THEN** perform the following based on the status of given alarms:

1) **IF** detectors on both unit intakes are in alarm, **THEN**:

a) Ensure the following VC intake dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet)
__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ b) **GO TO** Step 1.d.

2) **IF** Unit 1 intake HI chlorine detector(s) in alarm, **THEN**:

a) Ensure the following VC dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet).

b) Ensure the following dampers - OPEN:

__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ c) **GO TO** Step 1.d.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. (Continued)	
	3) **IF** Unit 2 intake Hi chlorine detector(s) in alarm, **THEN**: a) Ensure the following VC dampers - CLOSED: __ • 2VC-5B (CRA Filt Inlet) __ • 2VC-6A (CRA Filt Inlet). b) Ensure the following dampers - OPEN: __ • 1VC-5B (CRA Filt Inlet) __ • 1VC-6A (CRA Filt Inlet). __ c) **GO TO** Step 1.d.
c. Ensure the following VC dampers - OPEN: __ • 1VC-5B (CRA Filt Inlet) __ • 1VC-6A (CRA Filt Inlet) __ • 2VC-5B (CRA Filt Inlet) __ • 2VC-6A (CRA Filt Inlet).	
d. Repeat Step 1 of this enclosure until notified by station management as follows: __ • At least once every 8 hours OR __ • Any time VC/YC related annunciators on 1AD-18 actuate.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. **Ensure proper VA System operation as follows:**

- Ensure the following fans - OFF:

__ • ABUXF 1A
__ • ABUXF 1B.

- Ensure VA System filter is in service as follows:

__ • 1ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED

__ • 1ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.

- Ensure the following fans - ON:

__ • ABFXF-1A
__ • ABFXF 1B.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Verify proper VE System operation as follows:**	
__ a. VE fans - ON.	__ a. Manually start fan(s).
__ b. Annulus pressure - BETWEEN -1.4 IN. WC AND -1.8 IN. WC.	b. Perform the following: 1) **<u>IF</u>** annulus pressure is more positive than -1.4 in. WC, **<u>THEN</u>**: a) Verify flow indicated on the following indications: __ • "VE 1A FLOW TO STACK" __ • "VE 1B FLOW TO STACK". b) **<u>IF</u>** flow is not indicated, **<u>THEN</u>** dispatch operator to verify status of the following dampers based on their local indication or their operating piston rods being extended 4" to 6": __ • 1AVS-D-2 (VE A Trn Recirc Damp) (AB-603, JJ-51, Rm 500) - CLOSED __ • 1AVS-D-7 (VE B Trn Recirc Damp) (AB-603, HH-52, Rm 500) - CLOSED __ • 1AVS-D-3 (VE A Trn Exh Damp) (AB-603, JJ-52, Rm 500) - OPEN __ • 1AVS-D-8 (VE B Trn Exh Damp) (AB-603, HH-52, Rm 500) - OPEN. __ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **<u>REFER TO</u>** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure). __ d) **<u>GO TO</u>** Step 3.c. (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	
	2) **IF** annulus pressure is more negative than -1.8 in. WC, **THEN**: __ a) Determine which VE train indicates highest discharge flow to stack. __ b) Within 2 hours, ensure VE train that indicates highest discharge flow to stack is secured. __ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **REFER TO** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure).
__ c. Repeat Step 3.b every 30 minutes until notified by station management.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 4. **Record time ventilation systems are verified on following table:**

TIME	SYSTEM (VC, VE)	INITIALS

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. **Ensure proper Unit 2 VA System operation as follows:**

   - Ensure the following fans - OFF:

     __ • ABUXF-2A
     __ • ABUXF-2B.

   - Ensure VA System filter is in service as follows:

     __ • 2ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED

     __ • 2ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.

   - Ensure the following fans - ON:

     __ • ABFXF-2A
     __ • ABFXF-2B.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify at least one NC pump - ON.** RO DOES THIS ENCLOSURE	**Perform the following:** a. Use NC T-Colds to determine NC temperature as required in subsequent steps. b. **GO TO** Step 4.
2. **Use NC T-Avg to determine NC temperature as required in subsequent steps.**	
3. **IF AT ANY TIME NC pumps are tripped, THEN use NC T-Colds to determine NC temperature as required in subsequent steps.**	
4. **Verify one of the following:** • NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F. OR • NC temperature - TRENDING TO 557°F.	**GO TO Step 7.**
5. **Continue to monitor NC temperature.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **Do not continue in this enclosure until one of the following occurs:** • NC temperature - GREATER THAN 557°F AND INCREASING IN AN UNCONTROLLED MANNER. OR • NC temperature - GREATER THAN 557°F AND STABLE. OR • NC temperature - LESS THAN 557°F AND DECREASING IN AN UNCONTROLLED MANNER.	
7. **Verify NC temperature - LESS THAN 557°F AND DECREASING.**	**Perform the following:** a. <u>IF</u> NC temperature is greater than 557°F **<u>AND</u>** increasing, **<u>THEN</u>** stabilize NC temperature at 557°F as follows: 1) **<u>IF</u>** steam dumps are available, **<u>THEN</u>** use steam dumps. 2) **<u>IF</u>** steam dumps are not available, **<u>THEN</u>** use S/G PORVs. b. <u>IF</u> the following conditions exist: • NC temperature is greater than 557°F and stable • Time and manpower is available, **<u>THEN</u>** stabilize NC temperature at 557°F as follows: 1) **<u>IF</u>** steam dumps are available, **<u>THEN</u>** use steam dumps. 2) **<u>IF</u>** steam dumps are not available, **<u>THEN</u>** use S/G PORVs. c. **<u>GO</u> <u>TO</u>** Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Attempt to stop the NC cooldown as follows:**	
a. Ensure all steam dumps - CLOSED.	
b. Ensure all S/G PORVs - CLOSED.	b. **IF** any S/G PORV cannot be closed, **THEN** close its isolation valve.
c. Ensure S/G blowdown is isolated.	
d. Close the following valves: • 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V) • 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) • 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V) • 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V).	
e. Depress and hold "S/V BEFORE SEAT DRN" "CLOSE" pushbutton (1MC-3) to close the following valves: • 1SM-41 (Stop Vlv #1 Before Seat Drn) • 1SM-44 (Stop Vlv #2 Before Seat Drn) • 1SM-43 (Stop Vlv #3 Before Seat Drn) • 1SM-42 (Stop Vlv #4 Before Seat Drn).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
f. Verify NC cooldown - STOPPED.	f. IF cooldown continues, **THEN** throttle feed flow as follows: 1) IF S/G N/R level is less than 11% (29% ACC) in all S/G's, **THEN** throttle feed flow to achieve the following: • Minimize cooldown • Maintain total feed flow greater than 450 GPM. 2) **WHEN** N/R level is greater than 11% (29% ACC) in at least one S/G, **THEN** throttle feed flow further to achieve the following: • Minimize cooldown • Maintain at least one S/G N/R level greater than 11% (29% ACC). 3) IF cooldown continues, **THEN** close the following valves: • All MSIVs • All MSIV bypass valves.
9. **Continue to perform the actions of this enclosure as required to ensure one of the following:** • NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F. OR • NC temperature - TRENDING TO 557°F.	

A. Purpose

This procedure provides actions to terminate leakage of reactor coolant into the secondary system following a steam generator tube rupture.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 25, when condenser air ejector radiation, S/G blowdown radiation or steamline radiation is abnormal.

b. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 30, EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 5, EP/1/A/5000/E-2 (Faulted Steam Generator Isolation), Step 10, EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators), Step 7, and EP/1/A/5000/FR-H.3 (Response To Steam Generator High Level), Step 8, when secondary radiation is abnormal.

c. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 29, EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 4, EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization), Step 10, EP/1/A/5000/ES-3.1 (Post - SGTR Cooldown Using Backfill), Step 6, EP/1/A/5000/ES-3.2 (Post - SGTR Cooldown Using Blowdown), Step 6, EP/1/A/5000/ES-3.3 (Post - SGTR Cooldown Using Steam Dump), Step 8, EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired), Step 12, and EP/1/A/5000/ECA-3.2 (SGTR With Loss Of Reactor Coolant - Saturated Recovery Desired), Step 6, when a S/G N/R level increases in an uncontrolled manner.

d. Any foldout page that has E-3 transition criteria whenever any S/G level increases in an uncontrolled manner or any S/G has abnormal radiation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Monitor Enclosure 1 (Foldout Page).**

2. **Identify ruptured S/G(s) as follows:**

RO __ • S/G level - INCREASING IN AN UNCONTROLLED MANNER.

OR

__ • RP determines ruptured S/G by frisking the cation columns in the CT lab.

OR

BOP • The following EMF trip 1 lights - LIT:

__ • 1EMF-26 (Steamline 1A)

__ • 1EMF-27 (Steamline 1B)

__ • 1EMF-28 (Steamline 1C)

__ • 1EMF-29 (Steamline 1D).

OR

• **IF** S/G Sampling is required to identify ruptured S/G(s), **THEN**:

a. Ensure the following signals - RESET:

__ 1) Phase A Containment Isolations.

__ 2) CA System valve control.

__ 3) KC NC NI NM St signals.

__ b. Align all S/Gs for Chemistry sampling.

__ c. Notify Chemistry to sample all S/Gs for activity.

Perform the following:

__ a. **WHEN** ruptured S/G(s) is identified, **THEN** perform Steps 3 through 9.

__ b. **GO TO** Step 10.

Crew may ask ROP to frisk CAT COLUMNS to get confirmation of leak. This takes about 5 minutes

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 3. **Verify at least one intact S/G - AVAILABLE FOR NC SYSTEM COOLDOWN.** RO	__ **Maintain one S/G available for NC System cooldown in subsequent steps.**
4. **Isolate steam flow from ruptured S/G(s) as follows:** RO	
__ a. Verify all ruptured S/G(s) PORV - CLOSED. The PORV block valve may already have been isolated If not it will be closed here. CRITICAL TASK!	a. **<u>WHEN</u>** ruptured S/G(s) pressure is less than 1090 PSIG, **<u>THEN</u>** perform the following: __ 1) Ensure ruptured S/G(s) PORV - CLOSED. __ 2) **<u>IF</u>** ruptured S/G(s) PORV will not close, **<u>THEN</u>** manually close ruptured S/G(s) PORV isolation valve. __ 3) **<u>IF</u>** ruptured S/G(s) PORV isolation valve will not manually close, **<u>THEN</u>** dispatch operator to close ruptured S/G(s) PORV isolation valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
__ b. Verify S/G(s) 1B and 1C - INTACT. RO	b. Perform the following:
	__ 1) **IF** both motor driven CA pumps available, **THEN** close the "CAPT TRIP T/V CTRL".
	__ 2) **IF** CA Pump #1 is the only source of feedwater, **THEN** maintain steam flow to the CAPT from at least one S/G.
	3) **IF** S/G 1B is ruptured, **THEN**:
	__ a) Dispatch two operators to unlock and close 1SA-1 (1B S/G Main Steam to CAPT Maintenance Isol) (DH-624, FF-53, Rm 572) (Breakaway lock installed).
	__ b) **IF** 1SA-1 cannot be closed, **THEN** dispatch two operators to unlock and close 1SA-3 (1B S/G Main Steam to CAPT Stop Check) (AB-551, DD-53, Rm 217) (Breakaway lock installed).
	4) **IF** S/G 1C is ruptured, **THEN**:
	__ a) Dispatch two operators to unlock and close 1SA-4 (1C S/G Main Steam to CAPT Maintenance Isol) (DH-624, FF-53, Rm 572) (Breakaway lock installed).
	__ b) **IF** 1SA-4 cannot be closed, **THEN** dispatch two operators to unlock and close 1SA-6 (1C S/G Main Steam to CAPT Stop Check) (AB-551, DD-53, Rm 217) (Breakaway lock installed) (Ladder needed).
	__ 5) **WHEN** the ruptured S/G steam supply to CA Pump #1 is isolated, **THEN** open the "CAPT TRIP T/V CTRL".

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
RO c. Isolate blowdown and steam drain on all ruptured S/G(s) as follows:	
• S/G 1A:	
__ 1) Close 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 43-44, Rm 591).
2) Verify the following blowdown isolation valves - CLOSED:	
__ a) 1BB-56A (S/G 1A Bldwn Cont Isol Insd).	__ a) Manually close valve.
__ b) 1BB-148B (S/G 1A Bldwn Cont Isol Byp).	b) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-56A is open, **THEN** perform the following: __ 1. Ensure "S/G A BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-148B (S/G 1A Bldwn Cont Isol Byp) (DH-580, EE-FF, 44-45, Rm 591) __ • 1BB-81 (1A S/G Blowdown Penetration Valve Test Isol) (DH-583, EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
RO __ c) 1BB-57B (S/G 1A Bldwn Cont Isol Otsd).	c) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-56A is open, **THEN** perform the following: __ 1. Ensure "S/G A BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-57B (S/G 1A Bldwn Cont Isol Otsd) (DH-580, EE-FF, 44-45, Rm 591) __ • 1BB-81 (1A S/G Blowdown Penetration Valve Test Isol) (DH-583, EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
• S/G 1B:	
__ 1) Close 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) (DH-583, FF-53, Rm 572).
2) Verify the following blowdown isolation valves - CLOSED:	
__ a) 1BB-19A (S/G 1B Bldwn Cont Isol Insd).	__ a) Manually close valve.
__ b) 1BB-150B (S/G 1B Bldwn Cont Isol Byp).	b) Perform the following: __ (1) Manually close valve. (2) <u>**IF**</u> valve will not close <u>**AND**</u> 1BB-19A is open, <u>**THEN**</u> perform the following: __ 1. Ensure "S/G B BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-150B (S/G 1B Bldwn Cont Isol Byp) (DH-580, FF, 52-53, Rm 572) __ • 1BB-83 (1B S/G Blowdown Penetration Valve Test Isol) (DH-580, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
__ c) 1BB-21B (S/G 1B Bldwn Cont Isol Otsd).	c) Perform the following: __ (1) Manually close valve. (2) **<u>IF</u>** valve will not close **<u>AND</u>** 1BB-19A is open, **<u>THEN</u>** perform the following: __ 1. Ensure "S/G B BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-21B (S/G 1B Bldwn Cont Isol Otsd) (DH-580, FF, 52-53, Rm 572) __ • 1BB-83 (1B S/G Blowdown Penetration Valve Test Isol) (DH-580, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
• S/G 1C:	
__ 1) Close 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V) (DH-580, GG, 52-53, Rm 572).
2) Verify the following blowdown isolation valves - CLOSED:	
__ a) 1BB-60A (S/G 1C Bldwn Cont Isol Insd).	__ a) Manually close valve.
__ b) 1BB-149B (S/G 1C Bldwn Cont Isol Byp).	b) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-60A is open, **THEN** perform the following: __ 1. Ensure "S/G C BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-149B (S/G 1C Bldwn Cont Isol Byp) (DH-578, FF-GG, 52, Rm 572) __ • 1BB-82 (1C S/G Blowdown Penetration Valve Test Isol) (DH-583, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
__ c) 1BB-61B (S/G 1C Bldwn Cont Isol Otsd).	c) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-60A is open, **THEN** perform the following: __ 1. Ensure "S/G C BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-61B (S/G 1C Bldwn Cont Isol Otsd) (DH-578, FF-GG, 52, Rm 572) __ • 1BB-82 (1C S/G Blowdown Penetration Valve Test Isol) (DH-583, FF-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
• S/G 1D:	
__ 1) Close 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V).	__ 1) Dispatch operator to close 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 44-45, Rm 591).
2) Verify the following blowdown isolation valves - CLOSED:	
__ a) 1BB-8A (S/G 1D Bldwn Cont Isol Insd).	__ a) Manually close valve.
__ b) 1BB-147B (S/G 1D Bldwn Cont Isol Byp).	b) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-8A is open, **THEN** perform the following: __ 1. Ensure "S/G D BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-147B (S/G 1D Bldwn Cont Isol Byp) (DH-582, EE-FF, 44, Rm 591) __ • 1BB-80 (1D S/G Blowdown Penetration Valve Test Isol) (DH-583,EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
__ c) 1BB-10B (S/G 1D Bldwn Cont Isol Otsd).	c) Perform the following: __ (1) Manually close valve. (2) **IF** valve will not close **AND** 1BB-8A is open, **THEN** perform the following: __ 1. Ensure "S/G D BLDWN FLOW CTRL" - CLOSED. 2. Dispatch operators to ensure the following valves - CLOSED: __ • 1BB-10B (S/G 1D Bldwn Cont Isol Otsd) (DH-582, EE-FF, 44, Rm 591) __ • 1BB-80 (1D S/G Blowdown Penetration Valve Test Isol) (DH-583,EE-FF, 44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. **Close the following valves on all ruptured S/G(s):** RO __ • MSIV __ • MSIV bypass valve.	**Perform the following:** a. Close the following valves on remaining S/Gs: __ • MSIV __ • MSIV bypass valve. __ b. Place steam dump control in manual and lower controller output to 0%. __ c. Place "STEAM DUMP SELECT" switch in pressure mode. d. Transfer turbine steam seal supply to AS as follows: __ 1) Open 1TL-8 (Aux Stm To Stm Seal Reg). __ 2) Close 1TL-2 (Main Stm To Stm Seal Reg). e. Ensure the following turbine S/V before seat drain valves - CLOSED: __ • 1SM-41 (Stop Vlv #1 Before Seat Drn) __ • 1SM-44 (Stop Vlv #2 Before Seat Drn) __ • 1SM-43 (Stop Vlv #3 Before Seat Drn) __ • 1SM-42 (Stop Vlv #4 Before Seat Drn). __ f. Close 1AS-1 (SM To AS Inlet). g. Ensure the following valves - CLOSED: __ • 1HM-1 (MSRH 1A&1B SSRH Stm Source) __ • 1HM-2 (MSRH 1C&1D SSRH Stm Source). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
	__ h. Dispatch operator to isolate steam flow from all ruptured S/G(s). **REFER TO** Enclosure 2 (Locally Isolating Steam Flow From Ruptured S/G(s)).
	__ i. **WHEN** cooldown is initiated in subsequent steps, **THEN** use intact S/G(s) PORV for steam dump.
	__ j. **IF** at least one intact S/G cannot be isolated from all ruptured S/G(s), **THEN** **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
6. **Control ruptured S/G(s) level as follows:**	
BOP __ a. Verify ruptured S/G(s) N/R level - GREATER THAN 11% (29% ACC).	a. Perform the following: __ 1) **IF** any ruptured S/G is also faulted, **THEN** do not establish feed flow to the ruptured S/G unless needed for NC System cooldown. 2) **IF** any ruptured S/G(s) is not faulted **OR** is required for cooldown, **THEN**: __ a) Establish and maintain feed flow to affected S/G(s). __ b) **WHEN** affected S/G(s) N/R level greater than 11% (29% ACC), **THEN** perform Steps 6.b and 6.c. __ 3) **GO TO** Step 7.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
BOP b. Isolate feed flow to all ruptured S/G(s) as follows:	
• S/G 1A:	
__ 1) Close 1CA-62A (CA Pmp A Disch To S/G 1A Isol).	1) Perform the following: __ a) Close 1CA-60 (CA Pump 1A Flow To S/G 1A). __ b) Dispatch operator with 14" valve wrench to close 1CA-62A (CA Pmp A Disch To S/G 1A Isol) (DH-587, DD-EE, 44-45, Rm 591).
__ 2) Close 1CA-66B (CA Pmp 1 Disch To S/G 1A Isol).	2) Perform the following: __ a) Close 1CA-64 (CA Pump #1 Flow To S/G 1A). __ b) Dispatch operator with 14" valve wrench to close 1CA-66B (CA Pmp 1 Disch To S/G 1A Isol) (DH-584, DD-EE, 44-45, Rm 591).
• S/G 1B:	
__ 1) Close 1CA-58A (CA Pmp A Disch To S/G 1B Isol).	1) Perform the following: __ a) Close 1CA-56 (CA Pump 1A Flow To S/G 1B). __ b) Dispatch operator with 14" valve wrench to close 1CA-58A (CA Pmp A Disch To S/G 1B Isol) (DH-586, DD-EE, 52-53, Rm 572).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
__ 2) Close 1CA-54B (CA Pmp 1 Disch To S/G 1B Isol).	2) Perform the following: __ a) Close 1CA-52 (CA Pump #1 Flow To S/G 1B). __ b) Dispatch operator with 14" valve wrench to close 1CA-54B (CA Pmp 1 Disch To S/G 1B Isol) (DH-584, DD-EE, 52-53, Rm 572).
• S/G 1C:	
__ 1) Close 1CA-46B (CA Pmp B Disch To S/G 1C Isol).	1) Perform the following: __ a) Close 1CA-44 (CA Pump 1B Flow To S/G 1C). __ b) Dispatch operator with 14" valve wrench to close 1CA-46B (CA Pmp B Disch To S/G 1C Isol) (DH-586, DD, 53-54, Rm 572).
__ 2) Close 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol).	2) Perform the following: __ a) Close 1CA-48 (CA Pump #1 Flow To S/G 1C). __ b) Dispatch operator with 14" valve wrench to close 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol) (DH-584, EE-53, Rm 572).
• S/G 1D:	
__ 1) Close 1CA-42B (CA Pmp B Disch To S/G 1D Isol).	1) Perform the following: __ a) Close 1CA-40 (CA Pump 1B Flow To S/G 1D). __ b) Dispatch operator with 14" valve wrench to close 1CA-42B (CA Pmp B Disch To S/G 1D Isol) (DH-586, DD-EE, 43-44, Rm 591).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
__ 2) Close 1CA-38A (CA Pmp 1 Disch To S/G 1D Isol).	2) Perform the following: __ a) Close 1CA-36 (CA Pump #1 Flow To S/G 1D). __ b) Dispatch operator with 14" valve wrench to close 1CA-38A (CA Pmp 1 Disch To S/G 1D Isol) (DH-584, DD-EE, 43-44, Rm 591).
__ c. **IF AT ANY TIME** ruptured S/G(s) N/R level is less than 11% (29% ACC), **THEN** perform Step 6.	
__ 7. **Verify at least one NC pump - ON.** BOP	**CAUTION** **NC T-Cold indication in the ruptured loop may cause an invalid Integrity Status Tree condition.** __ **Disregard NC T-Cold indication in the ruptured loop, until directed by this EP or until this EP is exited.**
BOP 8. **WHEN "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) is lit, THEN:**	
__ a. Depress ECCS steam pressure "BLOCK" pushbuttons.	
__ b. Verify main steam isolation blocked status lights (1SI-13) - LIT.	
c. Maintain NC pressure less than 1955 PSIG using one of the following: __ • Pzr spray OR __ • Pzr PORV.	

ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

NOTE
- NC pump trip criteria based on NC subcooling does not apply after starting a controlled cooldown.
- After the low steamline pressure main steam isolation signal is blocked Main Steam Isolation will occur if the high steam pressure rate setpoint is exceeded.

9. **Initiate NC System cooldown as follows:**

RO

__ a. Verify all ruptured S/G(s) pressure - GREATER THAN 320 PSIG.

__ a. **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

__ b. Determine required core exit temperature from the table below:

LOWEST RUPTURED S/G PRESSURE (PSIG)	CORE EXIT T/Cs (°F)
EQUAL TO OR GREATER THAN 1200	532 (512 ACC)
1100 - 1199	520 (501 ACC)
1000 - 1099	507 (489 ACC)
900 - 999	494 (476 ACC)
800 - 899	479 (461 ACC)
700 - 799	462 (445 ACC)
600 - 699	442 (426 ACC)
500 - 599	420 (405 ACC)
400 - 499	392 (379 ACC)
320 - 399	364 (352 ACC)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
RO c. Ensure ruptured S/G(s) isolated as follows:	
1) Verify the following valves on all ruptured S/G(s) - CLOSED: __ • MSIV __ • MSIV bypass valves.	1) Ensure the following valves on at least one intact S/G - CLOSED: __ • MSIV __ • MSIV bypass valve.
__ 2) Verify S/G PORV on ruptured S/G(s) - CLOSED OR ISOLATED.	2) **IF** ruptured S/G(s) pressure is less than 1090 PSIG, **THEN** perform the following: __ a) Ensure S/G PORV on ruptured S/G(s) - CLOSED **OR** ISOLATED. b) **IF** S/G PORV on ruptured S/G(s) not closed or isolated, **THEN**: __ (1) Ensure operator dispatched to close ruptured S/G(s) PORV isolation valve. (2) Do not continue until affected S/G PORV(s): __ • Isolated OR __ • Determined to be unisolable.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
3) **IF** S/G 1B **OR** 1C ruptured, **THEN** verify one of the following CAPT steam supply valves - CLOSED: __ • "CAPT TRIP T/V CTRL" OR __ • Manual isolation valve on the affected S/G.	3) Perform the following: __ a) Ensure operator dispatched to isolate CAPT steam supply from the ruptured S/G. b) Do not continue until affected CAPT steam supply: __ • Isolated OR __ • Determined to be unisolable.
RO d. Verify the condenser is available as follows: __ • "C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT __ • MSIV on intact S/G(s) - OPEN.	__ d. **GO TO** Step 9.g RNO.
__ e. Verify steam dumps - IN PRESSURE MODE.	e. Place steam dumps in pressure mode as follows: __ 1) Place "STM DUMP CTRL" M/A station in manual. __ 2) Manually adjust "STM DUMP CTRL" M/A station output to match "% STM DUMP DEMAND" (1SMP5211). __ 3) **WHEN** output on the "STM DUMP CTRL" M/A station is equal to the "% STM DUMP DEMAND" (1SMP5211), **THEN** place the steam dumps in pressure mode.
__ f. **WHEN** "P-12 LO-LO TAVG" status light (1SI-18) is lit, **THEN** place the steam dump interlock bypass switches in "BYP INTLK."	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

RO

__ g. Dump steam to condenser from intact S/G(s) at maximum rate while attempting to avoid a Main Steam Isolation.

g. Perform the following:

__ 1) Dump steam from all intact S/G(s) at maximum rate with S/G PORV(s).

__ 2) **IF** any intact S/G PORV cannot be opened from the control room, **THEN** dispatch operator(s) to dump steam at maximum rate from intact S/G(s) PORV. **REFER TO** Enclosure 3 (Local Operation of S/G PORVs).

3) **IF** operator(s) were dispatched to S/G PORV(s), **THEN**:

__ a) Obtain sound powered phone from storage box on rear wall of control room.

__ b) Connect sound powered phone to jack on 1MC-11.

__ c) Monitor sound powered phone for communication from the Doghouse(s).

4) **IF** no intact S/G is available for NC System cooldown, **THEN** contact station management to determine which of the following to perform:

__ • Use faulted S/G

OR

__ • **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

__ 5) **GO TO** Step 9.h.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
__ h. Verify main steam isolation blocked status lights (1SI-13) - LIT. BOP	h. Perform the following: 1) Depressurize NC System to less than 1955 PSIG using one of the following: __ • Pzr spray OR __ • Pzr PORV. 2) **WHEN** "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) is lit, **THEN**: __ a) Depress ECCS steam pressure "BLOCK" pushbuttons. __ b) Verify main steam isolation blocked status lights (1SI-13) - LIT. __ 3) Maintain NC pressure less than 1955 PSIG.
__ i. **WHEN** core exit T/Cs are less than required temperature, **THEN** stabilize core exit T/Cs less than required temperature. RO	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Control intact S/G levels as follows:**	
__ a. Verify N/R level in all intact S/Gs - GREATER THAN 11% (29% ACC). BOP	a. Perform the following: __ 1) Maintain total feed flow greater than 450 GPM to intact S/Gs until at least one intact S/G N/R level greater than 11% (29% ACC). 2) **IF** total feed flow greater than 450 GPM cannot be established, **THEN** contact station management for guidance to establish feed flow from one of the following alternate sources: __ • CF __ • CM __ • Alternate low pressure water source.
__ b. Throttle feed flow to maintain all intact S/G N/R levels between 16% (29% ACC) and 50%.	b. **IF** N/R level in any intact S/G continues to increase in an uncontrolled manner, **THEN**: __ 1) Stop NC system cooldown. __ 2) **RETURN TO** Step 1.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. **Verify Pzr PORV and isolation valve status as follows:** BOP	
__ a. Power to all Pzr PORV isolation valves - AVAILABLE.	a. Dispatch operator to restore power to affected Pzr PORV isolation valve(s): __ • 1EMXD-F02C (PORV Isol Motor (1NC31B)) (AB-560, BB-50, Rm 372) __ • 1EMXC-F03C (Pressurizer Power Operated Relief Isol. Valve 1NC33A) (AB-577, BB-50, Rm 496) __ • 1EMXD-F05A (PORV Isol Motor (1NC35B)) (AB-560, BB-50, Rm 372).
__ b. All Pzr PORVs - CLOSED.	b. **IF** Pzr pressure is less than 2315 PSIG, **THEN**: __ 1) Manually close Pzr PORV(s). __ 2) **IF** any Pzr PORV cannot be closed, **THEN** close its isolation valve. __ 3) **IF** Pzr PORV cannot be closed **OR** isolated, **THEN GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
__ c. At least one Pzr PORV isolation valve - OPEN.	__ c. Open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
d. **IF AT ANY TIME** a Pzr PORV opens due to high pressure while in this procedure, **THEN** perform the following: __ 1) **WHEN** Pzr pressure decreases to less than 2315 PSIG, **THEN** ensure the valve closes or is isolated. __ 2) **IF** Pzr PORV cannot be closed **OR** isolated, **THEN GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Ensure S/I - RESET:**	
BOP __ a. ECCS.	a. Perform the following: __ 1) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers. __ 2) Concurrently implement Enclosure 12 (ECCS Master Reset) while continuing in this procedure.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	
13. **Ensure the following containment isolation signals - RESET:** BOP __ • Phase A __ • Phase B.	
14. **Establish VI to containment as follows:** BOP __ • Ensure 1VI-77B (VI Cont Isol) - OPEN. __ • Verify VI pressure - GREATER THAN 85 PSIG.	**Perform the following:** a. Align N_2 to the Pzr PORVs by opening the following valves: __ • 1NI-438A (Emer N2 From CLA A To 1NC-34A) __ • 1NI-439B (Emer N2 From CLA B To 1NC-32B). __ b. **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 15. **Verify criteria to stop operating ND pumps as follows:**	
__ a. At least one ND pump - ON.	__ a. **GO TO** Step 15.e.
__ b. Verify ND pump(s) suction - ALIGNED TO FWST.	__ b. **GO TO** Step 16.
__ c. NC pressure - GREATER THAN 285 PSIG.	__ c. **GO TO** Step 16.
__ d. Stop ND pump(s) with suction aligned to FWST.	
__ e. **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart ND pumps.	
__ 16. **Verify ruptured S/G(s) - IDENTIFIED.**	__ **Do not continue in this procedure until ruptured S/G(s) identified.**
17. **Verify if NC System cooldown should be stopped:**	
__ a. Verify core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	__ a. Do not continue in this procedure until core exit T/Cs are less than required temperature.
__ b. Stabilize core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	Crew will hold here until they meet temperature requirements.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
RO 18. **Verify ruptured S/G(s) pressure is under operator control as follows:**	
__ a. All ruptured S/G(s) pressure - STABLE OR INCREASING.	a. Perform the following: __ 1) Ensure ruptured S/G(s) isolated. **<u>REFER</u> <u>TO</u>** Steps 3 through 6. __ 2) **<u>IF</u>** ruptured S/G(s) pressure is less than intact S/G(s) used for cooldown, **<u>THEN</u> <u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired). 3) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** D/P between ruptured S/G(s) and intact S/G(s) used for cooldown is less than 250 PSIG, **<u>THEN</u>**: __ • Maintain total NC System cooldown less than 100°F in an hour __ • Dump steam from intact S/Gs to maintain intact S/G pressures 250 PSIG below ruptured S/G(s) pressure. __ 4) **<u>IF</u>** intact S/G(s) used for cooldown can not be maintained at least 250 PSIG below the pressure of the ruptured S/G(s), **<u>THEN</u> <u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired). __ 5) **<u>GO</u> <u>TO</u>** Step 19.
__ b. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** ruptured S/G(s) pressure is decreasing while in this procedure, **<u>THEN</u>** perform Step 18.	
__ 19. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 20°F.** RO	__ **<u>IF</u> NC subcooling cannot be promptly restored to greater than 20°F, <u>THEN</u> <u>GO</u> <u>TO</u> EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
20. **Depressurize NC System using PZR Spray as follows:**	
BOP	
__ a. Verify normal Pzr spray flow - AVAILABLE.	__ a. **<u>GO</u> <u>TO</u>** Step 21.
__ b. Verify Pzr level - LESS THAN 76% (73% ACC)	__ b. Observe Caution prior to Step 23 and **<u>GO</u> <u>TO</u>** Step 23.
__ c. Depressurize NC System with maximum available spray.	
d. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** during this step one of the following conditions exists:	This is a judgement call about going to step 21.
__ • Spray valves are not effective in reducing NC pressure	
OR	
__ • Ruptured S/G(s) NR level is approaching 83% (82% ACC).	
__ **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 21.	
e. Do not continue until at least one of the following conditions satisfied:	
__ • NC subcooling based on core exit T/Cs - LESS THAN 0°F	
OR	
__ • Pzr level - GREATER THAN 76% (73% ACC)	
OR	
• Both of the following:	
__ • NC pressure - LESS THAN RUPTURED S/G(s) PRESSURE	
<u>AND</u>	
__ • Pzr level - GREATER THAN 11% (20% ACC).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
20. (Continued)	
BOP f. Close the following valve(s):	
__ 1) Pzr spray valves.	1) **IF** spray valve(s) will not close, **THEN**: __ a) Stop NC pumps 1A and 1B. __ b) **IF** NC pressure continues to decrease, **THEN** stop third NC pump as required.
__ 2) 1NV-37A (NV Supply To Pzr Aux Spray).	2) Ensure one of the following valves - CLOSED: __ • 1NV-312A (Chrg Line Cont Isol) OR __ • 1NV-314B (Chrg Line Cont Isol).
__ g. Observe Caution prior to Step 23 and **GO TO** Step 23.	
21. **Depressurize NC System using Pzr PORV as follows:**	
__ a. Verify at least one Pzr PORV - AVAILABLE.	a. Establish NV aux spray as follows: __ 1) Ensure at least one NI pump - ON. __ 2) Ensure at least one NV pump - ON. 3) Ensure the following NV pump miniflow valves - OPEN: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol). 4) Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
21. (Continued)	
	__ 5) Manually throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.
	__ 6) Manually close 1NV-309 (Seal Water Injection Flow).
	7) Open the following valves:
	__ • 1NV-312A (Chrg Line Cont Isol)
	__ • 1NV-314B (Chrg Line Cont Isol).
	__ 8) Place 1NV-309 in auto.
	9) Ensure the following valves - CLOSED:
	__ • 1NC-27 (Pzr Spray Ctrl Frm Loop A)
	__ • 1NC-29 (Pzr Spray Ctrl Frm Loop B)
	__ • 1NV-39A (NV Supply To Loop D Isol)
	__ • 1NV-32B (NV Supply To Loop A Isol).
	__ 10) Maintain charging flow less than 180 GPM.
	__ 11) Throttle 1NV-37A (NV Supply To Pzr Aux Spray) and charging flow as required.
	__ 12) **<u>RETURN</u> <u>TO</u>** Step 20.e.
__ b. Verify Pzr level - LESS THAN 76% (73% ACC).	__ b. Observe Caution prior to Step 23 and **<u>GO</u> <u>TO</u>** Step 23.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
21. (Continued)	
__ c. Open one Pzr PORV.	c. Perform the following: 1) Align N_2 to the Pzr PORVs by opening the following valves: __ • 1NI-438A (Emer N2 From CLA A To 1NC-34A) __ • 1NI-439B (Emer N2 From CLA B To 1NC-32B). __ 2) Open one Pzr PORV.
d. Do not continue until at least one of the following conditions satisfied: __ • NC subcooling based on core exit T/Cs - LESS THAN 0°F OR __ • Pzr level - GREATER THAN 76% (73% ACC) OR • Both of the following: __ • NC pressure - LESS THAN RUPTURED S/G(s) PRESSURE **AND** __ • Pzr level - GREATER THAN 11% (20% ACC).	
__ e. Close Pzr PORV.	__ e. Close Pzr PORV isolation valve.
__ f. Close Pzr spray valve(s).	f. **IF** spray valve(s) will not close, **THEN**: __ 1) Stop NC pumps 1A and 1B. __ 2) **IF** NC pressure continues to decrease, **THEN** stop third NC pump as required.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 22. **Verify NC pressure - INCREASING.**	**Perform the following:**
	__ a. Close Pzr PORV isolation valve.
	b. **IF** pressure continues to decrease, **THEN** perform the following:
	1) Monitor the following conditions for indication of leakage from the Pzr PORV:
	__ • PRT pressure
	__ • Pzr Relief Valve Temp.
	__ 2) **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

CAUTION **S/I must be terminated when termination criteria are satisfied to prevent overfilling the ruptured S/G(s).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
23. **Verify S/I termination criteria as follows:**	
BOP __ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
b. Verify secondary heat sink as follows:	__ b. **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
__ • N/R level in at least one intact S/G - GREATER THAN 11% (29% ACC)	
OR	
__ • Total feed flow available to S/G(s) - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR INCREASING.	__ c. **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
__ d. Pzr level - GREATER THAN 11% (20% ACC).	__ d. **RETURN TO** Step 7.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. **Stop S/I pumps as follows:**	
BOP __ a. Stop NI pumps.	a. Perform the following: 1) **IF** NI Pump 1A failed to trip, **THEN** perform the following: a) Ensure the following valves - OPEN: __ • 1NI-115A (NI Pump 1A Miniflow Isol) __ • 1NI-147B (NI Pump Miniflow Hdr To FWST Isol). b) **WHEN** miniflow path aligned, **THEN** ensure the following valves - CLOSED: __ • 1NI-121A (NI Pump 1A To H-Legs B&C) __ • 1NI-118A (NI Pump 1A C-Leg Inj Isol). __ c) Dispatch operator to locally trip 1ETA#11 (1A NI Pump Motor) (AB-577, AA-49, Rm 496). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. (Continued)	
	2) **IF** NI Pump 1B failed to trip, **THEN** perform the following: a) Ensure the following valves - OPEN: __ • 1NI-144A (NI Pump 1B Miniflow Isol) __ • 1NI-147B (NI Pump Miniflow Hdr To FWST Isol). b) **WHEN** miniflow path aligned, **THEN** ensure the following valves - CLOSED: __ • 1NI-150B (NI Pump 1B C-Leg Inj Isol) __ • 1NI-152B (NI Pump 1B To H-Legs A&D). __ c) Dispatch operator to locally trip 1ETB#11 (1B NI Pump Motor) (AB-560, AA-49, Rm 372).
__ b. Ensure only one NV pump - ON. BOP	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25. **Isolate NV S/I flowpath as follows:**	
BOP	
a. Verify the following valves - OPEN:	a. **IF** NV pump suctions are aligned for Cold Leg Recirc, **THEN** perform the following:
__ • 1NV-252A (NV Pumps Suct From FWST)	__ 1) **GO TO** Enclosure 10 (Establish Charging With NV Miniflow Isolated).
__ • 1NV-253B (NV Pumps Suct From FWST).	__ 2) **GO TO** Step 27.
b. Ensure the following valves - OPEN:	b. Perform the following:
__ • 1NV-203A (NV Pumps A&B Recirc Isol)	1) Dispatch operator to open affected valve(s):
__ • 1NV-202B (NV Pmps A&B Recirc Isol).	__ • 1NV-203A (NV Pumps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed)
	__ • 1NV-202B (NV Pmps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed).
	__ 2) **GO TO** Enclosure 10 (Establish Charging With NV Miniflow Isolated).
	__ 3) **WHEN** 1NV-203A **AND** 1NV-202B are opened, **THEN** charging flow may be reduced below 60 GPM.
	__ 4) **GO TO** Step 27.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25. (Continued)	
BOP c. Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). SCENARIO MAY BE TERMINATED HERER	c. Perform the following: 1) Dispatch operator to close the affected valve(s). **REFER TO** the following enclosure(s) for the affected valve(s): __ • Enclosure 13 (Locally Close 1NI-9A) __ • Enclosure 15 (Locally Close 1NI-10B). 2) **IF** NC pump seal cooling is established from KC flow to thermal barrier, **THEN** perform the following: __ a) Ensure all NC pumps - OFF. __ b) Stop NV Pumps. __ c) **WHEN** 1NI-9A **AND** 1NI-10B are closed, **THEN** restore NV pump to service. **REFER TO** Enclosure 9 (NV Pump Restart). d) Ensure the following valves - OPEN: __ • 1NI-115A (NI Pump 1A Miniflow Isol) __ • 1NI-144A (NI Pump 1B Miniflow Isol) __ • 1NI-147B (NI Pump Miniflow Hdr To FWST Isol). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25. (Continued)	
	e) Close one of the following valves: __ • 1NI-118A (NI Pump 1A C-Leg Inj Isol) OR __ • 1NI-150B (NI Pump 1B C-Leg Inj Isol).
	__ f) Start NI Pump associated with the closed NI Pump C-Leg injection valve.
	__ g) Manually align associated NI Pump C-leg injection valve as required to maintain Pzr level greater than 11% (20% ACC).
	__ h) **GO TO** Step 32.
	__ 3) **WHEN** 1NI-9A **AND** 1NI-10B are closed, **THEN** perform Steps 26 through 31.
	__ 4) **GO TO** Step 32.

NOTE VI pressure less than 50 PSIG will prevent operation of 1NV-294 and 1NV-309 from the control room.

26. **Establish charging as follows:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ a. Verify VI pressure - GREATER THAN 50 PSIG.	__ a. **GO TO** Step 26.b RNO.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. (Continued)	
__ b. Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.	b. Perform the following: __ 1) Place the controller for 1NV-294 in the 100% demand position. __ 2) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) for 32 GPM charging line flow. __ 3) Throttle 1NV-295 to control charging flow as required in subsequent steps. __ 4) **<u>IF</u>** VI pressure less than 50 PSIG, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 26.c RNO.
__ c. Close 1NV-309 (Seal Water Injection Flow).	c. Dispatch operator with radio to perform the following: __ 1) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ 2) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.
d. Ensure one of the following valves - OPEN: __ • 1NV-32B (NV Supply To Loop A Isol) OR __ • 1NV-39A (NV Supply To Loop D Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. (Continued)	
e. Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	e. Dispatch operator to open the affected valve(s). **REFER TO** the following enclosure(s) for affected valve(s): __ • Enclosure 14 (Locally Open 1NV-312A) __ • Enclosure 16 (Locally Open 1NV-314B).
__ f. Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.	__ f. **GO TO** Step 26.h.
__ g. Place 1NV-309 in auto.	
h. Perform the following: __ • Maintain charging flow less than 180 GPM __ • Maintain 32 GPM seal water flow.	
__ 27. **Control charging flow to maintain Pzr level greater than 11% (20% ACC).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
28. **Verify S/I flow not required as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	a. Perform the following: __ 1) Manually start S/I pumps and align valves as necessary to restore NC subcooling. __ 2) **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
__ b. Pzr level - GREATER THAN 11% (20% ACC).	b. Perform the following: __ 1) Control charging flow to restore Pzr level to greater than 11% (20% ACC). 2) **IF** Pzr level cannot be maintained at greater than 11% (20% ACC), **THEN**: __ a) Manually start S/I pumps and align valves as necessary to restore Pzr level. __ b) **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
29. **Ensure proper operation of VCT Makeup Control System as follows:**	
__ a. Determine the required shutdown boron concentration. **REFER TO** ROD Book, Section 5.11.	
b. **WHEN** the required shutdown boron concentration is determined, **THEN**:	
__ 1) Adjust VCT makeup controls for a boron concentration that is greater than or equal to the required shutdown boron concentration.	
__ 2) Ensure "NC MAKEUP MODE SELECT" - IN "AUTO".	
__ 3) Place the "NC MAKEUP CONTROL" switch momentarily to the "START" position.	
30. **Establish normal letdown as follows:**	
__ a. Verify VI pressure - GREATER THAN 35 PSIG.	a. Perform the following: __ 1) **WHEN** VI pressure is greater than 35 PSIG, **THEN** perform Steps 30.b through 30.n. __ 2) **GO TO** Step 31.
__ b. Verify Pzr level - GREATER THAN 25% (34% ACC).	b. Perform the following: __ 1) **WHEN** Pzr level increases to greater than 25% (34% ACC), **THEN** perform Steps 30.c through 30.n. __ 2) **GO TO** Step 31.
c. Ensure the following valves - CLOSED: __ • 1KC-56A (KC To ND Hx 1A Sup Isol) __ • 1KC-81B (KC To ND Hx 1B Sup Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. (Continued)	
d. Verify the following EMF trip 1 lights - DARK: __ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	d. Perform the following: __ 1) Notify station management to evaluate restoring normal letdown with high NC System activity. __ 2) Establish excess letdown. **<u>REFER TO</u>** Enclosure 4 (Establishing Excess Letdown). __ 3) **<u>WHEN</u>** station management approval to establish normal letdown is obtained, **<u>THEN</u>** perform Steps 30.e through 30.n. __ 4) **<u>GO</u>** **<u>TO</u>** Step 31.
e. Verify the following valves for the operating KC train(s) - OPEN: • Train A: __ • 1KC-1A (Aux Bldg Non-Ess Ret Hdr Isol) __ • 1KC-50A (Aux Bldg Non-Ess Hdr Isol). • Train B: __ • 1KC-2B (Aux Bldg Non-Ess Ret Hdr Isol) __ • 1KC-53B (Aux Bldg Non-Ess Hdr Isol).	__ e. Manually open valve(s).
__ f. Ensure 1NV-849 (Letdn Flow Var Orif Ctrl) valve demand position - 0%.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. (Continued)	
g. Open the following valves: __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol) __ • 1NV-15B (Letdn Cont Isol).	g. Perform the following: 1) Ensure the following valves - CLOSED: __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol) __ • 1NV-15B (Letdn Cont Isol). __ 2) Establish excess letdown. **REFER TO** Enclosure 4 (Establishing Excess Letdown). __ 3) **GO TO** Step 31.
__ h. While performing the following steps, manually adjust charging flow to maintain letdown subcooled.	
__ i. Throttle 1NV-148 (Letdn Press Control) to 45% demand.	
__ j. Open 1NV-10A (Letdn Orif 1B Otlt Cont Isol).	
k. Throttle open 1NV-849 (Letdn Flow Var Orif Ctrl) in 1% to 5% increments until one of the following conditions is met: __ • Letdown flow and letdown pressure increases OR __ • Valve demand position is 60% open.	
__ l. Do not continue until one of the above conditions is met.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. (Continued)	
__ m. Verify letdown flow and letdown pressure - HAS INCREASED.	m. Perform the following: 1) Close the following valves: __ • 1NV-849 (Letdn Flow Var Orif Ctrl) __ • 1NV-10A (Letdn Orif 1B Otlt Cont Isol) __ • 1NV-1A (NC Letdn To Regen Hx Isol) __ • 1NV-2A (NC Letdn To Regen Hx Isol). __ 2) Establish excess letdown. **REFER TO** Enclosure 4 (Establishing Excess Letdown). __ 3) **GO TO** Step 31.
__ n. Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure between 150 - 200 PSIG.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

30. (Continued)

o. **WHEN** 5 minutes have elapsed, **THEN** perform the following:

__ 1) Adjust 1NV-849 (Letdn Flow Var Orif Ctrl) in 1% increments to desired letdown flow.

2) **WHEN** letdown at desired flow, **THEN** perform the following:

__ a) Adjust 1NV-148 (Letdn Press Control) to maintain letdown pressure at 350 PSIG.

__ b) Ensure 1NV-148 (Letdn Press Control) - IN AUTO.

__ 3) **IF AT ANY TIME** additional letdown flow desired, **THEN** establish letdown with the 45 or 75 GPM orifice. **REFER TO** OP/1/A/6200/001 (Chemical and Volume Control System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. **Align NV pump suction to the VCT as follows:**	
a. Verify at least one of the following NV pump suction valves - OPEN:	a. Perform the following:
__ • 1NV-252A (NV Pumps Suct From FWST) OR __ • 1NV-253B (NV Pumps Suct From FWST).	__ 1) Notify station management for guidance to restore NV pump suction to the VCT. __ 2) <u>**GO**</u> <u>**TO**</u> Step 32.
b. Open the following valves: __ • 1NV-188A (VCT Otlt Isol) __ • 1NV-189B (VCT Otlt Isol).	
c. Close the following valves: __ • 1NV-252A (NV Pumps Suct From FWST) __ • 1NV-253B (NV Pumps Suct From FWST).	
32. **Isolate CLAs as follows:**	
__ a. Verify NC pressure - LESS THAN 700 PSIG.	a. Perform the following: __ 1) <u>**WHEN**</u> NC pressure is less than 700 PSIG, <u>**THEN**</u> perform Steps 32.b through 32.e. __ 2) Observe Note prior to Step 33 and <u>**GO**</u> <u>**TO**</u> Step 33.
b. Verify the following: __ • NC subcooling based on core exit T/Cs - GREATER THAN 0°F __ • Verify Pzr level - GREATER THAN 11% (20% ACC).	__ b. <u>**GO**</u> <u>**TO**</u> EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
32. (Continued)	
__ c. Dispatch operator to restore power to all CLA discharge isolation valves. **REFER TO** Enclosure 11 (Power Alignment for CLA Valves).	
__ d. Maintain NC pressure greater than CLA pressure until the CLAs are isolated or vented.	
e. **WHEN** power is aligned, **THEN**:	
1) Close all of the following valves: __ • 1NI-54A (C-Leg Accum A Disch Isol) __ • 1NI-65B (C-Leg Accum B Disch Isol) __ • 1NI-76A (C-Leg Accum C Disch Isol) __ • 1NI-88B (C-Leg Accum D Disch Isol).	1) Vent any CLA which cannot be isolated as follows: __ a) Open 1NI-47A (C-Leg Accum N2 Sup Cont Isol). __ b) Place breaker 1CB-1 (behind 1MC-6) (Key #11) to "ON". c) Open the valve for the CLA(s) to be vented: __ • 1NI-50 (C-Leg Accum A N2 Supply Isol) __ • 1NI-61 (C-Leg Accum B N2 Supply Isol) __ • 1NI-72 (C-Leg Accum C N2 Supply Isol) __ • 1NI-84 (C-Leg Accum D N2 Supply Isol). __ d) Close 1NI-47A (C-Leg Accum N2 Sup Cont Isol). __ e) Open 1NI-83 (C-Leg Accums N2 Vent Ctrl) to depressurize the affected CLA(s). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

32. (Continued)

f) **__WHEN__** CLA(s) is vented, **__THEN__**:

__ (1) Close 1NI-83 (C-Leg Accums N2 Vent Ctrl).

(2) Close valve(s) previously opened:

__ • 1NI-50 (C-Leg Accum A N2 Supply Isol)

__ • 1NI-61 (C-Leg Accum B N2 Supply Isol)

__ • 1NI-72 (C-Leg Accum C N2 Supply Isol)

__ • 1NI-84 (C-Leg Accum D N2 Supply Isol).

__ (3) Place breaker 1CB-1 (behind 1MC-6) to "OFF".

__ 2) Notify dispatched operator to remove power from all CLA isolation valves. **__REFER TO__** Enclosure 11 (Power Alignment for CLA Valves).

__NOTE__ Enclosure 5 (NC Pressure And Makeup Control to Minimize Leakage) shall remain in effect until subsequent procedures provide alternative NC pressure and makeup control guidance.

__ 33. **Control NC pressure and charging flow to minimize primary to secondary leakage. __REFER TO__ Enclosure 5 (NC Pressure And Makeup Control to Minimize Leakage).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 34. **Verify at least one NC pump - ON.**	__ **<u>WHEN</u> primary to secondary leakage has been stopped, <u>THEN</u> consider NC T-Cold indication in the ruptured loop to be valid. <u>REFER</u> <u>TO</u> Enclosure 5 (NC Pressure And Makeup Control to Minimize Leakage).**
35. **Verify proper NS pump operation as follows:**	
__ a. At least one NS pump - ON.	a. Perform the following: __ 1) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** an NS pump(s) starts while in this procedure, **<u>THEN</u>** perform Step 35. __ 2) **<u>GO</u> <u>TO</u>** Step 36.
b. Verify the following valves - OPEN: __ • 1FW-27A (ND Pump 1A Suct From FWST) __ • 1FW-55B (ND Pump 1B Suct From FWST).	b. Perform the following: __ 1) **<u>IF</u>** NS pump(s) have previously been stopped more than once, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 36. __ 2) **<u>WHEN</u>** containment pressure is less than 1 PSIG, **<u>THEN</u>** perform Steps 35.e through 35.g. __ 3) **<u>GO</u> <u>TO</u>** Step 36.
__ c. Containment pressure - LESS THAN 2.4 PSIG.	c. Perform the following: __ 1) **<u>WHEN</u>** containment pressure is less than 2.4 PSIG, **<u>THEN</u>** perform Step 35. __ 2) **<u>GO</u> <u>TO</u>** Step 36.
__ d. Verify operating NS pump(s) - HAVE REMAINED RUNNING SINCE INITIAL PHASE B SIGNAL.	__ d. **<u>IF</u>** NS pump(s) has previously been stopped, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 36.
__ e. Reset NS.	
__ f. Stop NS pumps.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
35. (Continued)	
g. Close the following valves:	
__ • 1NS-29A (NS Spray Hdr 1A Cont Isol)	
__ • 1NS-32A (NS Spray Hdr 1A Cont Isol)	
__ • 1NS-15B (NS Spray Hdr 1B Cont Isol)	
__ • 1NS-12B (NS Spray Hdr 1B Cont Isol).	
36. **Verify all AC busses are energized by offsite power as follows:**	**Perform the following:**
• A Train:	__ a. **<u>WHEN</u>** time allows, **<u>THEN</u>** attempt to restore offsite power while continuing with this procedure. **<u>REFER TO</u>** AP/1/A/5500/007 (Loss of Normal Power).
__ • "FTA B/O NORM FDR FRM ATC" - CLOSED	
__ • "D/G 1A BKR TO ETA" - OPEN	b. Manually start following equipment:
__ • 1ETA - ENERGIZED.	__ • Start all available CRD vent fans.
• B Train:	__ • Dispatch operator to start available VI compressors.
__ • "FTB B/O NORM FDR FRM ATD" - CLOSED	
__ • "D/G 1B BKR TO ETB" - OPEN	
__ • 1ETB - ENERGIZED.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
37. **Verify conditions to stop operating D/Gs as follows:**	
__ a. At least one D/G - ON.	__ a. **GO TO** Step 38.
b. Verify 1ETA is energized by offsite power as follows:	b. Perform the following:
__ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	__ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 37.d.
__ c. Dispatch operator to stop 1A D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows:	d. Perform the following:
__ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	__ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 38.
__ e. Dispatch operator to stop 1B D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

38. **Minimize secondary system contamination as follows:**

    a. Dispatch operators to perform the following:

    __ 1) Inspect aux building and turbine building for leakage.

    __ 2) Isolate or minimize leakage where possible but do not isolate S/I or charging paths to the NC System.

    __ 3) Isolate or identify leakage into the turbine building sump. **REFER TO** PT/1/B/4150/001G (Turbine Building Sump Isolation).

    b. Remove CM polishing demineralizers from service as follows:

    __ 1) Ensure "POLSH DEMIN BYP CTRL" - PLACED IN MANUAL.

    __ 2) Ensure "POLSH DEMIN BYP CTRL" - OPEN.

    __ 3) Notify Secondary Chemistry CM polishing demineralizers have been bypassed.

    __ c. Align auxiliary systems to minimize secondary side contamination. **REFER TO** Enclosure 6 (Auxiliary System Alignment).

__ 39. **Operate Pzr heaters as necessary to saturate Pzr water at ruptured S/G(s) pressure.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
40. **Verify NC pump cooling is aligned as follows:**	
a. Verify KC aligned to Reactor Bldg Non Essential Header: • A train __ • 1KC-3A (Rx Bldg Non-Ess Ret Hdr Isol) - OPEN __ • 1KC-230A (Rx Bldg Non-Ess Hdr Isol) - OPEN __ • A train KC pump(s) - ON. OR • B train __ • 1KC-228B (Rx Bldg Non-Ess Hdr Isol) - OPEN __ • 1KC-18B (Rx Bldg Non-Ess Ret Hdr Isol) - OPEN __ • B train KC pump(s) - ON.	a. Perform one of the following based on seal injection status: __ • **IF** NC pump seal injection flow is greater than 6 GPM to each NC pump, **THEN** manually open the affected valve(s). • **IF** NC pump seal injection flow is less than 6 GPM to any NC pump, **THEN**: **NOTE** NC pump seals will be cooled during NC System cooldown. __ 1) Maintain NC pump seal injection and thermal barrier cooling isolated to the affected NC pump(s). __ 2) **GO TO** Step 41.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

40. (Continued)

b. Verify the following valves - OPEN:

- __ • 1KC-394A (NC Pump 1A Therm Bar Otlt)
- __ • 1KC-364B (NC Pump 1B Therm Bar Otlt)
- __ • 1KC-345A (NC Pump 1C Therm Bar Otlt)
- __ • 1KC-413B (NC Pump 1D Therm Bar Otlt)
- __ • 1KC-424B (NC Pumps Ret Hdr Cont Isol)
- __ • 1KC-425A (NC Pumps Ret Hdr Cont Isol)
- __ • 1KC-338B (NC Pumps Sup Hdr Cont Isol).

b. Perform one of the following based on seal injection status:

- **IF** NC pump seal injection flow is greater than 6 GPM to each NC pump, **THEN** perform the following:

  __ 1) Manually open the affected valve(s).

  __ 2) Monitor KC surge tank levels for signs of KC leakage.

  3) **IF AT ANY TIME** KC leakage suspected, **THEN** close the following:

  - __ • 1KC-424B (NC Pumps Ret Hdr Cont Isol)
  - __ • 1KC-425A (NC Pumps Ret Hdr Cont Isol)
  - __ • 1KC-338B (NC Pumps Sup Hdr Cont Isol).

- **IF** NC pump seal injection flow is less than 6 GPM to any NC pump, **THEN**:

  NOTE NC pump seals will be cooled during NC System cooldown.

  __ 1) Maintain NC pump seal injection and thermal barrier cooling isolated to the affected NC pump(s).

  __ 2) **GO TO** Step 41.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
40. (Continued)	
__ c. NC pump seal injection flow - GREATER THAN 6 GPM TO EACH NC PUMP.	c. Perform one of the following based on seal injection status: __ • **IF** seal injection flow exists, **THEN** throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) to maintain 32 GPM seal injection flow. OR __ • **IF** seal injection flow has been lost, **THEN** **REFER TO** AP/1/A/5500/008 (Malfunction of Reactor Coolant Pump), Case II.(Loss of Seal Water Injection).
41. **Establish NC pump seal return flow as follows:**	
__ a. Verify NC pump seal injection flow - GREATER THAN 6 GPM TO EACH NC PUMP.	a. Perform the following: __ 1) **WHEN** NC pump seal injection is restored, **THEN** perform Steps 41.b through 41.g. __ 2) Observe Note prior to Step 42 and **GO TO** Step 42.
__ b. Verify 1AD-7, D/1 "SEALWATER HX KC HI/LO FLOW" - DARK.	b. Perform the following: __ 1) Notify station management to evaluate restoring NC pump seal return flow. __ 2) **WHEN** notified by station management **OR** 1AD-7, D/1 dark, **THEN** perform Steps 41.c through 41.g. __ 3) Observe Note prior to Step 42 and **GO TO** Step 42.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
41. (Continued)	
c. Verify the following EMF trip 1 lights - DARK: __ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	c. Perform the following: __ 1) Notify station management to evaluate restoring NC pump seal return with high NC System activity. __ 2) **WHEN** station management approval to establish NC pump seal return is obtained, **THEN** perform Steps 41.d through 41.g. __ 3) Observe Note prior to Step 42 and **GO TO** Step 42.
__ d. Verify NCDT pressure - LESS THAN VCT PRESSURE.	d. Perform the following: __ 1) Consult with station management to establish normal NCDT pressure. **REFER TO** OP/1/A/6500/014 (Operations Controlled Liquid Waste Systems). __ 2) **WHEN** NCDT pressure is less than VCT pressure, **THEN** perform Steps 41.e through 41.g. __ 3) Observe Note prior to Step 42 and **GO TO** Step 42.
e. Open the following valves: __ • 1NV-89A (NC Pmps Seal Ret Cont Isol) __ • 1NV-91B (NC Pmps Seal Ret Cont Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
41. (Continued)	
f. **IF AT ANY TIME** NCDT pressure is greater than VCT, **THEN** perform the following:	
__ 1) Monitor NC Pump #1 seal ΔP.	
__ 2) Verify excess letdown - ISOLATED.	__ 2) Align 1NV-125B (Excess Letdn Hx Otlt Ctrl) to "NCDT".
3) Close the following valves:	
__ • 1NV-89A (NC Pmps Seal Ret Cont Isol)	
__ • 1NV-91B (NC Pmps Seal Ret Cont Isol).	
__ g. Verify excess letdown - ISOLATED.	__ g. Align 1NV-125B (Excess Letdn Hx Otlt Ctrl) to "VCT".

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE

- Preference should be given to starting 1B NC pump to provide normal Pzr spray capability. If 1B NC pump is not available, then two or three NC pumps may need to be started to provide normal Pzr spray capability.
- If B S/G is the ruptured S/G , then B NC loop may be hotter than the other NC loops. In this case A NC pump should be in operation along with B NC pump for effective spray flow.

42. **Verify NC pump status as follows:**

__ a. Verify 1B NC pump - ON.

a. Perform the following:

__ 1) **IF** all NC pumps are off, **THEN** ensure Natural Circulation. **REFER TO** Enclosure 8 (Natural Circulation Monitoring Parameters).

__ 2) Start NC pumps. **REFER TO** Enclosure 7 (NC Pump Start).

3) **IF** plant conditions do not allow start of NC pumps, **THEN** perform the following:

__ a) **WHEN** NC pump(s) become available, **THEN** observe Notes prior to Step 42 and perform Step 42.

__ b) **GO TO** Step 43.

__ 4) **GO TO** Step 43.

__ b. Stop NC pumps not needed for Pzr spray flow.

__ c. Ensure the normal Pzr spray valve associated with secured NC pump - IN MANUAL AND CLOSED.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
43. **Determine status of N/Is as follows:**	
__ a. Verify I/R channels - LESS THAN 10^{-10} AMPS.	a. Perform the following: __ 1) **<u>WHEN</u>** I/R channels are less than 10^{-10} Amps, **<u>THEN</u>** perform Steps 43.b and 43.c. __ 2) **<u>GO</u> <u>TO</u>** Step 44.
__ b. Verify S/R channels - ENERGIZED.	__ b. Place S/R select switches in "RESET".
__ c. Transfer one channel of the "NIS RECORDER" to S/R instrumentation.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
44. **Shutdown unnecessary plant equipment as follows:**	
__ a. Verify turbine generator megawatt output - LESS THAN **OR** EQUAL TO ZERO MW.	a. Perform the following: __ 1) Determine and correct cause of continued turbine generator output. __ 2) **WHEN** turbine generator megawatt output less than or equal to zero MW, **THEN** perform Step 44.b and Step 44.c. __ 3) **GO TO** Step 44.d.
b. Ensure the following breakers and MODs - OPEN: __ • MOD 1BG and 1BT __ • MOD 1AG and 1AT __ • Generator Breakers 1A and 1B.	
__ c. Ensure main generator "EXCITATION" - OFF.	
__ d. Verify "MAN/AUTO REG" select switch "MAN" mode light - LIT.	__ d. Transfer to manual mode.
__ e. Dispatch operator to secure NF chillers and pumps.	
__ f. Stop excess condensate booster pumps.	
__ g. Stop excess hotwell pumps.	
__ h. Stop C heater drain pumps.	
__ i. Stop excess RC pumps and cooling tower fans. **REFER TO** OP/1/B/6400/001A (Condenser Circulating Water System).	

ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

<u>CAUTION</u>

- **If no NC pump can be run, then using EP/1/A/5000/ES-3.1 (Post - SGTR Cooldown Using Backfill) may result in void formation in the affected loop and inadequate shutdown margin due to poor mixing of unborated S/G water.**
- **If S/G N/R level has exceeded 92%, then using EP/1/A/5000/ES-3.3 (Post - SGTR Cooldown Using Steam Dump) may result in damage to piping and equipment.**
- **If the condenser is unavailable, then using EP/1/A/5000/ES-3.3 (Post - SGTR Cooldown Using Steam Dump) may result in higher offsite radiological releases.**

45. **Consult with station management to determine appropriate post-SGTR cooldown method:**

__ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/ES-3.1 (Post - SGTR Cooldown Using Backfill)

OR

__ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/ES-3.2 (Post - SGTR Cooldown Using Blowdown)

OR

__ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/ES-3.3 (Post - SGTR Cooldown Using Steam Dump).

<u>END</u>

Scenario 1

Scenario starts at 10-8 amps with a power increase to 1% power. When a positive SUR is evident, the I/R power channel will fail. The reactor should be stabilized and the I/R failure dealt with. The next event is the loss of a CCW pump. Subsequently, a loss of offsite power to B essential bus (1ETB) will occur. The D/G will not load and the cooling water valve to the D/G will not open, and the crew will secure the D/G. All power to 1ETB is lost for the remainder of the scenario. A small leak on the reactor coolant system (~25 gpm) will develop requiring charging flow to be increased and letdown to be reduced. Once the leak is quantified, the running feed pump will trip and the aux feed water pump will not start in auto. Based on power < 5%, the reactor should NOT be tripped, however, 1A aux feed water pump should be manually started.

The major begins with a large steam break on 1A S/G outside containment. The 1A RHR pump will not start automatically. The recirc valve on one of the running RHR pumps will fail to open and the pump will be secured. The blowdown isolation valve inside containment on the faulted S/G does not close automatically and the outside valve has no power and is not closed. The outside valve should be locally manually closed. The crew will transition from E-0 to E-2 and once the S/G is isolated per E-2, they will terminate S/I per ES-1.1. The scenario will be terminated when the high pressure injection isolation valves are closed.

Scenario 2

Scenario starts at 100% power with 1A D/G out of service. Power reduction is required for testing. Boration will be done followed by turbine load decrease. The RN strainer on the running pump will clog requiring another RN pump to be started and the initially running pump to be secured. A condenser dump valve will fail to an intermediate position requiring manual isolation. Reactor power will initially increase and have to be maintained by the crew to prevent exceeding 100%. Once the valve is isolated and stable conditions exist, a loss of vacuum will occur and load will be manually reduced to stabilize and recover vacuum. Finally, the PZR spray valve will open and no manual control is available. The spray valve mode select key switch will be used to fail the spray valve closed.

The major event begins with a S/G tube leak on 1A S/G (650 gpm). Feed water will not automatically isolate. The high head injection valves will fail to open on the safety injection. The PORV on the ruptured S/G will fail open and require the isolation valve to be closed. Once the NC system is cooled down and depressurized where S/I can be terminated, the scenario will end when the high head injection valves are closed.

Scenario 3

Starts at 75% power increasing to 100% @ 5%/hr with 1A D/G out of service. PR channel N44 will fail high requiring its removal from service. Then a control rod will drop partially into the core and rods will be placed in manual. Once the rod is addressed, The PZR PORV will open and won't close automatically. The crew will manually attempt to close, but the PORV will stick partially open requiring the block valve to be closed. A loss of feed pump runback will occur but the rods will not respond in auto even if they are placed back in auto.

The major will begin with the loss of the second running feed pump and will require the crew to trip the reactor. At that time the major accident (LB LOCA) will occur. Automatic S/I will not occur and be manually initiated. During the swap to CLR after the 1B ND pump is secured due to its sump valve being closed, an "A" train blackout will occur. With no ND aligned to the sump, the crew will send someone to manually open the B sump valve and transition to ECA-1.1. While in ECA-1.1 (loss of recirc), the local operators will manually open the "B" train containment sump valve and the crew will go back to ES-1.3. The scenario will be terminated when proper S/I flow is verified per ES-1.3.

2009 NRC EXAMINATION

Facility: Catawba Nuclear Station Scenario No.: **3** Op-Test No.: 2009 D-1

SNAP 143

Examiners: ______________ Operators: ______________

Initial Conditions:

- 75% power
- EFPD = 450 days
- Boron Concentration is 208 ppm

Turnover:

- 1A D/G was placed in Maintenance Mode and red tagged 2 hours ago for PMs and is expected back in 6 hours.
- Increase power to 100% at 5% an hour per OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.1, Power Increase

Event No.	Malf. No.	Event Type*	Event Description
1	BOP	N	Dilute for power increase (DCS)
2	RO	R	Increase power to 100%
3	BOP SRO	I TS	P/R N44A failure
4	RO SRO	C TS	Rod M12 drops partially into the core and sticks
5	BOP SRO	C TS	PORV open does not fully reclose, can be blocked
6	RO	C	Loss of 1A CF pump/ no auto rod motion
7	ALL	M	Large Break LOCA/ Loss of emergency coolant recirculation Additional Failures Auto S/I train A & B fails to auto actuate 1NI-184B fails closed 1A essential train loss of power

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

SIMULATOR SETUP

Reset to a 75% power EOL snap
Roll Charts
Provide a boration/dilution plan
Clear EHC alarm and any OAC/ 1.47 bypass alarms
Sign off OP/1/A/6100/003 enclosure 4.1 thru step 2.52 (students start at 2.53)

MALFUNCTIONS, REMOTES, and OVERRIDES

Malfunction #	Description	Value	Event Trigger	Ramp	Delay
MAL-ISE002A	AUTO SI TRN A FAILS TO ACTUATE				
MAL-ISE002B	AUTO SI TRN B FAILS TO ACTUATE				
VLV-NI037F	NI184B CNMT SUMP LINE 1B ISOL (STEM) FAIL TO POSITION	0			
OVR-DG015B	D/G 1B MAINT MODE PB (11/378) INITIATE PB	ON			
OVR-DG047	*DG-PNL* MAINTENANCE MODE PB BLACK PB	ON			
OVR-DG048A	*DG-PNL* MODE SEL 2 POS LOCKOUT RELAY SW TRIP POS	ON			
MAL-ENB011G	P/R DETECTOR 44A FAILURE	100	3		
MAL-IRX006M12	DROPPED ROD M12	STATIONARY	4		Del in 1
MAL-IRX010M12	PERMANENTLY STUCK ROD M12-38A		4		2
MAL-OV0691B	NCDJ5167 NC-34A DEMAND OPEN fail to NORMAL/ALARM	ALARM	5		
VLV-NC007F	NC34A PZR PORV FAIL TO POSITION	1	5		1
MAL-IRX009	RODS FAIL TO MOVE	AUTO	6		
OVR-FWP012C	CFPT 1A TRIP & RESET TRIP PB	ON	6		
OVR-FWP015C	CFPT 1B TRIP & RESET TRIP PB	ON	7		
MAL-NC013C	NC COLD LEG C LEAK	27.5	8		
OVR-EP029D	ETA NORM FDR FRM ATC TRIP PB	ON	9		10
VLV-NC007F	NC34A PZR PORV FAIL TO POSITION	0.25	12		1
MAL-EQB003A	LOSS OF D/G 1A SEQUENCER CTRL PWR		21		300
VLV-NI037F	NI184B CNMT SUMP LINE 1B ISOL (STEM) FAIL TO POSITION	1	22	300	300
VLV-NC006C	NC33A PZR PORV ISOL VLV FAIL PWR		23	300	
LOA-CNT002	H2 ANALYZERS	BOTH	24	600	

EVENT TRIGGERS (other than manual)

Event Trigger	Description
8	Reactor trip either train [jpplp4(1) | jpplp4(2)]
9	x11i357F (TRUE when 1B ND pump is secured)
12	X10i103c (TRUE when 1NC-34A is taken to the close position)

CRITICAL TASKS (See attached documentation)

E-0 D – Manually actuate at least one train of SIS-actuated safeguards before any of the following:

- Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRG
- Completion of Step 5.a of ES-0.1

ES-1.3 A – Transfer to cold leg recirculation and establish ECCS recirculation flow that at least meets the assumptions of plant specific LOCA analyses.*

*Per Technical Specification 3.5.2 basis background section:

> *The ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (SI) (intermediate head), and residual heat removal (RHR) (low head). Each subsystem consists of two redundant, 100% capacity trains. The ECCS accumulators and the RWST are also part of the ECCS, but are not considered part of an ECCS flow path as described by this LCO.*
>
> *The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the RWST can be injected into the RCS following the accidents described in this LCO. The major components of each subsystem are the centrifugal charging pumps, the RHR pumps, heat exchangers, and the SI pumps. Each of the three subsystems consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. This interconnecting and redundant subsystem design provides the operators with the ability to utilize components from opposite trains to achieve the required 100% flow to the core.*

QUALITATIVE ATTRIBUTES

	Required	Actual
Total malfunctions	5 - 8	8
Malfunctions after EOP entry	1 - 2	3
Abnormal events	2 - 4	4
Major transients	1 - 2	1
EOPs entered/requiring substantive actions	1 - 2	2
EOP contingencies requiring substantive actions	0 - 2	1
Critical tasks	2 - 3	2

REFERENCES

OP/1/A/6150/009 (Boron Concentration Control) revision 068DCS
OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.1 revision 106DCS
OP/1/B/6300/001 (Turbine Generator) revision 091
AP/1/A/5500/016 (Malfunction of Nuclear Instrumentation System) revision 023
AP/1/A/5500/014 (Control Rod Misalignment) revision 015
AP/1/A/5500/011 (Pressurizer Pressure Anomalies) revision 022DCS
AP/1/A/5500/003 (Load Rejection) revision 036
EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) revision 036DCS
EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant) revision 023
EP/1/A/5000/ES-1.3 (Transfer to Cold Leg Recirculation) revision 021
EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirculation) revision 31DCS

OTHER NOTES AND INSTRUCTIONS

NOTE: The following steps are GUIDELINES. The NRC lead examiner will direct timing of events unless otherwise noted.

NOTE: Any groups or individuals (IAE, RxGrp, RP, SOC, SWM) that are called to I/R a problem or for simple notification of a problem, repeat back the information they provide unless otherwise noted.

NOTE: Any operators dispatched should repeat back information provided. Call back items are listed below when necessary for the scenario.

Event 1 – Dilute for power increase

This event will be entered once the crew has taken turnover and evaluated plant conditions. When the first dilution batch has been completed, the next event can be started.

Event 2 – Increase power to 100%

This event will be entered once the crew has taken turnover and evaluated plant conditions.

When turbine power has increased by 3-5 MW, the next event can be started.

Event 3 – P/R N44A failure, SRO Technical Specification

Initiating Cues:

- 1AD-2, A/3, A/8, B/8, C/8 E/8 and others

When SPOC is notified to place OTDT/OPDT channel in trip per Step 5, reply:
"Place Channel 4 of OPDT and OTDT in trip condition per Model W/O 00874531."

When AP/1/A/5500/016 is completed, and the SRO has completed consulting Technical Specifications, the next event can be inserted.

TS – 3.3.1 Items 2a, 3, 6, 7, 16b, 16c, 16d, 16e Conditions D, E, R, S

<u>Event 4 – Rod M12 drops partially into the core and sticks</u>

Initiating Cues:

- 1AD-2, D/10, Rod Bank ORANGE background on DRPI display

When AP/1/A/5500/014 is completed (but before rod retrieval is attempted) and the SRO has completed consulting Technical Specifications, the next event can be inserted.

TS – 3.1.4 Condition B

<u>Event 5 – PORV open does not fully reclose, can be blocked, SRO Technical Specification</u>

Initiating Cue:

- 1AD-6 C/12, E/10, F-8

When AP/1/A/5500/011 is complete and the SRO has completed consulting Technical Specifications, the next event can be inserted.

If an operator is dispatched to remove power from 1NC-33A, **insert EVENT 23**.

When EVENT 23 is activated, state **"Power has been removed from 1NC-33A"**.

TS – 3.4.11 Condition B
TS – 3.4.1 Condition A (based on NC pressure at the time)

<u>Event 6 – Loss of 1A CF pump/ no auto rod motion</u>

Initiating Cues:

- 1AD-5, A/1, A/4
- 1AD-1, F/4

When AP/1/A/5500/003 is completed, the next event can be inserted. This will begin the major event.

TS – 3.1.6 Condition A (IF Control Rods are at Lo-Lo insertion limit)

<u>Event 7 – Large Break LOCA/ Loss of emergency coolant recirculation</u>

This is the major event.

NOTE: Depending on student reading speed, they could enter EP/1/A/5000/ES-1.3 without ever going to EP/1/A/5000/E-1.

<u>Additional failures</u>

- Auto S/I train A & B fails to auto actuate
- 1NI-184B fails closed
- 1A essential train loss of power

In E-0, RNO Step 10.a.8).a) and b) when an operator is dispatched to secure ice condenser air handling units and place H2 analyzers in service, **insert EVENT 24**.

Call back when the analyzers are in service and state: **"Both Unit 1 H2 Analyzers are in service."**

NOTE: At kickout from E-0, SUBCRITICALITY is RED due to N44 failure. NC INTEGRITY is RED due to cooldown of loops due to LB LOCA. NC INTEGRITY is VALID and the crew should transition briefly to EP/1/A/5000/FR-P.1 but kick back out to E-1 due to flow to the NC cold legs. HEAT SINK could also be in RED due to operator action.

In E-1 Step 4, if asked to sample S/Gs for activity state **"I will sample Unit 1 S/Gs for activity and report the results back in about an hour."**

In E-1 Step 4, if asked to frisk cation columns for activity state **"I will frisk Unit 1 cation columns for activity and report back the results in a few minutes.**

Call back in 5 minutes and state **"Unit 1 cation columns indicate no abnormal activity."**

In ES-1.3 Step 4.b RNO, when dispatched to remove power from 1EDE-F01F, **insert EVENT 21**.

Call back when the breaker is open and state "**1EDE-F01F is open.**"

In ES-1.3 Step 5.a.2).c).(2), RNO when dispatched to manually open 1NI-184B, **insert EVENT 22**.

Call back when the valve reaches full open and state "**1NI-184B is open.**"

<u>Scenario End Point</u>

AFTER VERIFICATION OF PROPER S/I FLOW PER STEP 5.i of EP/1/5000/ES-1.3.

CREW TURNOVER INFORMATION

Initial Conditions:

- 75% power
- EFPD = 450 days
- Boron Concentration is 208 ppm

Turnover:

- 1A D/G was placed in Maintenance Mode and red tagged 2 hours ago for PMs and is expected back in 6 hours.
- Increase power to 100% at 5% an hour per OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.1, Power Increase

Duke Energy Catawba Nuclear Station **Boron Concentration Control** **Continuous Use**	Procedure No. OP/1/A/6150/009 Revision No. DCS 068 Electronic Reference No. CN005FKT

Boron Concentration Control

1. Purpose

To describe the operation of the Boron Concentration Control System.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can affect core reactivity by changing boron concentration. (R.M.)

2.2 The following Limits and Precautions are Reactivity Management related: (R.M.)

2.2.1 When changing the boron concentration of the NC System, closely monitor the following for expected indication:

- Rod motion
- T-AVG
- Nuclear instrumentation

2.2.2 When performing dilutions at or near 100% power, batch additions to the VCT (instead of continuous dilution at low flow rates) are the preferred method. {PIP C99-0587}

2.2.3 If the NC System is filled and vented and the boron concentration is being reduced in the NC System, at least one NC pump shall be in operation, recirculating the NC System. {PIP C99-2510}

2.2.4 If the boron concentration is being increased in the NC System, at least one NC pump or one ND pump shall be in operation, recirculating the NC System.

2.2.5 Following an increase or decrease of the NC System boron concentration of $\geq$ 50 ppm, pressurizer spray shall be operated to equalize the boron concentration throughout the system.

2.2.6 When the reactor is subcritical and dilution is in progress, if the Nuclear Instrumentation increases by a factor of two, secure the operation immediately and evaluate the cause.

2.2.7 If the unit has operated continuously for several months, significant Boron 10 depletion may have occurred. The effective boron concentration of the NC System may be lower than indicated by Chemistry samples. NC temperature shall be carefully monitored following VCT makeup.

2.3 During continuous dilution operations, sample the NC System H_2 concentration every eight hours.

2.4 When manually operating any motor operated valve, minimize the torque applied to the handwheel.

2.5 After manual operation, maintenance or packing adjustment of any motor operated safety related valve, it shall be cycled electrically to ensure reliable automatic operation.

2.6 With the "NC MAKEUP MODE SELECT" switch in the "DILUTE" position, the makeup flow rate is limited by letdown flow, the VCT spray nozzle, and VCT pressure. The maximum expected makeup flow rate is approximately 95 gpm.

2.7 With the "NC MAKEUP MODE SELECT" switch in the "ALTERNATE DILUTE" position, the maximum expected makeup flow rate is approximately 130 gpm.

2.8 With BAT boron concentration greater than or equal to 7200 ppm, it is recommended that only manual makeup be performed when the NC System boron concentration is ≥ 1300 ppm. Automatic or manual makeup can be used when NC System boron concentration is < 1300 ppm. {PIP 03-7305}

2.9 With BAT boron concentration less than 7200 ppm, it is recommended that only manual makeup be performed when the NC System boron concentration is ≥ 1250 ppm. Automatic or manual makeup can be used when NC System boron concentration is < 1250 ppm. {PIP 03-7305}

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Automatic Makeup

4.2 Boration

4.3 Dilution

4.4 Alternate Dilution

4.5 Manual Operation Of The Makeup Controls

4.6 Operation Of The Boric Acid Transfer Pumps In Miniflow

4.7 Placing Boric Acid Tank #2 In Service For Unit #1

4.8 Valve Checklist

4.9 Rapid Boration

4.10 Deboration Of The NC System Using A Mixed Bed Demineralizer

4.11 Unit # 1 Boric Acid Tank Cleanup

4.12 Boric Acid Addition To NCP Seals

4.13 Recirculation Of The Boric Acid Tank With The BAT Recirc Pump

4.14 Blend Control Verification

All steps performed by BOP

1. Initial Conditions

☐ 1.1 Review the Limits and Precautions.

_____ 1.2 **IF** in Mode 1 or 2, ensure R2 reactivity management controls established per SOMP 01-02 (Reactivity Management). (R.M.)

☐ 1.3 Verify the NV System is in operation per OP/1/A/6200/001 (Chemical and Volume Control System).

☐ 1.4 Verify sufficient RHT volume is available to receive the reactor coolant displaced during the planned dilution operation.

☐ 1.5 Verify the NB System is in operation per OP/1/A/6200/012 (Reactor Makeup Water).

☐ 1.6 Ensure a minimum of one NC pump remains in operation throughout the evolution.

2. Procedure

NOTE: This enclosure will affect reactivity of the core and is therefore designated important to Reactivity Management per the guidelines of NSD 304 (Reactivity Management). (R.M.)

☐ 2.1 Ensure valves are aligned per Enclosure 4.8 (Valve Checklist).

_____ 2.2 **IF** the blender is set for automatic makeup per Enclosure 4.1, Automatic Makeup, record the setpoint on 1NV-242A (RMWST To B/A Blender Ctrl): ____________ gpm

2.3 Ensure the following valve control switches in "AUTO":

☐ 1NV-242A (RMWST To B/A Blender Ctrl)
☐ 1NV-181A (B/A Blender Otlt To VCT)

☐ 2.4 Ensure 1NV-242A (RMWST To B/A Blender Ctrl) controller in auto.

☐ 2.5 Ensure at least one reactor makeup water pump is in "AUTO" or "ON".

☐ 2.6 Adjust the total makeup batch counter to the desired volume of reactor makeup water to be added. (R.M.)

☐ 2.7 Place the "NC MAKEUP MODE SELECT" switch to the "DILUTE" position.

NOTE: High letdown flow rates result in increased backpressure on the letdown line. If letdown flow is ≥ 90 gpm, it may be desirable to reduce the dilution flow rate to 80 gpm to avoid the Total Makeup Flow Deviation alarm and associated automatic actions.

☐ 2.8 Adjust the setpoint for 1NV-242A (RMWST To B/A Blender Ctrl) to the desired flow.

_____ 2.9 **IF AT ANY TIME** it is desired to divert letdown to the RHT manually operate 1NV-172A (3-Way Divert To VCT-RHT) as follows: NOT DESIRED

- ☐ 2.9.1 Place the control switch for 1NV-172A (3-Way Divert To VCT-RHT) to the "RHT" position.
- ☐ 2.9.2 Ensure VCT level is monitored continuously while diverting to the RHT.
- ☐ 2.9.3 **WHEN** desired VCT level is reached return 1NV-172A (3-Way Divert To VCT-RHT) to "AUTO".

NOTE:	If necessary, dilution can be manually secured at any time by placing the "NC MAKEUP CONTROL" switch to the "STOP" position.

☐ 2.10 Place the "NC MAKEUP CONTROL" switch in the "START" position. (R.M.)

2.11 Verify the following valves open:

- ☐ 1NV-242A (RMWST To B/A Blender Ctrl)
- ☐ 1NV-181A (B/A Blender Otlt To VCT)

_____ 2.12 **IF** in "AUTO", verify the reactor makeup water pump starts.

2.13 **WHEN** the desired volume of reactor makeup water is reached on the total makeup batch counter, ensure the following valves close. (R.M.)

- ☐ 1NV-242A (RMWST To B/A Blender Ctrl)
- ☐ 1NV-181A (B/A Blender Otlt To VCT)

_____ 2.14 **IF** automatic makeup is desired, perform one of the following:

_____ 2.14.1 **IF** it is desired to change the blender outlet boron concentration, refer to Enclosure 4.1 (Automatic Makeup).

OR

_____ 2.14.2 **IF** makeup at the previous concentration is acceptable **AND** the system was previously aligned per Enclosure 4.1 (Automatic Makeup), perform the following:

- ☐ 2.14.2.1 Ensure the controller for 1NV-242A (RMWST To B/A Blender Ctrl) is set to the value recorded in Step 2.2. (R.M.)
- ☐ 2.14.2.2 Place the "NC MAKEUP MODE SELECT" switch in "AUTO".
- ☐ 2.14.2.3 Place the "NC MAKEUP CONTROL" switch to the "START" position. (R.M.)

2.15 Do **NOT** file this enclosure in the Control Copy folder of this procedure.

Duke Energy Catawba Nuclear Station	Procedure No. OP/1/A/6100/003
Controlling Procedure For Unit Operation	Revision No. 106 DCS
Continuous Use	Electronic Reference No. CN005FK5

Controlling Procedure For Unit Operation

1. Purpose

To describe the operation of the unit between approximately 15% and 100% full power.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can effect core reactivity by the following: (R.M.)

- Control rod movement
- Turbine load changes
- Feedwater manipulations
- Reactor power changes

2.2 The following Limits and Precautions are Reactivity Management related: (R.M.)

2.2.1 Before returning reactor control to automatic, T-AVG shall be within ± 1°F of T-REF.

2.2.2 Do **NOT** exceed rod insertion limits or temporary rod withdrawal limits.

2.2.3 Automatic control rod withdrawal is blocked when Control Bank D ≥ 200 steps withdrawn.

2.2.4 The difference in boron concentration between the PZR and NC System is desired to be maintained within ± 50 ppm.

2.2.5 Axial Flux Difference (AFD) shall be maintained within the allowable limits as defined in the ROD manual at all power levels above 50% reactor power. (Tech Spec 3.2.3)

2.2.6 During a power change, other indications of reactor power shall be observed along with power range and secondary thermal power indications to aid in determining the reactor power level. Using indications like turbine impulse pressure, CF flow rate, NC loop ΔTs, and others may help in detecting the miscalibration of a nuclear instrument.

2.3 In the event of an inadvertent power reduction, it is recommended that the power level **NOT** be increased until an investigation has been conducted and corrective action taken.

2.4 If reactor control is in manual, maintain T-AVG within ± 2°F of T-REF to prevent receiving "T-REF/T-AUCT HI/LO" alarm.

2.5 Whenever there is a thermal power change greater than or equal to 15% rated thermal power within a one hour period: (OAC point C1L4790 in alarm)

- Notify Chemistry to take an isotopic analysis for iodine within 2 to 6 hours following the last power change that is greater than or equal to 15% rated thermal power within a one hour period. (T.S. SR 3.4.16.2)

- When thermal power has stabilized, notify Radiation Protection to sample and analyze gaseous effluents. (S.L.C. 16.11-6)

2.6 S/G blowdown flowrate shall **NOT** exceed a maximum of 200 GPM per S/G.

2.7 After a thermal power change when plant conditions stabilize, 1EMF-39 setpoints shall be adjusted so the Trip 2 setpoint is set at three times the containment activity and Trip 1 setpoint is set at 70% of Trip 2 setpoint.

2.8 If the RC System condenser inlet temperature drops to less than or equal to 60°F when the Rx is shutdown or less than or equal to 55°F when the Rx is critical, the system shall be configured as follows:

- One RC pump running (throttled).
- One tower inlet isolated.
- All three riser bypasses open.

2.9 OAC point C1K0628 (CF Flow Venturi Correction Factor) shall be reset to 1.0 when either of the following conditions are met:

- A step load change such as a load rejection greater than 10% rated thermal power,
- A ramp load change of greater than 15% rated thermal power in a one hour period.

2.10 When the unit is engaged in a power maneuver resulting in a mismatch between OAC point C1P1385 (Reactor Thermal Power, Best) and any excore power channel in excess of 2% refer to Tech Spec Basis for SR 3.3.1.2.

2.11 The insertion of Control Bank D will affect mismatch between OAC point C1P1385 (Reactor Thermal Power, Best) and the excore power range channels. This is due to shielding of the power range detectors by Control Bank D. Therefore, refer to Tech Spec Basis for SR 3.3.1.2 when mismatch between Reactor Thermal Power (Best Estimate) and the excore power range channels shall be observed to be exceeding 2%.

2.12 The Reactor Engineering Group normally provides information for planned power maneuvers. The OAC xenon predict program can be used to help anticipate dilution and boration requirements. {PIP C99-0587}

2.13 The Steamline N-16 Radiation Monitors (EMF-71, 72, 73, 74) become inaccurate at power levels below 40% due to inaccuracies in the algorithm used to calculate the output of these monitors. {PIP 99-3980}

2.14 It is recommended that Primary Chemistry be notified prior to all significant boric acid additions or dilutions to the NC System such that proper pH control may be maintained. Normal boric acid additions and dilutions should be communicated at the Control Room shift briefing. {PIP C-01-665}

2.15 In accordance with INPO best practices when personnel are accessing areas that could experience significant dose rate changes resulting from increasing power, Operations shall maintain Reactor power steady or decreasing.

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Power Increase

4.2 Power Decrease

4.3 Unit Operation Between 85% and 100% Power

4.4 T-AVG Coastdown

- 4.4.1 T-AVG Coastdown Data
- 4.4.2 Adjustment Of DCS ACCEPTED VALUE For T AVG
- 4.4.3 T-AVG Coastdown Tracking Data (Phase 1 and Phase 2)

4.5 Power Escalation Guideline

_____ 2.50 **IF** required due to Generator/Automatic Voltage Regulator (AVR) testing at approximately 75% turbine power (~885 MWe), perform the following:

_____ 2.50.1 **IF** performing Generator/Automatic Voltage Regulator (AVR) testing, **HOLD** until Generator/AVR personnel are ready for Operations to continue with Unit 1 power increase.

☐ 2.50.2 Once notified by AVR personnel that AVR testing is complete, at this power, begin power increase.

Person making notification__________________

CAUTION:	Alternate indications of reactor power shall be monitored to verify reactor power level and help prevent NI miscalibration.

_____ 2.51 At 75% reactor power , compare OAC heat balance point C1P1385 (Reactor Thermal Power, Best) to nuclear instrumentation.

_____ 2.52 **IF** required, notify IAE to adjust nuclear instrumentation per Model W/O #00874628. Person notified _____________________________

CAUTION:	Failure to perform the following step as written may result in lifting the AS Header relief valve.

NOTE:	OAC Graphics CF Pump Details, CFPMP1A and CFPMP1B, shall be referred to while swapping steam supplies for CFPTs.

_____ 2.53 At approximately 85% turbine power (1024 MWe), perform the following while ensuring CF pump speed is maintained:

All steps to here complete. No steps signed off here...

☐ 2.53.1 Slowly open 1SP-3 (SC To CFPT 1A & 1B) (TB-640, 1G-24).

☐ 2.53.2 Adjust setpoint of 1AS-2 (Main Stm To Aux Stm) to 125 psig.

☐ 2.53.3 Slowly close 1AS-12 (AS To CFPT Isol).

☐ 2.53.4 **IF** Unit 1 and Unit 2 AS headers are cross-tied, adjust setpoint of 2AS-2 (Main Stm To Aux Stm) to maintain the desired AS header pressure.

_____ 2.54 **IF** a temporary PC was installed at the local MSR Panel for placing the MSR's in service, remove the PC.

_____ 2.55 **IF** desired to increase turbine power to greater than 85%, go to Enclosure 4.3 (Unit Operation Between 85% and 100% Power).

2.56 File this enclosure in the Control Copy folder of this procedure.

Duke Energy Catawba Nuclear Station **Turbine Generator** **Multiple Use**	Procedure No. **OP/1/B/6300/001** Revision No. **091** Electronic Reference No. **CN005FO7**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Turbine Generator

1. Purpose

To describe the proper method for operating the Turbine-Generator.

2. Limits and Precautions

2.1 This procedure is Reactivity Management related because it controls activities that can effect reactivity. (R.M.)

2.2 Low load operation limits:

2.2.1 The unit can be operated continuously at low loads when exhaust hood temperature is < 175°F. The load shall, however, be increased slowly until the temperature decreases below 125°F before increasing load at normal rate (Multipoint Recorder on 1MC3).

2.2.2 Limit turbine/generator operation below 5% load to 1 hour to prevent moisture erosion unless directed by the Turbine Engineer for testing

2.2.3 Motoring of the unit is to be avoided.

2.2.4 Excessive use of the exhaust hood sprays shall be avoided to prevent accelerated blade erosion.

2.3 Journal bearings shall **NOT** be operated with metal temperatures above 250°F (OAC Turbine Bearings graphic (TGBRG)).

2.4 Lube oil cooler discharge temperatures shall be 100°F to 120°F when at rated speed.

2.5 The lube oil temperature rise shall **NOT** exceed 50°F on the main bearings and 45°F on the thrust bearing.

2.6 Under no conditions shall the thrust bearing be operated above 190°F metal temperature (OAC Turbine Bearings graphic (TGBRG)).

2.7 Never allow a hot rotor to stand without rolling. If and when a hot rotor was allowed to stand still, when possible rotate the shaft 180° and allow to stand still again for one-half the time it first stood still, and then put the turbine on turning gear.

2.8 The minimum allowed cold gas temperature is 86°F for operation. The maximum cold gas temperature is 122°F. (OAC points C1A0522 (Cold Gas from Hydrogen Cooler Turbine End) and C1A0528 (Cold Gas from Hydrogen Cooler Exciter End), Main Generator graphic (MAINGEN)).

2.9 Do **NOT** exceed the load, hydrogen pressure, and power factor limits per the Unit One Revised Data Book Figure 43.

2.10 If the limits of the Unit One Revised Data Book Figure 43 (Generator Capability Curves) are exceeded, the Turbine Generator shall be tripped.

2.11 The generator shall **NOT** be operated without excitation. If the generator is operated without field, the unit shall be immediately tripped off the line and shutdown for inspection.

2.12 Following a trip-out due to differential phase relays, both the armature and field windings shall be meggered and inspected before attempting to resynchronize.

2.13 Do **NOT** allow turbine generator speed to exceed 2000 rpm on overspeed tests.

2.14 The turbine shall **NOT** be operated with condenser vacuum less than 24.3 inches Hg.

2.15 The maximum differential pressure between adjacent LP shell pressures shall **NOT** exceed 2.0 inches Hg. (main condenser vacuum gauges on 1MC13, OAC points C1P1669 (D/P between A & B Condensers) and C1P1670 (D/P between B & C Condensers) or Main Condenser graphic (CMCOND)).

2.16 Do **NOT** hold the turbine at speeds < 800 rpm for more than 5 minutes.

2.17 When steam seals are on the turbine, the steam packing exhauster shall be operating, and the turbine shall be on turning gear. The turbine may be taken off gear with steam seals established with concurrence from the Turbine Engineer.

2.18 When a condition arises that is serious enough to make a reduction in speed necessary, it shall be initiated by selecting "MANUAL" and "CONTROL VALVE LOWER" or by tripping the turbine.

2.19 Temperature of the LH System reservoir shall be ≥ 90°F prior to turbine start (OAC point C1A0188 (LH TEMP)).

2.20 A sudden downward trend on an LP turbine's lower extraction temperature shall be investigated as a possible indication of water induction into the turbine. This is indicated on the recorder on the rear of 1MC8 labeled "TURBINE WATER DETECTION", using any of the LP 8th stage lower temperatures.

2.21 The time the turbine generator is on turning gear shall be kept to a minimum to prevent the buildup of copper dust in the generator coil slots.

2.22 When system is in "EMERG MANUAL" runbacks and limit circuits may **NOT** be available.

2.23 Control rods shall **NOT** exceed rod withdrawal limits. Prior to changing power, refer to Reactor Operating Data Book, Temporary Control Rod Withdrawal Limits.

2.24 A "LOAD RATE" > "6.2 MW/MIN" shall **NOT** be used during normal load changes.

2.25 The main turbine oil temperature limit of 80 to 90°F shall be maintained when the turbine is on the turning gear.

2.26 Differential temperature between adjacent exhaust hoods shall **NOT** exceed 30°F unless evaluated and approved by the responsible engineer (Turbine Generator System Expert). (OAC points C1P1667 (A & B Exhaust Hoods Metal Delta Temp) and C1P1668 (B & C Exhaust Hoods Metal Delta Temp) or Main Condenser graphic (CMCOND)).

2.27 During turbine acceleration, the heat up rate of the first stage bowl inner surface (OAC Point C1P1283 (First Stage Metal Temp Rate)) shall be < 150°F/hr.

2.28 During turbine acceleration, the rate of change of the reheat steam temperature (OAC points C1P1287 to C1P1292 (CIV No. 1 (to 6) Inlet Temp Rate) or Turbine Generator graphic (TG)) shall be < 125°F/hr.

2.29 Any deviations from this procedure that could affect steam admission rates shall require an engineering evaluation to be performed which specifically addresses partial arc admission.

2.30 The 6.9KV Switchgear Automatic Fast Transfer Switches are placed in the ENABLE position whenever the generator breakers are closed and in the DEFEAT position whenever the generator breakers are open. If an autoswap of the tie breaker occurs when in the DEFEAT position, equipment being supplied by the 6.9KV Switchgear is more likely to trip than when the switch in ENABLE.{PIP 98-4093, PIP 98-3589}

2.31 Feedback loops shall **NOT** be taken in/out of service during turbine control valve movement. Following turbine control valve movement, DEHC shall be allowed to stabilize prior to placing feedback loops in/out of service to prevent unexpected load changes. (PIP 03-5660)

2.32 The Main Turbine OIU Work Station has the capability to perform control functions for the Main Turbine, including tripping and resetting of the turbine. If a control function window is inadvertently selected while manipulating the Main Turbine OIU Work Station, the window shall be closed to prevent actuation of the control function.

2.33 The Main Turbine shall **NOT** be run more than 3 hours at 1800 RPM, no load, unless directed by the Turbine Engineer for testing.

2.34 The Excitation System can affect the functioning of heart pacemakers. Personnel with pacemaker devices shall **NOT** enter the AVR enclosure/building during operation or testing. If the AVR enclosure/building is **NOT** installed, personnel with pacemaker devices shall remain at least 20 feet away from the AVR during operation or testing.

2.35 Failure to confirm steam isolation to the turbine prior to opening the generator breaker may result in destructive overspeed of the steam turbine power train. {PIP C-08-5018}

3. Procedure

Refer to Section 4 (Enclosures).

4. Enclosures

4.1 Turbine Generator Startup

4.2 Load Changing

4.3 Transfer Turbine From Auto Control To Manual Control And Transfer Turbine From Manual Control To Auto Control

4.4 Turbine Generator Shutdown

4.5 Placing (Removing) Core Monitor And Pyrolysate Collector In (From) Service

4.6 Valve Checklist

4.7 Generator Operating Limits

4.8 Turbine Generator Roll Computer Points

4.9 Lamp Verification

4.10 Operation of Turbine TSI Panel

4.11 Reboot of the Main Turbine OIU Computer

4.12 Transfer of the Main Turbine OIU Computer Alarm Switch That Drives the "EHC Fault Annunciator"

4.13 Voltage Regulator Operation From Control Room

4.14 Voltage Regulator Operation From U1 Gen Voltage Reg Local Control Panel

1. Initial Conditions

_____ 1.1 Ensure R2 reactivity management controls established per SOMP 01-02 (Reactivity Management). (R.M.)

_____ 1.2 Review the Limits and Precautions.

_____ 1.3 Verify turbine generator is operating per Enclosure 4.1 (Turbine Generator Startup) of this procedure.

2. Procedure

CAUTION:	The load, hydrogen pressure and power factor limits per the Unit One Revised Data Book Figure 43 shall **NOT** be exceeded.

NOTE:	Several of the parameters required for this procedure can be found on OAC graphics, and a list of all OAC points are found on Enclosure 4.8 (Turbine Generator Roll Computer Points).

_____ 2.1 **IF** increasing turbine generator load, perform the following:

_____ 2.1.1 Increase turbine generator load to rated load within the following limitations:

☐ 2.1.1.1 Control valve casing difference, OAC point C1A0961 (Turb Valve Chest Inner Surface Metal Temp) minus C1A0967 (Turb Valve Chest Outer Surface Metal Temp), shall **NOT** exceed curve "Allowable Temp Difference on Control Valve Casing" in the Unit 1 OAC Databook.

_____ 2.1.1.2 **WHEN** exhaust hood temperature is > 125°F, the load shall be increased slowly until the temperature falls to ≤ 125°F, then the load may be increased in accordance per the normal procedure.

☐ 2.1.1.3 "Rate Of Change" of First-Stage Bowl inner surface temperature shall **NOT** exceed 150°F/hr (OAC point C1P1283 (First Stage Metal Temp Rate).

☐ 2.1.1.4 OAC point C1A1140 (Turbine Lower Inner Shell Temp) vs. Percent Steam Flow (OAC point C1P1588 (Design Total Main Steam Flow, Measured (%))) shall be maintained above and to the left of the curve in the Unit One OAC Databook "Load-Changing Recommendations".

☐ 2.1.1.5 Verify Groups B and C valves on Enclosure 4.6 (Valve Checklist) close at 15% of full load (181 MW, 105 psig Turbine Impulse Pressure).

☐ 2.1.1.6 Verify the following valves close at 15% of full load (181 MW, 105 psig Turbine Impulse Pressure):

- 1SM-21 (Ctrl Vlv #2 Stm Lead Drn)
- 1SM-29 (Ctrl Vlv #1 Stm Lead Drn)

Steps in Green will be signed off already.

_____ 2.1.1.7 **WHEN** CV3 comes off of its fully closed seat (65% of full load, 783 MW), verify 1SM-25 (Ctrl Vlv #3 Stm Lead Drn) closes.

_____ 2.1.1.8 **WHEN** CV4 comes off of its fully closed seat (92% of full load, 1109 MW), verify 1SM-33 (Ctrl Vlv #4 Stm Lead Drn) closes.

☐ 2.1.1.9 S/G blowdown flowrates shall be adjusted to obtain maximum blowdown for the appropriate load.

CAUTION: 1. Until it is recognized that the first stage shell metal temperature change rate stays below the allowable limit (150°F/hr), the following loading rate shall **NOT** be exceeded:

- 1/2%/min - First Stage Inner Shell Temperature (1MC3 or OAC point C1A1140 (Turbine Lower Inner Shell Temp)) $\leq$ 350°F
- 1%/min - First Stage Inner Shell Temperature (1MC3 or OAC point C1A1140 (Turbine Lower Inner Shell Temp)) > 350°F

2. Normal steady-state load changes shall be made without exceeding the limits shown on Enclosure 4.7 (Generator Operating Limits) and in the Unit One OAC Databook "Recommended Startup and Loading Curves".

3. Unit One Reactor Operating Data, Section 2.4 shall be referred to for allowable ramp rates. A "LOAD RATE" > 6.2 MW/MIN shall **NOT** be used during normal load changes.

_____ 2.1.2 Increase turbine generator load by performing the following:

RO

☐ 2.1.2.1 Select "LOAD RATE" and verify it illuminates.

☐ 2.1.2.2 Input the desired load rate.

☐ 2.1.2.3 Select "ENTER" or "OK" and verify "LOAD RATE" goes dark.

☐ 2.1.2.4 Select "TARGET" and verify it illuminates.

☐ 2.1.2.5 Input the desired load target.

☐ 2.1.2.6 Select "ENTER" and verify " TARGET " goes dark.

☐ 2.1.2.7 Verify new load target appears on Target Display.

☐ 2.1.2.8 Select "GO" and verify it illuminates to start load increase.

☐ 2.1.2.9 S/G blowdown changes shall be coordinated with Secondary Chemistry.

CAUTION:	The load, hydrogen pressure and power factor limits per the Unit One Revised Data Book Figure 43 shall **NOT** be exceeded.

_____ 2.2 **IF** decreasing turbine generator load, perform the following:

_____ 2.2.1 Decrease turbine generator load within the following limitations:

☐ 2.2.1.1 Rate of change of First-Stage Bowl Inner Surface Temperature shall **NOT** exceed 150°F/hr (OAC point C1P1283 (First Stage Metal Temp Rate)).

☐ 2.2.1.2 OAC point C1A1140 (Turbine Lower Inner Shell Temp) vs. Percent Steam Flow (OAC point C1P1588 (Design Total Main Steam Flow, Measured (%)) shall be maintained above and to the left of curve in the Unit One OAC Databook "Load-Changing Recommendations".

☐ 2.2.1.3 Control valve casing difference, OAC point C1A0961 (Turb Valve Chest Inner Surface Metal Temp) minus C1A0967 (Turb Valve Chest Outer Surface Metal Temp), shall **NOT** exceed curve "Allowable Temp Difference on Control Valve Casing" in the Unit 1 OAC Databook.

☐ 2.2.1.4 S/G blowdown flowrates shall be adjusted to obtain maximum blowdown for the appropriate load.

_____ 2.2.1.5 **IF** CV4 fully closes (92% of full load, 1109 MWE), verify 1SM-33 (Ctrl Vlv #4 Stm Lead Drn) opens.

_____ 2.2.1.6 **IF** CV3 fully closes (65% of full load, 783 MWE), verify 1SM-25 (Ctrl Vlv #3 Stm Lead Drn) opens.

CAUTION:	1. Normal steady-state load change shall be made without exceeding limits shown on Enclosure 4.7 (Generator Operating Limits) and in the Unit One OAC Databook "Recommended Starting and Loading Curves". 2. Unit One Reactor Operating Data, Section 2.4 shall be referred to for allowable ramp rates.

_____ 2.2.2 Decrease turbine generator load by performing the following:

- ☐ 2.2.2.1 Select "LOAD RATE" and verify it illuminates.
- ☐ 2.2.2.2 Input the desired load rate.
- ☐ 2.2.2.3 Select "ENTER" and verify " LOAD RATE " goes dark
- ☐ 2.2.2.4 Select "TARGET" and verify it illuminates.
- ☐ 2.2.2.5 Input the desired load target.
- ☐ 2.2.2.6 Select "ENTER" and verify " TARGET " goes dark.
- ☐ 2.2.2.7 Verify new load target appears on Target Display.
- ☐ 2.2.2.8 Select "GO" and verify it illuminates to start load decrease.
- ☐ 2.2.2.9 S/G blowdown changes shall be coordinated with Secondary Chemistry.

2.3 Do **NOT** file this enclosure in the Control Copy folder of this procedure.

Initiating Cues:

- 1AD-2, A/3, A/8, B/8, C/8 E/8 and others

A. Purpose

- **To verify the proper response in the event of a nuclear instrumentation malfunction.**

B. Symptoms

Case I. Source Range Malfunction

- Indication lost or erratic
- 1AD-2, D/1 "S/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, D/3 "S/R HI FLUX LEVEL AT SHUTDOWN" - LIT
- 1AD-2, D/4 "S/R HI FLUX LEVEL AT SHUTDOWN" - LIT.

Case II. Audio Count Rate Malfunction

- Audible count rate lost.

Case III. Intermediate Range Malfunction

- Indication lost or erratic
- 1AD-2, C/1 "I/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, C/2 "I/R COMPENSATING VOLTAGE FAILURE" - LIT
- 1AD-2, C/3 "I/R HI FLUX LEVEL ROD STOP" - LIT
- S/R failure to re-energize during shutdown.

Case IV. Power Range Malfunction

- Indication lost or erratic
- 1AD-2, A/1 "P/R HI NEUTRON FLUX RATE ALERT" - LIT
- 1AD-2, A/2 "P/R HI NEUTRON FLUX LO SETPOINT ALERT" - LIT
- 1AD-2, A/3 "P/R HI NEUTRON FLUX HI SETPOINT ALERT" - LIT
- 1AD-2, B/3 "COMPARATOR P/R CHANNEL DEVIATION" - LIT
- 1AD-2, B/5 "P/R HI VOLTAGE FAILURE" - LIT
- 1AD-2, E/8 "OVER POWER ROD STOP" - LIT

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
1. Verify at least one of the following S/R Channels - OPERABLE: __ • N-31 OR __ • N-32.	**Perform the following:** a. **IF** in Mode 2 below P-6, **THEN** perform the following: __ 1) Manually trip reactor. __ 2) **GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection). b. **IF** in Mode, 3, 4, or 5 **AND** the following conditions exist: __ • Reactor Trip Breakers - CLOSED __ • Rod control system capable of rod withdrawal. **THEN** perform the following: __ 1) Manually trip reactor. __ 2) **IF** any control rods were withdrawn **AND** Pzr Pressure greater than 1955 PSIG, **THEN GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection). __ 3) **IF** any control rods were withdrawn **AND** Pzr Pressure less than 1955 PSIG, **THEN REFER TO** AP/1/A/5500/005 (Reactor Trip or Inadvertent S/I Below P-11). __ c. **GO TO** Step 5.
__ **2. Verify unit - IN MODE 2 BELOW P-6.**	__ **GO TO Step 5.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Limited boron concentration changes associated with NC inventory control or limited plant temperature changes are allowed.

__ 3. **Stop operations involving positive reactivity additions.**

__ 4. **GO TO Step 7.**

__ 5. **Verify unit - IN MODE 6.**

__ **GO TO Step 7.**

NOTE BDMS (Gamma Metrics) automatic actuations and alarm not required for operability during refueling operations.

6. **Verify at least two of the following neutron flux monitors - OPERABLE:**

   __ • N-31

   __ • N-32

   __ • A Train BDMS

   __ • B Train BDMS.

Perform the following:

a. Notify fuel handling operators to perform the following:

   __ 1) Place components being handled in a safe position.

   __ 2) Suspend Core Alterations.

__ b. Suspend operations that would cause introduction of coolant into the NC system with boron concentration less than limit specified in the COLR.

__ c. **IF** no neutron flux monitors operable, **THEN** immediately initiate actions to restore one neutron flux monitor to operable status.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. Identify the affected S/R channel(s): __ • N31 OR __ • N32.	
8. Verify the following alarms - DARK: __ • 1AD-2, D/3 "S/R HI FLUX LEVEL AT SHUTDOWN" __ • 1AD-2, D/4 "S/R HI FLUX LEVEL AT SHUTDOWN".	**Perform the following:** __ a. Depress "OFF" for the containment evacuation alarm. __ b. Notify plant personnel to disregard the containment evacuation alarm.
9. Verify affected S/R channel control power available: __ • Control power fuse - ILLUMINATED OR __ • Control Power ON - LIT	**Perform the following:** __ a. Notify OSM that due to loss of control power S/R LEVEL TRIP cannot be bypassed. Reactor power reduction to below P-6 S/R BLOCK PERMISSIVE will result in Reactor Trip due to "N/I Hi Flux SR RX Trip". __ b. **GO TO** Step 14.

NOTE 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" will actuate in the following step.

10. At the affected S/R drawer, perform the following:

__ a. Place the "LEVEL TRIP" switch for the affected channel in "BYPASS".

__ b. Verify the "LEVEL TRIP BYPASS" light for the affected channel - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 11. **Verify the affected S/R channel trip bypass status light (1SI-19) - LIT.**

__ 12. **Verify 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" - LIT.**

13. **Block the high flux at shutdown function as follows:**

 __ a. At the affected S/R drawer, place the "HIGH FLUX AT SHUTDOWN" switch for the affected channel in "BLOCK".

 __ b. Verify 1AD-2, D/2 "S/R HI SHUTDOWN FLUX ALM BLOCKED" - LIT.

14. **Ensure the following components - ALIGNED TO THE OPERABLE S/R CHANNEL:**

 __ • "CHANNEL SELECTOR" switch on the Audio Count Rate Channel panel

 __ • "NIS RECORDER".

__ 15. **Determine and correct cause of S/R malfunction.**

16. **Ensure compliance with appropriate Tech Specs:**

 __ • 3.3.1 (Reactor Trip System (RTS) Instrumentation)

 __ • 3.9.2 (Nuclear Instrumentation)

 __ • 3.3.9 (Boron Dilution Mitigation System(BDMS)).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

17. **Determine required notifications:**

    __ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency)

    __ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).

__ 18. **Notify Reactor Group Engineer of occurrence.**

__ 19. **WHEN the affected S/R channel is repaired, THEN ensure IAE returns the channel to service.**

__ 20. **Determine long term plant status. RETURN TO procedure in effect.**

END

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. <u>Operator Actions</u>	
__ 1. **Verify the unit - IN MODE 6.**	**Perform the following:** __ a. Stop any positive reactivity additions until audible count rate indication is restored or station management approval is obtained. __ b. **<u>GO</u> <u>TO</u>** Step 3.
__ 2. **Verify audio count rate signal - AUDIBLE IN CONTAINMENT.**	__ **<u>IF</u> the count rate is audible in the control room, <u>THEN</u> shift the "AMPLIFIER SELECTOR" switch (inside and at the back of the Audio Count Rate Drawer) to the "A1" position (Key #18).**
3. **Verify S/R channels operable as follows:** __ • N-31 - ON SCALE __ • N-32 - ON SCALE.	**<u>IF</u> a single S/R channel has failed, <u>THEN</u>:** __ a. At the Audio Count Rate panel, place the "CHANNEL SELECTOR" switch to the operable S/R channel position. __ b. **<u>GO</u> <u>TO</u>** Case I (Source Range Malfunctions).
__ 4. **Determine and correct cause of audio count rate malfunction.**	
__ 5. **<u>RETURN</u> <u>TO</u> procedure in effect.**	

<u>END</u>

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Verify reactor power - GREATER THAN 10%.**	__ **Stop any power increase.**
__ 2. **Verify 1AD-2, C/3 "I/R HI FLUX LEVEL ROD STOP" - DARK.**	__ **Adjust turbine load to maintain T-Avg at T-Ref.**
3. **Identify affected I/R channel:** __ • N-35 OR __ • N-36.	

NOTE 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" will actuate in the following step.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **At the affected I/R drawer, perform the following:** __ a. Place the "LEVEL TRIP" switch for affected channel in "BYPASS". __ b. Verify the "LEVEL TRIP BYPASS" light on the affected I/R drawer - LIT.	
__ 5. **Verify the affected I/R channel trip bypass status light (1SI-19) - LIT.**	
__ 6. **Verify 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" - LIT.**	
__ 7. **Ensure the "NIS RECORDER" - ALIGNED TO THE OPERABLE I/R CHANNEL.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 8. **<u>WHEN</u> the operable I/R channel is less than 10^{-10} Amps, <u>THEN</u> ensure S/R channels are reset.**

__ 9. **Determine and correct cause of I/R malfunction.**

__ 10. **Ensure compliance with Tech Spec 3.3.1 (Reactor Trip System (RTS) Instrumentation).**

11. **Determine required notifications:**

- __ **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency)
- __ **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).

__ 12. **Notify Reactor Group Engineer of occurrence.**

<u>CAUTION</u> **Installing I/R fuses with any P/R channel inoperable or in a tripped condition, may result in a reactor trip on P/R rate trip due to voltage spikes.**

__ 13. **<u>WHEN</u> the affected I/R channel is repaired, <u>THEN</u> ensure IAE returns the channel to service.**

__ 14. **Determine long term plant status. <u>RETURN TO</u> procedure in effect.**

<u>END</u>

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions RO DOES THIS PAGE	
__ 1. **Verify all rod motion - STOPPED.**	__ **IF unwarranted rod motion is occurring, THEN place "CRD BANK SELECT" to manual.**
__ 2. **Verify 1AD-2, E/8 "OVER POWER ROD STOP" - DARK.**	__ **Adjust Turbine load to maintain T-Avg at T-Ref.**
3. **Identify failed P/R channel:** __ • N-41 OR __ • N-42 OR __ • N-43 OR __ • N-44.	
__ 4. **Ensure unaffected channels - OPERABLE.**	
5. **Request IAE to place the following bistables in the tripped condition. REFER TO Model W/O #00874531:** __ • OT DELTA T __ • OP DELTA T.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **Perform the following actions at the Miscellaneous Control And Indication Panel:**	BOP DOES THIS PAGE

__ a. Place the appropriate "ROD STOP BYPASS" switch to the affected channel position.

__ b. Verify the affected nuclear overpower rod stop channel bypassed status light (1SI-19) - LIT.

__ c. Place "POWER MISMATCH BYPASS" switch to the affected channel position.

7. **Perform the following actions at the Detector Current Comparator panel:**

__ a. Place "UPPER SECTION" channel defeat switch to the affected channel.

__ b. Verify the "CHANNEL DEFEAT" light for the upper section - LIT.

__ c. Place "LOWER SECTION" channel defeat switch to the affected channel.

__ d. Verify the "CHANNEL DEFEAT" light for the lower section - LIT.

__ 8. **At the Comparator And Rate panel, place the "COMPARATOR CHANNEL DEFEAT" switch to the affected channel position.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

BOP DOES THIS PAGE EXCEPT LAST STEP

NOTE The following annunciators will actuate in the following step:
1AD-2, A/1 "P/R HI NEUTRON FLUX RATE ALERT"
1AD-2, A/3 "P/R HI NEUTRON FLUX HI SET POINT ALERT"
1AD-2, B/5 "P/R HI VOLTAGE FAILURE"
1AD-2, E/8 "OVER POWER ROD STOP".

9. **De-energize the affected channel as follows:**

__ a. Remove the control power fuses at Power Range A drawer.

NOTE Replacement of the affected P/R control power fuses shall not occur without authorization of the Superintendent of Operations or his designee.

__ b. Request the OSM to maintain the control power fuses under his control.

__ c. Verify the affected Power Range cabinet shows no physical signs of damage.

RESPONSE NOT OBTAINED: __ c. Remove the instrument power fuses at Power Range B drawer.

__ 10. **Ensure affected channel bistables are in the required state. REFER TO Enclosure 1 (P/R Bistables That Must Be Tripped).**

__ 11. **Ensure "NIS RECORDER" - SELECTED TO AN OPERABLE P/R CHANNEL.**

__ 12. **Adjust control rods to maintain T-Ave at T-Ref.**

RESPONSE NOT OBTAINED: __ **IF rods will not move in manual, THEN adjust turbine load to maintain T-Ave at T-Ref.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 13. **WHEN T-ave within 1°F of T-Ref, AND auto rod control desired, THEN return control rods to auto.**	RO
__ 14. **Determine and correct cause of P/R malfunction.**	
15. **Ensure compliance with appropriate Tech Specs:** __ • 3.2.4 (Quadrant Power Tilt Ratio (QPTR)) __ • 3.3.1 (Reactor Trip System (RTS) Instrumentation).	TS 3.3.1 Items 2a, 3, 6, 7, 16b, 16d, 16e Conditions D,E,R,S
16. **Determine required notifications:** __ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency) __ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 17. **Notify Reactor Group Engineer of occurrence.**	
__ 18. **WHEN the affected P/R channel is repaired, THEN ensure IAE returns the channel to service.**	
__ 19. **Determine long term plant status. RETURN TO procedure in effect.**	

END

1. **Ensure the following reactor trip system interlocks in required state (1SI-18) for existing unit conditions within 1 hour:**

   __ • P-7

   __ • P-8

   __ • P-9

   __ • P-10.

2. **Ensure the following bistables for the affected channel are placed in the tripped condition within 72 hours:**

   __ • NC loop OTDT reactor trip status light (1SI-7) - LIT
   __ • NC loop OPDT reactor trip status light (1SI-7) - LIT.

NOTE The following bistables can only be assured to stay in the tripped condition by the removal of the affected channel's control power fuses.

3. **Ensure the following bistables for the affected channel are in the tripped condition within 72 hours:**

   __ • P/R high flux low setpoint status light (1SI-3) - LIT
   __ • P/R high flux high setpoint status light (1SI-3) - LIT
   __ • P/R high flux rate status light (1SI-3) - LIT.

Duke Power Company Catawba Nuclear Station **Control Rod Misalignment** **Continuous Use**	Procedure No. **AP/ 1/A/5500/014** Revision No. **015** Electronic Reference No. **CN005CEI**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

Initiating Cues:
- 1AD-2, D/10, Rod Bank ORANGE background on DRPI display

A. Purpose

- To verify proper operator response in the event one or more control rods are found to be stuck, misaligned or dropped.

B. Symptoms

Case I Control Rod Misalignment

- N/I indication of flux tilt
- Individual rod(s) greater than 12 steps from bank position
- 1AD-2, B/3 "COMPARATOR P/R CHANNEL DEVIATION" - LIT
- 1AD-2, B/1 "P/R LOWER DET HI FLUX DEV OR AUTO DEFEAT" - LIT
- 1AD-2, B/2 "P/R UPPER DET HI FLUX DEV OR AUTO DEFEAT" - LIT.

Case II Dropped Control Rod

- 1AD-2, A/4 "T-REF/T-AUCT HI/LO" - LIT
- Sudden decrease in T-Avg
- Turbine Load - DECREASING
- Rod bottom light(s) - LIT
- 1AD-2, D/9 "RPI AT BOTTOM ROD DROP" - LIT
- 1AD-2, E/9 "RPI TWO OR MORE RODS AT BOTTOM" - LIT
- N/I indication of flux tilt
- 1AD-2, B/3 "COMPARATOR P/R CHANNEL DEVIATION" - LIT
- 1AD-6, F/8 "PZR LO PRESS CONTROL" - LIT
- Unexpected Rod Withdrawal.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

RO DOES THIS PAGE

__ 1. **Verify only one rod - MISALIGNED.**

IF two or more rods are misaligned by greater than 24 steps, THEN:

__ a. Manually trip Reactor.

__ b. GO TO EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

__ 2. **Ensure "CRD BANK SELECT" switch - IN MANUAL.**

__ 3. **Verify affected rod bottom light(s) - DARK.**

__ **IF rod is dropped, THEN GO TO Case II (Dropped Control Rod).**

__ 4. **Stop any turbine load changes in progress.**

__ 5. **Adjust turbine load to maintain T-Avg within 1°F of T-Ref.**

NOTE If either "Data A Failure" or "Data B Failure" is indicated, and the "No Urgent Alarm" block is green, then the affected individual rod position indications will be in the "Half Accuracy" mode providing 12 step increment position indication instead of 6. Individual rod position indication may differ by as much as 10 steps from group step counter indication.

6. **Verify any of the following DRPI indications - IN ALARM:**

__ • Data A Failure

OR

__ • Data B Failure.

__ **GO TO Step 11.**

No DRPI alarms.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Determine affected rod(s) by at least one of the following:**	
__ • Individual rod display is yellow or red	
__ • Rod Bottom light - LIT.	
__ 8. **Request IAE to investigate and correct cause of DRPI malfunction. <u>REFER</u> <u>TO</u> AM/1/A/5100/003 (Troubleshooting Cause For Invalid DRPI Indication).**	
9. **<u>WHEN</u> rod position indication has been restored, <u>THEN</u>:**	
__ a. Verify all rods - ALIGNED.	__ a. **<u>GO</u> <u>TO</u>** Step 11.
__ b. **<u>GO</u> <u>TO</u>** Step 15.	
__ 10. **<u>GO</u> <u>TO</u> Step 15.**	
11. **Ensure compliance with appropriate Tech Specs:**	TS 3.1.4 Condition B
__ • 3.1.1 (Shutdown Margin (SDM))	
__ • 3.1.4 (Rod Group Alignment Limits)	
__ • 3.1.5 (Shutdown Bank Insertion Limit)	
__ • 3.1.6 (Control Bank Insertion Limits)	
__ • 3.1.7 (Rod Position Indication)	
__ • 3.2.3 (Axial Flux Difference (AFD))	
__ • 3.2.4 (Quadrant Power Tilt Ratio (QPTR))	
__ • SLC 16.7-11 (Position Indication System - Shutdown).	
__ 12. **Notify Reactor Group Engineer of occurrence.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 13. **Determine and correct cause of rod misalignment.**	
RO 14. **Verify the affected rod(s) are operable as follows:**	
__ a. Verify 1AD-2, A/10 "ROD CONTROL URGENT FAILURE" - DARK.	__ a. **GO TO** AP/1/A/5500/015 (Rod Control Malfunctions), Case I (Failure Of Rods To Move).
__ b. Realign affected rod. **REFER TO** OP/1/A/6150/008 (Rod Control).	They will not be allowed to retrieve the rod.
15. **Determine required notifications:**	
__ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 16. **Determine long term plant status. RETURN TO procedure in effect.**	

END

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Verify only one rod - DROPPED OR MISALIGNED.**	**IF two or more rods are dropped OR misaligned by greater than 24 steps, THEN:** __ a. Manually trip Reactor. __ b. **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).
__ 2. **Ensure "CRD BANK SELECT" switch - IN MANUAL.**	
__ 3. **Adjust turbine load to maintain T-Avg within 1°F of T-Ref.**	
__ 4. **Verify 1AD-2, A/10 "ROD CONTROL URGENT FAILURE" - DARK.**	**Perform the following:** __ a. Do not move control rods. __ b. **IF AT ANY TIME** reactor power must be reduced, **THEN** use boron to reduce reactor power. __ c. Dispatch operator to Rod Control System cabinets to determine location of failure. d. Request IAE to perform the following: __ 1) Determine and correct cause of dropped rod. __ 2) Reset alarm. __ e. **WHEN** the "ROD CONTROL URGENT FAILURE" alarm is reset, **THEN** control rods and boron may be used for power changes.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Excore nuclear instrumentation may be skewed by dropped rod.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 5. **Use OAC point C1P1385 (Reactor Thermal Power, Best) to determine reactor power in subsequent steps.**	__ **Use delta temperature indication to estimate reactor power.**
6. **Verify the following - WITHIN TECH SPEC LIMITS:** __ • AFD (Tech Spec 3.2.3) __ • QPTR (Tech Spec 3.2.4).	**Reduce reactor power as required by Tech Specs per one of the following:** __ • OP/1/A/6100/003 (Controlling Procedure For Unit Operation) OR __ • AP/1/A/5500/009 (Rapid Downpower).
7. **Ensure compliance with appropriate Tech Specs:** __ • 3.1.1 (Shutdown Margin (SDM)) __ • 3.1.4 (Rod Group Alignment Limits) __ • 3.1.5 (Shutdown Bank Insertion Limit) __ • 3.1.6 (Control Bank Insertion Limits) __ • 3.1.7 (Rod Position Indication) __ • 3.2.3 (Axial Flux Difference (AFD)) __ • 3.2.4 (Quadrant Power Tilt Ratio (QPTR)) __ • SLC 16.7-11 (Position Indication System - Shutdown).	
__ 8. **Notify Reactor Group Engineer of occurrence.**	
__ 9. **Request IAE to investigate and correct cause of dropped rod.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Determine required notifications:** __ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency) __ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 11. **Verify reactor power - GREATER THAN OR EQUAL TO 5%.**	**Perform the following:** **NOTE** A shutdown is performed to avoid the risk of mode change while recovering the dropped rod. __ a. **IF** any control bank is withdrawn, **THEN** begin unit shutdown to be in Mode 3 within 6 hours. **REFER TO** OP/1/A/6100/003 (Controlling Procedure For Unit Operation). __ b. **IF** dropped rod is in shutdown bank, **THEN** insert shutdown banks after control banks have been inserted.
__ 12. **Do not continue until any required power reductions are complete.**	
13. **WHEN the following conditions are met, THEN retrieve dropped rod. REFER TO OP/1/A/6150/008 (Rod Control):** __ • Steady state plant conditions __ • Rod control problem repaired.	
__ 14. **Determine long term plant status. RETURN TO procedure in effect.**	

END

Initiating Cue:
- 1AD-6 C/12, E/10, F-8

NC Pressure decreasing

A. Purpose

To ensure proper response in the event of abnormal Pressurizer pressure, assess plant conditions, and identify the appropriate steps for the following cases:

Case I Pressurizer Pressure Decreasing

Case II Pressurizer Pressure Increasing.

B. Symptoms

Case I. Pressurizer Pressure Decreasing:

- 1AD-6, E/10 "PZR PORV DISCH HI TEMP" - LIT
- 1AD-6, E/11 "PZR SAFETY DISCHARGE HI TEMP" - LIT
- 1AD-6, F/8 "PZR LO PRESS CONTROL" - LIT
- 1AD-6, A/8 "PZR HI PRESS ALERT" - LIT
- All Pzr heaters - ENERGIZED
- 1AD-6, D/11 "PZR LO PRESS PORV NC34 BLOCKED" - LIT
- 1AD-6, D/10 "PZR LO PRESS PORV NC32 & 36 BLOCKED" - LIT
- Pressurizer pressure less than 2235 PSIG and decreasing

Case II. Pressurizer Pressure Increasing:

- 1AD-6, D/8 "PZR LO PRESS ALERT" - LIT
- 1AD-6, C/8 "PZR HI PRESS DEV CONTROL" - LIT
- 1AD-6, B/8 "PZR HI PRESS" - LIT
- Pressurizer pressure greater than 2235 PSIG and increasing
- All Pzr heaters - ENERGIZED.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

BOP

__ 1. **Verify all Pzr PORVs - CLOSED.**

PORV will stick before it gets full closed.

Perform the following:

__ a. Manually close Pzr PORV(s).

b. **IF** any Pzr PORV cannot be closed, **THEN**:

__ 1) Close the affected PORV(s) isolation valve.

2) **IF** the Pzr PORV isolation valve cannot be closed, **THEN** perform the following:

__ a) **IF** in Mode 3 with CLAs isolated **OR** in Mode 4, **THEN GO TO** AP/1/A/5500/027 (Shutdown LOCA).

__ b) Trip reactor.

__ c) **WHEN** reactor tripped **OR** S/I setpoint reached, **THEN** ensure S/I initiated.

__ d) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Control rods may withdraw on decreasing NC pressure.

__ 2. **Verify Pzr spray valve(s) - CLOSED.**

BOP

Perform the following:

__ a. Manually close affected spray valve(s).

b. **IF** affected spray valve(s) will not close, **THEN** perform the following:

1) **IF AT ANY TIME** the Control Room Supervisor determines that a reactor trip is required, **THEN**:

__ a) Trip reactor.

__ b) **WHEN** reactor power less than 5%, **THEN** stop NC Pumps 1A and 1B.

__ c) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

2) Select "FAIL CLOSED" for affected spray valve(s) mode select switch:

__ • "1 NC-27 PZR SPRAY VLV MODE SELECT"

__ • "1 NC-29 PZR SPRAY VLV MODE SELECT".

__ 3) **IF** NC pressure is stable **OR** increasing, **THEN GO TO** Step 3.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
	4) **IF** NC pressure continues to decrease, **THEN**: a) **IF** in Modes 1 or 2, **THEN**: __ (1) Trip reactor. __ (2) **WHEN** reactor power less than 5%, **THEN** stop NC Pumps 1A and 1B. __ (3) **GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection). __ b) Stop NC Pumps 1A and 1B. __ c) **IF** NC pressure continues to decrease, **THEN** stop additional NC pumps as required. __ d) **REFER TO** AP/1/A/5500/004 (Loss of Reactor Coolant Pump).
__ 3. **Verify all Pzr heaters - ENERGIZED.** BOP	__ **IF Pzr pressure is less than 2220 PSIG, THEN ensure all Pzr heaters are energized.**
__ 4. **Ensure 1NV-37A (NV Supply To Pzr Aux Spray) - CLOSED.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Positive reactivity is inserted during an increase in NC pressure which may cause auto rod insertion.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 5. **Verify NC pressure - STABLE OR INCREASING.** BOP	__ **<u>IF</u> pressure continues to decrease, <u>THEN</u> <u>REFER</u> <u>TO</u> AP/1/A/5500/010 (Reactor Coolant Leak).**
6. **<u>WHEN</u> NC pressure is stable, <u>THEN</u>:** RO __ • Stabilize unit at appropriate power level. • Adjust the following as required to maintain T-Avg within 1°F of T-Ref: __ • Turbine load __ • Control rods __ • Boron concentration.	
7. **<u>IF</u> a Pzr pressure channel failed, <u>THEN</u> perform following:**	
__ a. Verify "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) in required state for unit conditions.	__ a. Ensure compliance with Tech Spec 3.3.2 (Engineered Safety Features Actuation System (ESFAS) Instrumentation).
b. Notify IAE to fail following bistables for affected channel per Model W/O #00874531. Bistables shall be tripped within 72 hours: __ • Pzr low pressure S/I __ • OT Delta T __ • Pzr high pressure Reactor Trip __ • Pzr low pressure Reactor Trip.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Ensure compliance with appropriate Tech Specs:**	TS 3.4.11 Condition B TS 3.4.1 Condition A (based on NC pressure at the time)

__ • 3.3.1 (Reactor Trip System (RTS) Instrumentation)

__ • 3.3.2 (Engineered Safety Features Actuation System (ESFAS) Instrumentation)

__ • 3.3.3 (Post Accident Monitoring (PAM) Instrumentation)

__ • 3.3.4 (Remote Shutdown System)

__ • 3.4.1 (RCS Pressure, Temperature, and Flow Departure From Nucleate Boiling (DNB) Limits)

__ • 3.4.4 (RCS Loops - MODES 1 and 2)

__ • 3.4.5 (RCS Loops - MODE 3)

__ • 3.4.6 (RCS Loops - MODE 4)

__ • 3.4.9 (Pressurizer)

__ • 3.4.10 (Pressurizer Safety Valves)

__ • 3.4.11 (Pressurizer Power Operated Relief Valves (PORVs))

__ • 3.4.13 (RCS Operational Leakage).

__ 9. **Determine long term plant status.**
<u>RETURN</u> <u>TO</u> procedure in effect.

<u>END</u>

Initiating Cues:
- 1AD-5, A/1, A/4
- 1AD-1, F/4

Turbine load decreasing

A. Purpose

CASE I Switchyard Available:

- To verify proper response in the event of a Load Rejection with Unit Tie Switchyard PCBs closed and the switchyard is available.

CASE II Switchyard Not Available:

- To verify proper response in the event of a Load Rejection with all Unit Tie Switchyard PCBs open and/or the switchyard is not available, with the Unit carrying it's in-house loads.

B. Symptoms

CASE I Switchyard Available:

Switchyard energized **AND** any Switchyard Unit Tie PCB closed **AND**:

- 1AD-1, F/4 "TURB RUNBACK INITIATED" - LIT
- Turbine Generator megawatt output - RAPIDLY DECREASING
- "C-7A LOSS OF LOAD INTLK COND DUMP" status light (1SI-18) - LIT
- "C-7B LOSS OF LOAD INTLK ATMOS DUMP" status light (1SI-18) - LIT
- Condenser or atmospheric steam dump valves - OPEN
- Any load rejection occurring or is required
- Control rods - STEPPING IN.

CASE II Switchyard Not Available:

Switchyard not available **AND**:

- 1AD-1, F/4 "TURB RUNBACK INITIATED" - LIT
- Turbine Generator megawatt output - RAPIDLY DECREASING
- "C-7A LOSS OF LOAD INTLK COND DUMP" status light (1SI-18) - LIT
- "C-7B LOSS OF LOAD INTLK ATMOS DUMP" status light (1SI-18) - LIT
- Condenser or atmospheric steam dump valves - OPEN
- Control rods - STEPPING IN.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions RO DOES THIS PAGE	
__ 1. **Verify turbine load - DECREASING IN AUTOMATIC.**	**Perform the following:** __ a. Select "MANUAL" on turbine control panel. __ b. Depress "CONTROL VALVES LOWER" pushbutton and reduce turbine load as required.
2. **Verify proper reactor response:** __ • Control rods - IN "AUTO" AND STEPPING IN __ • P/R neutron flux - DECREASING.	__ **IF T-Avg is greater than 1.5°F higher than T-Ref, THEN manually insert control rods as required to maintain T-Avg within 1°F of T-Ref.** Rods fail to work in AUTO
3. **Verify proper steam dump operation as follows:**	
__ a. Verify T-Ref instrumentation - AVAILABLE.	__ a. **IF** T-Avg Coastdown is in progress, **THEN** determine T-Ref from table. **REFER TO** Enclosure 4 (T-Ref Value Following Runback/Power Reduction).
__ b. "C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT.	b. Perform the following: __ 1) Manually operate S/G PORVs as necessary to maintain T-Avg at T-Ref. __ 2) **GO TO** Step 4.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	

RO DOES THIS PAGE

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
c. Verify the following: __ • "C-7A LOSS OF LOAD INTLK COND DUMP" status light (1SI-18) - LIT. __ • Steam dump valves - MODULATING.	c. **IF** steam dump valves are closed **AND** T-Avg is 3°F greater than T-Ref, **THEN**: __ 1) Place "STM DUMP CTRL" in manual. __ 2) Adjust "STM DUMP CTRL" to 0% demand. __ 3) Place the steam dumps in pressure mode. __ 4) Manually operate condenser steam dump valves to maintain T-Avg at T-Ref. __ 5) **IF** steam dump valves fail to operate, **THEN** dump steam as necessary from available S/G PORVs to maintain T-Avg at T-Ref.
__ d. T-Avg - DECREASING TO T-REF.	d. Perform the following: __ 1) Place "STM DUMP CTRL" in manual. __ 2) Adjust "STM DUMP CTRL" to 0% demand. __ 3) Place the steam dumps in pressure mode. __ 4) Manually operate condenser steam dump valves to maintain T-Avg at T-Ref. __ 5) **IF** steam dump valves fail to operate, **THEN** dump steam as necessary from available S/G PORVs to maintain T-Avg at T-Ref.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Verify Pzr PORV and Pzr spray valve status as follows:**	BOP DOES THIS PAGE
__ a. All Pzr PORVs - CLOSED.	a. **IF** Pzr pressure is less than 2315 PSIG, **THEN**: __ 1) Manually close Pzr PORV(s). __ 2) **IF** any Pzr PORV cannot be closed, **THEN** close its isolation valve. 3) **IF** Pzr PORV isolation valve cannot be closed, **THEN**: __ a) Trip reactor. __ b) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).
__ b. Normal Pzr spray valves - CLOSED.	b. **IF** Pzr pressure is less than 2260 PSIG, **THEN**: __ 1) Manually close the affected spray valve(s). __ 2) **REFER TO** AP/1/A/5500/011 (Pressurizer Pressure Anomalies).
5. **Verify proper CM System operation as follows:**	
__ a. **WHEN** reactor power is less than 75%, **THEN** ensure both C-htr drain pumps - OFF.	
__ b. Verify reactor power - GREATER THAN 56% PRIOR TO THE EVENT.	__ b. **GO TO** Step 6.
__ c. Verify standby hotwell pump(s) - ON.	__ c. Manually start standby hotwell pump(s) as necessary.
__ d. Verify standby condensate booster pump(s) - ON.	__ d. Manually start standby condensate booster pump(s) as necessary.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 6. **Verify the following generator alarms - DARK:** __ • 1AD-11, C/1 "GEN BKR A OVER CURRENT" __ • 1AD-11, F/1 "GEN BKR B OVER CURRENT".	__ **Ensure turbine generator load - REDUCED TO APPROXIMATELY 48% AND THE ALARM CLEARS.**
RO 7. **Verify S/G levels are adequate as follows:** __ • All S/G low level alert alarms (1AD-4) - DARK __ • All S/G low CF flow alarms (1AD-4) - DARK.	**Perform the following:** __ a. Ensure feedwater regulating valves - MODULATING TO CONTROL S/G LEVELS AT PROGRAM SETPOINT. b. **IF** any S/G(s) N/R level is decreasing in an uncontrolled manner, **THEN**: __ 1) Trip reactor. __ 2) **GO TO** EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 8. **Verify reactor power - GREATER THAN 20%.** [RO]	**Perform the following:** __ a. Place "CRD BANK SELECT" switch - IN MANUAL. __ b. Maintain control rods above insertion limits. __ c. Operate control rods to stabilize reactor power between 6%-10%. d. **IF AT ANY TIME** reactor power is less than or equal to 5%, **THEN** perform the following: __ 1) Ensure turbine - TRIPPED. __ 2) Concurrently insert control rods to shutdown the reactor. **REFER TO** OP/1/A/6150/008 (Rod Control). __ 3) **GO TO** AP/1/A/5500/002 (Turbine Generator Trip). __ e. **GO TO** Step 10.
__ 9. **IF AT ANY TIME reactor power is less than or equal to 20%, THEN perform Step 8 RNO.** [RO]	
__ 10. **Verify AS header pressure - GREATER THAN OR EQUAL TO 140 PSIG.** [BOP]	__ **Adjust 1AS-2 (Main Stm To Aux Steam) as required to maintain AS header pressure between 140 PSIG and 150 PSIG.**
__ 11. **Adjust 1TL-4 (Stm Seal Reg Byp) as necessary to maintain steam seal pressure between 4 PSIG - 6 PSIG.** [RO]	Calculating boron for this is an ADMIN JPM on this exam. If they start to do it, then the next event should begin and the TS can be reviewed during followup.
__ 12. **Monitor Enclosure 3 (Rod Insertion Limit Boration).** [BOP]	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 13. **Verify reactor power - LESS THAN 30%.** RO	**Perform the following:** a. **IF** the runback target load is less than 30%, **THEN**: __ 1) **WHEN** time and personnel permit, **THEN** perform applicable steps of OP/1/A/6100/003 (Controlling Procedure For Unit Operation). __ 2) Do not continue in this procedure until reactor power is less than 30%. __ 3) **WHEN** reactor power is less than 30%, **THEN GO TO** Step 14. b. **WHEN** the appropriate runback target load is reached, **THEN**: __ 1) Stabilize unit at current power level. __ 2) Maintain control rods above insertion limits. 3) Adjust the following as required to maintain T-Avg within 1°F of T-Ref: __ • Turbine load __ • Control rods __ • Boron concentration. __ c. **GO TO** Step 15.
__ 14. **Verify the "RESET" light on "AMSAC FOR CF VALVES" switch - DARK.**	**Perform the following:** __ a. **IF** turbine impulse pressure is less than 190 PSIG, **THEN** notify IAE to correct the cause of the AMSAC failure to deactivate. __ b. Depress the "BYPASS" pushbutton on "AMSAC FOR CF VALVES" switch. __ c. **WHEN** 2 minutes has elapsed, **THEN** verify "RESET" light on "AMSAC FOR CF VALVES" switch has remained dark.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **Verify the following PCBs - CLOSED:** BOP __ • Generator breaker 1A __ • Generator breaker 1B __ • PCB 14 __ • PCB 15 __ • PCB 17 __ • PCB 18.	**NOTE** When separated from the grid the turbine reverts to speed control. **Perform the following:** __ a. **IF** both generator PCBs are open, **THEN** ensure main turbine speed - MAINTAINED BETWEEN 1792 AND 1807 RPM. b. **IF** the turbine generator is separated from the grid, **THEN**: __ 1) Ensure main turbine speed - MAINTAINED BETWEEN 1792 AND 1807 RPM. __ 2) Ensure main generator voltage - MAINTAINED BETWEEN 20.9 KV AND 23.1 KV. c. **IF** load rejection caused by loss of main busline 1A or 1B, **THEN**: 1) Notify Transmission Control Center (TCC), using one of the following methods, to investigate and repair cause of the loss of busline: __ • 704-382-9403 __ • 704-382-9404 __ • 704-399-9744 __ • 704-382-4413 (System Operating Center). __ 2) **WHEN** notified by TCC that the affected busline is ready to be re energized, **THEN** restore power to the affected busline. **REFER TO** Enclosure 1 (Offsite Power Restoration).
__ 16. **Adjust power factor as necessary. REFER TO Unit 1 Revised Data Book Figure 43.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
RO 17. **<u>WHEN</u> the appropriate runback target load is reached, <u>THEN</u>:** __ • Stabilize unit at appropriate power level. __ • Maintain control rods above insertion limits. • Adjust the following as required to maintain T-Avg within 1°F of T-Ref: __ • Turbine load __ • Control rods __ • Boron concentration.	
__ 18. **Notify System Operating Center (SOC) using the red dispatcher telephone of current unit status.**	
__ 19. **Determine and correct cause of load rejection.**	Load rejection caused by loss of CF pump.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 20. **Shut down unnecessary plant equipment as follows:**	
a. Restore CM and CF as follows:	
__ 1) Verify C-htr drain pumps - ON.	__ 1) **WHEN** time and manpower permit, **THEN** complete the shutdown of the C-htr drain pumps. **REFER TO** OP/1/B/6250/004 (Feedwater Heater Vents, Drains and Bleed System).
RO __ 2) Verify both CF Pumps - IN SERVICE.	__ 2) **GO TO** Step 20.b.
__ 3) Shutdown one CF pump as necessary. **REFER TO** OP/1/A/6250/001 (Condensate and Feedwater System).	
__ 4) Shutdown excess Condensate Booster Pumps. **REFER TO** OP/1/A/6250/001 (Condensate and Feedwater System).	
__ 5) Shutdown excess Hotwell Pumps. **REFER TO** OP/1/A/6250/001 (Condensate and Feedwater System).	
BOP __ b. RC pump(s) and cooling tower fans. **REFER TO** OP/1/B/6400/001A (Condenser Circulating Water System).	
RO 21. **Reset steam dump valves as follows:**	
__ a. Verify reactor power - STABLE.	a. Perform the following: __ 1) **WHEN** reactor power is stable, **THEN** perform Steps 21.b through 21.g. __ 2) **GO TO** Step 22.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

21. (Continued)

RO does this page

__ b. Verify steam dump valves - IN "T-AVG" MODE.

b. Perform the following:

1) **IF** using S/G PORVs, **THEN**:

__ a) **WHEN** T-Avg is within 1°F of T-Ref **AND** stable, **THEN** close S/G PORVs.

__ b) **GO TO** Step 21.d.

2) **WHEN** T-Avg is within 1°F of T-Ref **AND** stable, **THEN**:

__ a) Ensure steam dumps - CLOSED.

__ b) Perform Steps 21.d through 21.g.

__ 3) **GO TO** Step 22.

__ c. Verify steam dump valves - CLOSED.

c. Perform the following:

__ 1) **WHEN** steam dump valves are closed, **THEN** perform Steps 21.d through 21.g.

__ 2) **GO TO** Step 22.

__ d. Reset steam dump valves.

e. Verify the following status lights (1SI-18) - DARK:

__ • "C-7A LOSS OF LOAD INTLK COND DUMP"

__ • "C-7B LOSS OF LOAD INTLK ATMOS DUMP".

__ f. **IF** "T-AVG" mode of operation is available, **THEN** ensure steam dump valves in "T-AVG" mode.

__ g. Verify "STM DUMP CTRL" - IN AUTO.

__ g. **IF** steam dumps are in "T-AVG" mode, **THEN** place "STM DUMP CTRL" in auto.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 22. **Verify reactor power - GREATER THAN 15%.** RO	__ **Transfer feed flow to CA nozzles. <u>REFER</u> <u>TO</u> Enclosure 2 (Transferring Feed Flow From CF To CA Nozzles).**
__ 23. **Verify CA pumps - OFF.** BOP	**Perform the following:** __ a. **<u>WHEN</u>** CA is no longer needed to feed S/G(s), **<u>THEN</u>** shutdown the CA System following the automatic start and return CA System to standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6250/002 (Auxiliary Feedwater System). __ b. Re-establish S/G blowdown. **<u>REFER</u> <u>TO</u>** OP/1/A/6250/008 (Steam Generator Blowdown).
__ 24. **Verify reactor power change - GREATER THAN OR EQUAL TO 15% IN A 1 HOUR PERIOD.** RO	__ **<u>GO</u> <u>TO</u> Step 26.** Depending on how far they reduce power, this step may apply and they will do step 25.
25. **Notify the following sections to take appropriate samples:** __ • Radiation Protection to sample and analyze gaseous effluents. **<u>REFER</u> <u>TO</u>** Selected Licensee Commitments Manual, Section 16.11-6. __ • Primary Chemistry to sample for isotopic analysis of iodine. **<u>REFER</u> <u>TO</u>** Tech Specs 3.4.16 (Sample must be taken between 2 hours and 6 hours following last power change greater than or equal to 15% rated thermal power within a 1 hour period).	
26. **Ensure compliance with appropriate Tech Specs:** __ • 3.1.1 (Shutdown Margin (SDM)) __ • 3.1.6 (Control Bank Insertion Limits) __ • 3.8.1 (AC Sources - Operating).	TS 3.1.6 Condition A (if rods are below LoLo insertion limits.)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 27. **Notify Reactor Group Engineer of occurrence.**

__ 28. **Determine long term plant status. <u>RETURN</u> <u>TO</u> OP/1/A/6100/003 (Controlling Procedure For Unit Operation).**

<u>END</u>

A. Purpose

This procedure provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of all Reactor Trips and S/I above P-11, valid S/I below P-11 and to assess plant conditions, and to identify the appropriate recovery procedure.

B. Symptoms or Entry Conditions

1. **The following conditions are symptoms that require a Reactor Trip:**

- 1 of 2 S/R channels - GREATER THAN 10^5 CPS WHILE BELOW P-6
- 1 of 2 I/R channels - GREATER THAN 25% FULL POWER AMPS EQUIVALENT WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 25% FULL POWER WHILE BELOW P-10
- 2 of 4 P/R channels - GREATER THAN 109% FULL POWER
- 2 of 4 P/R channels - +5% FULL POWER IN 2 SECONDS
- 2 of 4 loop ΔTs - GREATER THAN THE OPΔT SETPOINT
- 2 of 4 loop ΔTs - GREATER THAN THE OTΔT SETPOINT
- 2 of 4 Pzr pressure channels - GREATER THAN 2385 PSIG
- 2 of 4 Pzr pressure channels - LESS THAN 1945 PSIG WHILE ABOVE P-7
- 2 of 3 Pzr level channels - GREATER THAN 92% WHILE ABOVE P-7
- 2 of 4 S/G N/R level channels on 1 of 4 S/Gs - LESS THAN LO-LO SETPOINT
- 2 of 4 NC pump buses - LESS THAN 77% OF NORMAL VOLTAGE (5082 VOLTS) WHILE ABOVE P-7
- 2 of 4 NC pump buses - LESS THAN 56 HERTZ WHILE ABOVE P-7
- 2 of 3 NC flow channels on 2 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-7 AND BELOW P-8
- 2 of 3 NC flow channels on 1 of 4 NC loops - LESS THAN 90% OF LOOP MINIMUM MEASURED FLOW WHILE ABOVE P-8
- 4 of 4 turbine stop valves - CLOSED WHILE ABOVE P-9
- 2 of 4 turbine stop valves EHC pressure - LESS THAN 550 PSIG WHILE ABOVE P-9
- 1 of 2 S/I trains - ACTUATED
- 2 of 2 SSPS trains - GENERAL WARNING ALARM.

2. **The following are symptoms of a Reactor Trip:**
   - Any Reactor Trip annunciator - LIT
   - Neutron level - RAPIDLY DECREASING
   - Rod bottom lights - LIT.

3. **The following are symptoms that require a Reactor Trip and S/I:**
   - 2 of 4 Pzr pressure channels - LESS THAN 1845 PSIG
   - 2 of 3 containment pressure channels - GREATER THAN 1.2 PSIG.

4. **The following are symptoms of a Reactor Trip and S/I:**
   - Any S/I Reactor Trip annunciator - LIT
   - NV, NI, and ND pumps - ON
   - "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT
   - E/S Load Sequencer Actuated status lights (1SI-14) - LIT.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. <u>Operator Actions</u>

RO DOES THIS PAGE

__ 1. **Monitor Enclosure 1 (Foldout Page).**

2. **Verify Reactor Trip:**

- __ All rod bottom lights - LIT
- __ All reactor trip and bypass breakers - OPEN
- __ I/R amps - DECREASING.

Perform the following:

__ a. Manually trip reactor.

b. **<u>IF</u>** reactor will not trip, **<u>THEN</u>** concurrently:

- __ Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
- __ **<u>GO</u> <u>TO</u>** EP/1/A/5000/FR-S.1 (Response To Nuclear Power Generation/ATWS).

3. **Verify Turbine Trip:**

- __ All turbine stop valves - CLOSED

Perform the following:

__ a. Manually trip the turbine.

b. **<u>IF</u>** turbine will not trip, **<u>THEN</u>**:

__ 1) Depress the "MANUAL" pushbutton on the turbine control panel.

__ 2) Rapidly unload turbine by simultaneously depressing the "CONTROL VALVE LOWER" and "FAST RATE" pushbuttons.

3) **<u>IF</u>** turbine will not runback, **<u>THEN</u>** close:

- __ All MSIVs
- __ All MSIV bypass valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Verify 1ETA and 1ETB - ENERGIZED.**	**Perform the following:**
BOP DOES THIS PAGE	__ a. **IF** 1ETA **AND** 1ETB are de-energized, **THEN GO TO** EP/1/A/5000/ECA-0.0 (Loss Of All AC Power).
	__ b. **WHEN** time allows, **THEN** attempt to restore power to de-energized switchgear while continuing with this procedure. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power).
5. **Verify S/I is actuated:**	
__ a. "SAFETY INJECTION ACTUATED" status light (1SI-13) - LIT.	a. Perform the following:
	1) Verify conditions requiring S/I:
	__ • Pzr pressure - LESS THAN 1845 PSIG
	OR
Auto S/I is blocked on both channels. Manual initiation required. CRITICAL TASK !	__ • Containment pressure - GREATER THAN 1.2 PSIG.
	__ 2) **IF** S/I is required, **THEN** manually initiate S/I.
	3) **IF** S/I is not required, **THEN** concurrently:
	__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
	__ • **GO TO** EP/1/A/5000/ES-0.1 (Reactor Trip Response).
__ b. Both E/S load sequencer actuated status lights (1SI-14) - LIT.	__ b. Manually initiate S/I.
__ 6. **Announce "Unit 1 Safety Injection".**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Determine required notifications:**	
__ • **<u>REFER TO</u>** RP/0/A/5000/001 (Classification Of Emergency)	
__ • **<u>REFER TO</u>** RP/0/B/5000/013 (NRC Notification Requirements).	
__ 8. **Verify all Feedwater Isolation status lights (1SI-5) - LIT.** RO	**Perform the following:** __ a. Manually initiate Feedwater Isolation. __ b. <u>IF</u> proper status light indication is not obtained, **<u>THEN</u>** manually close valves.
BOP 9. **Verify Phase A Containment Isolation status as follows:**	
__ a. Phase A "RESET" lights - DARK.	__ a. Manually initiate Phase A Isolation.
__ b. Monitor Light Panel Group 5 St lights - LIT.	__ b. Manually align valves.
BOP 10. **Verify proper Phase B actuation as follows:**	
__ a. Containment pressure - HAS REMAINED LESS THAN 3 PSIG.	a. Perform the following: **<u>NOTE</u>** This time may be used later to determine when to align ND Aux spray. __ 1) Record approximate time of reactor trip. ______________________ __ 2) Verify NS pumps - INDICATING FLOW. __ 3) <u>IF</u> flow is not indicated, **<u>THEN</u>** manually initiate Phase B Isolation for affected train(s). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. (Continued)

BOP

4) Verify Phase B Isolation has actuated as follows:

__ a) Phase B Isolation "RESET" lights - DARK.

__ b) **IF** Phase B Isolation "RESET" lights are lit, **THEN** manually initiate Phase B Isolation.

c) Verify following monitor light panel lights - LIT:

__ • Group 1 Sp lights

__ • Group 5 Sp lights

__ • Group 5 St lights L/11 and L/12.

__ d) **IF** monitor light panel not in correct alignment, **THEN** ensure correct alignment.

e) **IF** NS pump(s) did not start, **THEN** perform the following for the affected train(s):

__ (1) Reset ECCS.

__ (2) Reset D/G load sequencer.

__ (3) Manually start affected NS pump.

__ (4) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.

__ 5) Stop all NC pumps.

__ 6) Maintain seal injection flow.

__ 7) Energize H2 igniters.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	8) Dispatch operator to perform the following:
	__ a) Secure all ice condenser air handling units. **<u>REFER</u> <u>TO</u>** Enclosure 13 (Securing All Ice Condenser Air Handling Units).
	__ b) Place containment H_2 analyzers in service. **<u>REFER</u> <u>TO</u>** OP/1/A/6450/010 (Containment Hydrogen Control Systems).
	__ 9) **<u>WHEN</u>** 9 minutes has elapsed, **<u>THEN</u>** verify proper VX system operation. **<u>REFER</u> <u>TO</u>** Enclosure 7 (VX System Operation).
	__ 10) **<u>GO</u> <u>TO</u>** Step 11.
__ b. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** containment pressure exceeds 3 PSIG while in this procedure, **<u>THEN</u>** perform Step 10.a.	
BOP 11. **Verify proper CA pump status as follows:**	
__ a. Motor driven CA pumps - ON.	a. Perform the following for the affected train(s):
	__ 1) Reset ECCS.
	__ 2) Reset D/G load sequencer.
	__ 3) Manually start affected motor driven CA pump.
	__ 4) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.
RO __ b. 3 S/G N/R levels - GREATER THAN 11%.	__ b. Ensure CA Pump #1 - RUNNING.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Verify all of the following S/I pumps - ON:** __ • NV pumps __ • ND pumps __ • NI pumps. BOP DOES THIS PAGE	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. __ d. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
__ 13. **Verify all KC pumps - ON.**	**Perform the following for affected train(s):** __ a. Reset ECCS. __ b. Reset D/G load sequencer. __ c. Manually start affected pump. __ d. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
__ 14. **Verify all Unit 1 and Unit 2 RN pumps - ON.**	**Perform the following:** __ a. **IF** any Unit 2 RN pump is off, **THEN** manually start affected pump(s). b. **IF** any Unit 1 RN pump is off, **THEN** perform the following for affected train(s): __ 1) Reset ECCS. __ 2) Reset D/G load sequencer. __ 3) Manually start affected pump. __ 4) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.
15. **Verify proper ventilation systems operation as follows:** __ • **REFER TO** Enclosure 2 (Ventilation System Verification). __ • Notify Unit 2 operator to perform Enclosure 3 (Opposite Unit Ventilation Verification).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 16. **Verify all S/G pressures - GREATER THAN 775 PSIG.** RO	**Perform the following:** a. Verify the following valves - CLOSED: __ • All MSIVs __ • All MSIV bypass valves __ • All S/G PORVs. b. **IF** any valve is open, **THEN**: __ 1) Manually initiate Main Steam Isolation. __ 2) **IF** any valve is still open, **THEN** manually close valve.
RO 17. **Verify proper S/I flow as follows:**	
__ a. "NV S/I FLOW" - INDICATING FLOW.	__ a. Manually start NV pump(s) and align valves.
__ b. NC pressure - LESS THAN 1620 PSIG.	b. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) **IF** ND pump miniflow valve(s) cannot be opened, **THEN** perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on. __ e) **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart the ND pump. __ 3) **GO TO** Step 18.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
BOP __ c. NI pumps - INDICATING FLOW.	__ c. Manually start NI pump(s) and align valves.
__ d. NC pressure - LESS THAN 285 PSIG.	d. Perform the following: __ 1) Ensure ND pump miniflow valve on operating ND pump(s) - OPEN. 2) **__IF__** the ND pump miniflow valve(s) cannot be opened, **__THEN__** perform the following for affected train(s): __ a) Reset ECCS. __ b) Reset D/G load sequencer. __ c) Stop ND pump. __ d) **__IF AT ANY TIME__** a B/O occurs, **__THEN__** restart S/I equipment previously on. __ e) **__IF AT ANY TIME__** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **__THEN__** restart the ND pump. __ 3) **__GO TO__** Step 18.
BOP __ e. ND pumps - INDICATING FLOW TO C-LEGS.	__ e. Manually start ND pump(s) and align valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
18. **Control S/G levels as follows:**	
__ a. Verify total CA flow - GREATER THAN 450 GPM. BOP	a. Perform the following: __ 1) **IF** N/R level in all S/Gs is less than 11% (29% ACC), **THEN** manually start CA pumps and ensure correct valve alignment. 2) **IF** N/R level in all S/Gs is less than 11% (29% ACC) **AND** feed flow greater than 450 GPM cannot be established, **THEN** concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink).
__ b. **WHEN** at least one S/G N/R level is greater than 11% (29% ACC), **THEN** throttle feed flow to maintain all S/G N/R levels between 11% (29% ACC) and 50%. BOP	
__ 19. **Verify all CA isolation valves - OPEN.** BOP	__ **Manually open valve(s).**
__ 20. **Verify S/I equipment status based on monitor light panel - IN PROPER ALIGNMENT.**	__ **Manually align equipment.**

NOTE Enclosure 4 (NC Temperature Control) shall remain in effect until subsequent procedures provide alternative NC temperature control guidance.

RO

__ 21. **Control NC temperature. REFER TO Enclosure 4 (NC Temperature Control).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. **Verify Pzr PORV and Pzr spray valve status as follows:** BOP	
__ a. All Pzr PORVs - CLOSED.	a. **IF** Pzr pressure is less than 2315 PSIG, **THEN**: __ 1) Manually close Pzr PORV(s). __ 2) **IF** any Pzr PORV cannot be closed, **THEN** close its isolation valve. 3) **IF** any Pzr PORV cannot be closed **OR** isolated, **THEN** perform the following: __ a) Energize H_2 igniters. b) Dispatch operator to perform the following: __ (1) Secure all ice condenser air handling units. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units). __ (2) Place containment H2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control Systems).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
22. (Continued)	
	c) **IF** both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **THEN** start one VX fan. **REFER TO** Enclosure 5 (VX Fan Manual Start). d) Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. Normal Pzr spray valves - CLOSED. BOP	b. **IF** Pzr pressure is less than 2260 PSIG, **THEN**: __ 1) Manually close spray valve(s). 2) **IF** spray valve(s) cannot be closed, **THEN**: __ a) Stop NC pumps 1A and 1B. __ b) **IF** NC pressure continues to decrease, **THEN** stop third NC pump as required.
BOP __ c. At least one Pzr PORV isolation valve - OPEN.	__ c. **IF** power is available, **THEN** open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
RO __ 23. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**	**IF any NV OR NI pump is on, THEN:** __ a. Ensure all NC pumps - OFF. __ b. Maintain seal injection flow.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
RO 24. **Verify main steamlines are intact as follows:** __ • All S/G pressures - STABLE OR INCREASING __ • ALL S/Gs - PRESSURIZED.	**<u>IF</u> pressure in any S/G is decreasing in an uncontrolled manner <u>OR</u> any S/G is depressurized, <u>THEN</u> perform the following:** a. <u>IF</u> both the following conditions exist, __ • Containment pressure - GREATER THAN 1 PSIG __ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG __ **<u>THEN</u>** manually start one VX fan. **<u>REFER</u> <u>TO</u>** Enclosure 5 (VX Fan Manual Start). b. Concurrently: __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).
BOP 25. **Verify S/G tubes are intact as follows:** • Verify the following EMF trip 1 lights - DARK: __ • 1EMF-33 (Condenser Air Ejector Exhaust) __ • 1EMF-26 (Steamline 1A) __ • 1EMF-27 (Steamline 1B) __ • 1EMF-28 (Steamline 1C) __ • 1EMF-29 (Steamline 1D). __ • All S/G levels - STABLE OR INCREASING IN A CONTROLLED MANNER.	**<u>IF</u> any EMF trip 1 light is lit <u>OR</u> any S/G level is increasing in an uncontrolled manner, <u>THEN</u> concurrently:** __ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ • **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

26. **Verify NC System is intact as follows:**

BOP

a. Verify the following NC pump thermal barrier alarms - DARK:

__ • 1AD-6, E/1, "NCP A THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/2, "NCP B THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/3, "NCP C THERMAL BARRIER KC OUTLET HI/LO FLOW"

__ • 1AD-6, E/4, "NCP D THERMAL BARRIER KC OUTLET HI/LO FLOW".

a. Perform the following:

1) Ensure the valve for the affected NC pump(s) - CLOSED:

__ • 1KC-394A (NC Pump 1A Therm Bar Otlt)

__ • 1KC-364B (NC Pump 1B Therm Bar Otlt)

__ • 1KC-345A (NC Pump 1C Therm Bar Otlt)

__ • 1KC-413B (NC Pump 1D Therm Bar Otlt).

2) **IF** the valve for the affected NC pump will not close, **THEN** perform the following:

__ a) Trip all NC pumps.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

26. (Continued)

b) Perform the following:

__ (1) Dispatch operator with radio to standby at 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419) (Ladder needed).

__ (2) Close 1KC-425A (NC Pumps Ret Hdr Cont Isol) from Control Room.

__ (3) **IF** 1KC-425A (NC Pumps Ret Hdr Cont Isol) will not close completely from Control Room, **THEN** have operator locally close 1KC-425A (NC Pumps Ret Hdr Cont Isol) (AB-588, GG-52, Rm 419).

__ (4) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) has been closed, **THEN** close 1KC-424B (NC Pumps Ret Hdr Cont Isol).

__ (5) **WHEN** 1KC-425A (NC Pumps Ret Hdr Cont Isol) is closed, **THEN** notify the dispatched operator to return.

(6) Close the following valves:

__ • 1KC-338B (NC Pumps Sup Hdr Cont Isol)

__ • 1KC-430A (Rx Bldg Drn Hdr Cont Isol)

__ • 1KC-429B (Rx Bldg Drn Hdr Cont Isol).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. (Continued)	
BOP b. Verify NC System is intact as follows:	b. Perform the following:
__ • Containment pressure - LESS THAN 1 PSIG.	__ 1) Energize H2 igniters.
__ • **<u>IF</u>** normal off-site power is available, **<u>THEN</u>** verify containment pressure less than 0.3 PSIG.	2) Dispatch operator to perform the following:
• Containment high range EMFs - LESS THAN 3 R/HR:	__ a) Secure all ice condenser air handling units. **<u>REFER TO</u>** Enclosure 13 (Securing All Ice Condenser Air Handling Units).
__ • 1EMF-53A (Containment Trn A) __ • 1EMF-53B (Containment Trn B).	__ b) Place containment H2 analyzers in service. **<u>REFER TO</u>** OP/1/A/6450/010 (Containment Hydrogen Control Systems).
• Containment EMF trip 1 lights - DARK:	3) **<u>IF</u>** both the following conditions exist,
__ • 1EMF-38 (Containment Particulate) __ • 1EMF-39 (Containment Gas)	__ • Containment pressure - GREATER THAN 1 PSIG
__ • Containment sump level - STABLE.	__ • Containment pressure - HAS REMAINED LESS THAN 3 PSIG
	__ **<u>THEN</u>** manually start one VX fan. **<u>REFER TO</u>** Enclosure 5 (VX Fan Manual Start).
	4) Concurrently:
	__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
	__ • **<u>GO TO</u>** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
27. **Verify S/I termination criteria as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **<u>GO TO</u>** Step 28.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
b. Verify secondary heat sink as follows: __ • N/R level in at least one S/G - GREATER THAN 11% OR __ • Total feed flow to S/Gs - GREATER THAN 450 GPM.	__ b. **GO TO** Step 28.
__ c. NC pressure - STABLE OR INCREASING.	__ c. **GO TO** Step 28.
__ d. Pzr level - GREATER THAN 11%.	d. Perform the following: __ 1) **IF** NC pressure is increasing **AND** normal Pzr spray is available, **THEN** attempt to stabilize NC pressure using normal Pzr spray. __ 2) **RETURN TO** Step 27.a.
e. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following: __ a) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers. __ b) Concurrently implement Enclosure 8 (ECCS Master Reset) while continuing in this procedure.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
__ f. Ensure only one NV pump - ON.	
__ g. Verify NC pressure - STABLE OR INCREASING.	g. Perform the following: __ 1) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ 2) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
__ h. Verify VI pressure - GREATER THAN 50 PSIG.	h. In subsequent steps, control room control is lost for the following valves and local operation will be required: __ • 1NV-294 (NV Pmps A&B Disch Flow Ctrl) __ • 1NV-309 (Seal Water Injection Flow).
i. Isolate NV S/I flowpath as follows:	
1) Verify the following valves - OPEN: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol).	1) Perform the following: __ a) Open affected valve(s). __ b) **IF** 1NV-203A **AND** 1NV-202B are open, **THEN GO TO** Step 27.i.2. c) Dispatch operator to open affected valve(s): __ • 1NV-203A (NV Pumps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed) __ • 1NV-202B (NV Pmps A&B Recirc Isol) (AB-554, HH-JJ, 54-55, Rm 231) (Ladder needed). __ d) Close 1NV-309 (Seal Water Injection Flow). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

e) **IF** control of 1NV-309 is lost from the control room, **THEN** dispatch operator with radio to perform the following:

__ (1) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed).

__ (2) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

f) Open the following valves:

__ • 1NV-312A (Chrg Line Cont Isol)

__ • 1NV-314B (Chrg Line Cont Isol).

g) **IF** 1NV-312A **OR** 1NV-314B cannot be opened, **THEN** dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 10 (Locally Open 1NV-312A)

__ • Enclosure 12 (Locally Open 1NV-314B).

__ h) Do not continue in this procedure until 1NV-312A and 1NV-314B are open.

__ i) **IF** NC pressure is greater than 1950 PSIG, **THEN** throttle 1NV-309 or 1NV-311 to 50% open.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

27. (Continued)

__ j) Open 1NV-294 (NV Pmps A&B Disch Flow Ctrl).

k) **IF** control of 1NV-294 is lost from the control room, **THEN**:

__ (1) Place the controller for 1NV-294 in the 100% demand position.

__ (2) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) to control charging flow as required in subsequent steps.

l) Close the following valves:

__ • 1NI-9A (NV Pmp C/L Inj Isol)

__ • 1NI-10B (NV Pmp C/L Inj Isol).

m) **IF** 1NI-9A **OR** 1NI-10B cannot be closed, **THEN** dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s):

__ • Enclosure 9 (Locally Close 1NI-9A)

__ • Enclosure 11 (Locally Close 1NI-10B).

n) Throttle charging and seal injection to maintain the following:

__ • Charging line flow between 60 GPM and 180 GPM

__ • NC pump seal injection flow.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
	__ o) **WHEN** 1NV-203A **AND** 1NV-202B are opened, **THEN** charging flow may be reduced below 60 GPM.
	__ p) **GO TO** Step 27.k.
2) Close the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol).	2) Dispatch operator to close the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 9 (Locally Close 1NI-9A) __ • Enclosure 11 (Locally Close 1NI-10B).
j. Establish charging as follows:	
__ 1) Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.	1) Perform the following: __ a) Place the controller for 1NV-294 in the 100% demand position. __ b) Dispatch operator with a radio to throttle 1NV-295 (NV Pmps A & B Disch Ctrl Isol) (AB-551, JJ-55, Rm 231) for 32 GPM charging line flow. __ c) Throttle 1NV-295 to control charging flow as required in subsequent steps.
__ 2) Close 1NV-309 (Seal Water Injection Flow).	2) Dispatch operator with radio to perform the following: __ a) Close 1NV-308 (Seal Wtr Inj Flow Ctrl Isol) (AB-554, JJ-54, Rm 233) (Ladder needed). __ b) Throttle 1NV-311 (Seal Wtr Inj Flow Ctrl Byp) (AB-555, JJ-54, Rm 233) to maintain 32 GPM seal water flow in subsequent steps.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
3) Open the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).	3) Dispatch operator to open the affected valve(s). Refer to the following enclosure(s) for the affected valve(s): __ • Enclosure 10 (Locally Open 1NV-312A) __ • Enclosure 12 (Locally Open 1NV-314B).
__ 4) Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.	__ 4) **<u>GO</u> <u>TO</u>** Step 27.j.6.
__ 5) Place 1NV-309 in auto.	
6) Perform the following: __ • Maintain charging flow less than 180 GPM. __ • Maintain 32 GPM seal water flow.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
k. Control charging as follows:	
__ 1) Control charging flow to maintain Pzr level stable.	
__ 2) Verify Pzr level - STABLE OR INCREASING.	2) **IF** Pzr level is decreasing, **THEN**: a) Open the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol). b) Close the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol). __ c) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ d) **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).
l. Ensure the following containment isolation signals - RESET: __ • Phase A __ • Phase B.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
27. (Continued)	
m. Establish VI to containment as follows:	m. Perform the following:
__ • Ensure 1VI-77B (VI Cont Isol) - OPEN.	1) Align N_2 to the Pzr PORVs by opening the following valves:
__ • Verify VI pressure - GREATER THAN 85 PSIG.	__ • 1NI-438A (Emer N2 From CLA A To 1NC-34A)
	__ • 1NI-439B (Emer N2 From CLA B To 1NC-32B).
	__ 2) **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.
n. Concurrently:	
__ • Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
__ • Monitor EP/1/A/5000/ES-1.1 (Safety Injection Termination), Enclosure 1 (Foldout Page)	
__ • **GO TO** EP/1/A/5000/ES-1.1 (Safety Injection Termination), Step 12.	
__ 28. **Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).**	
29. **Control S/G levels as follows:**	
__ a. Verify N/R level in all S/Gs - GREATER THAN 11%.	__ a. Maintain total feed flow greater than 450 GPM until at least one S/G N/R level is greater than 11%.
__ b. Throttle feed flow to maintain all S/G N/R levels between 11% and 50%.	__ b. **IF** N/R level in any S/G continues to increase in an uncontrolled manner, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
30. **Verify secondary radiation is normal as follows:**	
a. Ensure the following signals - RESET:	
__ 1) Phase A Containment Isolations	
__ 2) CA System valve control	
__ 3) KC NC NI NM St signals.	
__ b. Align all S/Gs for chemistry sampling.	
c. Perform at least one of the following:	
__ • Notify Chemistry to sample all S/Gs for activity.	
OR	
__ • Notify RP to frisk all cation columns for activity.	
d. Verify the following EMF trip 1 lights - DARK:	__ d. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
__ • 1EMF-33 (Condenser Air Ejector Exhaust)	
__ • 1EMF-26 (Steamline 1A)	
__ • 1EMF-27 (Steamline 1B)	
__ • 1EMF-28 (Steamline 1C)	
__ • 1EMF-29 (Steamline 1D).	
__ e. **<u>WHEN</u>** activity results are reported, **<u>THEN</u>** verify all S/Gs indicate no activity.	e. Perform the following: __ 1) Notify station management to evaluate S/G(s) activity results. __ 2) **<u>IF</u>** S/G(s) activity indicate a SGTR, **<u>THEN</u> <u>GO</u> <u>TO</u>** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. **Verify auxiliary building radiation is normal as follows:**	**Evaluate cause of abnormal conditions as follows:**
__ • EMF-41 (Aux Bldg Ventilation) trip 1 light - DARK	__ a. Monitor OAC EMF alarms, OAC VA Graphic, and area monitor EMFs to determine location of activity.
__ • All area monitor EMF trip 1 lights - DARK	__ b. Dispatch operator to locate potential leak.
	__ c. <u>IF</u> cause of alarm is LOCA outside containment, **THEN <u>GO TO</u>** EP/1/A/5000/ECA-1.2 (LOCA Outside Containment).
32. **Verify PRT conditions are normal as follows:**	**Evaluate following possible causes of abnormal PRT conditions:**
__ • PRT pressure - LESS THAN 8 PSIG	__ • Pzr safety temperatures __ • Pzr safety relief flow indicated
__ • PRT level - LESS THAN 89%	__ • Pzr PORVs __ • Rx head vents
__ • PRT temperature - LESS THAN 130°F.	__ • NC pump seal return header relief __ • Letdown orifice header relief.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
33. **Ensure S/I - RESET:**	
__ a. ECCS.	a. **IF** either reactor trip breaker is closed, **THEN**: __ 1) Ensure reactor trip breakers - OPEN. __ 2) **WHEN** trip breakers open, **THEN** reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	
34. **Ensure the following containment isolation signals - RESET:** __ • Phase A __ • Phase B.	
35. **Establish VI to containment as follows:** __ • Ensure 1VI-77B (VI Cont Isol) - OPEN. __ • Verify VI pressure - GREATER THAN 85 PSIG.	**Perform the following:** a. Align N_2 to the Pzr PORVs by opening the following valves: __ • 1NI-438A (Emer N2 From CLA A To 1NC-34A) __ • 1NI-439B (Emer N2 From CLA B To 1NC-32B). __ b. **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
36. **Verify criteria to stop operating ND pumps as follows:**	
__ a. NC pressure - GREATER THAN 285 PSIG.	__ a. **GO TO** EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).
__ b. NC pressure - STABLE OR INCREASING.	__ b. **GO TO** Step 37.
__ c. At least one ND pump - ON.	__ c. **GO TO** Step 36.e.
__ d. Ensure all ND pump(s) with suction aligned to FWST - STOPPED.	
__ e. **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart ND pumps.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
37. **Verify conditions to stop operating D/Gs as follows:**	
__ a. At least one D/G - ON.	__ a. **<u>GO</u> <u>TO</u>** Step 38.
b. Verify 1ETA is energized by offsite power as follows: __ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	b. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **<u>REFER</u> <u>TO</u>** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **<u>GO</u> <u>TO</u>** Step 37.d.
__ c. Dispatch operator to stop 1A D/G and place in standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows: __ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	d. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **<u>REFER</u> <u>TO</u>** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **<u>GO</u> <u>TO</u>** Step 38.
__ e. Dispatch operator to stop 1B D/G and place in standby readiness. **<u>REFER</u> <u>TO</u>** OP/1/A/6350/002 (Diesel Generator Operation).	
__ 38. **<u>RETURN</u> <u>TO</u> Step 21.**	

<u>END</u>

1. **IF any S/G(s) suspected ruptured, THEN perform the following:**

   - **WHEN** the following conditions met:

     - Total CA flow - GREATER THAN 450 GPM

     AND

     - All intact S/G(s) N/R level - GREATER THAN 11%(29% ACC)

     THEN throttle feed flow to ruptured S/G(s) to maintain ruptured S/G(s) N/R level between 11%(29% ACC) and 39%.

2. **NC Pump Trip Criteria:**

   - **IF** the following conditions are satisfied, **THEN** trip all NC pumps while maintaining seal injection flow:

     - At least one NV or NI pump - ON

     - NC subcooling based on core exit T/Cs - LESS THAN OR EQUAL TO 0°F.

3. **CA Suction Source Switchover Criteria:**

   - **IF** either of the following annunciators are lit, **THEN REFER TO** AP/1/A/5500/006 (Loss of S/G Feedwater):

     - 1AD-5, H/4 "CACST LO LEVEL"

     OR

     - 1AD-8, B/1 "UST LO LEVEL".

4. **Position Criteria for 1NV-202B and 1NV-203A (NV Pumps A&B Recirc Isol):**

   - **IF** NC pressure is less than 1500 PSIG **AND** NV S/I flowpath is aligned, **THEN** close 1NV-202B and 1NV-203A.

   - **IF** NC pressure is greater than 2000 PSIG, **THEN** open 1NV-202B and 1NV-203A.

5. **Cold Leg Recirc Switchover Criterion:**

   - **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **AND** an S/I has occurred, **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify proper VC/YC operation as follows:**	BOP DOES THIS ENCLOSURE
a. Verify one train of the following equipment is in operation: __ • YC chiller __ • CR AHU-1 __ • CRA AHU-1 __ • CRA PFT-1.	a. Perform the following: __ 1) Shift operating VC/YC trains. **<u>REFER</u> <u>TO</u>** Enclosure 6 (Shifting Operating VC/YC Train). 2) **<u>IF</u>** no train can be properly aligned, **<u>THEN</u>** dispatch operator and IAE/Maintenance to restore at least one train of VC/YC. **<u>REFER</u> <u>TO</u>** the following: __ • OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System) __ • EM/0/A/5200/001 (Troubleshooting Cause For Improper Operation of VC/YC System).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

b. Verify the following alarms - DARK:

__ • 1AD-18, A/8 "UNIT 1 INTAKE HI CHLORINE 1A"

__ • 1AD-18, B/8 "UNIT 1 INTAKE HI CHLORINE 1B"

__ • 1AD-18, D/8 "UNIT 2 INTAKE HI CHLORINE 2A"

__ • 1AD-18, E/8 "UNIT 2 INTAKE HI CHLORINE 2B".

b. **IF** chlorine odor is detected in the Control Room, **THEN** perform the following based on the status of given alarms:

1) **IF** detectors on both unit intakes are in alarm, **THEN**:

a) Ensure the following VC intake dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet)
__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ b) **GO TO** Step 1.d.

2) **IF** Unit 1 intake HI chlorine detector(s) in alarm, **THEN**:

a) Ensure the following VC dampers - CLOSED:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet).

b) Ensure the following dampers - OPEN:

__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

__ c) **GO TO** Step 1.d.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

3) **IF** Unit 2 intake Hi chlorine detector(s) in alarm, **THEN**:

   a) Ensure the following VC dampers - CLOSED:

   __ • 2VC-5B (CRA Filt Inlet)
   __ • 2VC-6A (CRA Filt Inlet).

   b) Ensure the following dampers - OPEN:

   __ • 1VC-5B (CRA Filt Inlet)
   __ • 1VC-6A (CRA Filt Inlet).

   __ c) **GO TO** Step 1.d.

c. Ensure the following VC dampers - OPEN:

__ • 1VC-5B (CRA Filt Inlet)
__ • 1VC-6A (CRA Filt Inlet)
__ • 2VC-5B (CRA Filt Inlet)
__ • 2VC-6A (CRA Filt Inlet).

d. Repeat Step 1 of this enclosure until notified by station management as follows:

__ • At least once every 8 hours

OR

__ • Any time VC/YC related annunciators on 1AD-18 actuate.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. **Ensure proper VA System operation as follows:**

- Ensure the following fans - OFF:

__ • ABUXF 1A
__ • ABUXF 1B.

- Ensure VA System filter is in service as follows:

__ • 1ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED

__ • 1ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.

- Ensure the following fans - ON:

__ • ABFXF-1A
__ • ABFXF 1B.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Verify proper VE System operation as follows:**	
__ a. VE fans - ON.	__ a. Manually start fan(s).
__ b. Annulus pressure - BETWEEN -1.4 IN. WC AND -1.8 IN. WC.	b. Perform the following:

1) **IF** annulus pressure is more positive than -1.4 in. WC, **THEN**:

a) Verify flow indicated on the following indications:

__ • "VE 1A FLOW TO STACK"
__ • "VE 1B FLOW TO STACK".

b) **IF** flow is not indicated, **THEN** dispatch operator to verify status of the following dampers based on their local indication or their operating piston rods being extended 4" to 6":

__ • 1AVS-D-2 (VE A Trn Recirc Damp) (AB-603, JJ-51, Rm 500) - CLOSED

__ • 1AVS-D-7 (VE B Trn Recirc Damp) (AB-603, HH-52, Rm 500) - CLOSED

__ • 1AVS-D-3 (VE A Trn Exh Damp) (AB-603, JJ-52, Rm 500) - OPEN

__ • 1AVS-D-8 (VE B Trn Exh Damp) (AB-603, HH-52, Rm 500) - OPEN.

__ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **REFER TO** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure).

__ d) **GO TO** Step 3.c.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	
	2) **IF** annulus pressure is more negative than -1.8 in. WC, **THEN**: __ a) Determine which VE train indicates highest discharge flow to stack. __ b) Within 2 hours, ensure VE train that indicates highest discharge flow to stack is secured. __ c) Consult plant engineering staff and notify IAE/Maintenance to troubleshoot and repair. **REFER TO** EM/1/A/5200/002 (Troubleshooting Cause For VE System Hi/Lo Pressure).
__ c. Repeat Step 3.b every 30 minutes until notified by station management.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 4. **Record time ventilation systems are verified on following table:**

TIME	SYSTEM (VC, VE)	INITIALS

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. **Ensure proper Unit 2 VA System operation as follows:**

   - Ensure the following fans - OFF:

     __ • ABUXF-2A
     __ • ABUXF-2B.

   - Ensure VA System filter is in service as follows:

     __ • 2ABF-D-12 & 19 (VA Filter A Bypass Dampers) - CLOSED

     __ • 2ABF-D-5 & 20 (VA Filter B Bypass Dampers) - CLOSED.

   - Ensure the following fans - ON:

     __ • ABFXF-2A
     __ • ABFXF-2B.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Verify at least one NC pump - ON.** RO DOES THIS ENCLOSURE	**Perform the following:** a. Use NC T-Colds to determine NC temperature as required in subsequent steps. b. **GO TO** Step 4.
2. **Use NC T-Avg to determine NC temperature as required in subsequent steps.**	
3. **IF AT ANY TIME NC pumps are tripped, THEN use NC T-Colds to determine NC temperature as required in subsequent steps.**	
4. **Verify one of the following:** • NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F. OR • NC temperature - TRENDING TO 557°F.	**GO TO Step 7.**
5. **Continue to monitor NC temperature.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. **Do not continue in this enclosure until one of the following occurs:**

   - NC temperature - GREATER THAN 557°F AND INCREASING IN AN UNCONTROLLED MANNER.

   OR

   - NC temperature - GREATER THAN 557°F AND STABLE.

   OR

   - NC temperature - LESS THAN 557°F AND DECREASING IN AN UNCONTROLLED MANNER.

7. **Verify NC temperature - LESS THAN 557°F AND DECREASING.**

   Perform the following:

   a. **IF** NC temperature is greater than 557°F **AND** increasing, **THEN** stabilize NC temperature at 557°F as follows:

      1) **IF** steam dumps are available, **THEN** use steam dumps.

      2) **IF** steam dumps are not available, **THEN** use S/G PORVs.

   b. **IF** the following conditions exist:

      - NC temperature is greater than 557°F and stable

      - Time and manpower is available,

      THEN stabilize NC temperature at 557°F as follows:

      1) **IF** steam dumps are available, **THEN** use steam dumps.

      2) **IF** steam dumps are not available, **THEN** use S/G PORVs.

   c. **GO TO** Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. **Attempt to stop the NC cooldown as follows:**

    a. Ensure all steam dumps - CLOSED.

    b. Ensure all S/G PORVs - CLOSED.

    > b. **IF** any S/G PORV cannot be closed, **THEN** close its isolation valve.

    c. Ensure S/G blowdown is isolated.

    d. Close the following valves:

    - 1SM-77A (S/G 1A Otlt Hdr Bldwn C/V)
    - 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V)
    - 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V)
    - 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V).

    e. Depress and hold "S/V BEFORE SEAT DRN" "CLOSE" pushbutton (1MC-3) to close the following valves:

    - 1SM-41 (Stop Vlv #1 Before Seat Drn)
    - 1SM-44 (Stop Vlv #2 Before Seat Drn)
    - 1SM-43 (Stop Vlv #3 Before Seat Drn)
    - 1SM-42 (Stop Vlv #4 Before Seat Drn).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. (Continued)

f. Verify NC cooldown - STOPPED.

f. **IF** cooldown continues, **THEN** throttle feed flow as follows:

1) **IF** S/G N/R level is less than 11% (29% ACC) in all S/G's, **THEN** throttle feed flow to achieve the following:
   - Minimize cooldown
   - Maintain total feed flow greater than 450 GPM.

2) **WHEN** N/R level is greater than 11% (29% ACC) in at least one S/G, **THEN** throttle feed flow further to achieve the following:
   - Minimize cooldown
   - Maintain at least one S/G N/R level greater than 11% (29% ACC).

3) **IF** cooldown continues, **THEN** close the following valves:
   - All MSIVs
   - All MSIV bypass valves.

9. **Continue to perform the actions of this enclosure as required to ensure one of the following:**

- NC temperature - STABLE AT LESS THAN OR EQUAL TO 557°F.

OR

- NC temperature - TRENDING TO 557°F.

Duke Energy Catawba Nuclear Station **Loss of Reactor or Secondary Coolant** **Continuous Use**	Procedure No. **EP/1/A/5000/E-1** Revision No. **023** Electronic Reference No. **CP0094CP**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

At some point in this procedure, FWST level will drop to 37% and they will transition to ES-1.3

A. Purpose

This procedure provides actions to recover from a loss of reactor or secondary coolant.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 22, and EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink), Step 41 and EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink), Step 43 when a Pzr PORV is stuck open and its isolation valve cannot be closed.

b. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 26, with any of the following symptoms: high containment radiation, high containment pressure, or high containment recirculation sump level.

c. EP/1/A/5000/E-0 (Reactor Trip Or Safety Injection), Step 36, EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators), Step 8 and EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink), Step 46, when NC pressure is less than the shutoff head pressure of the ND pumps.

d. EP/1/A/5000/ES-1.1 (Safety Injection Termination), Step 14 and EP/1/A/5000/ES-1.1 (Safety Injection Termination), Step 33, and EP/1/A/5000/FR-I.2 (Response To Low Pressurizer Level), Step 8, if S/I has to be reinitiated.

e. EP/1/A/5000/E-2 (Faulted Steam Generator Isolation), Step 12, after identification and isolation of a faulted S/G.

f. EP/1/A/5000/ECA-0.2 (Loss Of All AC Power Recovery With S/I Required), Step 15, after normal injection mode conditions are established.

g. EP/1/A/5000/ECA-1.2 (LOCA Outside Containment), Step 3, when a LOCA outside containment is isolated.

h. EP/1/A/5000/FR-C.1 (Response To Inadequate Core Cooling), Step 21 and EP/1/A/5000/FR-C.1 (Response To Inadequate Core Cooling), Step 31, and EP/1/A/5000/FR-C.2 (Response To Degraded Core Cooling), Step 24, after core cooling has been established.

i. EP/1/A/5000/FR-H.1 (Response To Loss Of Secondary Heat Sink), Step 39, after secondary heat sink has been re-established and all Pzr PORVs are closed.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Monitor Enclosure 1 (Foldout Page).**

RO

2. **Verify main steamlines are intact as follows:**

__ • All S/G pressures - STABLE OR INCREASING

__ • All S/Gs - PRESSURIZED.

IF pressure in any S/G is decreasing in an uncontrolled manner OR any S/G is depressurized, THEN:

a. **IF** any faulted S/G(s) feedlines **OR** steamlines are not isolated, **THEN**:

__ 1) **IF** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation) has been performed for the affected S/G, **THEN GO TO** Step 2 RNO b.

__ 2) **GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).

b. **IF** the affected S/G(s) is faulted outside containment, **THEN** request RP to perform the following:

__ 1) Monitor the area of the steam fault for radiation.

__ 2) Notify the control room of any abnormal radiation conditions.

BOP

3. **Control intact S/G levels as follows:**

__ a. Verify N/R level in all intact S/Gs - GREATER THAN 11% (29% ACC).

__ a. Maintain total feed flow greater than 450 GPM until at least one intact S/G N/R level is greater than 11% (29% ACC).

__ b. Throttle feed flow to maintain all intact S/G N/R levels between 11% (29% ACC) and 50%.

__ b. **IF** N/R level any S/G continues to increase in an uncontrolled manner, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 4. **Verify secondary radiation is normal as follows:**	
a. Ensure the following signals - RESET:	
__ 1) Phase A Containment Isolations	
__ 2) CA System valve control	
__ 3) KC NC NI NM St signals.	
__ b. Align all S/Gs for Chemistry sampling.	
c. Perform at least one of the following:	
__ • Notify Chemistry to sample all S/Gs for activity.	
OR	
__ • Notify RP to frisk all cation columns for activity.	
d. Verify the following EMF trip 1 lights - DARK:	__ d. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
__ • 1EMF-33 (Condenser Air Ejector Exhaust)	
__ • 1EMF-26 (Steamline 1A)	
__ • 1EMF-27 (Steamline 1B)	
__ • 1EMF-28 (Steamline 1C)	
__ • 1EMF-29 (Steamline 1D).	
__ e. **WHEN** activity results are reported, **THEN** verify all S/Gs indicate no activity.	e. Perform the following: __ 1) Notify station management to evaluate S/G(s) activity results. __ 2) **IF** S/G(s) activity indicate a SGTR, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 5. **Verify Pzr PORV and isolation valve status as follows:**	
__ a. Power to all Pzr PORV isolation valves - AVAILABLE.	a. Dispatch operator to restore power to affected Pzr PORV isolation valve(s): __ • 1EMXD-F02C (PORV Isol Motor (1NC31B)) (AB-560, BB-50, Rm 372) __ • 1EMXC-F03C (Pressurizer Power Operated Relief Isol. Valve 1NC33A) (AB-577, BB-50, Rm 496) __ • 1EMXD-F05A (PORV Isol Motor (1NC35B)) (AB-560, BB-50, Rm 372).
__ b. All Pzr PORVs - CLOSED.	b. **<u>IF</u>** Pzr pressure is less than 2315 PSIG, **<u>THEN</u>**: __ 1) Manually close Pzr PORV(s). __ 2) **<u>IF</u>** any Pzr PORV cannot be closed, **<u>THEN</u>** close its isolation valve.
__ c. At least one Pzr PORV isolation valve - OPEN.	__ c. Open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
__ d. **<u>IF AT ANY TIME</u>** a Pzr PORV opens due to high pressure, **<u>THEN</u>**, after Pzr pressure decreases to less than 2315 PSIG, ensure the valve closes or is isolated.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 6. **Verify S/I termination criteria as follows:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **GO TO** Step 6.f.
b. Verify secondary heat sink as follows:	__ b. **GO TO** Step 6.f.
__ • N/R level in at least one intact S/G - GREATER THAN 11% (29% ACC)	
OR	
__ • Total feed flow to all intact S/Gs - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR INCREASING.	__ c. **GO TO** Step 6.f.
__ d. Pzr level - GREATER THAN 11% (20% ACC).	d. Perform the following: __ 1) **IF** NC pressure is increasing **AND** normal Pzr spray is available, **THEN** attempt to stabilize NC pressure using normal Pzr spray. __ 2) **GO TO** Step 6.f.
__ e. **GO TO** EP/1/A/5000/ES-1.1 (Safety Injection Termination).	
__ f. Monitor S/I termination criteria. **REFER TO** Enclosure 2 (S/I Termination Criteria).	
__ g. **IF AT ANY TIME** S/I termination criteria is met while in this procedure, **THEN RETURN TO** Step 6.	
BOP 7. **Verify proper NS pump operation as follows:**	
__ a. At least one NS pump - ON.	a. Perform the following: __ 1) **IF AT ANY TIME** an NS pump(s) starts while in this procedure, **THEN** perform Step 7. __ 2) **GO TO** Step 8.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
BOP b. Verify the following valves - OPEN:	b. Perform the following:
__ • 1FW-27A (ND Pump 1A Suct From FWST)	__ 1) **IF** NS pump(s) have previously been stopped more than once, **THEN GO TO** Step 8.
__ • 1FW-55B (ND Pump 1B Suct From FWST).	__ 2) **WHEN** containment pressure is less than 1 PSIG, **THEN** perform Steps 7.e through 7.h.
	__ 3) **GO TO** Step 8.
__ c. Containment pressure - LESS THAN 2.4 PSIG.	c. Perform the following:
	__ 1) **WHEN** containment pressure is less than 2.4 PSIG, **THEN** perform Step 7.
	__ 2) **GO TO** Step 8.
__ d. Verify operating NS pump(s) - HAVE REMAINED RUNNING SINCE INITIAL PHASE B SIGNAL.	__ d. **IF** NS pump(s) has previously been stopped, **THEN GO TO** Step 8.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
e. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following: __ a) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers. __ b) **WHEN** trip breakers open, **THEN** reset ECCS.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	
__ f. Reset NS.	
__ g. Stop NS pumps.	
h. Close the following valves: __ • 1NS-29A (NS Spray Hdr 1A Cont Isol) __ • 1NS-32A (NS Spray Hdr 1A Cont Isol) __ • 1NS-15B (NS Spray Hdr 1B Cont Isol) __ • 1NS-12B (NS Spray Hdr 1B Cont Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 8. **Verify criteria to stop operating ND pumps as follows:**	
__ a. NC pressure - GREATER THAN 285 PSIG.	__ a. **GO TO** Step 10.
__ b. NC pressure - STABLE OR INCREASING.	__ b. **GO TO** Step 9.
__ c. At least one ND pump - ON.	__ c. **GO TO** Step 8.h.
__ d. ND pumps suction - ALIGNED TO FWST.	__ d. **GO TO** Step 9.
__ e. Verify FWST level - GREATER THAN 45%.	e. Perform the following: 1) **IF AT ANY TIME** the following conditions exist: __ • Any ND pump(s) operating with flow - LESS THAN 1000 GPM TO THE LOOPS **AND** __ • KC to the associated ND HX - ISOLATED, __ **THEN** stop the affected ND pump(s) within 3 hours. __ 2) **GO TO** Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
f. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following: __ a) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers. __ b) **WHEN** trip breakers open, **THEN** reset ECCS.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	
__ g. Stop ND pumps.	
__ h. **IF AT ANY TIME** NC pressure decreases to less than 285 PSIG in an uncontrolled manner, **THEN** restart ND pumps.	
9. **Verify NC and S/G pressures as follows:**	
__ a. All S/G pressures - STABLE OR INCREASING.	__ a. **IF** S/G pressure is decreasing due to a faulted S/G, **THEN RETURN TO** Step 1.
__ b. NC pressure - STABLE OR DECREASING.	__ b. **RETURN TO** Step 1.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Verify conditions to stop operating D/Gs as follows:** BOP	
__ a. At least one D/G - ON.	__ a. **GO TO** Step 11.
b. Verify 1ETA is energized by offsite power as follows: __ • "D/G 1A BKR TO ETA" - OPEN __ • 1ETA - ENERGIZED.	b. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **GO TO** Step 10.d.
__ c. **WHEN** S/I is reset, **THEN** dispatch operator to stop 1A D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	
d. Verify 1ETB is energized by offsite power as follows: __ • "D/G 1B BKR TO ETB" - OPEN __ • 1ETB - ENERGIZED.	d. Perform the following: __ 1) Attempt to restore offsite power to affected switchgear. **REFER TO** AP/1/A/5500/007 (Loss of Normal Power). __ 2) **IF** 1ETA is energized from offsite power, **THEN GO TO** Step 10.f. __ 3) **GO TO** Step 11.
__ e. **WHEN** S/I is reset, **THEN** dispatch operator to stop 1B D/G and place in standby readiness. **REFER TO** OP/1/A/6350/002 (Diesel Generator Operation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	
BOP f. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following: __ a) **<u>IF</u>** either reactor trip breaker is closed, **<u>THEN</u>** dispatch operator to open Unit 1 reactor trip breakers. __ b) **<u>WHEN</u>** trip breakers open, **<u>THEN</u>** reset ECCS.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ 3) **<u>IF AT ANY TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.	

Depending on reader speed, FWST may be at 37% by this point. If not they will continue in this procedure until then and transition per Enclosure 1.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 11. **Obtain containment H_2 concentration as follows:**	
__ a. Ensure operator has been dispatched to secure all ice condenser air handling units. **REFER TO** Enclosure 3 (Securing All Ice Condenser Air Handling Units).	
__ b. Verify containment H_2 analyzers - IN SERVICE.	b. Perform the following: __ 1) Dispatch operator to place containment H_2 analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control System). __ 2) **WHEN** H_2 analyzers are in service, **THEN** perform Steps 11.c through 11.e. __ 3) **GO TO** Step 12.
__ c. Verify containment H_2 concentration - LESS THAN 6%.	c. Perform the following: __ 1) Obtain recommendation from station management for method to reduce H_2 concentration. __ 2) **GO TO** Step 12.
__ d. Verify containment H_2 concentration - LESS THAN 0.5%.	__ d. Dispatch operator to place H_2 recombiners in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control System).
__ e. **WHEN** the ice condenser air handling units are off **AND** H_2 concentration is less than 6%, **THEN** energize the H_2 igniters (1MC-7).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. **Initiate evaluation of plant status as follows:** BOP	
__ a. Verify S/I systems - ALIGNED FOR INJECTION MODE.	__ a. **<u>GO</u> <u>TO</u>** Step 12.c.
b. Verify Cold Leg Recirc capability as follows:	
__ 1) At least one ND pump - AVAILABLE.	__ 1) **<u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
2) Verify power to all of the following valves - AVAILABLE: __ • 1FW-27A (ND Pump 1A Suct From FWST) __ • 1NI-185A (ND Pump 1A Cont Sump Suct) __ • 1ND-28A (ND Supply To NV & 1A NI Pmps) __ • 1FW-55B (ND Pump 1B Suct From FWST) __ • 1NI-184B (ND Pump 1B Cont Sump Suct) __ • 1NI-332A (NI Pump Suct X-Over From ND) __ • 1NI-333B (NI Pump Suct From ND) __ • 1NI-334B (NI Pump Suct X-Over From ND) __ • 1NI-136B (ND Supply To NI Pump 1B).	2) Perform the following: • **<u>IF</u>** power cannot be verified to minimum number of valves required to perform the following: __ • Transfer one train of ND to the containment sump __ • Establish ND flow from containment sump to one train of NV and NI pumps. __ **<u>THEN</u> <u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12. (Continued)	
BOP 3) Verify power to all of the following valves - AVAILABLE: __ • 1NI-115A (NI Pump 1A Miniflow Isol) __ • 1NI-144A (NI Pump 1B Miniflow Isol) __ • 1NI-147B (NI Pump Miniflow Hdr To FWST Isol).	3) **IF** power cannot be verified to minimum number of valves required to isolate NI pump miniflow, **THEN** perform the following: __ • Attempt to restore power to miniflow isolation valve(s) • Have operator standing by to locally close the required valve: __ • 1NI-147B (NI Miniflow Hdr To FWST Isol) (AB-548, HH-JJ, 53-54, Rm 234) __ • 1NI-115A (NI Pump 1A Miniflow Isol) (AB-549, GG-HH, 53-54, Rm 235) __ • 1NI-144A (NI Pump 1B Miniflow Isol) (AB-548, HH-JJ, 53-54, Rm 234).
4) Verify the "ENABLE" lights for the following switches - LIT: __ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A" __ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".	__ 4) **WHEN** criteria for establishing Cold Leg Recirc are met, **THEN** manual alignment to containment sump will be required.
c. Verify auxiliary building radiation is normal as follows: __ • EMF-41 (Aux Bldg Ventilation) trip 1 light - DARK __ • All area monitor EMF trip 1 lights - DARK.	c. Evaluate cause of abnormal conditions as follows: __ 1) Monitor OAC EMF alarms, OAC VA Graphic, and area monitor EMFs to determine location of activity. __ 2) Dispatch operator to locate potential leak. __ 3) **IF** cause of alarm is LOCA outside containment, **THEN GO TO** EP/1/A/5000/ECA-1.2 (LOCA Outside Containment).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

12. (Continued)

d. **WHEN** the TSC is activated **AND** staffed, **THEN**:

__ 1) Notify the Reactor Engineer to assess core damage. **REFER TO** RP/0/A/5000/015 (Core Damage Assessment).

__ 2) Notify Chemistry to obtain current NC boron concentration.

__ 3) **WHEN** ND is aligned for Cold Leg Recirc, **THEN** notify Chemistry to obtain current containment sump boron concentration.

4) Notify Operating Engineer of the following:

__ a) VA is required to be aligned to normal within 72 hours of the event.

__ b) Evaluate aligning VA to normal mode. **REFER TO** OP/0/A/6450/003 (Auxiliary Building Ventilation System).

__ e. Notify station management to evaluate starting additional plant equipment to assist in recovery.

13. **Verify NC System cooldown and depressurization is required as follows:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ a. NC pressure - GREATER THAN 285 PSIG.	__ a. **IF** ND flow to C-Legs is greater than 675 GPM, **THEN GO TO** Step 14.
__ b. **GO TO** EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
14. **Verify transfer to Cold Leg Recirc as follows:**	
__ a. FWST level - LESS THAN 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" - LIT).	__ a. **<u>RETURN</u> <u>TO</u>** Step 11.
__ b. S/I systems - ALIGNED FOR COLD LEG RECIRC.	__ b. **<u>GO</u> <u>TO</u>** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).
15. **Isolate CLAs as follows:**	
__ a. Verify at least two NC T-Hots - LESS THAN 328°F.	a. Perform the following: __ 1) **<u>WHEN</u>** at least two NC T-Hots less than 328°F, **<u>THEN</u>** perform Steps 15.b through 15.d. __ 2) **<u>GO</u> <u>TO</u>** Step 16.
__ b. Dispatch operator to restore power to all CLA discharge isolation valves. **<u>REFER</u> <u>TO</u>** Enclosure 4 (Power Alignment for CLA Valves).	
c. Ensure S/I - RESET:	
__ 1) ECCS.	1) Perform the following: __ a) **<u>IF</u>** either reactor trip breaker is closed, **<u>THEN</u>** dispatch operator to open Unit 1 reactor trip breakers. __ b) **<u>WHEN</u>** trip breakers open, **<u>THEN</u>** reset ECCS.
__ 2) D/G load sequencers.	2) Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

15. (Continued)

   __ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.

   d. **WHEN** power is aligned, **THEN**:

      1) Close all of the following valves:

      __ • 1NI-54A (C-Leg Accum A Disch Isol)

      __ • 1NI-65B (C-Leg Accum B Disch Isol)

      __ • 1NI-76A (C-Leg Accum C Disch Isol)

      __ • 1NI-88B (C-Leg Accum D Disch Isol).

RNO:

1) Perform the following:

   a) Ensure containment isolation signals - RESET:

   __ • Phase A
   __ • Phase B.

   __ b) Ensure 1VI-77B (VI Cont Isol) - OPEN.

   __ c) **IF** VI pressure is less than 85 PSIG, **THEN** dispatch operator to ensure proper VI compressor operation.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

15. (Continued)

d) Vent any CLA which cannot be isolated as follows:

__ (1) Open 1NI-47A (C-Leg Accum N2 Sup Cont Isol).

__ (2) Place breaker 1CB-1 (behind 1MC-6) (Key #11) to "ON".

(3) Open the valve for CLA(s) to be vented:

__ • 1NI-50 (C-Leg Accum A N2 Supply Isol)

__ • 1NI-61 (C-Leg Accum B N2 Supply Isol)

__ • 1NI-72 (C-Leg Accum C N2 Supply Isol)

__ • 1NI-84 (C-Leg Accum D N2 Supply Isol).

__ (4) Close 1NI-47A.

__ (5) Open 1NI-83 (C-Leg Accums N2 Vent Ctrl) to depressurize the affected CLA(s).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

15. (Continued)

(6) **<u>WHEN</u>** CLA(s) is vented, **<u>THEN</u>**:

__ 1. Close 1NI-83.

2. Close valve(s) previously opened:

__ • 1NI-50 (C-Leg Accum A N2 Supply Isol)

__ • 1NI-61 (C-Leg Accum B N2 Supply Isol)

__ • 1NI-72 (C-Leg Accum C N2 Supply Isol)

__ • 1NI-84 (C-Leg Accum D N2 Supply Isol).

__ 3. Place breaker 1CB-1 (behind 1MC-6) to "OFF".

__ 2) Notify dispatched operator to remove power from all CLA isolation valves. **<u>REFER</u> <u>TO</u>** Enclosure 4 (Power Alignment for CLA Valves).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16. **Determine S/G depressurization requirements as follows:**	
__ a. Verify NC pressure - LESS THAN INTACT S/G(s) PRESSURE.	__ a. **<u>GO</u> <u>TO</u>** Step 18.
__ b. Notify Chemistry to sample all S/Gs for activity levels.	
c. **<u>WHEN</u>** S/G sample results are known, **<u>THEN</u>**:	
__ 1) Request RP to perform a dose projection on steaming S/Gs.	
2) **<u>WHEN</u>** the dose projection is complete, **<u>THEN</u>**:	
__ a) Verify the dose projection for each S/G - ACCEPTABLE.	__ a) Do not dump steam from any S/G with an unacceptable dose projection.
__ b) Perform Step 17 for all intact S/Gs.	
__ d. **<u>GO</u> <u>TO</u>** Step 18.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. **Depressurize intact S/G(s) to NC pressure as follows:**	
__ a. Verify "C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT.	a. Perform the following: __ 1) Dump steam from all intact S/G(s) PORV until S/G pressure is less than NC pressure. __ 2) **GO TO** Step 18.
__ b. Depress ECCS steam pressure "BLOCK" pushbuttons.	
__ c. Verify MSIVs on all intact S/Gs - OPEN.	c. Perform the following: __ 1) Dump steam from all intact S/G(s) PORV until S/G pressure is less than NC pressure. __ 2) **GO TO** Step 18.
__ d. **WHEN** "P-12 LO-LO TAVG" status light (1SI-18) is lit, **THEN** place the steam dump interlock bypass switches in "BYP INTLK."	
__ e. Verify steam dumps - IN PRESSURE MODE.	e. Place steam dumps in pressure mode as follows: __ 1) Place "STM DUMP CTRL" M/A station in manual. __ 2) Manually adjust "STM DUMP CTRL" M/A station output to match "% STM DUMP DEMAND" (1SMP5211). __ 3) **WHEN** output on the "STM DUMP CTRL" M/A station is equal to the "% STM DUMP DEMAND" (1SMP5211), **THEN** place the steam dumps in pressure mode.
__ f. Dump steam to condenser until S/G pressure is less than NC pressure.	__ f. Dump steam from all intact S/G(s) PORV until S/G pressure is less than NC pressure.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 18. **Consult with station management to determine whether reactor vessel head should be vented.**	
19. **<u>WHEN</u> 4 hours after event initiation has elapsed, <u>THEN</u> verify power available to the following valves required for Hot Leg Recirc:**	
__ a. 1NI-121A (NI Pump 1A To H-Legs B&C).	__ a. Dispatch operator to ensure 1EMXA-R07C (Safety Inj. Pump 1A Hot Leg Inj. Header Isol. Valve 1NI121A) (AB-577, FF-54, Rm 478) - CLOSED.
__ b. 1NI-162A (NI To C-Legs Inj Hdr Isol).	__ b. Dispatch operator to ensure 1EMXA-R05A (Safety Inj. Pumps Cold Leg Inj. Hdr. Isol. Valve 1NI162A) (AB-577, FF-54, Rm 478) - CLOSED.
__ c. 1NI-152B (NI Pump 1B To H-Legs A&D).	__ c. Dispatch operator to ensure 1EMXJ-R06D (Safety Inj. Pump 1B Hot Leg Header Isol. Valve 1NI152B) (AB-560, GG-56, Rm 330) - CLOSED.
__ d. 1NI-173A (ND Hdr 1A To Cold Legs C&D).	__ d. Dispatch operator to ensure 1EMXA-R07D (ND Header 1A To NC Cold Leg Loops C & D Valve 1NI173A) (AB-577, FF-54, Rm 478) - CLOSED.
__ e. 1NI-178B (ND Hdr 1B To Cold Legs A&B).	__ e. Dispatch operator to ensure 1EMXJ-R04A (ND Header 1B To NC Cold Leg Loops A & B Valve 1NI178B) (AB-560, GG-56, Rm 330) - CLOSED.
__ f. 1NI-183B (ND Hdr A&B Hot Leg Inj Isol).	__ f. Dispatch operator to ensure 1EMXB-F01D (ND Header A&B Hot Leg Injection Isol Valve 1NI183B) (AB-560, FF-56, Rm 330) - CLOSED.
__ 20. **<u>WHEN</u> 6 hours after event initiation has elapsed, <u>THEN</u> <u>GO</u> <u>TO</u> EP/1/A/5000/ES-1.4 (Transfer To Hot Leg Recirculation).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 21. **Consult with station management to evaluate long term plant status.**	

END

1. **NC Pump Trip Criteria:**

   - **IF** the following conditions are satisfied, **THEN** trip all NC pumps while maintaining seal injection flow:

   __ • At least one NV or NI pump - ON

   __ • NC subcooling based on core exit T/Cs - LESS THAN OR EQUAL TO 0°F.

2. **S/I Reinitiation Criteria:**

   __ • **IF** NC subcooling based on core exit T/Cs is less than 0°F **OR** Pzr level cannot be maintained greater than 11% (20% ACC), **THEN** manually start S/I pumps and align valves as required to restore subcooling and Pzr level.

3. **Secondary Integrity Criteria:**

   __ • **IF** pressure in any unisolated S/G is decreasing in an uncontrolled manner **OR** any unisolated S/G is completely depressurized, **THEN GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).

4. **SGTR Transition Criteria:**

   - **IF** level in any S/G is increasing in an uncontrolled manner **OR** any S/G has abnormal radiation, **THEN**:

   __ a. Manually start S/I pumps and align valves.

   __ b. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

5. **Cold Leg Recirc Switchover Criterion:**

   __ • **IF** FWST level decreases to 37% (1AD-9, D/8 "FWST 2/4 LO LEVEL" lit), **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

Duke Energy Catawba Nuclear Station **Transfer to Cold Leg Recirculation** **Continuous Use**	Procedure No. **EP/1/A/5000/ES-1.3** Revision No. **021** Electronic Reference No. **CP0094CV**

PERFORMANCE

* * * * * * * * * * UNCONTROLLED FOR PRINT * * * * * * * * * *

(ISSUED) - PDF Format

A. Purpose

This procedure provides the necessary instructions for transferring the safety injection system and containment spray system to the recirculation mode.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 14, on low FWST level.

b. EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators), Step 10, on low FWST level.

c. Other procedures whenever FWST level reaches the switchover setpoint.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Monitor Enclosure 1 (Foldout Page).**

CAUTION **S/I recirculation flow to NC System must be maintained at all times.**

NOTE
- Steps 2 through 8 should be performed without delay.
- CSF should not be implemented until directed by this procedure.

BOP

2. **Verify at least one of the following annuniciators - LIT:**

__ • 1AD-20, B/3 "CONT. SUMP LEVEL >3.3 ft"

OR

__ • 1AD-21, B/3 "CONT. SUMP LEVEL >3.3 ft".

Perform the following:

a. Ensure S/I - RESET:

__ 1) ECCS.

__ 2) D/G load sequencers.

__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.

b. Ensure the following valves - CLOSED:

__ • 1FW-27A (ND Pump 1A Suct From FWST)

__ • 1FW-55B (ND Pump 1B Suct From FWST).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. (Continued)

c. **IF** valve(s) will not close, **THEN**:

__ 1) Stop associated ND pump(s).

2) Depress the following "DEFEAT" pushbutton(s) for the affected train(s):

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A"

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".

__ 3) Close the associated ND pump(s) containment sump suction valve(s).

__ d. **IF** FWST level less than 37% due to FWST puncture, **THEN RETURN TO** procedure and step in effect.

__ e. **IF** both NS pumps are off, **THEN GO TO** Step 2 RNO g.

f. **IF** either of the following annunciators are lit:

__ • 1AD-20, B/2 "CONT. SUMP LEVEL >2.5 ft"

OR

__ • 1AD-21, B/2 "CONT. SUMP LEVEL >2.5 ft",

__ **THEN GO TO** Step 3.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
	g. **IF** all of the following conditions met: __ • FWST level - LESS THAN 8% __ • NC temperature - GREATER THAN 200°F __ • Containment Spray - PREVIOUSLY IN SERVICE __ • Indicated containment sump level - GREATER THAN 0.5 FT. __ **THEN GO TO** Step 3.
	__ h. **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect.
	__ i. **IF** both "CONT. SUMP LEVEL >3.3 ft" annunciators on 1AD-20 and 1AD-21 dark, **THEN** stop all pumps taking suction from the containment sump.
	__ j. **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
__ 3. **Verify KC flow to ND heat exchangers - GREATER THAN 5000 GPM.** BOP	__ **Establish KC flow to affected ND Hx(s).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 4. **Ensure S/I - RESET:**	
__ a. ECCS.	a. Perform the following: __ 1) **IF** either reactor trip breaker is closed, **THEN** dispatch operator to open Unit 1 reactor trip breakers. __ 2) **WHEN** trip breakers open, **THEN** reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

BOP 5. **Align S/I system for recirc as follows:**

a. Verify following valves - OPEN:

__ • 1NI-185A (ND Pump 1A Cont Sump Suct)

__ • 1NI-184B (ND Pump 1B Cont Sump Suct).

1NI-184B will NOT be open. 10 seconds after they secure the pump, there will be a loss of all essential power to A train. "A" train power to essential equipment will not be restored for the remainder of the scenario.

a. Perform the following:

__ 1) Manually open affected valve(s).

2) **IF** valve(s) will not open, **THEN**:

__ a) Stop the ND pump(s) associated with a closed containment sump suction valve(s).

b) Close the associated ND pump(s) suction valve from the FWST:

__ • 1FW-27A (ND Pump 1A Suct From FWST)

__ • 1FW-55B (ND Pump 1B Suct From FWST).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5. (Continued)

BOP

c) **WHEN** the ND pump(s) suction valve from the FWST is closed, **THEN** perform the following:

(1) Attempt to manually open the affected containment sump suction valve(s).

__ • 1NI-185A (ND Pump 1A Cont Sump Suct)

__ • 1NI-184B (ND Pump 1B Cont Sump Suct).

(2) **IF** affected containment sump suction valve will not open, **THEN** dispatch two operators to open the affected valve(s):

__ • 1NI-185A (ND Pump 1A Cont Sump Suct) (AB-545, EE-FF, 52-53, Rm 217)

__ • 1NI-184B (ND Pump 1B Cont Sump Suct) (AB-545, FF-GG, 52-53, Rm 217).

Once they call, it will take 10 minutes to get the valve open, 5 to get there and 5 to open.

3) **IF** both containment sump suction valves are closed, **THEN**:

__ a) **IF** a valid red **OR** orange path procedure is in effect, **THEN** **RETURN TO** procedure in effect.

__ b) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

Both valves are NOT closed. 1NI-185A is open

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
BOP b. Verify following valves - CLOSED:	b. Perform the following:
__ • 1FW-27A (ND Pump 1A Suct From FWST)	__ 1) Manually close affected valve(s).
__ • 1FW-55B (ND Pump 1B Suct From FWST).	2) **IF** valve(s) will not close, **THEN**:
	__ a) Stop associated ND pump(s).
	b) Depress the following "DEFEAT" pushbutton(s) for the affected train(s):
	__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A"
	__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".
	__ c) Close the associated ND pump(s) containment sump suction valve(s).
	d) **IF** both containment sump suction valves are closed, **THEN**:
	__ (1) **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect.
	__ (2) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
BOP __ c. Verify ND pumps - ON.	c. Perform the following:
	__ 1) Start ND pump(s) with suction aligned to an open containment sump suction valve.
There should be no valid RED paths and the crew should go to ECA-1.1	2) **IF** no ND pump can be started **OR** no ND train can be aligned for recirc, **THEN**:
	__ a) **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect.
	__ b) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
d. Isolate NI pump miniflow as follows:	
__ 1) Verify NC pressure - LESS THAN 1620 PSIG.	1) Perform the following:
	__ a) Stop NI pumps.
	__ b) **WHEN** pressure is less than 1620 PSIG, **THEN** start NI pumps.
2) Close the following valves:	
__ • 1NI-115A (NI Pump 1A Miniflow Isol)	
__ • 1NI-144A (NI Pump 1B Miniflow Isol).	
__ 3) Place "PWR DISCON FOR 1NI-147B" switch in "ENABLE".	
__ 4) Close 1NI-147B (NI Pump Miniflow Hdr To FWST Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
e. Close the following valves: __ • 1ND-32A (ND Train 1A Hot Leg Inj Isol) __ • 1ND-65B (ND Train 1B Hot Leg Inj Isol).	
f. Verify at least one of the following NV pumps miniflow valves - CLOSED: __ • 1NV-203A (NV Pumps A&B Recirc Isol) OR __ • 1NV-202B (NV Pmps A&B Recirc Isol).	f. Perform the following: __ 1) **IF** 1NI-9A (NV Pmp C/L Inj Isol) **AND** 1NI-10B (NV Pmp C/L Inj Isol) are closed, **THEN** maintain charging flow greater than 60 GPM. 2) Close the following valves: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol).
g. Align ND train discharges to NI and NV pump suctions as follows: 1) Open the following valves: __ • 1NI-332A (NI Pump Suct X-Over From ND) __ • 1NI-333B (NI Pump Suct From ND). __ 2) Ensure 1NI-334B (NI Pump Suct X-Over From ND) - OPEN. 3) Open the following valves: __ • 1ND-28A (ND Supply To NV & 1A NI Pmps) __ • 1NI-136B (ND Supply To NI Pump 1B).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
h. Isolate FWST from NV and NI pumps as follows:	
__ 1) Place "PWR DISCON FOR 1NI-100B" switch in "ENABLE".	
__ 2) Close 1NI-100B (NI Pmps Suct From FWST).	__ 2) Dispatch operator to close 1NI-100B (NI Pmps Suct From FWST) (AB-552, HH-JJ, 53-54, Rm 234).
3) Close the following valves:	3) Perform the following:
__ • 1NV-252A (NV Pumps Suct From FWST)	a) **IF** 1NV-252A (NV Pumps Suct From FWST) cannot be closed, **THEN** dispatch operator to perform the following:
__ • 1NV-253B (NV Pumps Suct From FWST).	__ (1) Open 1EMXA-R04A (NV Pump Suction From FWST Motor (1NV252A)) (AB-577, FF-54, Rm 478).
	__ (2) Close 1NV-252A (NV Pumps Suct From FWST) (AB-554, HH-53, Rm 234) (Ladder needed).
	b) **IF** 1NV-253B (NV Pumps Suct From FWST) cannot be closed, **THEN** dispatch operator to perform the following:
	__ (1) Open 1EMXJ-R03A (NV Pump Suction From FWST Motor (1NV253B)) (AB-560, GG-56, Rm 330).
	__ (2) Close 1NV-253B (NV Pumps Suct From FWST) (AB-554, HH-JJ, 53-54, Rm 234) (Ladder needed).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
i. Verify proper recirc flow as follows: __ • "NV S/I FLOW" - INDICATING FLOW __ • NI pumps - INDICATING FLOW __ • ND pumps - INDICATING FLOW.	__ i. **<u>IF</u>** any S/I pump on without a suction flowpath, **<u>THEN</u>** stop the affected pump(s).
6. <u>WHEN</u> FWST level decreases to 11% (1AD-9, E/8 "FWST LO-LO LEVEL" alarm lit), <u>THEN</u> perform the following:	
__ a. Stop NS Pumps.	
__ b. Align NS for recirc. **<u>REFER TO</u>** Enclosure 2 (Aligning NS for Recirculation).	
7. <u>IF</u> any NS pump in service with suction aligned to FWST, <u>THEN</u> perform the following:	
__ a. Ensure appropriate operator is in possession of Enclosure 2 (Aligning NS for Recirculation).	
__ b. Designate operator to ensure NS pumps immediately secured when FWST level decreases to 11% **<u>OR</u>** 1AD-9, E/8 "FWST LO-LO LEVEL" alarm lit.	
__ c. **<u>IF</u>** time and manpower permit, **<u>THEN</u>** notify designated operator to review Enclosure 2 (Aligning NS for Recirculation) for current plant conditions.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Verify criteria for initiation of ND aux containment spray:**	
__ a. Containment pressure - GREATER THAN 3 PSIG.	a. Perform the following: __ 1) **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** containment pressure exceeds 3 PSIG, **<u>THEN</u>** perform Step 8. __ 2) Observe Caution prior to Step 9 and **<u>GO</u> <u>TO</u>** Step 9.
__ b. Time since reactor trip - GREATER THAN 50 MIN.	b. Perform the following: __ 1) Designate someone to notify Control Room Supervisor when 50 min from reactor trip has elapsed. __ 2) **<u>WHEN</u>** the time since reactor trip is greater than 50 min, **<u>THEN</u>** perform Step 8. __ 3) Observe Caution prior to Step 9 and **<u>GO</u> <u>TO</u>** Step 9.
c. Verify the following valves - CLOSED: __ • 1NS-43A (ND Pmp 1A To Cont Spray Hdr) __ • 1NS-38B (ND Pmp 1B To Cont Spray Hdr).	__ c. Observe Caution prior to Step 9 and **<u>GO</u> <u>TO</u>** Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
d. Verify core cooling can be maintained with minimum S/I flow as follows:	d. Perform the following:
__ • "NV S/I FLOW" - INDICATING FLOW __ • At least one NI pump - INDICATING FLOW.	__ 1) **IF** both ND trains are aligned **AND** operating in Cold Leg Recirc, **THEN GO TO** Step 8.e.
	2) **IF** one NV **AND** one NI pump are available, **THEN**:
	__ a) **IF** NC pressure is greater than 285 PSIG, **THEN GO TO** Step 8.e.
	__ b) Ensure one NV pump - ON.
	__ c) Ensure one NI pump - ON.
	d) Open the following valves: __ • 1NI-9A (NV Pmp C/L Inj Isol) __ • 1NI-10B (NV Pmp C/L Inj Isol).
	e) Close the following valves: __ • 1NV-312A (Chrg Line Cont Isol) __ • 1NV-314B (Chrg Line Cont Isol).
	__ f) **IF** "NV S/I FLOW" **AND** NI pump flow is indicated, **THEN GO TO** Step 8.e.
	__ 3) Observe Caution prior to Step 9 and **GO TO** Step 9.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

8. (Continued)

e. Align one ND train to provide aux containment spray as follows:

- Train A:

__ 1) Place "PWR DISCON FOR 1NI-173A" switch in "ENABLE".

__ 2) Close 1NI-173A (ND Hdr 1A To Cold Legs C&D).

__ 3) Open 1NS-43A (ND Pmp 1A To Cont Spray Hdr).

OR

- Train B:

__ 1) Place "PWR DISCON FOR 1NI-178B" switch in "ENABLE".

__ 2) Close 1NI-178B (ND Hdr 1B To Cold Legs A&B).

__ 3) Open 1NS-38B (ND Pmp 1B To Cont Spray Hdr).

__ f. **WHEN** containment pressure is less than 1 PSIG, **THEN** secure ND Aux Spray. **REFER TO** Enclosure 4 (Securing ND Aux Spray).

CAUTION **If a B/O occurs, NV/NI pump(s) may sequence on or be left in service without adequate suction, It is critical to ensure ECCS pumps are not operated without adequate pump suction.**

9. **IF AT ANY TIME a B/O occurs, THEN perform the following:**

__ a. Ensure NV/NI pumps taking suction from de-energized ND pump(s) - OFF.

__ b. Restart S/I equipment previously on.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 10. **EP/1/A/5000/F-0 (Critical Safety Function Status Trees) may now be implemented.**	
11. **Verify proper recirc flow as follows:** __ • "NV S/I FLOW" - INDICATING FLOW __ • NI pumps - INDICATING FLOW __ • ND pumps - INDICATING FLOW.	**Perform the following:** a. **IF** at least one flow path cannot be established from the containment sump to the NC System, **THEN**: __ 1) **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect. __ 2) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation). __ b. **WHEN** time and manpower permit, **THEN** continue attempts to establish maximum Cold Leg Recirc capability.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE Monitoring for signs of containment sump blockage must be performed as long as ECCS pumps are aligned to sump.

12. **IF AT ANY TIME ECCS or NS pumps indicate signs of cavitation, OR loss of S/I recirc flow to NC system occurs, THEN perform the following:**

NOTE If adequate sump level exists and pumps cavitate, sump blockage should be suspected, unless other cause is known.

a. **IF** at least one train of Cold Leg Recirc cannot be maintained, **THEN** perform one of the following:

__ • **IF** sump blockage is suspected, **THEN GO TO** EP/1/A/5000/ECA-1.3 (Containment Sump Blockage).

OR

__ • **IF** loss of emergency coolant recirc is known to be caused by failure other than sump blockage, **THEN GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13. **Verify ND & NS rooms sump pump interlock status as follows:**	
a. Verify "ON" is released on the following switches: __ • "ND & NS ROOM SMP PMP 1A" __ • "ND & NS ROOM SMP PMP 1B" __ • "ND & NS ROOM SMP PMP 2A" (2MC11) __ • "ND & NS ROOM SMP PMP 2B" (2MC11).	__ a. Depress "LCL" on the affected switch(s) to release the "ON" button.
b. Verify "RESET" lights dark. __ • "ND & NS ROOM SMP PMP 1A" __ • "ND & NS ROOM SMP PMP 1B" __ • "ND & NS ROOM SMP PMP 2A" (2MC11) __ • "ND & NS ROOM SMP PMP 2B" (2MC11).	__ b. Dispatch operator to place the local control switch for the affected pump(s) to "STDBY" on 1ELCP0243 (AB-547, MM-53, Rm 212).
c. Place protective shrouds over the following control switches to prevent inadvertent reset: __ • "ND & NS ROOM SMP PMP 1A" __ • "ND & NS ROOM SMP PMP 1B" __ • "ND & NS ROOM SMP PMP 2A" (2MC11) __ • "ND & NS ROOM SMP PMP 2B" (2MC11).	
__ d. Consult station management for recommendation and concurrence prior to resetting the interlocks.	
14. **Determine if station management needs to evaluate transfer to hot leg recirc:**	
__ • Verify procedure entered from EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).	__ • Consult station management to evaluate the potential need for transfer to hot leg recirc.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **Initiate makeup to FWST as follows:**	
a. Verify the following valves - CLOSED:	a. Perform the following:
__ • 1NV-252A (NV Pumps Suct From FWST)	__ 1) **<u>WHEN</u>** all valves are closed, **<u>THEN</u>** perform Step 15.
__ • 1NV-253B (NV Pumps Suct From FWST)	__ 2) **<u>GO</u> <u>TO</u>** Step 16.
__ • 1FW-27A (ND Pump 1A Suct From FWST)	
__ • 1FW-55B (ND Pump 1B Suct From FWST)	
__ • 1NI-100B (NI Pmps Suct From FWST)	
__ • 1NS-20A (NS Pump 1A Suct From FWST)	
__ • 1NS-3B (NS Pump 1B Suct From FWST).	

<u>CAUTION</u>

- **Makeup to FWST greater than 50,000 gallons may violate containment flooding assumptions.**
- **Makeup to FWST at concentrations other than the minimum Tech Spec value may violate containment sump chemistry assumptions.**

__ b. Initiate makeup of 50,000 gallons to FWST at minimum Tech Spec boron concentration. **<u>REFER</u> <u>TO</u>** Enclosure 3 (FWST Makeup).

__ 16. **<u>RETURN</u> <u>TO</u> procedure and step in effect.**

<u>END</u>

1. **S/I Reinitiation Criteria:**

__ • **<u>IF</u>** NC subcooling based on core exit T/Cs is less than 0°F **<u>OR</u>** Pzr level cannot be maintained greater than 11% (20% ACC), **<u>THEN</u>** manually start S/I pumps and align valves as required to restore subcooling and Pzr level.

2. **Loss Of Emergency Coolant Recirculation:**

• **<u>IF</u>** Step 5 has been completed **<u>AND</u>** recirc flow is subsequently lost, **<u>THEN</u>** perform the following:

__ a. **<u>IF</u>** a valid red **<u>OR</u>** orange path procedure is in effect, **<u>THEN</u> <u>RETURN</u> <u>TO</u>** procedure in effect.

__ b. **<u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

3. **Loss Of FWST Supply To ECCS Pumps:**

__ • **<u>IF</u>** FWST level decreases to less than 11%, **<u>THEN</u>** stop NS pumps taking suction from the FWST.

__ • **<u>IF</u>** FWST level decreases to less than 5%, **<u>THEN</u>** stop all pumps taking suction from the FWST.

A. Purpose

This procedure provides actions to restore emergency coolant recirculation capability, to delay depletion of the FWST by adding makeup and reducing outflow, and to depressurize the NC System to minimize break flow.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 12, when Cold Leg Recirc capability cannot be verified.

b. EP/1/A/5000/ES-1.2 (Post LOCA Cooldown And Depressurization), Step 5, when Cold Leg Recirc capability cannot be verified.

c. EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation), Step 5, when at least one flowpath from the sump cannot be established or maintained.

d. EP/1/A/5000/ECA-1.2 (LOCA Outside Containment), Step 3, when a LOCA outside containment cannot be isolated.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **IF loss of Emergency Coolant Recirculation is due to sump blockage, THEN GO TO EP/1/A/5000/ECA-1.3 (Containment Sump Blockage).**

__ 2. **Monitor Enclosure 1 (Foldout Page).**

BOP

3. **Restore recirc capability as follows:**

a. Verify all of the following pumps - AVAILABLE TO BE OPERATED FROM THE CONTROL ROOM:

- __ ND pumps
- __ NV pumps
- __ NI pumps.

__ a. **IF** power is available to the affected essential bus(s), **THEN** dispatch operator and maintenance to determine and correct cause of pump failure. **REFER TO** EM/1/A/5200/005 (Troubleshooting Cause For ND, NI, or NV Pump(s) Failing to Start).

b. Verify the following valves - AVAILABLE TO BE OPERATED FROM THE CONTROL ROOM:

- __ 1NI-185A (ND Pump 1A Cont Sump Suct)
- __ 1NI-184B (ND Pump 1B Cont Sump Suct).

May not do this since the power loss is beyond just those breakers.

b. Perform the following:

1) **IF** power is not available, **THEN** dispatch operator to ensure the following breakers are closed:

- __ 1EMXA-R08D (ND Pump 1A Suction From Containment Sump Valve 1NI185A) (AB-577, FF-54, Rm 478)
- __ 1EMXB-F01C (ND Pump 1B Suction From Containment Sump Valve 1NI184B) (AB-560, FF-56, Rm 330).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. (Continued)

BOP

2) **IF** power cannot be restored to at least one valve **OR** valve cannot be operated from the control room, **THEN**:

__ a) **IF** ND Pump 1A is available, **THEN** dispatch two operators to standby to open 1NI-185A (ND Pump 1A Cont Sump Suct) (AB-545, EE-FF, 52-53, Rm 217).

This should already have been done in ES-1.3

__ b) **IF** ND Pump 1B is available, **THEN** dispatch two operators to standby to open 1NI-184B (ND Pump 1B Cont Sump Suct) (AB-545, FF-GG, 52-53, Rm 217).

c) **WHEN** at least one of the following - LIT:

__ • 1AD-20, B/2 "CONT. SUMP LEVEL >2.5 ft"

OR

__ • 1AD-21, B/2 "CONT. SUMP LEVEL >2.5 ft"

__ **THEN** have dispatched operator open affected valve(s).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	
BOP c. Verify containment sump level adequate as follows: __ • 1AD-20, B/2 "CONT. SUMP LEVEL >2.5 ft" - LIT OR __ • 1AD-21, B/2 "CONT. SUMP LEVEL >2.5 ft" - LIT OR • All of the following: __ • FWST level - LESS THAN 8% __ • NC temperature - GREATER THAN 200°F __ • Containment Spray - PREVIOUSLY IN SERVICE __ • Indicated containment sump level - GREATER THAN 0.5 FT.	__ c. **IF** NC inventory lost outside containment, **THEN GO TO** Step 4.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. (Continued)

BOP __ d. Verify Cold Leg Recirc capability - RESTORED.

d. Perform the following:

1) Continue attempts to restore recirc capability as follows:

__ • Power restoration
__ • Local valve operation
__ • Obtain maintenance assistance as required. **REFER TO** EM/1/A/5200/006 (Troubleshooting Cause For FW, ND, NI, or NV Valves(s) Failing to Operate).
__ • Other actions as specified by station management.

2) **WHEN** emergency coolant recirc capability is restored during this procedure, **THEN**:

a) **IF** transfer to Cold Leg Recirc is required, **THEN** perform the following:

(1) Ensure the following valves - OPEN:

__ • 1NS-29A (NS Spray Hdr 1A Cont Isol)
__ • 1NS-32A (NS Spray Hdr 1A Cont Isol)
__ • 1NS-15B (NS Spray Hdr 1B Cont Isol)
__ • 1NS-12B (NS Spray Hdr 1B Cont Isol).

__ (2) **GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

__ b) **RETURN TO** procedure and step in effect.

__ 3) **GO TO** Step 4.

__ e. **RETURN TO** procedure and step in effect.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 4. **Ensure S/I - RESET:**	
__ a. ECCS.	a. Perform the following: __ 1) **<u>IF</u>** either reactor trip breaker is closed, **<u>THEN</u>** dispatch operator to open Unit 1 reactor trip breakers. __ 2) **<u>WHEN</u>** trip breakers open, **<u>THEN</u>** reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **<u>IF AT ANY TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.	
BOP 5. **Depress the "DEFEAT" pushbuttons on the following switches:** __ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A" __ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".	
BOP 6. **Verify adequate FWST level as follows:**	
__ a. FWST level - GREATER THAN 5%.	__ a. **<u>GO TO</u>** Step 33.
__ b. **<u>IF AT ANY TIME</u>** FWST level is less than 5%, **<u>THEN GO TO</u>** Step 33.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 7. **Determine NS requirements as follows:**	
a. Verify following NS pump suction valves - OPEN:	__ a. **GO TO** Step 10.
__ • 1NS-20A (NS Pump 1A Suct From FWST)	
__ • 1NS-3B (NS Pump 1B Suct From FWST).	
__ b. Determine number of NS pumps required from the following table:	

FWST LEVEL	CONTAINMENT PRESSURE (PSIG)	NS PUMPS REQUIRED
GREATER THAN 5%	GREATER THAN 15	2
	BETWEEN 10 AND 15	1
	LESS THAN 10	0
LESS THAN 5%	N/A	0

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ c. Verify the number of NS pumps on - EQUAL TO NUMBER REQUIRED.	__ c. Manually operate NS pumps as required by table above.
	Will secure the 1B NS pump.
BOP 8. **Verify criteria to align NS for recirc as follows:**	
__ a. Any NS pump - ON.	__ a. **GO TO** Step 9.
b. Verify at least one of the following annunciators - LIT:	b. Perform the following:
__ • 1AD-20, B/3 "CONT. SUMP LEVEL >3.3 ft"	__ 1) **WHEN** at least one "CONT. SUMP LEVEL >3.3 ft" annunciator is LIT, **THEN GO TO** Step 8.c.
OR	__ 2) **GO TO** Step 9.
__ • 1AD-21, B/3 "CONT. SUMP LEVEL >3.3 ft".	
__ c. Align NS for recirc. **REFER TO** Enclosure 3 (Aligning NS for Recirculation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
BOP 9. **Align NS spray valves as follows:**	
__ a. Verify NS Pump 1A - ON.	a. Perform the following: __ 1) Ensure NS Train A - RESET. 2) Close the following valves: __ • 1NS-29A (NS Spray Hdr 1A Cont Isol) __ • 1NS-32A (NS Spray Hdr 1A Cont Isol).
__ b. Verify NS Pump 1B - ON.	b. Perform the following: __ 1) Ensure NS Train B - RESET. 2) Close the following valves: __ • 1NS-15B (NS Spray Hdr 1B Cont Isol) __ • 1NS-12B (NS Spray Hdr 1B Cont Isol).
c. **<u>IF AT ANY TIME</u>** NS pumps are stopped or started, **<u>THEN</u>**: __ • Ensure associated NS Train - RESET. __ • Close associated spray valves after securing a pump. __ • Open associated spray valves prior to starting a pump.	Depending on reader speed 1NI-184B should be open by this time and the crew would go back to ES-1.3 per enclosure 1 guidance.
__ 10. **Initiate makeup to FWST. <u>REFER TO</u> OP/1/A/6200/014 (Refueling Water System).**	

1. **Emergency Coolant Recirc Capability Restoration:**

   - **WHEN** emergency coolant recirc capability is restored during this procedure, **THEN**:

     a. **IF** transfer to Cold Leg Recirc is required, **THEN** perform the following:

        1) Ensure the following valves -OPEN:

        __ • 1NS-29A (NS Spray Hdr 1A Cont Isol)
        __ • 1NS-32A (NS Spray Hdr 1A Cont Isol)
        __ • 1NS-15B (NS Spray Hdr 1B Cont Isol)
        __ • 1NS-12B (NS Spray Hdr 1B Cont Isol).

        __ 2) **GO TO** EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirculation).

     __ b. **RETURN TO** procedure and step in effect.

2. **ECCS Suction Source Monitoring Criteria:**

   __ • **IF** the suction source is lost to any ECCS **OR** NS pump, **THEN** stop the affected pump.

   __ • **IF** FWST level decreases to less than 5%, **THEN** stop all pumps taking suction from the FWST.

   __ • **IF** both "CONT. SUMP LEVEL >2.5 ft" annunciators on 1AD-20 and 1AD-21 dark, **THEN** stop all pumps taking suction from the containment sump.

3. **CA Suction Source Switchover Criteria:**

   - **IF** either of the following annunciators are lit, **THEN REFER TO** AP/1/A/5500/006 (Loss of S/G Feedwater):

   __ • 1AD-5, H/4 "CACST LO LEVEL"

   OR

   __ • 1AD-8, B/1 "UST LO LEVEL".

Duke Energy Catawba Nuclear Station **Transfer to Cold Leg Recirculation**	Procedure No. **EP/1/A/5000/ES-1.3**
	Revision No. **021**
Continuous Use	Electronic Reference No. **CP0094CV**

PERFORMANCE

A. Purpose

This procedure provides the necessary instructions for transferring the safety injection system and containment spray system to the recirculation mode.

B. Symptoms or Entry Conditions

This procedure is entered from:

a. EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant), Step 14, on low FWST level.

b. EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization Of All Steam Generators), Step 10, on low FWST level.

c. Other procedures whenever FWST level reaches the switchover setpoint.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

BOP DOES ALL THESE ACTIONS

__ 1. **Monitor Enclosure 1 (Foldout Page).**

CAUTION **S/I recirculation flow to NC System must be maintained at all times.**

NOTE
- Steps 2 through 8 should be performed without delay.
- CSF should not be implemented until directed by this procedure.

2. **Verify at least one of the following annunciators - LIT:**

__ • 1AD-20, B/3 "CONT. SUMP LEVEL >3.3 ft"

OR

__ • 1AD-21, B/3 "CONT. SUMP LEVEL >3.3 ft".

Perform the following:

a. Ensure S/I - RESET:

__ 1) ECCS.

__ 2) D/G load sequencers.

__ 3) **IF AT ANY TIME** a B/O occurs, **THEN** restart S/I equipment previously on.

b. Ensure the following valves - CLOSED:

__ • 1FW-27A (ND Pump 1A Suct From FWST)

__ • 1FW-55B (ND Pump 1B Suct From FWST).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. (Continued)

c. **IF** valve(s) will not close, **THEN**:

__ 1) Stop associated ND pump(s).

2) Depress the following "DEFEAT" pushbutton(s) for the affected train(s):

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A"

__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".

__ 3) Close the associated ND pump(s) containment sump suction valve(s).

__ d. **IF** FWST level less than 37% due to FWST puncture, **THEN RETURN TO** procedure and step in effect.

__ e. **IF** both NS pumps are off, **THEN GO TO** Step 2 RNO g.

f. **IF** either of the following annunciators are lit:

__ • 1AD-20, B/2 "CONT. SUMP LEVEL >2.5 ft"

OR

__ • 1AD-21, B/2 "CONT. SUMP LEVEL >2.5 ft",

__ **THEN GO TO** Step 3.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
	g. **IF** all of the following conditions met: __ • FWST level - LESS THAN 8% __ • NC temperature - GREATER THAN 200°F __ • Containment Spray - PREVIOUSLY IN SERVICE __ • Indicated containment sump level - GREATER THAN 0.5 FT. __ **THEN GO TO** Step 3.
	__ h. **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect.
	__ i. **IF** both "CONT. SUMP LEVEL >3.3 ft" annunciators on 1AD-20 and 1AD-21 dark, **THEN** stop all pumps taking suction from the containment sump.
	__ j. **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
__ 3. **Verify KC flow to ND heat exchangers - GREATER THAN 5000 GPM.**	__ **Establish KC flow to affected ND Hx(s).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Ensure S/I - RESET:**	
__ a. ECCS.	a. Perform the following: __ 1) **<u>IF</u>** either reactor trip breaker is closed, **<u>THEN</u>** dispatch operator to open Unit 1 reactor trip breakers. __ 2) **<u>WHEN</u>** trip breakers open, **<u>THEN</u>** reset ECCS.
__ b. D/G load sequencers.	b. Dispatch operator to open the affected sequencer(s) control power breaker: __ • 1EDE-F01F (Diesel Generator Load Sequencer Panel 1DGLSA) (AB-577, BB-46, Rm 496) __ • 1EDF-F01F (Diesel Generator Load Sequencer Panel 1DGLSB) (AB-560, BB-46, Rm 372).
__ c. **<u>IF AT ANY TIME</u>** a B/O occurs, **<u>THEN</u>** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. **Align S/I system for recirc as follows:**	
a. Verify following valves - OPEN:	a. Perform the following:
__ • 1NI-185A (ND Pump 1A Cont Sump Suct)	__ 1) Manually open affected valve(s).
__ • 1NI-184B (ND Pump 1B Cont Sump Suct).	2) **IF** valve(s) will not open, **THEN**:
	__ a) Stop the ND pump(s) associated with a closed containment sump suction valve(s).
	b) Close the associated ND pump(s) suction valve from the FWST:
	__ • 1FW-27A (ND Pump 1A Suct From FWST)
	__ • 1FW-55B (ND Pump 1B Suct From FWST).
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5. (Continued)

c) **WHEN** the ND pump(s) suction valve from the FWST is closed, **THEN** perform the following:

(1) Attempt to manually open the affected containment sump suction valve(s).

__ • 1NI-185A (ND Pump 1A Cont Sump Suct)

__ • 1NI-184B (ND Pump 1B Cont Sump Suct).

(2) **IF** affected containment sump suction valve will not open, **THEN** dispatch two operators to open the affected valve(s):

__ • 1NI-185A (ND Pump 1A Cont Sump Suct) (AB-545, EE-FF, 52-53, Rm 217)

__ • 1NI-184B (ND Pump 1B Cont Sump Suct) (AB-545, FF-GG, 52-53, Rm 217).

3) **IF** both containment sump suction valves are closed, **THEN**:

__ a) **IF** a valid red **OR** orange path procedure is in effect, **THEN** **RETURN TO** procedure in effect.

__ b) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
b. Verify following valves - CLOSED:	b. Perform the following:
__ • 1FW-27A (ND Pump 1A Suct From FWST)	__ 1) Manually close affected valve(s).
__ • 1FW-55B (ND Pump 1B Suct From FWST).	2) **IF** valve(s) will not close, **THEN**:
	__ a) Stop associated ND pump(s).
	b) Depress the following "DEFEAT" pushbutton(s) for the affected train(s):
	__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN A"
	__ • "C-LEG RECIR FWST TO CONT SUMP SWAP TRN B".
	__ c) Close the associated ND pump(s) containment sump suction valve(s).
	d) **IF** both containment sump suction valves are closed, **THEN**:
	__ (1) **IF** a valid red **OR** orange path procedure is in effect, **THEN** **RETURN** **TO** procedure in effect.
	__ (2) **GO** **TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
__ c. Verify ND pumps - ON.	c. Perform the following:
Should start 1B ND pump at this time. CRITICAL TASK !	__ 1) Start ND pump(s) with suction aligned to an open containment sump suction valve.
	2) **IF** no ND pump can be started **OR** no ND train can be aligned for recirc, **THEN**:
	__ a) **IF** a valid red **OR** orange path procedure is in effect, **THEN RETURN TO** procedure in effect.
	__ b) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
d. Isolate NI pump miniflow as follows:	
__ 1) Verify NC pressure - LESS THAN 1620 PSIG.	1) Perform the following:
	__ a) Stop NI pumps.
	__ b) **WHEN** pressure is less than 1620 PSIG, **THEN** start NI pumps.
2) Close the following valves:	
__ • 1NI-115A (NI Pump 1A Miniflow Isol)	
__ • 1NI-144A (NI Pump 1B Miniflow Isol).	
__ 3) Place "PWR DISCON FOR 1NI-147B" switch in "ENABLE".	
__ 4) Close 1NI-147B (NI Pump Miniflow Hdr To FWST Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
e. Close the following valves: __ • 1ND-32A (ND Train 1A Hot Leg Inj Isol) __ • 1ND-65B (ND Train 1B Hot Leg Inj Isol).	
f. Verify at least one of the following NV pumps miniflow valves - CLOSED: __ • 1NV-203A (NV Pumps A&B Recirc Isol) OR __ • 1NV-202B (NV Pmps A&B Recirc Isol).	f. Perform the following: __ 1) **IF** 1NI-9A (NV Pmp C/L Inj Isol) **AND** 1NI-10B (NV Pmp C/L Inj Isol) are closed, **THEN** maintain charging flow greater than 60 GPM. 2) Close the following valves: __ • 1NV-203A (NV Pumps A&B Recirc Isol) __ • 1NV-202B (NV Pmps A&B Recirc Isol).
g. Align ND train discharges to NI and NV pump suctions as follows: 1) Open the following valves: __ • 1NI-332A (NI Pump Suct X-Over From ND) __ • 1NI-333B (NI Pump Suct From ND). __ 2) Ensure 1NI-334B (NI Pump Suct X-Over From ND) - OPEN. 3) Open the following valves: __ • 1ND-28A (ND Supply To NV & 1A NI Pmps) __ • 1NI-136B (ND Supply To NI Pump 1B).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
h. Isolate FWST from NV and NI pumps as follows:	
__ 1) Place "PWR DISCON FOR 1NI-100B" switch in "ENABLE".	
__ 2) Close 1NI-100B (NI Pmps Suct From FWST).	__ 2) Dispatch operator to close 1NI-100B (NI Pmps Suct From FWST) (AB-552, HH-JJ, 53-54, Rm 234).
3) Close the following valves:	3) Perform the following:
__ • 1NV-252A (NV Pumps Suct From FWST)	a) <u>IF</u> 1NV-252A (NV Pumps Suct From FWST) cannot be closed, **<u>THEN</u>** dispatch operator to perform the following:
__ • 1NV-253B (NV Pumps Suct From FWST).	__ (1) Open 1EMXA-R04A (NV Pump Suction From FWST Motor (1NV252A)) (AB-577, FF-54, Rm 478).
	__ (2) Close 1NV-252A (NV Pumps Suct From FWST) (AB-554, HH-53, Rm 234) (Ladder needed).
	b) <u>IF</u> 1NV-253B (NV Pumps Suct From FWST) cannot be closed, **<u>THEN</u>** dispatch operator to perform the following:
	__ (1) Open 1EMXJ-R03A (NV Pump Suction From FWST Motor (1NV253B)) (AB-560, GG-56, Rm 330).
	__ (2) Close 1NV-253B (NV Pumps Suct From FWST) (AB-554, HH-JJ, 53-54, Rm 234) (Ladder needed).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
i. Verify proper recirc flow as follows: __ • "NV S/I FLOW" - INDICATING FLOW __ • NI pumps - INDICATING FLOW __ • ND pumps - INDICATING FLOW.	__ i. **IF** any S/I pump on without a suction flowpath, **THEN** stop the affected pump(s). THE SCENARIO CAN BE TERMINATED AT THIS POINT.
6. **WHEN FWST level decreases to 11% (1AD-9, E/8 "FWST LO-LO LEVEL" alarm lit), THEN perform the following:**	
__ a. Stop NS Pumps.	
__ b. Align NS for recirc. **REFER TO** Enclosure 2 (Aligning NS for Recirculation).	
7. **IF any NS pump in service with suction aligned to FWST, THEN perform the following:**	
__ a. Ensure appropriate operator is in possession of Enclosure 2 (Aligning NS for Recirculation).	
__ b. Designate operator to ensure NS pumps immediately secured when FWST level decreases to 11% **OR** 1AD-9, E/8 "FWST LO-LO LEVEL" alarm lit.	
__ c. **IF** time and manpower permit, **THEN** notify designated operator to review Enclosure 2 (Aligning NS for Recirculation) for current plant conditions.	