

2009 NRC EXAMINATION

Facility:	Catawba Nuclear Station	Scenario No.:	1	Op-Test No.:	2009 D-1
SNAP 141					
Examiners:	_____		Operators:	_____	
	_____			_____	
	_____			_____	
<ul style="list-style-type: none"> • 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 					
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 1B2 trips, 1B1 will not start		
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 <u>Additional Failures</u> 1BB-56A fails to auto close 1A ND pump fails to autostart		
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

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-0 O – Close containment isolation valves such that at least one valve is closed on each critical phase A penetration before the end of the scenario.

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	3

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 1B2 trips, 1B1 will not start, 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 – 3.4.9 Condition B 3.8.1 Conditions A, B, D, F 3.8.9 Condition A 3.7.8 Condition A

Event 5 – NC system leak, SRO Technical Specification

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

When a leakage rate has been determined, and 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 cleared 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,B

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

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

When step 5 of AP/1/A/5500/006 is read, the next event should be inserted. This will begin the major event.

Event 7 – Steam line break on 1A S/G

Initiating cue: 1AD-3, A/1

This is the major event.

Additional failures

- 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, Step 10.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.”

Scenario End Point

ANYTIME 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

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

①

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.

ALL PREVIOUS STEPS WILL BE SIGNED OFF AND ARE NOT INCLUDED HERE.

Enclosure 4.1

Unit Startup

OP/1/A/6100/001

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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
Per L&P 0.5 is limit. See L&P.

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

②

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.

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.

RO 5. Verify the affected I/R channel trip bypass status light (1SI-19) - LIT.

RO 6. Verify 1AD-2, C/4 "N/I SYS S/R & I/R TRIP BYPASS" - LIT.

RO 7. Ensure the "NIS RECORDER" - ALIGNED TO THE OPERABLE I/R CHANNEL.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

RO

- __ 8. **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).**
11. **Determine required notifications:**
- __ • **REFER TO RP/0/A/5000/001 (Classification Of Emergency)**
 - __ • **REFER TO RP/0/B/5000/013 (NRC Notification Requirements).**
- __ 12. **Notify Reactor Group Engineer of occurrence.**

ITEM 4 Condition F

None

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
1AD-20, A/1 and 1AD-21, A/1
and others

3

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.**

1B1 KC pump will not start and the crew will have to start an A train pump. This will require action in Step 14.

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 LIT, will go to RNO, But will NOT do actions because one KC pump will be on already.

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.**

___ 7. **Start additional KC pump(s) as necessary to supply any KC loads presently in service.**

___ **GO TO Step 8.**

___ **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.**

8. **Verify KC flow to NC pumps as follows:**

- ___ • **1AD-20, A/1 "KC SUPPLY HDR FLOW TO NCP BRGS LOW" - DARK**
- ___ • **1AD-21, A/1 "KC SUPPLY HDR FLOW TO NCP BRGS LOW" - DARK**

Perform the following:

a. Ensure the following valves - OPEN:

- ___ • **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 Oflt Isol) - CLOSED
- ___ (4) 1NV-189B (VCT Oflt 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.**

- ___ 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).

none will be needed

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:**

Perform the following:

a. Verify the following:

___ • 1AD-10, A/1 "KC SURGE TANK A LO-LO LEVEL" - DARK

___ 1) Both Unit 1 RN Essential Headers - PRESSURIZED.

OR

___ • 1AD-10, A/2 "KC SURGE TANK B LO-LO LEVEL" - DARK.

___ 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)

CNS
AP/1/A/5500/021

LOSS OF COMPONENT COOLING

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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. **IF** KC Surge Tank 1A level continues to decrease **OR** is empty, **THEN**:

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.**

This will require a swap of the switches so A train is in TEMP mode and B train is in MINIFLOW mode

15. **Determine and correct cause of loss of KC.**

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

TS 3.7.7 Condition A

• SLC 16.9-7 (Boration Systems Flow Path - Shutdown)

• 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

• **REFER TO RP/0/A/5000/001**
(Classification Of Emergency)

• **REFER TO 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**
- ___ • **1AD-7, H/3 "VCT HI TEMP" - DARK**
- ___ • **Normal letdown - IN SERVICE.**

- ___ a. **IF** letdown isolated, **THEN** refer to AP/1/A/5500/012 (Loss Of Charging Or Letdown).
- ___ b. Do not continue in this procedure until Step 21 conditions are met.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

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

a. **IF** desired to align NV pump suction to VCT, then perform the following:

1) Open the following valves:

___ • 1NV-188A (VCT Off Isol)

___ • 1NV-189B (VCT Off Isol).

2) Close the following valves:

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

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

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

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

___ 23. **Determine long term plant status. RETURN TO procedure in affect.**

END

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	
***** UNCONTROLLED FOR PRINT ***** (ISSUED) - PDF Format	

4

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

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.**

__ b. **KC pump(s) - IN SERVICE AS NEEDED.**

__ c. **At least one NV pump - ON.**

__ d. **CA pump - ON.**

__ e. **VC/YC chiller - ON.**

__ 3. **Verify CA Pump #1 - ON.**

__ 4. **Maintain reactor power less than or equal to 100%.**

__ 5. **Verify D/G on the affected bus - RUNNING.**

__ a. Manually start pump(s).

b. Perform the following:

__ 1) Manually start pump(s).

__ 2) Ensure KC Hx outlet mode switches - PROPERLY ALIGNED.

__ c. **REFER TO AP/1/A/5500/012 (Loss of Charging or Letdown).**

__ d. **IF CA pump is required to maintain S/G levels, THEN manually start pump.**

__ e. **REFER TO OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System).**

__ **IF CA Pump #1 is required to maintain S/G levels, THEN start CA Pump #1.**

The crew should not RESET CA to secure the CAPT. The CAPT will secure automatically when CA is RESET in step 12. Otherwise an overspeed condition could result if it is started later due to steam trapped in the line

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.**
- ___ b. At least one ND pump - ON.
- ___ c. 1AD-11, K/3 "4KV B/O BUS FTA VOLTAGE LO" - DARK.

- ___ a. **GO TO** Step 12.
- ___ b. **REFER TO** AP/1/A/5500/019 (Loss of Residual Heat Removal System).
- ___ 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) **REFER TO** Enclosure 16 (S/G Level Control).

__ 2) **GO TO** Step 14.

__ b. **IF AT ANY TIME** CF flow control to S/Gs is lost, **THEN** perform Step 13.

CAUTION **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.**

__ c. **IF AT ANY TIME** any vital or auxiliary control channel battery charger has been de-energized for greater than 1 hour, **THEN** dispatch operators to locally control affected CA flow path. **REFER TO** 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.
- ___ b. Place additional letdown orifice in service as necessary to control Pzr level.

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.

___ 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 3.4.9 Condition B
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
LEAK IS approximately 30 gpm

5

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.**

___ c. **IF** Pzr level is stable **OR** increasing, **THEN GO TO** Step 5.

(RNO continued on next page)

PZR level will still be decreasing and the crew will have to reduce letdown.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4. (Continued)

d. **IF** Pzr level continues to decrease,
THEN:

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

4. (Continued)

b) **IF** 1NV-13A (Letdn Orif 1A Otlf 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 Otlf Cont Isol).

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

— (4) Close 1NV-13A (Letdn Orif 1A Otlf 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 Otlf Cont Isol)

— • 1NV-11A (Letdn Orif 1C Otlf Cont Isol)

— • 1NV-13A (Letdn Orif 1A Otlf 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 resealed, **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 Oflt Isol).
- ___ d. Close 1NV-189B (VCT Oflt 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
- 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).

Leak size is approximately 30 gpm

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

- 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)
- 3.6.3 Containment Isolation Valves
- 3.7.17 (Secondary Specific Activity)
- SLC 16.7-9 (Standby Shutdown System)

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

EVENT 6 can begin here.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

1. **Verify one train of the following equipment is in operation:**

- ___ • YC chiller
- ___ • CR AHU-1
- ___ • CRA AHU-1
- ___ • CRA PFT-1

2. **Verify the following annunciators - 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"

Perform the following:

- ___ a. Shift operating VC/YC trains. **REFER TO** Enclosure 15 (Shifting Operating VC/YC Train).
- b. **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).

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

- a. **IF** detectors on both unit intakes are in alarm, **THEN**:
 - 1) 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).
 - ___ 2) **GO TO** Step 4.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

2. (Continued)

- b. **IF** Unit 1 intake HI chlorine detector(s) in alarm, **THEN**:
- 1) Ensure the following VC dampers - CLOSED:
 - ___ • 1VC-5B (CRA Filtr Inlet)
 - ___ • 1VC-6A (CRA Filtr Inlet).
 - 2) Ensure the following dampers - OPEN:
 - ___ • 2VC-5B (CRA Filtr Inlet)
 - ___ • 2VC-6A (CRA Filtr Inlet).
 - ___ 3) **GO TO** Step 4.
- c. **IF** Unit 2 intake Hi chlorine detector(s) in alarm, **THEN**:
- 1) Ensure the following VC dampers - CLOSED:
 - ___ • 2VC-5B (CRA Filtr Inlet)
 - ___ • 2VC-6A (CRA Filtr Inlet).
 - 2) Ensure the following dampers - OPEN:
 - ___ • 1VC-5B (CRA Filtr Inlet)
 - ___ • 1VC-6A (CRA Filtr Inlet).
 - ___ 3) **GO TO** Step 4.

3. **Ensure the following VC dampers - OPEN:**

- ___ • 1VC-5B (CRA Filtr Inlet)
- ___ • 1VC-6A (CRA Filtr Inlet)
- ___ • 2VC-5B (CRA Filtr Inlet)
- ___ • 2VC-6A (CRA Filtr Inlet).

CNS
AP/1/A/5500/010

REACTOR COOLANT LEAK
Enclosure 14 - Page 3 of 3
Control Room Ventilation System Verification

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ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4. Repeat 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.

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

6

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).

RO

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

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).

RO

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

Perform the following:

- a. **Manually start CA pumps.**
- b. **Manually align CA valve(s) as required to establish flow.**

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.

1A CA pump feeds A/B S/Gs
1B CA pump feeds C/D S/Gs
CAPT feeds all S/Gs

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4. **Control S/G levels as follows:**

___ 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. **WHEN** at least one S/G N/R level is greater than 11%, **THEN** throttle feed flow to maintain all S/G N/R levels between 11% - 50%.

___ 5. **REFER TO Case II (Loss of Normal CA Supply).**

MAJOR EVENT WILL BE INSERTED
WHEN THIS STEP IS READ

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).

7. **Determine required notifications:**

- ___ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency)
- ___ • **REFER TO** 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. REFER TO OP/1/A/6250/001 (Condensate and Feedwater System).**

MAJOR EVENT START

Initiating cue: 1AD-3, A/1

7a

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 Δ Ts - GREATER THAN THE OP Δ T SETPOINT
- 2 of 4 loop Δ Ts - GREATER THAN THE OT Δ T 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:

- __ • All rod bottom lights - LIT
- __ • All reactor trip and bypass breakers - OPEN
- __ • 1/R amps - DECREASING

Perform the following:

- __ a. Manually trip reactor.
- b. **IF** reactor will not trip, **THEN** concurrently:
 - __ • 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:

- __ • All turbine stop valves - CLOSED

Perform the following:

- __ 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.**

BOP DOES THIS PAGE

1ETB is NOT
energized

Perform the following:

- 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

- • 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:**

- **REFER TO RP/0/A/5000/001**
(Classification Of Emergency)
- **REFER TO 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. **IF** proper status light indication is not obtained, **THEN** 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.

CRITICAL TASK

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.

10. **Verify proper Phase B actuation as follows:**

BOP

- a. Containment pressure - HAS REMAINED LESS THAN 3 PSIG.

- a. Perform the following:

NOTE 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) **IF** flow is not indicated, **THEN** 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 H₂ 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.

___ b. **IF AT ANY TIME** containment pressure exceeds 3 PSIG while in this procedure, **THEN** perform Step 10.a.

BOP

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. **IF AT ANY TIME** a B/O occurs, **THEN** 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. **IF AT ANY TIME** a B/O occurs, **THEN** 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.
1B RN has no power, but
2B is running.

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.

BOP

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.

__ 17. **Verify proper S/I flow as follows:**

BOP

__ a. **"NV S/I FLOW" - INDICATING FLOW.**

__ b. **NC pressure - LESS THAN 1620 PSIG.**

__ a. Manually start NV pump(s) and align valves.

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.**

Flow may be less than 450 gpm due to operator action.

___ 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.**

___ 20. **Verify S/I equipment status based on monitor light panel - IN PROPER ALIGNMENT.**

BOP

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

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).

___ **Manually open valve(s).**

___ **Manually align equipment.**

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 H₂ 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

RO

24. **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 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).

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) **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**

B train VA is powered from Unit 2 and therefore is unaffected by the 1B train blackout.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

3. **Verify proper VE System operation as follows:**

a. **VE fans - ON.**

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.

a. Manually start fan(s).

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

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.

c. Ensure S/G blowdown is isolated.

d. Close the following valves:

- 1SM-77A (S/G 1A Off Hdr Bldwn C/V)

- 1SM-76B (S/G 1B Off Hdr Bldwn C/V)

- 1SM-75A (S/G 1C Off Hdr Bldwn C/V)

- 1SM-74B (S/G 1D Off 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)

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

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 Power Company Catawba Nuclear Station Faulted Steam Generator Isolation	Procedure No. EP/1/A/5000/E-2
	Revision No. 012
	Electronic Reference No. CP0094CZ
Continuous Use	
PERFORMANCE	
***** UNCONTROLLED FOR PRINT ***** (ISSUED) - PDF Format	

7b

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.**

IF all S/Gs are faulted, THEN GO TO 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. **GO TO** 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) **IF** 1CA-185 (S/G 1A CA Nozz Tempering Isol) cannot be closed, **THEN**:

a) Manually close the following valves:

— • 1CF-100 (S/G CA Nozz Tempering Ctrl)

— • 1CF-156 (By 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 (By 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) **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:

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).

No power last known position was
closed

2) Perform the following:

— 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)

No power last known
position was OPEN

1BB-56A should
already be
closed but if not
this RNO will be
done.

Skip to page 18, steps in between are
for isolating other S/Gs that may be
faulted, but none are in this case.

3) Perform the following:

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 (By 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 (By 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).
 - 2) 1CA-58A (CA Pmp A Disch To S/G 1B Isol).
 - 3) 1CA-54B (CA Pmp 1 Disch To S/G 1B Isol).
- d. Verify CA Pump 1A or 1B - AVAILABLE.
- 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).
- 1) Dispatch operator to close 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) (DH-583, FF-53, Rm 572).
- 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) 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. **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 1B S/G, **THEN GO TO** Step 7.e.
 - 3) **GO TO** Step 7.f.
- 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).

___ 2) 1BB-150B (S/G 1B Bldwn Cont
Isol Byp).

___ 1) Manually close valve.

2) Perform the following:

___ a) Manually close valve.

b) **IF** valve will not close **AND**
1BB-19A is open, **THEN**
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) IF valve will not close AND
1BB-19A is open, THEN
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) **IF** 1CA-187 (S/G 1C CA Nozz Tempering Isol) cannot be closed, **THEN:**

a) Manually close the following valves:

___ • 1CF-100 (S/G CA Nozz Tempering Ctrl)

___ • 1CF-156 (By 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 (By 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) **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-75A (S/G 1C Otlt Hdr Bldwn C/V).

___ 2) 1CA-46B (CA Pmp B Disch To S/G 1C Isol).

___ 3) 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol).

___ d. Verify CA Pump 1A or 1B - AVAILABLE.

___ 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).

___ 1) Dispatch operator to close 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V) (DH-580, GG, 52-53, Rm 572).

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) 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. **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-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).
- ___ 2) 1BB-149B (S/G 1C Bldwn Cont
Isol Byp).

___ 1) Manually close valve.

2) 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-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 (By 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 (By 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).
- 2) 1CA-42B (CA Pmp B Disch To S/G 1D Isol).
- 3) 1CA-38A (CA Pmp 1 Disch To S/G 1D Isol).

d. Verify the following blowdown isolation valves - CLOSED:

- 1) 1BB-8A (S/G 1D Bldwn Cont Isol Insd).

- 1) Dispatch operator to close 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 44-45, Rm 591).
- 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) 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).

- 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. **WHEN NC T-Hots start to increase, THEN dump steam from intact S/G PORVs to stabilize NC T-Hots.**

RO

9. **Verify the following annunciators - DARK.**

BOP

___ • 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:**

- ___ • **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.**

___ f. **WHEN activity results reported, THEN verify all S/Gs indicate no activity.**

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

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. **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

11. **Verify S/I termination criteria as follows:**

RO/BOP

___ a. NC subcooling based on core exit T/Cs - **GREATER THAN 0°F.**

___ a. **GO TO** Step 12.

b. **Verify secondary heat sink as follows:**

___ b. **GO TO** 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. **GO TO** Step 12.

___ d. Pzr level - **GREATER THAN 11% (20% ACC).**

___ d. **GO TO** Step 12.

___ e. **GO TO 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. **GO TO EP/1/A/5000/E-1 (Loss Of Reactor Or Secondary Coolant).**

END

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.

7c

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

C. Operator Actions

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

BOP

__ 2. **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) 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. **IF AT ANY TIME** a B/O occurs, **THEN** 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:

- ___ • Ensure 1VI-77B (VI Cont Isol) - OPEN.
- ___ • Verify VI pressure - GREATER THAN 85 PSIG.

Perform the following:

- a. Align N₂ 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 5. **Verify proper NS pump operation as follows:**

___ a. **Containment pressure - HAS EXCEEDED 3 PSIG.**

b. Verify the following valves - OPEN:

- ___ • 1FW-27A (ND Pump 1A Suct From FWST)
- ___ • 1FW-55B (ND Pump 1B Suct From FWST).

___ c. Containment pressure - LESS THAN 2.4 PSIG.

___ 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

___ a. **GO TO Step 6.**

b. Perform the following:

___ 1) **WHEN** containment pressure is less than 1 PSIG, **THEN** perform Steps 5.d through 5.f.

___ 2) **GO TO** Step 6.

c. Perform the following:

___ 1) **WHEN** containment pressure is less than 2.4 PSIG, **THEN** perform Step 5.

___ 2) **GO TO** Step 6.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

 7. **Verify NC pressure - STABLE OR INCREASING.**
RO

Perform the following:

- a. Ensure Pzr spray valves - CLOSED.
- b. **IF** NC pressure continues to decrease, **THEN GO TO EP/1/A/5000/ES-1.2** (Post LOCA Cooldown And Depressurization).

 8. **Verify VI pressure - GREATER THAN 50 PSIG.**
BOP

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. **Isolate NV S/I flowpath as follows:**
BOP

- a. **Verify the following valves - OPEN:**
- 1NV-252A (NV Pumps Suct From FWST)
 - 1NV-253B (NV Pumps Suct From FWST).

a. **IF** NV pump suctions are aligned for Cold Leg Recirc, **THEN:**

- 1) Close 1NV-309 (Seal Water Injection Flow).
- 2) **IF** control of 1NV-309 is lost from the control room, **THEN** 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:

- ___ • 1NV-203A (NV Pumps A&B Recirc Isol)
- ___ • 1NV-202B (NV Pmps A&B Recirc Isol).

IF 1NV-203A was closed earlier due to low NC system pressure per enclosure 1 of E-0, or E-2 they will go to the RNO and open it.

b. Perform the following:

- ___ 1) Open affected valve(s).
- ___ 2) **IF** 1NV-203A **AND** 1NV-202B are open, **THEN GO TO** 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) **IF** control of 1NV-309 is lost from the control room, **THEN** 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.

c. Close the following valves:

BOP

- ___ • 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).

SCENARIO MAY BE TERMINATED ANYTIME
AFTER THIS STEP

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)

__ b. Throttle 1NV-294 (NV Pmps A&B Disch Flow Ctrl) for 32 GPM charging line flow.

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

d. Open the following valves:

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

__ e. Verify 1NV-309 - ABLE TO BE OPERATED FROM THE CONTROL ROOM.

__ f. Place 1NV-309 in auto.

__ 7) **GO TO** Step 11.

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. 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. 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. **GO TO** Step 10.g.

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.**

___ b. **Stop NI pumps.**

___ 13. **Ensure all ND pump(s) with suction aligned to FWST - STOPPED.**

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).

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

___ b. **Pzr level - GREATER THAN 11%**
(20% ACC)

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. 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).

2009 NRC EXAMINATION

Facility:	Catawba Nuclear Station	Scenario No.:	<u>2a</u>	Op-Test No.:	<u>2009 D-1</u>
SNAP 142					
Examiners:	_____	Operators:	_____	_____	_____
<u>Initial Conditions:</u>					
<ul style="list-style-type: none"> • 100% power • EFPD = 25 days • Boron Concentration is 1348 ppm 					
<u>Turnover:</u>					
<ul style="list-style-type: none"> • 1CFP5600 (1D S/G Narrow Range Level Ch #2) failed 2 hours ago. IAE repairs are in progress and estimated to take 4 hours. All TSAIL entries have been made. • Reduce power to 87% 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	SRO	TS	1B S/G WR level fails low (TS call only)		
4	BOP SRO	C TS	RN Strainer 1A high D/P, backflush does not operate		
5	RO	C	Generator voltage regulator fails voltage low		
6	RO	C	Loss of condenser vacuum/ reduce load with turbine in manual		
7	BOP SRO	C TS	PZR Spray valve 1NC-27 fails open with no manual control		
8	ALL	M	Tube rupture on 1A S/G <u>Additional Failures</u> 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

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
MAL-IPE003B	PZR SPRAY VLV NC-27 FAIL, NO MAN CTRL	100	7	60	
MAL-ISE007A	AUTO CF ISOL SIGNAL TRN A	BLOCK			
MAL-ISE007B	AUTO CF ISOL SIGNAL TRN B	BLOCK			
MAL-MT003	LOSS OF CONDENSER VACUUM (VLV LEAK)	0	11	300	
MAL-MT003	LOSS OF CONDENSER VACUUM (VLV LEAK)	25	6		
MAL-MT010	GLAND STEAM REGULATOR FAILURE (TL3)	0	15		15
MAL-MT012	EXTRACTION STEAM SEAL REGULATOR FAILURE (TL10)	0	15		15
MAL-RN002A	RN STRNER 1A HI D/P	0	12		5
MAL-RN002A	RN STRNER 1A HI D/P	100	4	60	
MAL-RN002A	RN STRNER 1A HI D/P	0	14		5 Del in 1
MAL-RN002A	RN STRNER 1A HI D/P	100	10	60	
MAL-SG001A	S/G A TUBE LEAK	650	8		
MAL-SM002A	S/G PORV SV19 FAILURE	100	9		5
OVR-EGB004C	VOLTAGE ADJUST RAISE PB	OFF	5		
OVR-EBG004C	VOLTAGE ADJUST RAISE PB	OFF	13		Del in 1
OVR-EGB004D	VOLTAGE ADJUST LOWER PB	ON	5		Del in 8
VLV-NI001A	NI9A B.I.T. DISCHARGE ISOL VLV FAIL AUTO ACTIONS				
VLV-NI002A	NI10B B.I.T. DISCHARGE ISOL VLV FAIL AUTO ACTIONS				
VLV-RN061F	RN30A RN STRAINER A BCKWASH ISOL FAIL TO POSITION	0			
XMT-SG016	LCF_5600 S/G 1D N/R LVL CH2 TO DCS/MCB/OAC (CFAA5600)	0			
XMT-SG094	XCF_5620 S/G B W/R LVL CH 2 TO DCS/OAC (CFAA5620)	0	3		

XMT-MT011	PTL_5000 TURBINE SEAL STEAM HEADER PRESS MTR	3.2			
XMT-MT011	PTL_5000 TURBINE SEAL STEAM HEADER PRESS MTR	0	15	15	Del in 2

EVENT TRIGGERS (other than manual)

Event Trigger	Description
9	jpplp4(1) jpplp4(2) (Reactor Trip either train)
10	jpplsia jpplsib (Safety Injection either train)
11	rtlh004>0.035 & x01d047m>1.1 (TL4 not closed and Steam Seal Header Pressure > 1.1 psig)
12	X11i038f (1A RN pump off button depressed)
13	X01i135m (Voltage Regulator in manual)
14	X11i038f & jpplsib & !jpplsia (1A RN pump off button depressed and B SI and no A SI)
15	SMSS < 1165 (MW less than 1165)

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/5500/037 (Generator Voltage and Electric Grid Disturbances) revision 000
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 – 1B S/G WR level fails low, SRO Technical Specification

Initiating Cues:

- 1AD-2 alarms F/10 (DCS alarm screen shows actual alarm)

TS 3.3.3 Item 21, Conditions A, C

Event 4 – RN Strainer 1A high D/P, backflush does not operate, 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 5 – Generator voltage regulator fails voltage low

Initiating Cues:

- OAC alarm C1A0567 (Unit 1 Generator Volts) - LO

At Step 17, when the SOC is contacted for guidance on adjusting generator voltage state “**Adjust voltage per the Voltage Schedule**”.

When step 18 of AP/1/A/5500/037 is reached, the next event can be entered.

Event 6 – Loss of condenser vacuum

Initiating Cues:

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

When load has been reduced to ~1165 per AP/1/A/5500/023, TL pressure will fail to 0 per EVENT 15. Once the crew begins adjusting 1TL-4, EVENT 11 will trigger which will make the leak smaller and go away completely after a few minutes so that vacuum recovers.

Event 7 – PZR Spray valve 1NC-27 fails intermediate with no manual control

NOTE: If the spray valve failure is not dealt with quickly, the reactor will trip and in that case, EVENT 8 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 8 – 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

ANYTIME 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:

- 1CFP5600 (1D S/G Narrow Range Level Ch #2) failed 2 hours ago. IAE repairs are in progress and estimated to take 4 hours. All TSAIL entries have been made.
- Reduce power to 87% 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.



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 ≥ 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

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":
 - INV-238A (B/A Xfer Pmp To Blender Ctrl)
 - INV-186A (B/A Blender Oult To VCT Oult)
- 2.3 Ensure INV-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 INV-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 INV-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.)

Boration

2.10 Verify the following valves open:

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

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 Otlf To VCT Otlf)

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:

2.14.1 Open the following valves:

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

Flushing should not be desired at this time.

- 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 Otlf To VCT Otlf)

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

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

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.

2

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 $\pm 1^\circ\text{F}$ 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 ΔT s, 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 $\pm 2^{\circ}\text{F}$ 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

Unit Operation Between 85% and 100% Power

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 _____

START
HERE

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 $\geq 15\%/hr$ (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 \geq 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).

N/A
these 2
steps

Unit Operation Between 85% and 100% Power

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 is
N/A

_____ 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)

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

RO

_____ 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

2.18 is
N/A

#00874628 to IAE to prevent the mismatch between OAC heat balance point C1P1385 (Reactor Thermal Power, Best) and any excore power channel exceeding 2%.

Unit Operation Between 85% and 100% Power

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.

No failed fuel

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 \leq 120 days away, notify Primary Chemistry to take an isotopic analysis for iodine within 2 to 6 hours following the last power change.

25 EFPD so >120 days to refueling

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).

2

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 $< 175^{\circ}\text{F}$. 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 $\geq 90^{\circ}\text{F}$ 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

START HERE

- 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 CIA1140 (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 ISM-33 (Ctrl Vlv #4 Stm Lead Dm) opens.
- 2.2.1.6 **IF** CV3 fully closes (65% of full load, 783 MWE), verify ISM-25 (Ctrl Vlv #3 Stm Lead Dm) opens.

Enclosure 4.2
Load Changing

OP/1/B/6300/001
Page 4 of 4

- 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.

SCENARIO 2 EVENT 3 DATA - 1B S/G W/R level fails low

INITIATING CUE: 1AD-2 alarms F/10 (DCS alarm screen shows actual alarm)

There is no procedural action for this event; it is a TS call for the SRO only.

TS 3.3.3 Item 21, Conditions A, C

4

Initiating Cues:

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

ALL STEPS PERFORMED BY BOP

A. Purpose

- 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.**

Any alternate RN Pump can be started.

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)

Conditions do not
require these
steps.

This alarm was in , but
should be off if 1A RN
pump was secured
earlier.
Backwash will not
operate in any case.

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:

CAUTION Closing of the RN supply x-over isolation valves may result in the momentary isolation of an essential header.

NOTE 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. **IF** flow is returning to normal, **THEN GO TO** Step 5.

c. **IF** flow is still excessive, **THEN**:

- ___ 1) Ensure both RN pump(s) on the affected train - OFF.
- ___ 2) Dispatch operators to locate any piping leaks. **REFER TO** 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.
REFER TO:

- ___ • OP/1/A/6400/005 (Component Cooling Water System)
- ___ • OP/2/A/6400/005 (Component Cooling Water System).

___ b. **Ensure KC Hx Oil 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. **REFER TO** 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. REFER TO:

- ___ • 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.**

___ **Align VC/YC to operating RN train. REFER TO OP/0/A/6450/011 (Control Room Area Ventilation/Chilled Water System).**

___ • **Verify YC Chiller - RUNNING.**

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).

12. **Determine required notifications:**

- __ ● **REFER TO RP/0/A/5000/001** (Classification Of Emergency)
- __ ● **REFER TO RP/0/B/5000/013** (NRC Notification Requirements).

__ 13. **Notify Environmental Chemistry of any RN pump shifts that have occurred.**

TS 3.7.8 Condition A

CNS
AP/0/A/5500/020

LOSS OF NUCLEAR SERVICE WATER
Case I
Loss of RN Train

PAGE NO.
9 of 52
Rev 37 DCS

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

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

END

5

<p>Duke Energy Catawba Nuclear Station Generator Voltage and Electric Grid Disturbances</p> <p>Continuous Use</p>	Procedure No. AP/1/A/5500/037
	Revision No. 000
	Electronic Reference No. CP00965X
PERFORMANCE	
<p>***** UNCONTROLLED FOR PRINT *****</p> <p>(ISSUED) - PDF Format</p>	

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

B. Symptoms

- **Case I Abnormal Generator or Grid Voltage:**
 - 1AD-11, K/6 "230 KV Switchyard Voltage LO" - LIT
 - 1AD-1, C/4 "GEN Excitation Limiter Active" - LIT
 - OAC point C1E1795 (230KV Y BUS VOLTS) - IN ALARM LO
 - OAC point C1E1797 (230KV R BUS VOLTS) - IN ALARM LO
 - OAC point C1A0567 (Unit 1 Generator Volts) - IN ALARM HI
 - OAC point C1A0567 (Unit 1 Generator Volts) - IN ALARM LO
 - OAC point C1A1631 (Unit 1 Generator MEGAVARS) - IN ALARM HI
 - OAC point C1A1631 (Unit 1 Generator MEGAVARS) - IN ALARM LO
 - Generator voltage and MVARs fluctuating
 - Generator Capability Curve Exceeded
 - TCC notification that "Real Time Contingency Analysis" (RTCA) indicates Switchyard voltage would **NOT** be adequate if the unit should trip.
- **Case II Abnormal Generator or Grid Frequency:**
 - OAC point C1A0561 (Generator Frequency) - IN ALARM LO
 - OAC point C1E1794 (230KV Y BUS Frequency) - Indicated Frequency less than 59.8 Hz
 - OAC point C1E1796 (230KV R BUS Frequency) - Indicated Frequency less than 59.8 Hz
 - SOC or TCC notification of Grid frequency disturbances
 - 1AD-1, D/6 "EHC System Fault" (EHC Alarm Panel input indicates Generator Frequency Correction activated) - LIT.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Verify Generator - TIED TO GRID**

Perform the following:

RO

NOTE Shared systems (RN, VC, YC, VA) require an operable normal power source to be operable.

a. **IF** notified by TCC that degraded switchyard (grid) voltage conditions exist, **THEN** ensure compliance with the following Tech Specs. **REFER TO** PT/1/A/4350/002C (Available Power Source Operability Check).

__ • 3.8.1 (AC Sources - Operating)

__ • 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))

__ • 3.7.12 (Auxiliary Building Filtered Ventilation System ABFVS)).

__ b. **RETURN TO** procedure and step in effect.

2. **Verify Generator MVARs - EXCEED GENERATOR CAPABILITY CURVE limits. REFER TO one of the following:**

Perform the following:

__ • GENCAP (OAC Graphic Display)

__ • Enclosure 1 (Unit 1 Generator Capability Curves)

__ a. **IF AT ANY TIME GENERATOR CAPABILITY CURVE** limits exceeded, **THEN GO TO** Step 3.

__ b. Observe Note prior to Step 5 and **GO TO** Step 5.

RO

GENCAP will not be exceeded.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

3. **Adjust Generator MVARs to operate within Generator Capability Curve limits as follows:**

- • Depress "LOWER" on the VOLTAGE ADJUST to reduce lagging MVARs

OR

- • Depress "RAISE" on the VOLTAGE ADJUST to reduce leading MVARs.

- 4. **Notify RES Engineer to evaluate generator abnormal operating conditions.**

Perform the following:

- a. **IF** voltage regulator in "AUTO", **THEN** perform the following:

- 1) Place voltage regulator in MANUAL.
- 2) Adjust MVARs to within the GENERATOR CAPABILITY CURVE limits.

- b. **IF** unable to maintain MVARs within Generator Capability Curve limits, **THEN** remove generator from service as follows:

- 1) **IF** reactor power greater than or equal to 69%, **THEN** perform the following:

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

- 2) **IF** reactor power less than 69%, **THEN** perform the following:

- a) Trip turbine.
- b) **GO TO** AP/1/A/5500/002 (Turbine Generator Trip).

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE The TCC "Real Time Contingency Analysis" (RTCA) program determines if the Unit will have adequate switchyard voltage available for ECCS loads following a Unit Trip with Safety Injection actuation.

- ___ 5. Verify TCC reported "Real Time Contingency Analysis" (RTCA) indicates CNS switchyard voltage would **NOT** be adequate if the unit should trip.

RO

No info received from TCC

Perform the following:

- ___ a. **IF** TCC has not reported "RTCA" indications, **THEN** notify TCC to monitor "RTCA" and report results to Control Room Supervisor.
- ___ b. **IF AT ANY TIME** TCC reports that "RTCA" indicates CNS switchyard voltage would **NOT** be adequate if the unit should trip, **THEN GO TO** Step 6.
- ___ c. Observe Note prior to Step 17 and **GO TO** Step 17.
- ___ 6. Record time TCC "RTCA" indicated CNS switchyard (grid) voltage **NOT** adequate.
- ___ 7. Start 2 hour timer from time TCC "RTCA" indicated CNS switchyard (grid) voltage **NOT** adequate.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE When TCC "RTCA" indicates switchyard voltage would **NOT** be adequate if the unit trips, the following conditions exist:

- Both trains of offsite (normal) power are inoperable.
- Both ECCS trains are in an unanalyzed condition and inoperable.
- Shared systems (RN, VC, YC, VA) that require an operable normal power source, are inoperable.

8. **Perform Tech Spec assessment as follows:**

a. Ensure compliance with the following Tech Specs due to both trains of the following systems inoperable:

- ___ • 3.8.1 (AC Sources - Operating)
- ___ • 3.5.2 (ECCS - Operating)
- ___ • 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))
- ___ • 3.7.12 (Auxiliary Building Filtered Ventilation System ABFVS)).

___ b. Ensure compliance with Tech Spec 3.0.3 due to both trains of ECCS, RN, VC, YC, VA inoperable.

___ 9. **Notify Regulatory Compliance to pursue licensing options due to loss of normal power source operability to shared systems.**

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE The TCC/SOC response to a degraded grid voltage condition may restore voltage to adequate status within one hour.

10. **Activate the TSC as follows:**

- ___ a. Verify TCC expects switchyard (grid) voltage restoration to adequate status in less than one hour.

- ___ b. Evaluate activating the TSC. **REFER TO** RP/0/B/5000/027 (Augmentation of Shift Utilizing the Emergency Response Organization without Emergency Declaration)

- a. Perform the following:
 - ___ 1) Activate the TSC. **REFER TO** RP/0/B/5000/027 (Augmentation of Shift Utilizing the Emergency Response Organization without Emergency Declaration)
 - ___ 2) Observe Note prior to Step 11 and **GO TO** Step 11.

NOTE The degraded switchyard (grid) voltage condition places ECCS in an unanalyzed condition reportable per 10CFR50.72(b)(3)(ii).

11. **Determine required notifications:**

- ___ • **REFER TO** RP/0/A/5000/001 (Classification Of Emergency)
- ___ • **REFER TO** RP/0/B/5000/013 (NRC Notification Requirements).

12. **Evaluate the following:**

- ___ • Stopping in progress surveillance testing.
- ___ • Stopping in progress maintenance activities.
- ___ • Returning systems to normal/functional status.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE The SOC/TCC is allowed 2 hours to restore switchyard (grid) voltage to adequate. The 2 hour time limit may be adjusted based on OSM assessment of plant or grid conditions.

13. **Do not continue in this procedure until one of the following conditions exist:**

- • 2 hours have elapsed since TCC "RTCA" indicated switchyard voltage **NOT** adequate.

OR

- • Notification from TCC that "RTCA" indicates switchyard voltage would be adequate should the unit trip.

OR

- • OSM adjust 2 hour time limit based on assessment of plant conditions

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

___ 14. Verify TCC reported that "RTCA" indicates switchyard voltage would be adequate should the unit trip.

Perform the following:

- NOTE**
- The jumpers bypass the 4160 degraded voltage 5 second time delay relay.
 - If an S/I occurs with the jumpers installed, the 4160V incoming breakers trip open when LOCA Sequencer actuates. The D/Gs will supply power.
- ___ a. Notify SPOC to install jumpers per AM/1/A/5100/008 (4Kv Essential Power (EPC) System Degraded Voltage Logic.

- NOTE** When jumpers are installed offsite power and shared systems remain inoperable until "RTCA" indicates switchyard voltage is adequate should the unit trip.
- ___ b. **WHEN** jumpers installed per AM/1/A/5100/008 (4Kv Essential Power (EPC) System Degraded Voltage Logic, **THEN** Unit 1 exits L.C.O. 3.0.3 due to both trains of ECCS inoperable Tech Spec 3.5.2.

___ 15. Do not continue in this procedure until TCC reports that "RTCA" indicates switchyard voltage would be adequate should the unit trip.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

16. **WHEN TCC reports "RTCA" indicates switchyard voltage has been returned to adequate should the unit trip, THEN perform the following:**

- ___ a. **IF** jumpers installed, **THEN** notify SPOC to remove jumpers per, AM/1/A/5100/008 (4Kv Essential Power (EPC) System Degraded Voltage Logic.
- b. Evaluate exiting the following Tech Spec LCO actions:
 - ___ • 3.8.1.(AC Sources - Operating)
 - ___ • 3.5.2 (ECCS - Operating)
 - ___ • 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))
 - ___ • 3.7.12 (Auxiliary Building Filtered Ventilation System ABFVS)).
 - ___ • Tech Spec LCO 3.0.3.
- ___ c. Notify Regulatory Compliance of Tech Spec LCO action status.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE Do not exceed any generator limits when adjusting generator voltage.

RO

17. **Coordinate with the SOC and perform generator voltage adjustments as follows:**

- Adjust Unit 1 Generator Bus Voltage per Unit 1 Revised Data Book Figure 23 (CNS Generator Voltage Operating Schedule).

OR

- Adjust Unit 1 Generator Bus Voltage per SOC request.

When the SOC is called, The crew will be told to adjust generator voltage according to the voltage schedule.

18. **When SOC/TCC verifies switchyard (grid) voltage adequate and reliable, THEN RETURN TO procedure step in effect.**

END

6

Duke Energy Catawba Nuclear Station Loss of Condenser Vacuum	Procedure No. AP/1/A/5500/023
	Revision No. 018
	Electronic Reference No. CN005CER
Continuous Use	
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.

___ 2) **REFER TO AP/1/A/5500/009** (Rapid Downpower).

___ 3) **GO TO** Step 3.

b. Perform the appropriate controlling procedure to reduce power:

___ • OP/1/A/6100/003 (Controlling Procedure For Unit Operation)

OR

___ • OP/1/A/6100/002 (Controlling Procedure For Unit Shutdown).

Crew should stay in this AP at this time.

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.

— b. Verify 1AD-8, B/4 "COOLING TOWER BASIN HI/LO LEVEL" - DARK.

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. **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

BOP

4. **Verify "STM PRESS TO CSAE" -
GREATER THAN 110 PSIG.**

Perform the following:

- ___ a. Adjust 1AS-2 (Main Stm To Aux Steam) setpoint to maintain AS header pressure 165 PSIG.
- ___ b. **IF** 1AS-2 will not control in automatic, **THEN** manually adjust 1AS-2 to maintain AS header pressure 165 PSIG.
- ___ c. **IF** 1AS-2 is functional, **THEN GO TO** Step 5.

CAUTION

Aligning the Unit 2 AS system to supply Unit 1 AS headers may cause small reactivity changes on Unit 2.

- d. **IF** Unit 2 available to supply Unit 1 AS header, **THEN** 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) **WHEN** 1AS-59 is open, **THEN** 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)

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.**

a. **GO TO** Step 7.

c. **GO TO** Step 6 RNO.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE Most TL valve positions can be displayed by OAC turn on code "TL-TF".

BOP

6. Verify supplemental steam flow into the steam seal header by at least one of the following:

- • 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.**

Depending on how closely they monitor vacuum, they may dispatch operators here because the trend doesnt immediately reverse on TL restoration

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.

___ 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. REFER TO Enclosure 2 (Verification Of Seal Flows).

— 10. Dispatch operator to ensure CFPT seal system and waterboxes operating properly. REFER TO Enclosure 3 (CFPT Stm Seal And Waterbox Vent Verification).

— 11. Determine and correct cause of loss of vacuum.

12. Determine required notifications:

— • REFER TO RP/0/A/5000/001 (Classification Of Emergency)

— • REFER TO RP/0/B/5000/013 (NRC Notification Requirements).

— 13. Verify Steam Seal System - IN NORMAL ALIGNMENT.

— 14. Determine long term plant status. RETURN TO procedure in affect.

The crew may not dispatch operators if they are confident they know that they understand where the issue is and have taken actions to mitigate it.

NONE

— WHEN conditions permit, THEN align steam seal system as required for current plant conditions. REFER TO OP/1/B/6300/005 (Steam Seal System).

END

7

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.**

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.

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. In any event, the SGTR will occur on Rx trip, whether the trip is manual or an automatic trip occurs.

(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.

___ 5. **Verify NC pressure - STABLE OR INCREASING.**

___ **IF pressure continues to decrease, THEN REFER TO AP/1/A/5500/010 (Reactor Coolant Leak).**

6. **WHEN NC pressure is stable, THEN:**

- ___ • 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. **IF a Pzr pressure channel failed, THEN 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. RETURN TO procedure in effect.**

END

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 ΔT s - GREATER THAN THE OP ΔT SETPOINT
- 2 of 4 loop ΔT s - GREATER THAN THE OT ΔT 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:**

- __ • All rod bottom lights - LIT
- __ • All reactor trip and bypass breakers - OPEN
- __ • I/R amps - DECREASING

Perform the following:

- __ a. Manually trip reactor.
- b. **IF** reactor will not trip, **THEN** concurrently:
 - __ • 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:**

- __ • All turbine stop valves - CLOSED

Perform the following:

- __ 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.**

BOP DOES THIS PAGE

Perform the following:

- ___ 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.

S/I should have already been actuated, but if not, it will be done here, per RNO.

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".**

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

7. **Determine required notifications:**

- • **REFER TO RP/0/A/5000/001 (Classification Of Emergency)**
- • **REFER TO RP/0/B/5000/013 (NRC Notification Requirements)**

8. **Verify all Feedwater Isolation status lights (1SI-5) - LIT.**

RO

CRITICAL TASK

Perform the following:

- a. **Manually initiate Feedwater Isolation.**
- b. **IF proper status light indication is not obtained, THEN manually close valves.**

9. **Verify Phase A Containment Isolation status as follows:**

BOP

- a. **Phase A "RESET" lights - DARK.**
- b. **Monitor Light Panel Group 5 St lights - LIT.**

- a. **Manually initiate Phase A Isolation.**
- b. **Manually align valves.**

10. **Verify proper Phase B actuation as follows:**

BOP

- a. **Containment pressure - HAS REMAINED LESS THAN 3 PSIG.**

- a. **Perform the following:**

NOTE 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) **IF** flow is not indicated, **THEN** 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 H₂ 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.

___ b. **IF AT ANY TIME** containment pressure exceeds 3 PSIG while in this procedure, **THEN** 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) **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

BOP

13. **Verify all KC pumps - ON.**

BOP

14. **Verify all Unit 1 and Unit 2 RN pumps - ON.**

Crew may reset ECCS and D/G sequencers to secure RN pump 1A since it restarts on the S/I and it still has Hi D/P.

BOP

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).

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.

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.

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.

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.

BOP

17. **Verify proper S/I flow as follows:**

- a. **"NV S/I FLOW" - INDICATING FLOW.**
- b. **NC pressure - LESS THAN 1620 PSIG.**

a. Manually start NV pump(s) and align valves.

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.

1NI-9A and 1NI-10B do not automatically position and the BOP should note and manually open these valves.
CRITICAL TASK to open at least one of these valves!

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

17. (Continued)

BOP

___ c. NI pumps - INDICATING FLOW.

___ d. NC pressure - LESS THAN 285 PSIG.

___ e. ND pumps - INDICATING FLOW TO C-LEGS.

___ c. Manually start NI pump(s) and align valves.

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. 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%.

19. **Verify all CA isolation valves - OPEN.**

— Manually open valve(s).

BOP

20. **Verify S/I equipment status based on monitor light panel - IN PROPER ALIGNMENT.**

— Manually align equipment.

BOP

If 1NI-9A and 1NI-10B are still closed, they will be opened based on this RNO.

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. **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 H₂ 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)

BOP

___ d. **Normal Pzr spray valves - CLOSED.**

___ c. **At least one Pzr PORV isolation valve - OPEN.**

BOP

___ 23. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**

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. **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. **IF** power is available, **THEN** open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.

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.

If the crew does not note the 1A S/G PORV open, they may transition to E-2 to isolate the PORV and THEN go to E-3. If they note it, they will likely have closed the block valve by this point and will continue in E-0.

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:**

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.

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).

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) **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.**

b. **Annulus pressure - BETWEEN -1.4 IN. WC AND -1.8 IN. WC**

a. Manually start fan(s).

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

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.**

5. **Continue to monitor NC temperature.**

GO TO Step 7.

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.

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CNS
EP/1/A/5000/E-3

STEAM GENERATOR TUBE RUPTURE

PAGE NO.
1 of 110
Rev 34 DCS

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 RP to frisk CAT COLUMNS to get confirmation of leak. This takes about 5 minutes. Sampling takes about 1 hour.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- __ 3. **Verify at least one intact S/G - AVAILABLE FOR NC SYSTEM COOLDOWN.**

RO

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!

- __ **Maintain one S/G available for NC System cooldown in subsequent steps.**

- a. **WHEN** ruptured S/G(s) pressure is less than 1090 PSIG, **THEN** perform the following:

- __ 1) **Ensure ruptured S/G(s) PORV - CLOSED.**
- __ 2) **IF** ruptured S/G(s) PORV will not close, **THEN** manually close ruptured S/G(s) PORV isolation valve.
- __ 3) **IF** ruptured S/G(s) PORV isolation valve will not manually close, **THEN** dispatch operator to close ruptured S/G(s) PORV isolation valve.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4. (Continued)

RO

___ b. Verify S/G(s) 1B and 1C - INTACT.

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 Off Hdr Bldwn C/V).

CRITICAL TASK

2) Verify the following blowdown isolation valves - CLOSED:

___ a) 1BB-56A (S/G 1A Bldwn Cont Isol Insd).

___ b) 1BB-148B (S/G 1A Bldwn Cont Isol Byp).

___ 1) Dispatch operator to close 1SM-77A (S/G 1A Off Hdr Bldwn C/V) (DH-583, FF-GG, 43-44, Rm 591).

___ a) Manually close valve.

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).

2) Verify the following blowdown isolation valves - CLOSED:

___ a) 1BB-19A (S/G 1B Bldwn Cont Isol Insd).

___ b) 1BB-150B (S/G 1B Bldwn Cont Isol Byp).

___ 1) Dispatch operator to close 1SM-76B (S/G 1B Otlt Hdr Bldwn C/V) (DH-583, FF-53, Rm 572).

___ a) Manually close valve.

b) Perform the following:

___ (1) Manually close valve.

(2) **IF** valve will not close **AND** 1BB-19A is open, **THEN** 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) **IF** valve will not close
AND 1BB-19A is open,
THEN 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).

2) Verify the following blowdown isolation valves - CLOSED:

___ a) 1BB-60A (S/G 1C Bldwn Cont Isol Insd).

___ b) 1BB-149B (S/G 1C Bldwn Cont Isol Byp).

___ 1) Dispatch operator to close 1SM-75A (S/G 1C Otlt Hdr Bldwn C/V) (DH-580, GG, 52-53, Rm 572).

___ a) Manually close valve.

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).

2) Verify the following blowdown isolation valves - CLOSED:

___ a) 1BB-8A (S/G 1D Bldwn Cont Isol Insd).

___ b) 1BB-147B (S/G 1D Bldwn Cont Isol Byp).

___ 1) Dispatch operator to close 1SM-74B (S/G 1D Otlt Hdr Bldwn C/V) (DH-583, FF-GG, 44-45, Rm 591).

___ a) Manually close valve.

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.

CLOSING 1SM-7 is a
CRITICAL TASK

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).

CLOSING BOTH THESE VALVES
IS CRITICAL

___ 2) Close 1CA-66B (CA Pmp 1 Disch
To S/G 1A Isol).

• S/G 1B:

___ 1) Close 1CA-58A (CA Pmp A Disch
To S/G 1B 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) 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).

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).

• S/G 1C:

— 1) Close 1CA-46B (CA Pmp B Disch To S/G 1C Isol).

— 2) Close 1CA-50A (CA Pmp 1 Disch To S/G 1C Isol).

• S/G 1D:

— 1) Close 1CA-42B (CA Pmp B Disch To S/G 1D 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).

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) 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).

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)

Target temperature could be lower depending on speed going through the procedure and when 1A S/G PORV is isolated.

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.

___ 2) Verify S/G PORV on ruptured S/G(s) - CLOSED OR ISOLATED.

These valves should already previously have been closed.

1) Ensure the following valves on at least one intact S/G - CLOSED:

___ • MSIV

___ • MSIV bypass valve.

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 TV 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.

___ e. Verify steam dumps - IN PRESSURE MODE.

___ d. **GO TO** Step 9.g RNO.

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)

- ___ g. Dump steam to condenser from intact S/G(s) at maximum rate while attempting to avoid a Main Steam Isolation.

IF a Main Steam Isolation occurs, the PORVS on intact S/Gs will be used per the RNO.

RO

- 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

- ___ b. **Throttle feed flow to maintain all intact
S/G N/R levels between 16%
(29% ACC) and 50%.**

- 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. **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

- | | |
|---|---|
| <p>___ a. Power to all Pzr PORV isolation valves - AVAILABLE.</p> <p>___ b. All Pzr PORVs - CLOSED.</p> <p>___ c. At least one Pzr PORV isolation valve - OPEN.</p> <p>d. IF AT ANY TIME a Pzr PORV opens due to high pressure while in this procedure, THEN perform the following:</p> <p>___ 1) WHEN Pzr pressure decreases to less than 2315 PSIG, THEN ensure the valve closes or is isolated.</p> <p>___ 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).</p> | <p>a. Dispatch operator to restore power to affected Pzr PORV isolation valve(s):</p> <p>___ • 1EMXD-F02C (PORV Isol Motor (1NC31B)) (AB-560, BB-50, Rm 372)</p> <p>___ • 1EMXC-F03C (Pressurizer Power Operated Relief Isol. Valve 1NC33A) (AB-577, BB-50, Rm 496)</p> <p>___ • 1EMXD-F05A (PORV Isol Motor (1NC35B)) (AB-560, BB-50, Rm 372).</p> <p>b. IF Pzr pressure is less than 2315 PSIG, THEN:</p> <p>___ 1) Manually close Pzr PORV(s).</p> <p>___ 2) IF any Pzr PORV cannot be closed, THEN close its isolation valve.</p> <p>___ 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).</p> <p>___ c. Open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.</p> |
|---|---|

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 N₂ 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.**
- ___ b. **Verify ND pump(s) suction - ALIGNED TO FWST.**
- ___ c. **NC pressure - GREATER THAN 285 PSIG.**
- ___ 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.**

- ___ a. **GO TO** Step 15.e.
- ___ b. **GO TO** Step 16.
- ___ c. **GO TO** Step 16.

___ 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.**
- ___ b. **Stabilize 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.**

Crew will hold here until they meet temperature requirements from the Table on page 18.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

18. **Verify ruptured S/G(s) pressure is under operator control as follows:**

RO

___ a. **All ruptured S/G(s) pressure - STABLE OR INCREASING.**

a. Perform the following:

- ___ 1) Ensure ruptured S/G(s) isolated. **REFER TO** Steps 3 through 6.
- ___ 2) **IF** ruptured S/G(s) pressure is less than intact S/G(s) used for cooldown, **THEN GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
- ___ 3) **IF AT ANY TIME** D/P between ruptured S/G(s) and intact S/G(s) used for cooldown is less than 250 PSIG, **THEN:**
 - ___ • 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) **IF** intact S/G(s) used for cooldown can not be maintained at least 250 PSIG below the pressure of the ruptured S/G(s), **THEN GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
- ___ 5) **GO TO** Step 19.

___ b. **IF AT ANY TIME** ruptured S/G(s) pressure is decreasing while in this procedure, **THEN** perform Step 18.

___ 19. **Verify NC subcooling based on core exit T/Cs - GREATER THAN 20°F.**

RO

___ **IF** NC subcooling cannot be promptly restored to greater than 20°F, **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

20. **Depressurize NC System using PZR**
Spray as follows:

BOP

- ___ a. Verify normal PZR spray flow - AVAILABLE.
- ___ b. Verify PZR level - LESS THAN 76% (73% ACC)
- ___ c. Depressurize NC System with maximum available spray.
- d. **IF AT ANY TIME** during this step one of the following conditions exists:
 - ___ • Spray valves are not effective in reducing NC pressure

OR

 - ___ • Ruptured S/G(s) NR level is approaching 83% (82% ACC).

___ **THEN GO TO** 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

AND

 - ___ • PZR level - GREATER THAN 11% (20% ACC).

- ___ a. **GO TO** Step 21.
- ___ b. Observe Caution prior to Step 23 and **GO TO** Step 23.

This is a judgement call about going to step 21 based on whether the SRO thinks sprays are "effective" and what he feels is "approaching 83%".

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

20. (Continued)

BOP

f. Close the following valve(s):

__ 1) Pzr spray valves.

__ 2) 1NV-37A (NV Supply To Pzr Aux Spray).

__ 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.

This step will be used if the crew determines that a PORV will be used to reduce NC pressure in addition to a spray valve.

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) Ensure one of the following valves - CLOSED:

__ • 1NV-312A (Chrg Line Cont Isol)

OR

__ • 1NV-314B (Chrg Line Cont Isol).

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) **RETURN TO** Step 20.e.
- ___ b. Verify Pzr level - LESS THAN 76% (73% ACC).
- ___ b. Observe Caution prior to Step 23 and **GO TO** Step 23.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

21. (Continued)

__ c. Open one Pzr PORV.

c. Perform the following:

1) Align N₂ 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).

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:**
 - __ • N/R level in at least one intact S/G - **GREATER THAN 11% (29% ACC)**
 - __ • **Total feed flow available to S/G(s) - GREATER THAN 450 GPM.**
- b. **GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).
- OR
- __ 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:**

- ___ • 1NV-252A (NV Pumps Suct From FWST)
- ___ • 1NV-253B (NV Pumps Suct From FWST).

b. **Ensure the following valves - OPEN:**

- ___ • 1NV-203A (NV Pumps A&B Recirc Isol)
- ___ • 1NV-202B (NV Pmps A&B Recirc Isol).

a. **IF** NV pump suctions are aligned for Cold Leg Recirc, **THEN** perform the following:

- ___ 1) **GO TO** Enclosure 10 (Establish Charging With NV Miniflow Isolated).
- ___ 2) **GO TO** Step 27.

b. Perform the following:

- 1) 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).
- ___ 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)

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. **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.

3. **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 necessary to restore subcooling and Pzr level.
- ___ b. **IF** S/I reinitiation occurs after Section C. (Operator Actions), Step 24, **THEN GO TO** EP/1/A/5000/ECA-3.1 (SGTR With Loss Of Reactor Coolant - Subcooled Recovery Desired).

4. **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) unless needed for NC System cooldown.

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).

6. **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".

7. **Multiple Tube Rupture Criteria:**

- **IF** level in any intact S/G increases in an uncontrolled manner **OR** any intact S/G indicates abnormal radiation, **THEN:**

___ a. Stop any operator controlled cooldown and depressurization in progress.

___ b. **RETURN TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture), Step 1.

2009 NRC EXAMINATION

Facility:	<u>Catawba Nuclear Station</u>	Scenario No.:	<u>3</u>	Op-Test No.:	<u>2009 D-1</u>
SNAP 143					
Examiners:	_____	Operators:	_____	_____	_____
<u>Initial Conditions:</u>					
<ul style="list-style-type: none"> • 75% power • EFPD = 450 days • Boron Concentration is 208 ppm 					
<u>Turnover:</u>					
<ul style="list-style-type: none"> • 1A D/G was placed in Maintenance Mode and red tagged 2 hours ago for PMs and is expected back in 6 hours. • 1CFP5600 (1D S/G Narrow Range Level Ch #2) failed 2 hours ago. IAE repairs are in progress and estimated to take 4 hours. All TSAIL entries have been made. • 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	C	Loss of 1A CF pump/ no auto rod motion		
5	BOP SRO	C TS	PORV open does not fully reclose, can be blocked		
6	RO SRO	C TS	1CF-55 (D CF Reg Valve) auto control fails/manual control available		
7	ALL	M	Large Break LOCA/ Loss of emergency coolant recirculation <u>Additional Failures</u> 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
LOA-CNT002	H2 ANALYZERS	BOTH	24		600
MAL-ENB011G	P/R DETECTOR 44A FAILURE	100	3		
MAL-EQB003A	LOSS OF D/G 1A SEQUENCER CTRL PWR		21		300
MAL-IRX009	RODS FAIL TO MOVE	AUTO	4		
MAL-ISE002A	AUTO SI TRN A FAILS TO ACTUATE				
MAL-ISE002B	AUTO SI TRN B FAILS TO ACTUATE				
MAL-NC013C	NC COLD LEG C LEAK	27.5	8		
MAL-OV0691B	NCDJ5167 NC-34A DEMAND OPEN fail to NORMAL/ALARM	ALARM	5		
MAL-SLIM22_04	1CFSS5060: CF55 FCV D Raise Output Pushbutton fail to position	Button Depressed	6		1 Del in 6
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			
OVR-EP029D	ETA NORM FDR FRM ATC TRIP PB	ON	9		10
OVR-FWP012C	CFPT 1A TRIP & RESET TRIP PB	ON	4		
OVR-FWP015C	CFPT 1B TRIP & RESET TRIP PB	ON	7		
VLV-NC006C	NC33A PZR PORV ISOL VLV FAIL PWR		23	300	
VLV-NC007F	NC34A PZR PORV FAIL TO POSITION	0.25	12		1
VLV-NC007F	NC34A PZR PORV FAIL TO POSITION	1	5		1
VLV-NI037F	NI184B CNMT SUMP LINE 1B ISOL (STEM) FAIL TO POSITION	0			
VLV-NI037F	NI184B CNMT SUMP LINE 1B ISOL (STEM) FAIL TO POSITION	1	22	300	300
XMT-SG013	LCF_5580 S/G 1D N/R LVL CH4 TO DCS/MCB/OAC (CFAA5580)	100	6		
XMT-SG016	LCF_5600 S/G 1D N/R LVL CH2 TO DCS/MCB/OAC (CFAA5600)	0			

EVENT TRIGGERS (other than manual)

Event Trigger	Description
8	Reactor trip either train [jplp4(1) jplp4(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.

Critical steps are denoted on the instructor guide.

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/5500/011 (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, 2b, 3, 6, 7, 16b, 16c, 16d, 16e Conditions D, E, R, S

Event 4 – Loss of 1A CF pump/ no auto rod motion

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.

TS – 3.1.6 Condition A (IF Control Rods are at Lo-Lo insertion limit)

Event 5 – PORV open does not fully reclose, can be blocked, SRO Technical Specification

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)

Event 6 – 1CF-55 (D CF Reg Valve) auto control fails/manual control available

Initiating Cues:

- 1AD-4 D/4, 1AD-2 F/9

When 1D S/G level has been stabilized in manual and the SRO has completed consulting Technical Specifications, the next event can be inserted. This will begin the major event.

TS – 3.3.1 Item 13 Condition E

TS – 3.3.2 Item 5.a.(2) Condition J, Item 5.b.(2) Condition D, Item 6.b Condition D

TS – 3.0.3 (due to two channels OOS)

TS – 3.3.3 Item 10 Condition B

Event 7 – Large Break LOCA/ Loss of emergency coolant recirculation

When the second feed pump is tripped, the T/G will trip on AMSAC, but because the reactor is <69% power, it will not trip automatically. The crew will manually trip the reactor based on the immediate actions of AP/06 (trip when >5% power and loss of all feedwater) This begins 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.

Additional failures

- 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 or ORANGE due to cooldown of loops during a 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 but should not be entered on that basis.

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."

Scenario End Point

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.
- 1CFP5600 (1D S/G Narrow Range Level Ch #2) failed 2 hours ago. IAE repairs are in progress and estimated to take 4 hours. All TSAIL entries have been made.
- Increase power to 100% at 5% an hour per OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Enclosure 4.1, Power Increase.

1

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 ≥ 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

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 Oflet 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 Oflt 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 Oflt 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.)

Enclosure 4.3

Dilution

OP/1/A/6150/009

Page 3 of 3

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

2

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 $\pm 1^{\circ}\text{F}$ 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 ΔT s, 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 $\pm 2^\circ\text{F}$ 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 Cooldown
 - 4.4.1 T-AVG Cooldown Data
 - 4.4.2 Adjustment Of DCS ACCEPTED VALUE For T AVG
 - 4.4.3 T-AVG Cooldown 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.

2

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 $< 175^{\circ}\text{F}$. The load shall, however, be increased slowly until the temperature decreases below 125°F before increasing load at normal rate (Multipoint Recorder on IMC3).
 - 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 $\geq 90^{\circ}\text{F}$ 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

Load Changing

- 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)) \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:

- 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.

Load Changing

- 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.

3

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

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:**

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- 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

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".

BOP DOES THIS PAGE
EXCEPT LAST STEP

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.

___ 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.

___ 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)

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.**

TS 3.3.1 Items 2a, 2b, 3, 6, 7, 16b, 16c
16d, 16e

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

Initiating Cues:
• 1AD-5, A/1, A/4
• 1AD-1, F/4
Turbine load decreasing

4

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.**
- ___ b. **"C-9 COND AVAILABLE FOR STM DUMP" status light (1SI-18) - LIT.**

- ___ 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. 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

c. Verify the following:

- ___ • "C-7A LOSS OF LOAD INTLK COND DUMP" status light (1SI-18) - LIT.
- ___ • Steam dump valves - MODULATING.

___ d. T-Avg - DECREASING TO T-REF.

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. 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.

___ c. Verify standby hotwell pump(s) - ON.

___ d. Verify standby condensate booster pump(s) - ON.

___ b. **GO TO** Step 6.

___ c. Manually start standby hotwell pump(s) as necessary.

___ 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

RO
8. **Verify reactor power - GREATER THAN 20%.**

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.

RO
9. **IF AT ANY TIME** reactor power is less than or equal to 20%, **THEN** perform Step 8 RNO.

BOP
10. **Verify AS header pressure - GREATER THAN OR EQUAL TO 140 PSIG.**

Adjust 1AS-2 (Main Stm To Aux Steam) as required to maintain AS header pressure between 140 PSIG and 150 PSIG.

RO
11. **Adjust 1TL-4 (Stm Seal Reg Byp) as necessary to maintain steam seal pressure between 4 PSIG - 6 PSIG.**

BOP
12. **Monitor Enclosure 3 (Rod Insertion Limit Boration).**

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.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

RO 13. **Verify reactor power - LESS THAN 30%.**

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

BOP 15. **Verify the following PCBs - CLOSED:**

- • 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. **WHEN the appropriate runback target load is reached, THEN:**

- • 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

20. **Shut down unnecessary plant equipment as follows:**

BOP

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).

21. **Reset steam dump valves as follows:**

RO

___ 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

RO
22. **Verify reactor power - GREATER THAN 15%.**

Transfer feed flow to CA nozzles. **REFER TO** Enclosure 2 (Transferring Feed Flow From CF To CA Nozzles).

BOP
23. **Verify CA pumps - OFF.**

Perform the following:

- a. **WHEN** CA is no longer needed to feed S/G(s), **THEN** shutdown the CA System following the automatic start and return CA System to standby readiness. **REFER TO** OP/1/A/6250/002 (Auxiliary Feedwater System).
- b. Re-establish S/G blowdown. **REFER TO** OP/1/A/6250/008 (Steam Generator Blowdown).

RO
24. **Verify reactor power change - GREATER THAN OR EQUAL TO 15% IN A 1 HOUR PERIOD.**

GO TO Step 26.

25. **Notify the following sections to take appropriate samples:**

- Radiation Protection to sample and analyze gaseous effluents. **REFER TO** Selected Licensee Commitments Manual, Section 16.11-6.
- Primary Chemistry to sample for isotopic analysis of iodine. **REFER TO** 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).

Depending on how far they reduce power, this step may apply and they will do step 25.

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.)

CNS
AP/1/A/5500/003

LOAD REJECTION
Case I
Switchyard Available

PAGE NO.
14 of 36
Rev 36 DCS

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

— 27. **Notify Reactor Group Engineer of occurrence.**

— 28. **Determine long term plant status. RETURN TO OP/1/A/6100/003 (Controlling Procedure For Unit Operation).**

END

Initiating Cue:

- 1AD-6 C/12, E/10, F-8

NC Pressure decreasing

5

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.

__ 5. **Verify NC pressure - STABLE OR INCREASING.**

BOP

__ **IF pressure continues to decrease, THEN REFER TO AP/1/A/5500/010 (Reactor Coolant Leak).**

6. **WHEN NC pressure is stable, THEN:**

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. **IF a Pzr pressure channel failed, THEN perform following:**

- __ a. Verify "P-11 PZR S/I BLOCK PERMISSIVE" status light (1SI-18) in required state for unit conditions.
- 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.

- __ a. Ensure compliance with Tech Spec 3.3.2 (Engineered Safety Features Actuation System (ESFAS) Instrumentation).

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

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

END

6

SCENARIO 3 EVENT 6 DATA

INITIATING CUE: 1AD-4 D/4 1AD-2 F/9

There was a Case 3 of AP/1/A/5500/006 but it was deleted as a result of the DCS modification. There is no specific procedural guidance for this failure, other than OMP 1-8, step 7.2.C guidance which states:

"When process control, process protection or safety signals are generated in response to valid plant conditions and equipment fails to automatically position, then a licensed operator is expected to properly position the equipment."

Crew is expected to manually control valve 1CF-55 to prevent a low S/G level reactor trip or a high S/G level T/G trip based on 1D S/G level. Once they have control and the SRO has consulted Technical Specifications, the Major Event will begin.

TS

3.3.1, Item 13.e

3.3.2 Item 5.a.(2) Condition J, Item 5.b.(2) Condition D, Item 6.b Condition D

3.3.3 Item 10 Conditions B, ~~D, F,~~ and H *YE*

3.0.3 (due to two failed channels)

2nd CF Pump TRIPS.
Containment pressure increasing
NOTE: LOCA occurs on Rx Trip.

79

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 ΔT s - GREATER THAN THE OP ΔT SETPOINT
- 2 of 4 loop ΔT s - GREATER THAN THE OT ΔT 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:**

- __ • All rod bottom lights - LIT
- __ • All reactor trip and bypass breakers - OPEN
- __ • I/R amps - DECREASING

Perform the following:

- __ a. Manually trip reactor.
- __ b. **IF** reactor will not trip, **THEN** concurrently:
 - __ • 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:**

- __ • All turbine stop valves - CLOSED

Perform the following:

- __ 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.

BOP DOES
THIS PAGE

Perform the following:

- ___ 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.

Auto S/I is blocked on both channels. Manual initiation required.
CRITICAL TASK !

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".

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

7. **Determine required notifications:**

- • **REFER TO RP/0/A/5000/001**
(Classification Of Emergency)
- • **REFER TO 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. **IF** proper status light indication is not obtained, **THEN** manually close valves.

BOP

9. **Verify Phase A Containment Isolation status as follows:**

- a. Phase A "RESET" lights - DARK.
- b. Monitor Light Panel Group 5 St lights - LIT.

- a. Manually initiate Phase A Isolation.
- 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:**

NOTE 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) **IF** flow is not indicated, **THEN** 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. **REFER TO** Enclosure 13 (Securing All Ice Condenser Air Handling Units).

___ b) Place containment H₂ 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.

___ b. **IF AT ANY TIME** containment pressure exceeds 3 PSIG while in this procedure, **THEN** 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) **IF AT ANY TIME** a B/O occurs, **THEN** 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.**

__ b. **NC pressure - LESS THAN 1620 PSIG.**

__ a. Manually start NV pump(s) and align valves.

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.

d. NC pressure - LESS THAN 285 PSIG.

BOP

e. ND pumps - INDICATING FLOW TO C-LEGS.

c. Manually start NI pump(s) and align valves.

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. 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.**

- Manually open valve(s).

BOP

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.

Should already have isolated a PORV per AP/11 earlier. May not perform RNO even though PORV is still open, since it IS isolated.

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 H₂ 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.

— c. ~~At least one Pzr PORV isolation valve - OPEN.~~

BOP

— 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.**

NC Pumps may have been previously tripped based on loss of support equipment due to Sp

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.

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.

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).

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:**

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 Offt)
- • 1KC-364B (NC Pump 1B Therm Bar Offt)
- • 1KC-345A (NC Pump 1C Therm Bar Offt)
- • 1KC-413B (NC Pump 1D Therm Bar Offt)

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:

- ___ • Containment pressure - LESS THAN 1 PSIG.
- ___ • IF normal off-site power is available, THEN verify containment pressure less than 0.3 PSIG.
- Containment high range EMFs - LESS THAN 3 R/HR:
 - ___ • 1EMF-53A (Containment Trn A)
 - ___ • 1EMF-53B (Containment Trn B).
- Containment EMF trip 1 lights - DARK:
 - ___ • 1EMF-38 (Containment Particulate)
 - ___ • 1EMF-39 (Containment Gas)
- ___ • Containment sump level - STABLE.

b. Perform the following:

- ___ 1) Energize H2 igniters.
- 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).
 - ___ b) Place containment H2 analyzers in service. REFER TO OP/1/A/6450/010 (Containment Hydrogen Control Systems).
- 3) 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).
- 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.

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:**

a. **Verify one train of the following equipment is in operation:**

- • YC chiller
- • CR AHU-1
- • CRA AHU-1
- • CRA PFT-1

BOP DOES THIS ENCLOSURE

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) **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**

b. **Annulus pressure - BETWEEN -1.4 IN. WC AND -1.8 IN. WC**

a. Manually start fan(s).

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

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

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.

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CNS
EP/1/A/5000/FR-P.1

RESPONSE TO IMMINENT PRESSURIZED THERMAL
SHOCK CONDITION

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A. Purpose

This procedure provides actions to avoid, or limit, thermal shock or pressurized thermal shock to the reactor pressure vessel, or overpressure conditions at low temperature.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (REACTOR COOLANT INTEGRITY) on a RED or either ORANGE condition.

May be entered due to RED or ORANGE path due to Tcolds falling after LOCA and cold injection. Path IS valid, but procedure recognizes a LOCA in step one (based on ND flow to CLs) and kicks back to procedure and step in effect.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

C. Operator Actions

___ 1. **Verify NC pressure - GREATER THAN 285 PSIG.**

___ **IF ND flow to C-Legs is greater than 675 GPM, THEN RETURN TO procedure and step in effect.**

___ 2. **Monitor Enclosure 1 (Foldout Page).**

___ 3. **Verify all NC T-Colds - STABLE OR INCREASING.**

Attempt to stop NC System cooldown as follows:

___ a. **Ensure all S/G PORVs - CLOSED.**

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

___ c. **Ensure all steam dump valves - CLOSED.**

___ d. **IF ND is in RHR mode, THEN stop any cooldown from ND System.**

e. **Identify faulted S/G(s) as follows:**

___ • **Any S/G pressure - DECREASING IN AN UNCONTROLLED MANNER**

OR

___ • **Any S/G - DEPRESSURIZED.**

(RNO continued on next page)

7c

Duke Energy Catawba Nuclear Station Loss of Reactor or Secondary Coolant	Procedure No. EP/1/A/5000/E-1
	Revision No. 023
	Electronic Reference No. CP0094CP
Continuous Use	
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).**

___ 2. **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:

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).**

___ b. **Throttle feed flow to maintain all intact S/G N/R levels between 11% (29% ACC) and 50%.**

___ 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. **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:**

- **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.**

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

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.**

___ b. **All Pzr PORVs - CLOSED.**

___ c. **At least one Pzr PORV isolation valve - OPEN.**

___ d. **IF AT ANY TIME** a Pzr PORV opens due to high pressure, **THEN**, after Pzr pressure decreases to less than 2315 PSIG, ensure the valve closes or is isolated.

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. **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.

___ c. Open one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

6. **Verify S/I termination criteria as follows:**

BOP

___ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.

b. Verify secondary heat sink as follows:

- ___ • 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.

___ d. PZR level - GREATER THAN 11% (20% ACC).

___ 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.

___ a. **GO TO** Step 6.f.

___ b. **GO TO** Step 6.f.

___ c. **GO TO** Step 6.f.

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.

7. **Verify proper NS pump operation as follows:**

BOP

___ 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:
 - ___ • 1FW-27A (ND Pump 1A Suct From FWST)
 - ___ • 1FW-55B (ND Pump 1B Suct From FWST).

- ___ c. Containment pressure - LESS THAN 2.4 PSIG.

- ___ d. Verify operating NS pump(s) - HAVE REMAINED RUNNING SINCE INITIAL PHASE B SIGNAL.

- b. Perform the following:
 - ___ 1) **IF** NS pump(s) have previously been stopped more than once, **THEN GO TO** Step 8.
 - ___ 2) **WHEN** containment pressure is less than 1 PSIG, **THEN** perform Steps 7.e through 7.h.
 - ___ 3) **GO TO** Step 8.

- c. Perform the following:
 - ___ 1) **WHEN** containment pressure is less than 2.4 PSIG, **THEN** perform Step 7.
 - ___ 2) **GO TO** Step 8.

- ___ 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.
- ___ b. NC pressure - STABLE OR INCREASING.
- ___ c. At least one ND pump - ON.
- ___ d. ND pumps suction - ALIGNED TO FWST.
- ___ e. Verify FWST level - GREATER THAN 45%.

- ___ a. **GO TO** Step 10.
- ___ b. **GO TO** Step 9.
- ___ c. **GO TO** Step 8.h.
- ___ d. **GO TO** Step 9.
- 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.
- ___ b. Verify 1ETA is energized by offsite power as follows:
 - ___ • "D/G 1A BKR TO ETA" - OPEN
 - ___ • 1ETA - ENERGIZED.
- ___ 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.
- ___ 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).

- ___ a. **GO TO** Step 11.
- ___ 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.
- ___ 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.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

10. (Continued)

BOP

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.

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 H₂ 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 H₂ analyzers - **IN SERVICE**.

___ c. Verify containment H₂ concentration - **LESS THAN 6%**.

___ d. Verify containment H₂ concentration - **LESS THAN 0.5%**.

___ e. **WHEN** the ice condenser air handling units are off **AND** H₂ concentration is less than 6%, **THEN** energize the H₂ igniters (1MC-7).

b. Perform the following:

___ 1) Dispatch operator to place containment H₂ analyzers in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control System).

___ 2) **WHEN** H₂ analyzers are in service, **THEN** perform Steps 11.c through 11.e.

___ 3) **GO TO** Step 12.

c. Perform the following:

___ 1) Obtain recommendation from station management for method to reduce H₂ concentration.

___ 2) **GO TO** Step 12.

___ d. Dispatch operator to place H₂ recombiners in service. **REFER TO** OP/1/A/6450/010 (Containment Hydrogen Control System).

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

12. **Initiate evaluation of plant status as follows:**

BOP

- ___ a. **Verify S/I systems - ALIGNED FOR INJECTION MODE.**
- b. **Verify Cold Leg Recirc capability as follows:**
 - ___ 1) **At least one ND pump - AVAILABLE.**
 - 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).**

- ___ a. **GO TO** Step 12.c.
- ___ 1) **GO TO** EP/1/A/5000/ECA-1.1 (Loss Of Emergency Coolant Recirculation).
- 2) Perform the following:
 - **IF** 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.
 - ___ **THEN GO TO** 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)

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"

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.

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) **WHEN** criteria for establishing Cold Leg Recirc are met, **THEN** manual alignment to containment sump will be required.

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).

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).

6. **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".

7. **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.

8. **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).

7d

Duke Energy Catawba Nuclear Station Transfer to Cold Leg Recirculation	Procedure No. EP/1/A/5000/ES-1.3
	Revision No. 021
	Electronic Reference No. CP0094CV
Continuous Use	
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 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).**

BOP

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.

Both valves are NOT closed. 1NI-185A is 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).

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

5. (Continued)

BOP

b. Verify following valves - CLOSED:

- ___ • 1FW-27A (ND Pump 1A Suct From FWST)
- ___ • 1FW-55B (ND Pump 1B Suct From FWST)

b. Perform the following:

- ___ 1) Manually close affected valve(s).
- ___ 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.

There should be no valid RED or ORANGE paths that need to be implemented so the crew should go to ECA-1.1. There may be an ORANGE/RED path on NC Integrity which IS valid, but should have been previously addressed.

c. Perform the following:

- ___ 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.
- ___ 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).

1) Perform the following:

- ___ a) Stop NI pumps.
- ___ b) WHEN pressure is less than 1620 PSIG, THEN start NI pumps.

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** manually start S/I pumps and align valves as required to restore subcooling and Pzr level.

2. **Loss Of Emergency Coolant Recirculation:**

- ___ • **IF** Step 5 has been completed **AND** recirc flow is subsequently lost, **THEN** perform the following:
 - ___ 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).

3. **Loss Of FWST Supply To ECCS Pumps:**

- ___ • **IF** FWST level decreases to less than 11%, **THEN** stop NS pumps taking suction from the FWST.
- ___ • **IF** FWST level decreases to less than 5%, **THEN** stop all pumps taking suction from the FWST.

7e

CNS
EP/1/A/5000/ECA-1.1

LOSS OF EMERGENCY COOLANT RECIRCULATION

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1 of 83
Rev 31-DCS

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

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 RNO since the power loss is beyond just those breakers.

__ 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. **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

This should already have been done in ES-1.3

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).

— 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.

Likely NOT restored at this time and should continue. Transition back to ES-1.3 will be per this step or Enclosure 1 guidance.

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) **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.

5. **Depress the "DEFEAT" pushbuttons on the following switches:**

BOP

__ • **"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. **GO TO** Step 33.

__ b. **IF AT ANY TIME** FWST level is less than 5%, **THEN GO TO** 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

___ c. Verify the number of NS pumps on - **EQUAL TO NUMBER REQUIRED.**

___ c. Manually operate NS pumps as required by table above.

BOP 8. **Verify criteria to align NS for recirc as follows:**

Will secure the 1B NS pump.

___ 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. **IF AT ANY TIME NS pumps are stopped or started, THEN:**

__ • **Ensure associated NS Train - RESET.**

__ • **Close associated spray valves after securing a pump.**

__ • **Open associated spray valves prior to starting a pump.**

__ 10. **Initiate makeup to FWST. REFER TO OP/1/A/6200/014 (Refueling Water System).**

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 or previous WHEN/THEN step (3.d.2) RNO).

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".

7F

Duke Energy Catawba Nuclear Station Transfer to Cold Leg Recirculation	Procedure No. EP/1/A/5000/ES-1.3
	Revision No. 021
	Electronic Reference No. CP0094CV
Continuous Use	
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

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).**

B train only. No power to A train.

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

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

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)

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)

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**:

- • 1FW-27A (ND Pump 1A Suct From FWST)
- • 1FW-55B (ND Pump 1B Suct From FWST).

b. Perform the following:

- 1) Manually close affected valve(s).
- 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.

Should start 1B ND pump at this time.
CRITICAL TASK !

c. Perform the following:

__ 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).

No "A" train power.

CRITICAL STEP due to potential for release of radioactivity to environment.

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).

No power to 1ND-32A and 1NV-203A.

f. Verify at least one of the following NV pumps miniflow valves - CLOSED:

- • 1NV-203A (NV Pumps 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.

OR

- • 1NV-202B (NV Pmps A&B Recirc Isol).

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).

1NI-333B is CRITICAL TASK

- 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).

1NI-136B is CRITICAL TASK

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)

3) Close the following valves:

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

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

1NV-253B
/e

It is Critical that 1NI-100B and 1NV-252A be closed from the control boards and an operator be dispatched to close 1NV-252A (which has no power). Ref DBD for NI system.
NOTE: The scenario ends on the next page.

— 2) Dispatch operator to close 1NI-100B (NI Pmps Suct From FWST) (AB-552, HH-JJ, 53-54, Rm 234).

3) Perform the following:

a) IF 1NV-252A (NV Pumps Suct From FWST) cannot be closed, THEN dispatch operator to perform the following:

— (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. **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).

Aligning NS for Recirc is JPM and should not be allowed during this scenario.

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.

NS pumps (if running) are secured per Enclosure 1 when FWST reaches 11% level.

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** manually start S/I pumps and align valves as required to restore subcooling and Pzr level.

2. **Loss Of Emergency Coolant Recirculation:**

- ___ • **IF** Step 5 has been completed **AND** recirc flow is subsequently lost, **THEN** perform the following:
 - ___ 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).

3. **Loss Of FWST Supply To ECCS Pumps:**

- ___ • **IF** FWST level decreases to less than 11%, **THEN** stop NS pumps taking suction from the FWST.
- ___ • **IF** FWST level decreases to less than 5%, **THEN** stop all pumps taking suction from the FWST.