CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-8

FUNCTIONAL RECOVERY PROCEDURE

REVISION 33

Safety Related

Approval Authority: Tim Riti 8/31/09
signature/date

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I. PURPOSE

This procedure provides the operator actions to be completed after events which are unable to be diagnosed, or for events where an Optimal Recovery Procedure is **NOT** sufficient. The actions in this procedure provide a systematic and structured response to plant casualties, based on the safety functions, and are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to prevent core damage by satisfying safety functions at risk while minimizing any radiological releases to the environment.

II. ENTRY CONDITIONS

The following conditions exist:

A. Post-Trip Immediate Actions are completed.

B. **ANY** of the following conditions exist:

- Something more than an uncomplicated reactor trip has occurred for which a single event diagnosis is **NOT** possible utilizing the diagnostic flowchart of EOP-0, POST-TRIP IMMEDIATE ACTIONS.
- Something more than an uncomplicated reactor trip has occurred for which an Optimal Recovery Procedure is **NOT** available.
- An Optimal Recovery Procedure has been implemented but ONE or MORE Safety Function Acceptance Criteria are **NOT** satisfied, and actions directed within the Optimal Recovery Procedure are **NOT** returning the parameter(s) to within their Acceptance Criteria.

III. PRECAUTIONS

The following specific precautions apply prior to or throughout this procedure.

A. WARNINGS

None

B. CAUTIONS

1. SUR and WRNI Power should be continuously monitored during any RCS temperature changes until adequate shutdown margin can be established. RCS temperature should **NOT** be lowered if SUR approaches zero and/or WRNI Power level stabilizes above 10^{-4}%.

2. Feedwater should **NOT** be added to a dry S/G if the other S/G still contains water. If both S/Gs become dry, only ONE S/G should be refilled to initiate Natural Circulation. A dry S/G is indicated by wide range S/G level indication off-scale low or by S/G pressure less than saturation pressure for existing T_{AVE} .

3. ESFAS actuated safety features should only be overridden to support a threatened safety function or when directed by the procedure.

4. Solid water operation of the RCS should only be attempted in order to maintain a subcooled margin of 25° F. Pressurizer level limits may be exceeded to restore RCS subcooling. If solid water operation of the RCS is undertaken, any functions or actions directly affecting makeup, letdown, system heatup or cooldown should be closely monitored to avoid rapid pressure excursions.

5. If the initial cooldown rate exceeds Technical Specification Limits, there may be a potential for pressurized thermal shock of the reactor vessel. Pressure/Temperature Limits of ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS should be maintained.

6. Maintaining subcooling of 25° F takes precedence over PTS considerations. If there is a conflict between maintaining adequate core cooling and complying with pressure/temperature limits, then maintenance of adequate core cooling should be given the higher priority.

7. The use of equipment in the containment building should be minimized when containment hydrogen concentration is greater than 4.0% to reduce the possibility of hydrogen ignition.

8. Common failure of a standby pump or component is possible if started following a pump or component failure. The cause of the failure should be determined prior to starting or restarting a standby pump or component.

(continue)

III.B (continued)

9. There is a possibility of RCS voiding throughout this procedure. Steps to eliminate voiding should be taken anytime voiding causes heat removal or inventory control to be threatened. Void elimination should be started soon enough to ensure heat removal and inventory control are **NOT** lost.

10. After the required shutdown boron concentration is attained in the RCS, makeup water added to the RCS during the cooldown should be at least equal to the shutdown boron concentration to prevent **ANY** dilution of RCS boron concentration.

11. There is a possibility for excessive 1B DG loading if the DG has been loaded and the LOCI Sequencer actuates. To prevent this from occurring, the operator should **NOT** energize any non-essential loads unless specifically allowed within this procedure. The maximum steady state 1B DG load limit is 3300 KW, the 1A DG load limit is 5400 KW. The SMECO load limit is 240 AMPS Continuous.

12. The number of auxiliary spray cycles should be minimized when the temperature differential is greater than 400° F to minimize spray nozzle thermal stress accumulation factor.

13. If VCT pressure is reduced by greater than 5 PSIG, the idle Charging Pumps may become gas bound if **NOT** started or vented.

(continue)

III. (continued)

C. **NOTES**

1. Hot and cold leg RTD and CET temperature indications may be influenced by charging pump or SIS injection water temperatures. Multiple RTD and CET indications should be used when injection is occurring.

2. During a depressurization event, pressurizer level may **NOT** provide an accurate indication of RCS inventory due to the formation of voids. Pressurizer level when combined with RCS subcooling based on CET temperatures will indicate the core is covered.

3. High energy line breaks may cause erratic instrumentation response depending on the magnitude and location of the break.

4. Harsh Containment Environment conditions will affect instrument indications. When necessary, modified parameter values designated by braces {} are used to compensate the indicated value for Harsh Containment Environment conditions. Harsh Containment Environment conditions exist when containment pressure is greater than 4.25 PSIG.

5. If cooling down by natural circulation with an isolated steam generator, an inverted delta T (T_{COLD} higher than T_{HOT}) may be observed in the idle loop. This is due to a small amount of reverse heat transfer in the isolated steam generator. The inverted delta T is **NOT** expected to have any significant effect on natural circulation flow in the operating steam generator loop.

6. An incident may cause inconsistencies between instruments. At least TWO independent indications should be used, when available, to evaluate and verify a specific plant condition.

7. Do **NOT** adopt manual operation of automatically controlled systems unless a malfunction is apparent or the automatic system operation will **NOT** support the maintenance of a safety function.

8. Systems shifted to manual operation must be monitored frequently to ensure correct operation.

9. Personnel should be prepared for the possibility of inadequate lighting in access areas and equipment rooms.

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. DETERMINE APPROPRIATE EMERGENCY REPSONSE ACTIONS PER THE ERPIP.	
WARNING **Dropping the Transfer Cask may spill fuel bundles in the Auxiliary Building causing high radiation levels.** 1. **IF** a Transfer Cask loaded with irradiated fuel assemblies has been dropped in the Auxiliary Building, **THEN** perform actions concurrently **PER** AOP-6D, FUEL HANDLING INCIDENT. 2. Determine the appropriate emergency response actions **PER** the ERPIP.	
B. OBTAIN FUNCTIONAL RECOVERY ENTRY PLACEKEEPER **AND** RECORD TIME.	

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PERFORM THE RCP TRIP STRATEGY.	
NOTE Subsequent operations to depressurize the plant under operator control are **NOT** considered a result of the event. 1. **IF** RCS pressure drops to 1725 PSIA as a result of the event, **THEN** trip RCPs so **EITHER** of the following pairs remain running: • 11A and 12B RCPs • 11B and 12A RCPs 2. **IF** CIS has actuated, **OR** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** trip **ALL** RCPs. 3. **IF** RCS pressure drops below the minimum pump operating limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, **THEN** trip **ALL** RCPs.	
D. MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS.	
1. Direct Chemistry to perform qualitative samples on **BOTH** S/Gs for activity **PER** CP-436. 2. Direct Chemistry to place the Hydrogen Monitors in service.	

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. DETERMINE STATUS OF SAFETY FUNCTIONS (STA).	
1. Identify success paths for **ALL** Safety Functions **PER** Section VI., RESOURCE ASSESSMENT TABLE.	
2. Confirm the selected success paths with the CRS.	
3. Commence the Safety Function Status Checks for **ALL** selected success paths.	3.1 **IF** Safety Function Acceptance Criteria are **NOT** met, **THEN** determine the appropriate emergency response actions **PER** the ERPIP.
F. PERFORM RECOVERY ACTIONS.	
1. Identify success paths **AND** determine if Acceptance Criteria are met for **ALL** Safety Functions **PER** Section VI., RESOURCE ASSESSMENT TABLE.	1.1 **IF** a success path can **NOT** be identified **PER** Section VI., RESOURCE ASSESSMENT TABLE, **THEN** select the highest numbered success path for that Safety Function (e.g.; HR-4).
2. **IF** entry is from an Optimal Recovery Procedure, **THEN** Exit the Optimal Recovery Procedure.	
(continue)	

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS

F. (continued)

NOTE

Safety Functions are presented in order of importance. Selected success paths should be commenced in accordance with the Safety Function hierarchy.

3. Commence the Recovery Actions **PER** APPENDIX (1), REACTIVITY CONTROL to APPENDIX (6), RADIATION LEVELS EXTERNAL TO CONTAINMENT with the following priority:

   a. Safety Functions that are **NOT** meeting their EOP-8 Acceptance Criteria.

   b. Safety Functions that were **NOT** met in EOP-0,
   AND Safety Functions that were **NOT** met in an Optimal Recovery Procedure.

   c. **ALL** remaining Safety Functions.

4. **IF**, at any time, a Safety Function is **NOT** being satisfied,
   THEN commence the Recovery Actions for the success path of the unsatisfied Safety Function, in accordance with the Safety Function hierarchy.

5. **IF**, at any time, **ANY** success path is unable to meet the acceptance criteria,
   THEN IMPLEMENT an appropriate success path as determined **PER** Section VI., RESOURCE ASSESSMENT TABLE.

(continue)

IV. FUNCTIONAL RECOVERY ENTRY

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
F. (continued) **<u>NOTE</u>** Safety Function success paths are listed in order of preference, success path #1 (e.g.: HR-1) being the most preferred. 6. **IF**, at any time, a lower numbered success path is able to be implemented for **ANY** safety function, **THEN**, as time permits, perform the following actions: a. Verify the lower numbered success path is available using the Resource Assessment Table. b. Commence performance of the lower numbered success path. c. Exit the original success path as appropriate. 7. **WHEN** the following conditions are met: • The Recovery Actions for the selected success paths are being performed • The Acceptance Criteria for each selected Safety Function success path is satisfied **THEN PROCEED** to Section V., <u>LONG TERM ACTIONS</u>. END of Section IV	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. DETERMINE PLANT STATUS.	
1. Determine the current status of the plant by identifying the following: • Present RCS conditions, including inventory, temperature, pressure and radiation levels • Selected success paths for fulfilling each safety function • Adequacy of core cooling • Plant area radiation levels • Rates of radioactivity release to the environment	
B. ATTEMPT TO DETERMINE SPECIFIC EVENT.	
1. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** entry into the appropriate Optimal Recovery Procedure may be made provided the following conditions are met: • The Safety Function Status Checks Acceptance Criteria, for **ALL** safety functions, for EOP-8, <u>FUNCTIONAL RECOVERY PROCEDURE</u> are satisfied • The Safety Function Status Checks Intermediate Acceptance Criteria for the Optimal Recovery Procedure are satisfied	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. **IF** 500KV OFFSITE POWER WAS LOST, **THEN** ATTEMPT TO RESTORE POWER TO PLANT LOADS.	
1. Call the SO-TSO to determine when power is expected.	
2. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION.	
3. Verify power is available to the switchyard auxiliaries: • **IF** SWYD SERV XFMR SX-10 is **NOT** energized, **AND** 11 4KV Vital Bus is energized, **THEN** close SWYD 4KV SERV XFMR FDR, 152-1113. • **IF** SWYD SERV XFMR SX-20 is **NOT** energized, **AND** 21 4KV Vital Bus is energized, **THEN** close SWYD SERV XFMR 4KV FDR, 152-2113. • Verify SP-10 and SP-20 are energized **PER** OI-28, OPERATION OF 500KV SWITCHYARD.	

(continue)

V. LONG TERM ACTIONS

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
C. (continued)	
<u>CAUTION</u> **Attempts should NOT be made to re-energize a bus if a fault is suspected.**	
4. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
<u>CAUTION</u> **Loads must be stripped from MCC-114R and MCC-104R to ensure 114R REACTOR MCC breaker, 52-1119 will NOT be overloaded.**	
a. **IF** MCC-114R is energized **AND** MCC-104R is **NOT** energized, **THEN** tie MCC-104R to MCC-114R as follows:	
(1) Verify SALTWATER SYSTEM AIR COMPRESSOR 11 is available, **AND** open the SALTWATER SYSTEM AIR COMPRESSOR 12 breaker, 52-10404.	(1).1 **IF** SALTWATER SYSTEM AIR COMPRESSOR 11 is **NOT** available, **THEN** verify SALTWATER SYSTEM AIR COMPRESSOR 11 breaker, 52-11404 is open.
(2) Verify BORIC ACID PUMP 11 is available, **AND** open the BORIC ACID PUMP 12 breaker, 52-10406.	(2).1 **IF** BORIC ACID PUMP 11 is **NOT** available, **THEN** verify BORIC ACID PUMP 11 breaker, 52-11406 is open.
(3) Open MCC-104R Main Feeder Breaker, 52-10401.	
(4) Rotate the left key on the MCC-104R Main Feeder Breaker, and remove **BOTH** interlock keys.	
(5) Insert the appropriate interlock key into MCC-104R Tie breaker, 52-10420.	
(6) Turn the key in the clockwise direction.	
(continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.4.a (continued)

(7) Close MCC-104R Tie Breaker, 52-10420.

(8) Open the following MCC breakers:

- BORIC ACID BATCH TANK HEATER 11, 52-11410
- BORIC ACID BATCH TANK MIXER, 52-11425

(9) Insert the appropriate interlock key into MCC-114R Tie Breaker, 52-11420.

(10) Turn the key in the clockwise direction.

(11) Close MCC-114R Tie Breaker, 52-11420.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4 (continued) b. **IF** MCC-114R is **NOT** energized **AND** MCC-104R is energized, **THEN** tie MCC-114R to MCC-104R as follows: (1) Open MCC-114R Main Feeder Breaker, 52-11401. (2) Rotate the left key on the MCC-114R Main Feeder Breaker, and remove **BOTH** interlock keys. (3) Insert the appropriate interlock key into MCC-114R Tie Breaker, 52-11420. (4) Turn the key in the clockwise direction. (5) Close MCC-114R Tie Breaker, 52-11420. (6) Insert the appropriate interlock key into MCC-104R Tie Breaker, 52-10420. (7) Turn the key in the clockwise direction. (8) Close MCC-104R Tie Breaker, 52-10420. 5. Verify the Emergency DC PPs are operating: • Turbine EMERG OIL PP • EMERG H_2 SEAL OIL PP • SGFP EMERG OIL PPs (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	

NOTE

Operation of the equipment in this procedure will **NOT** cause 1B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.

CAUTION

SMECO Power Supply System load shall be limited as follows:

- **240 AMPS Continuous**
- **216 AMPS for 16 hours followed by 264 AMPS for up to 8 hours, then reducing to 216 AMPS**
- **216 AMPS for 20 hours followed by 295 AMPS for up to 4 hours, then reducing to 216 AMPS**

6. Energize the following support equipment as necessary to facilitate shutdown, while maintaining load within the power source's ratings:

   a. Start a MAIN EXH FAN.

   b. Start the CNTMT AIR CLR(s) in LOW as necessary to restore and maintain containment temperature below 120° F.

   c. Start the SRW Room Ventilation **PER** OI-15, SERVICE WATER SYSTEM.

   d. **IF** the "SFP TEMP HI" alarm is received,
   THEN start the SFP CLG PP(s) **PER** the appropriate OI-24 series procedure.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

7. Restore power to MCC-101AT and MCC-101BT loads, while remaining within the power source's ratings, as follows:

   a. Strip **ALL** loads from MCC-101AT and MCC-101BT by opening individual MCC breakers.

   b. **IF** 11A 480V BUS is energized, **THEN** restore power to MCC-101AT from 11 4KV Vital Bus by closing normal feeder breaker 52-1109.

   c. **IF** 14B 480V BUS is energized, **THEN** restore power to MCC-101BT from 14 4KV Vital Bus by closing normal feeder breaker 52-1419.

   d. **IF** 11 4KV Vital Bus is energized **AND** 14 4KV Vital Bus is **NOT** energized, **THEN** tie MCC-101BT to MCC-101AT as follows:

      (1) Open MCC-101BT Main Feeder Breaker, 52-10141.

      (2) Rotate the bottom key on the MCC-101BT Main Feeder Breaker, and remove **BOTH** interlock keys.

      (3) Insert the appropriate interlock key into MCC-101BT Tie Breaker, 52-10160.

      (4) Turn the key in the clockwise direction.

      (5) Close MCC-101BT Tie Breaker, 52-10160.

      (6) Insert the appropriate interlock key into MCC-101AT Tie Breaker, 52-10120.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.7.d (continued) (7) Turn the key in the clockwise direction. (8) Close MCC-101AT Tie Breaker, 52-10120. e. **IF** 11 4KV Vital Bus is **NOT** energized **AND** 14 4KV Vital Bus is energized, **THEN** tie MCC-101AT to MCC-101BT as follows: (1) Open MCC-101AT Main Feeder Breaker, 52-10101. (2) Rotate the bottom key on the MCC-101AT Main Feeder Breaker, and remove **BOTH** interlock keys. (3) Insert the appropriate interlock key into MCC-101AT Tie Breaker, 52-10120. (4) Turn the key in the clockwise direction. (5) Close MCC-101AT Tie Breaker, 52-10120. (6) Insert the appropriate interlock key into MCC-101BT Tie Breaker, 52-10160. (7) Turn the key in the clockwise direction. (8) Close MCC-101BT Tie Breaker, 52-10160. (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.7 (continued) f. Energize MCC-101AT and MCC-101BT loads by shutting the following breakers: • Technical Support Center HVAC Chiller & Pump Breaker, 52-10111 • Distribution XFMR 11 Breaker, 52-10116 • XFMR 1X51 & 1X53 (telephone) Breaker, 52-10118 • Technical Support Center UPS Computer Breaker, 52-10122 • AFW PP Room A/C Unit Breaker, 52-10150 g. Start the Technical Support Center HVAC Chiller Pump by pushing the START button, 1-HS-112, located at the NW corner stairway on the 45 ft level of the Turbine Building. (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

CAUTION

3600 KW is the maximum load limit for 1B DG and is the setting of the DG fuel rack stop. 1B DG loading should be maintained below 3300 KW to prevent the DG RPMs from falling due to automatic load variations.

8. **IF** SIAS actuates
   AND 1B DG load exceeds 3600 KW,
   THEN perform rapid DG load reduction as follows:

   a. Open 14B BUS 480V FDR breaker, 52-1413.

   b. Stop the MAIN EXH FAN.

   c. **IF** the normal supply bus for MCC-101BT is energized,
      THEN restore power to MCC-101BT from 14 4KV Vital Bus by closing normal feeder breaker 52-1419.

   d. Close 14B BUS 480V FDR breaker, 52-1413.

9. **IF** SIAS actuates
   AND 1B DG load exceeds 3300 KW,
   THEN reduce DG load below 3300 KW as follows:

   a. Stop the MAIN EXH FAN.

   b. Locally open MCC-101BT Main Feeder Breaker, 52-10141.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 10. Lower the Main Generator Hydrogen Pressure to 2 PSIG by performing the following actions: a. Align the GENERATOR CO_2 CHARGE AND GAS VENT ISOLATION VALVE, 1-G-01, to the VENT position. b. Throttle open the GENERATOR GAS VENT LINE ISOLATION VALVE, 1-G-03. c. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: (1) Shut 1-G-03. (2) Secure the EMERG H_2 SEAL OIL PP. 11. Minimize the 250V DC Battery discharge by closing the 15 Battery Charger remote supply breaker, 52-1107, **OR** 25 Battery Charger remote supply breaker, 52-2107, to energize the Battery Charger on 13 250V DC Bus.	

V. LONG TERM ACTIONS

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
D. DETERMINE IF RCS COOLDOWN SHOULD CONTINUE.	
1. Determine if RCS cooldown to cold shutdown is required based on the following considerations: a. **IF** a high radioactivity release rate to the environment exists, **THEN** ensure cooldown is in progress **PER** the selected Heat Removal success path, **AND** dump steam to the condenser if possible. b. **IF** the available inventory approaches the minimum required for cooldown **PER** ATTACHMENT (9), <u>MAKEUP WATER REQUIRED FOR RCS COOLDOWN</u> **AND** is lowering due to insufficent makeup **THEN** ensure cooldown is in progress **PER** the selected Heat Removal success path. c. **IF** a loss of **ANY** vital auxiliaries may be anticipated, including a loss of electric power, compressed air, or cooling water supplies, **THEN** ensure cooldown is in progress **PER** the selected Heat Removal success path. d. **IF** a cooldown is necessary to make repairs, **THEN** ensure cooldown is in progress **PER** the selected Heat Removal success path.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. ENSURE EQUIPMENT AVAILABILITY AND PLANT CONDITIONS TO SUPPORT RCS COOLDOWN.	
1. Determine equipment availability and plant conditons to support RCS cooldown based on the following considerations: • Status of failed equipment or conditions which may prevent or inhibit a cooldown, such as a loss of **ALL** pressurizer sprays or inability to dump steam • Availability of condensate inventory 2. **IF** repairs to equipment are required, **THEN** establish plant conditions to support making the necessary repairs. 3. **IF** insufficient inventory is available **PER** ATTACHMENT (9), <u>MAKEUP WATER REQUIRED FOR RCS COOLDOWN</u>, **THEN** attempt to raise the inventory or obtain additional sources of feedwater.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. PERFORM PLANT COOLDOWN	
NOTE If a cooldown is to be performed, then guidance from the Plant Technical Support Center may be required. Standard Cooldown methods may require modification due to the nature of the event.	
1. **IF** a plant cooldown is to be performed, **THEN** conduct a RCS cooldown to less than 300° F using any method described in the Heat Removal success paths **OR** as prescribed by the Technical Support Center.	1.1 **IF** a cooldown is **NOT** required, **THEN** continue to maintain the safety functions until guidance is provided by the Plant Technical Support Center or an approved procedure can be implemented.
2. **IF** RCS activity will **NOT** result in unacceptable radiological consequences outside containment, **AND** CET temperatures are less than 300° F, **THEN** evaluate initiating Shutdown Cooling **PER** HR-3, SHUTDOWN COOLING SYSTEM.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. IMPLEMENT THE APPROPRIATE PROCEDURE

1. **WHEN** the following conditions are met:

   - The Safety Function Status Checks Acceptance Criteria, for **ALL** safety functions, for EOP-8, FUNCTIONAL RECOVERY PROCEDURE are met
   - An appropriate, approved procedure is available for implementation

   THEN perform the following:

   a. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.

   b. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.

   c. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.

END of Section V

VI. RESOURCE ASSESSMENT TABLE

REACTIVITY CONTROL SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION RESOURCE CONDITIONS	 ACCEPTANCE CRITERIA
RC-1: CEA Insertion	a. CEAs are able to be inserted, and SUR is negative **OR** b. A loss of **ALL** Vital 4KV Buses may have occurred	1. **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering, **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero
RC-2: Boration Using CVCS	a. Charging pump is available for boron addition b. Boric acid source is available: • BAST • RWT c. Charging path is available via normal flow path or SIS flow path	1. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero
RC-3: Boration Using SIS	a. HPSI pump is available for boron addition b. RWT is available as boric acid source c. A flow path is available	1. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero

VI. RESOURCE ASSESSMENT TABLE

VITAL AUXILIARIES SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION: RESOURCE CONDITIONS	SAFETY FUNCTION SUCCESS PATH DETERMINATION: ACCEPTANCE CRITERIA
VA-1: 500KV Offsite Power	a. At least ONE 500KV Bus is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 4. **EITHER** 1Y09 or 1Y10 is energized
VA-2: Diesel Generators	a. 1A, 1B OR 0C Diesel Generator is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 4. **EITHER** 1Y09 or 1Y10 is energized

(continue)

VI. RESOURCE ASSESSMENT TABLE

VITAL AUXILIARIES (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
VA-3: SMECO	a. SMECO Power Supply System is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 4. **EITHER** 1Y09 or 1Y10 is energized

VI. RESOURCE ASSESSMENT TABLE

RCS PRESSURE AND INVENTORY CONTROL SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION RESOURCE CONDITIONS	 ACCEPTANCE CRITERIA
PIC-1: CVCS	a. Charging pump is available b. Charging path is available via normal flow path or SIS flow path c. A charging source is available: • VCT • BAST • RWT d. A method of pressurizer pressure control is available: • Pressurizer heaters • Main Spray • Aux Spray • Controlled Steaming e. SIAS has **NOT** actuated **OR** has been reset	1. Pressurizer pressure less than the upper limits of Att. (1) 2. Pressurizer level greater than 30 inches 3. RCS subcooling is between 25°F and 140°F based on CET temperatures 4. Reactor Vessel level above the top of the hot leg
PIC-2: PORVs or Pressurizer Vent	a. PORV or Pressurizer Vent required to reduce pressure b. PORV or Pressurizer Vent available to control pressure c. Charging and letdown and/or SIS is available to control pressurizer level d. Once-Through-Cooling is **NOT** in progress (continue)	1. Pressurizer pressure less than 2400 PSIA 2. Pressurizer pressure less than the upper limits of Att. (1) 3. RCS subcooling is between 25°F and 140°F based on CET temperatures 4. Pressurizer level greater than 30 inches {90} 5. Reactor Vessel level above the top of the hot leg

VI. RESOURCE ASSESSMENT TABLE

RCS PRESSURE AND INVENTORY CONTROL (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION: RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
PIC-3: Loss Of Vital AC	a. A loss of **ALL** 4KV Vital Buses has occurred b. SIAS has **NOT** actuated **OR** has been reset	1. Pressurizer pressure less than the upper limits of Att. (1) 2. RCS subcooling greater than 25°F based on CET temperatures (1) **OR** CET temperatures less than 50°F superheated (1) 3. Reactor Vessel level indicates the core is covered
PIC-4: SIS	a. SIAS has actuated **OR** SIS is able to be used to supply RCS makeup	1. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating 2. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3) 3. Reactor Vessel level indicates the core is covered

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION — RESOURCE CONDITIONS	SAFETY FUNCTION SUCCESS PATH DETERMINATION — ACCEPTANCE CRITERIA
HR-1: S/G Heat Sink With **NO** SIS Operation	a. At least ONE S/G level greater than (-)350 inches b. Feedwater is available: • Main Feedwater • AFW • Booster Pump Injection c. SIAS has **NOT** actuated **OR** has been reset d. SIS operation **NOT** required	1. At least ONE S/G has level between (-)24 inches and (+)30 inches **OR** S/G level is being restored by feedwater flow 2. **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10°F 3. **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50°F 4. RCS subcooling greater than 25°F based on CET temperatures (1) 5. Reactor Vessel level above the top of the hot leg

(1) If needed, refer to Attachment (12) to read CETs.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION — RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
HR-2: SG Heat Sink With SIS Operation	a. At least ONE S/G level greater than (-)350 inches b. Feedwater is available: • Main Feedwater • AFW • Booster Pump Injection c. SIAS has actuated or SIS operation required	1. At least ONE S/G has level between 0 inches and (+)38 inches **OR** S/G level is being restored by feedwater flow 2. CET temperatures less than 50°F superheated (1) 3. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating 4. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
HR-3: Shutdown Cooling System	a. CET temperatures less than 300°F b. Radiation levels are low enough to allow valve repositioning	1. CET temperatures less than 300°F and less than 50°F superheated (1) 2. HPSI Pumps are injecting water into the RCS **PER** Att. (10) (2) 3. Pressurizer pressure less than 270 PSIA {245} 4. Reactor Vessel level indicates the core is covered
HR-4: Once-Through-Cooling	a. HPSI pumps are available b. BOTH PORVs are available c. Flow path is available d. RWT is available as a makeup source	1. CET temperatures less than 50°F superheated (1) 2. **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met, **THEN ALL** available Charging Pumps operating 3. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3) 4. Pressurizer pressure less than 1270 PSIA **OR** is lowering

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
CE-1: **NO** CIS	a. Containment pressure less than 2.8 PSIG	1. Containment pressure less than 2.8 PSIG
	b. CIS has **NOT** actuated **OR** has been reset	2. Containment temperature less than 220°F (1)
	c. Containment radiation alarms are clear with **NO** unexplained rise (2)	3. Containment radiation alarms are clear with **NO** unexplained rise (2)

(1) **NOT** available if 1Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
CE-2: Containment Isolation	a. Containment pressure less than 4.25 PSIG b. CSAS has **NOT** actuated **OR** has been reset	1. Containment pressure less than 4.25 PSIG 2. **ALL** available Containment Air Coolers are operating with maximum SRW flow 3. **ALL** containment penetrations required to be shut have an isolation valve shut 4. Hydrogen concentration less than 0.5% (1) **OR** **ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1) **OR** Hydrogen purge operation per Tech Support recommendation (1)

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
CE-3: Containment Spray	a. Containment pressure greater than 4.25 PSIG	1. Containment pressure less than 50 PSIG 2. **ALL** available Containment Air Coolers are operating with maximum SRW flow 3. Containment spray flow is greater than 1350 GPM per pump, if operating 4. **ALL** containment penetrations required to be shut have an isolation valve shut 5. Hydrogen concentration less than 0.5% (1) **OR** **ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1) **OR** Hydrogen purge operation per Tech Support recommendation (1)

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

VI. RESOURCE ASSESSMENT TABLE

RADIATION LEVELS EXTERNAL TO CONTAINMENT	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
SUCCESS PATH	**RESOURCE CONDITIONS**	**ACCEPTANCE CRITERIA**
RLEC-1:Normal Levels	a. Normal Radiation levels exist outside of containment b. Containment pressure less than 2.8 PSIG c. A loss of **ALL** Vital 4KV Buses may have occurred	1. Noble Gas Monitor (1-RIC-5415) alarm clear with **NO** unexplained rise 2. Condenser Off-Gas RMS (1-RI-1752) alarm clear with **NO** unexplained rise (1) 3. S/G B/D RMS (1-RI-4014) alarm clear with **NO** unexplained rise (1) 4. Main Vent Gaseous RMS (1-RI-5415) alarm clear with **NO** unexplained rise (1)

(1) **NOT** applicable if OOS due to loss of power.

(continue)

VI. RESOURCE ASSESSMENT TABLE

RADIATION LEVELS EXTERNAL TO CONTAINMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION — RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
RLEC-2: Containment Isolated	a. Radiation detected outside containment **OR** Containment pressure greater than 2.8 PSIG	1. **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (1-RIC-5415) • Condenser Off-Gas RMS (1-RI-1752) • S/G B/D RMS (1-RI-4014) • Main Vent Gaseous RMS (1-RI-5415) **OR** 2. **ALL** containment penetrations required to be shut have an isolation valve shut **IF** a tube rupture is identified in a S/G, • **ALL** release paths from the affected S/G to the environment are isolated • Affected S/G pressure less than 920 PSIA

VII. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the safety function status checks.

B. Perform safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being met, promptly upon discovery.

REACTIVITY CONTROL	SAFETY FUNCTION ACCEPTANCE CRITERIA	
SUCCESS PATH	**ACCEPTANCE CRITERIA**	**STATUS CHECK**
RC-1: CEA Insertion	a. **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	
RC-2: Boration Using CVCS	a. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	
RC-3: Boration Using SIS	a. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	**STATUS CHECK**
VA-1: 500KV Offsite Power	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14	
	d. **EITHER** 1Y09 or 1Y10 is energized	
VA-2: Diesel Generators	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14	
	d. **EITHER** 1Y09 or 1Y10 is energized	

(continue)

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
VA-3: SMECO	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14	
	d. **EITHER** 1Y09 or 1Y10 is energized	

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY CONTROL	SAFETY FUNCTION ACCEPTANCE CRITERIA	
SUCCESS PATH	**ACCEPTANCE CRITERIA**	**STATUS CHECK**
PIC-1: CVCS	a. Pressurizer pressure less than the upper limits of Att. (1)	
	b. Pressurizer level greater than 30 inches	
	c. RCS subcooling is between 25°F and 140°F based on CET temperatures	
	d. Reactor Vessel level above the top of the hot leg	
PIC-2: PORVs or Pressurizer Vent	a. Pressurizer pressure less than 2400 PSIA	
	b. Pressurizer pressure less than the upper limits of Att. (1)	
	c. RCS subcooling is between 25°F and 140°F based on CET temperatures	
	d. Pressurizer level greater than 30 inches {90}	
	e. Reactor Vessel level above the top of the hot leg	

(continue)

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY CONTROL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
PIC-3: Loss Of Vital AC	a. Pressurizer pressure less than the upper limits of Att. (1)	
	b. RCS subcooling greater than 25°F based on CET temperatures (1)	
	OR	
	CET temperatures less than 50°F superheated (1)	
	c. Reactor Vessel level indicates the core is covered	
PIC-4: SIS	a. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating	
	b. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	
	c. Reactor Vessel level indicates the core is covered	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	 STATUS CHECK
HR-1: SG Heat Sink With **NO** SIS Operation	a. At least ONE S/G has level between (-)24 inches and (+)30 inches	
	OR	
	S/G level is being restored by feedwater flow	
	b. **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10°F	
	c. **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50°F	
	d. RCS subcooling greater than 25°F based on CET temperatures (1)	
	e. Reactor Vessel level above the top of the hot leg	

(1) If needed, refer to Attachment (12) to read CETs.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
HR-2: SG Heat Sink With SIS Operation	a. At least ONE S/G has level between 0 inches and (+)38 inches	
	OR	
	S/G level is being restored by feedwater flow	
	b. CET temperatures less than 50°F superheated (1)	
	c. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating	
	d. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	**STATUS CHECK**
HR-3: Shutdown Cooling System	a. CET temperatures less than 300°F and less than 50°F superheated (1)	
	b. HPSI Pumps are injecting water into the RCS **PER** Att. (10) (2)	
	c. Pressurizer pressure less than 270 PSIA {245}	
	d. Reactor Vessel level indicates the core is covered	
HR-4: Once-Through-Cooling	a. CET temperatures less than 50°F superheated (1)	
	b. **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met, **THEN ALL** available Charging Pumps operating	
	c. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	
	d. Pressurizer pressure less than 1270 PSIA **OR** is lowering	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	**STATUS CHECK**
CE-1: **NO** CIS	a. Containment pressure less than 2.8 PSIG	
	b. Containment temperature less than 220°F (1)	
	c. Containment radiation alarms are clear with **NO** unexplained rise (2)	

(1) **NOT** available if 1Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
CE-2: Containment Isolation	a. Containment pressure less than 4.25 PSIG	
	b. **ALL** available Containment Air Coolers are operating with maximum SRW flow	
	c. **ALL** containment penetrations required to be shut have an isolation valve shut	
	d. Hydrogen concentration less than 0.5% (1)	
	OR	
	ALL available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1)	
	OR	
	Hydrogen purge operation per Tech Support recommendation (1)	

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
CE-3: Containment Spray	a. Containment pressure less than 50 PSIG	
	b. **ALL** available Containment Air Coolers are operating with maximum SRW flow	
	c. Containment spray flow is greater than 1350 GPM per pump, if operating	
	d. **ALL** containment penetrations required to be shut have an isolation valve shut	
	e. Hydrogen concentration less than 0.5% (1)	
	OR	
	ALL available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1)	
	OR	
	Hydrogen purge operation per Tech Support recommendation (1)	

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
RLEC-1:Normal Levels	a. Noble Gas Monitor (1-RIC-5415) alarm clear with **NO** unexplained rise	
	b. Condenser Off-Gas RMS (1-RI-1752) alarm clear with **NO** unexplained rise (1)	
	c. S/G B/D RMS (1-RI-4014) alarm clear with **NO** unexplained rise (1)	
	d. Main Vent Gaseous RMS (1-RI-5415) alarm clear with **NO** unexplained rise (1)	

(1) **NOT** applicable if OOS due to loss of power.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
RLEC-2: Containment Isolated	a. **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (1-RIC-5415) • Condenser Off-Gas RMS (1-RI-1752) • S/G B/D RMS (1-RI-4014) • Main Vent Gaseous RMS (1-RI-5415)	
	OR	
	b. **ALL** containment penetrations required to be shut have an isolation valve shut	
	IF a tube rupture is identified in a S/G:	
	• **ALL** release paths from the affected S/G to the environment are isolated	
	• Affected S/G pressure less than 920 PSIA	

VII. SAFETY FUNCTION STATUS CHECK

STATUS CHECK NUMBER	COMPLETED AT TIME
1	
2	
3	
4	
5	
6	
7	
8	

PLACEKEEPER
FUNCTIONAL RECOVERY ENTRY

INITIAL ENTRY	RECOVERY ACTIONS
• PERFORM THE RCP TRIP STRATEGY • MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS • IDENTIFY **ALL** SUCCESS PATHS • DETERMINE IF ACCEPTANCE CRITERIA ARE MET	• RECOVERY ACTION PRIORITY • Safety Functions **NOT** meeting their EOP-8 Acceptance Criteria • Safety Functions **NOT** met in EOP-0, **AND** Safety Functions **NOT** met in an Optimal Recovery Procedure • **ALL** remaining Safety Functions • IMPLEMENT LONG TERM ACTIONS

START	FUNCTION	DONE	PAGE
	A. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	8
	B. OBTAIN FUNCTIONAL RECOVERY ENTRY PLACEKEEPER AND RECORD TIME. ________		8
	C. PERFORM THE RCP TRIP STRATEGY.	C	9
	D. MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS.		9
	E. DETERMINE STATUS OF SAFETY FUNCTIONS (STA).	C	10
	F. PERFORM RECOVERY ACTIONS.	C	10
	• Identify success paths **AND** determine if the Acceptance Criteria are met for **ALL** Safety Functions		10
	• Exit the Optimal Recovery Procedure		10
	• Commence the Recovery Actions with the following priority • Safety Functions **NOT** meeting their EOP-8 Acceptance Criteria • Safety Functions **NOT** met in EOP-0, **AND** Safety Functions **NOT** met in an Optimal Recovery Procedure • **ALL** remaining Safety Functions		11
	• **WHEN** the Recovery Actions are being performed **AND** the Acceptance Criteria for each Safety Function is satisfied, **THEN PROCEED** to Section V., <u>LONG TERM ACTIONS</u>		12

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

LONG TERM ACTIONS

START	FUNCTION	DONE	PAGE
	A. DETERMINE PLANT STATUS.	C	13
	B. ATTEMPT TO DETERMINE SPECIFIC EVENT.	C	13
	• IF a specific event can be identified, **THEN** entry into the Optimal Recovery Procedure may be made.		13
	C. IF 500KV OFFSITE POWER WAS LOST, THEN ATTEMPT TO RESTORE POWER TO PLANT LOADS.	C	14
	• Tie MCC-104 and 114 • Restore power to MCC-101AT and 101BT		15 19
	D. DETERMINE IF RCS COOLDOWN SHOULD CONTINUE.	C	24
	E. ENSURE EQUIPMENT AVAILABILITY AND PLANT CONDITIONS TO SUPPORT RCS COOLDOWN.	C	25
	F. PERFORM PLANT COOLDOWN.		26
	• IF RCS activity will **NOT** result in unacceptable radiological consequences outside containment, **AND CET** temperatures are less than 300°F, **THEN** evaluate initiating Shutdown Cooling **PER** HR-3 SHUTDOWN COOLING SYSTEM.		26
	G. IMPLEMENT THE APPROPRIATE PROCEDURE.		27

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RESOURCE ASSESSMENT

Safety Functions **NOT** met in EOP-0 or Optimal Recovery Procedure

____	____	____	____	____	____
RC-1	VA-1	PIC-1	HR-1	CE-1	RLEC-1
RC-2	VA-2	PIC-2	HR-2	CE-2	RLEC-2
RC-3	VA-3	PIC-3	HR-3	CE-3	
		PIC-4	HR-4		

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. MAINTAIN RCS TEMPERATURE.	
1. **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.	

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. ESTABLISH REACTIVITY CONTROL BY CEA INSERTION.

1. Ensure the Reactor has tripped by performing **ANY** of the following:
   - Depress the four local Emergency Trip Buttons on the Trip Circuit Breakers in the Unit 1 Cable Spreading Room
   - Depress **ONE** set of Manual Reactor Trip Buttons
   - De-energize the CEDM Motor Generator Sets as follows:
     - Open 12A 480V BUS FDR
     - Open 12A-12B 480V BUS TIE
     - Open 13A 480V BUS FDR
     - Open 13A-13B 480V BUS TIE

NOTE

When re-energizing 12A and 13A 480V Buses, the breaker lineup should be returned to that existing prior to the trip.

- Energize 12A and 13A 480V Buses as follows:
  a. Energize 12A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.
  b. Energize 13A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.

(continue)

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. Check **NO** more than ONE CEA **NOT** fully inserted.	2.1 **IF ALL** CEA indications are lost, **THEN** perform the following actions: a. Ensure WRNI Power lowering and SUR is negative **OR** WRNI Power below 10^{-4}% and SUR is negative or zero. b. **WHEN** at least **ONE** Vital 4KV Bus has been restored, **THEN** establish reactivity control as follows: (1) Sample the RCS to determine boron concentration. (2) Determine if RCS boration is required **PER** the NEOPs. (3) **IF** RCS boration is required, **THEN** borate the RCS to achieve the required shutdown margin **PER** the selected Core and RCS Heat Removal success path. 2.2 **IF** more than ONE CEA fails to fully insert, **THEN PROCEED** to RC-2, BORATION USING CVCS, **OR** RC-3, BORATION USING SIS.

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-1.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering and SUR is negative. **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. MAINTAIN RCS TEMPERATURE.	
1. **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.	
B. ESTABLISH REACTIVITY CONTROL BY BORATION USING CVCS.	
1. Commence boration by performing the following: a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 1-CVC-518-CV • 1-CVC-519-CV	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the AUX HPSI HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 1-SI-656-MOV. (2) Open **ONE** of the AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (3) Open SI TO CHG HDR valve, 1-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 1-CVC-183, located in the 27 ft West Penetration Room.
(continue)	(continue)

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.a (continued)	B.1.a.1 (continued) (5) Shut L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the AUX HPSI HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 1-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 1-CVC-188.
b. Commence RCS boration from the BAST using the CVCS as follows: (1) Ensure BAST levels remain greater than 10 inches. (2) Shut VCT M/U valve, 1-CVC-512-CV. (3) Open BA DIRECT M/U valve, 1-CVC-514-MOV. (4) Open BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV (5) Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. (6) Start **ALL** available BA PPs. (7) Shut VCT OUT valve, 1-CVC-501-MOV. (8) Start **ALL** available CHG PPs. (9) Ensure CHG HDR PRESS is greater than RCS pressure. (continue)	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows: (1) Ensure RWT level is greater than 2 feet. (2) Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. (3) Shut VCT OUT valve, 1-CVC-501-MOV. (4) Start **ALL** available CHG PPs. (5) Ensure CHG HDR PRESS is greater than RCS pressure.

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) c. **IF** more than ONE CEA failed to fully insert, **THEN** borate the RCS to at least 2300 ppm. d. **WHEN** boration is complete **AND** WRNI power is less than 10^{-4}% and SUR is negative or zero, **THEN** secure boration as follows: (1) **IF** boration was from the BASTs, **THEN** perform the following actions: (a) Open VCT OUT valve, 1-CVC-501-MOV. (b) Stop the BA PP(s). (c) Shut BA DIRECT M/U valve, 1-CVC-514-MOV. (d) Shut BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV (2) **IF** boration was from a RWT, **THEN** perform the following actions: (a) Open VCT OUT valve, 1-CVC-501-MOV. (b) Shut RWT CHG PP SUCT valve, 1-CVC-504-MOV. (3) Return makeup to the VCT **PER** OI-2B, BORATION, DILUTION AND MAKEUP. 2. Ensure boric acid concentration in makeup water is adequate to maintain required shutdown margin.	

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-2.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • Boration rate greater than or equal to 40 GPM, WRNI power is lowering and SUR is negative **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. MAINTAIN RCS TEMPERATURE.	
1. **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.	
B. ESTABLISH REACTIVITY CONTROL BY BORATION USING SIS.	
1. **IF** pressurizer pressure is less than or equal to 1725 PSIA as a result of the event **OR** containment pressure is greater than or equal to 2.8 PSIG, **THEN** verify SIAS actuation.	
2. **IF** SIAS has **NOT** actuated, **THEN** establish HPSI flow by performing the following actions: a. Open MAIN and AUX HPSI HDR valves: MAIN • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV AUX • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) b. Start 11 and 13 HPSI PPs. c. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. d. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. e. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>. 3. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 11 HPSI PP • 13 HPSI PP (continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.3 (continued) b. Verify safety injection flow: • HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA (continue)	b.1 Perform the following actions as necessary: **CAUTION** **Operation of two HPSI Pumps on 14 4KV Bus may cause 1B DG loading to exceed 3600 KW.** • **IF** 11 HPSI PP failed, **THEN** perform the following actions: (1) **IF** 1B DG is powering 14 4KV Bus, **THEN** verify DG load is less than 2960 KW. (2) Start 12 HPSI PP. • **IF** 13 HPSI PP failed, **THEN** align 12 HPSI PP as follows: (1) Start 12 HPSI PP. (2) Open HPSI HDR XCONN valve, 1-SI-653-MOV. (3) Shut HPSI HDR XCONN valve, 1-SI-655-MOV. • Ensure electrical power is available to valves and pumps. • Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
4. Check SIS flow rate is greater than 40 GPM.	4.1 **IF** high RCS pressure is preventing adequate SIS flow, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path

5. **WHEN ALL** of the following conditions can be maintained:
• WRNI power is less than 10^{-4}% and SUR is negative or zero
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
    • S/G level greater than (-)170 inches
    • capable of being supplied with feedwater
    • capable of being steamed	

(continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) • Reactor Vessel level above the top of the hot leg **THEN** HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following: • RCS subcooling between 25 and 140° F based on CET temperatures • Pressurizer level between 101 inches {141} and 180 inches {190} 6. **IF** the HPSI throttle criteria can **NOT** be maintained after the pumps are throttled **OR** secured, **THEN** restart the appropriate pumps **AND** restore full flow.	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-3.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • Boration rate greater than or equal to 40 GPM, WRNI power is lowering and SUR is negative. **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN** perform the following actions: a. Concurrently perform the Recovery Actions for the next safety function in jeopardy while continuing efforts to establish reactivity control. b. Energize or restore other vital auxiliaries or components necessary to support the reactivity control success paths. c. Attempt manual operation of inoperative valves. d. **IF** high RCS pressure is preventing adequate SIS flow, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path e. Determine the appropriate emergency response actions **PER** the ERPIP.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

REACTIVITY CONTROL PLACEKEEPER
RC-1: CEA INSERTION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• CEAs are able to be inserted and SUR is negative **OR** • A loss of **ALL** Vital 4KV Buses may have occurred	• **NO** more than ONE CEA **NOT** fully inserted, and WRNI power is lowering **OR** • WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		1
	• **IF EITHER** of the following conditions exist: • WRNI Power greater than $10^{-4\%}$ • SUR is positive **THEN** maintain RCS temperature constant.		1
	B. ESTABLISH REACTIVITY CONTROL BY CEA INSERTION.		2
	• Check **NO** more than ONE CEA **NOT** fully inserted		3
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-1.		4
	• **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.		4

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

REACTIVITY CONTROL PLACEKEEPER
RC-2: BORATION USING CVCS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• Charging pump is available for boron addition
• Boric acid source is available:
  • BAST
  • RWT
• Charging path is available via normal flow path or SIS flow path
	• Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative
	OR
	• WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		5
	• **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.		5
	B. ESTABLISH REACTIVITY CONTROL BY BORATION USING CVCS.		5
	• Commence boration		5
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-2.		8
	• IF Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.		8

NOTE: Continuously applicable steps are designated with a "C" in the DONE column

REACTIVITY CONTROL PLACEKEEPER
RC-3: BORATION USING SIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• HPSI pump is available for boron addition • RWT is available as boric acid source • A flow path is available	• Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** • WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		9
	• **IF EITHER** of the following conditions exist: • WRNI Power greater than $10^{-4\%}$ • SUR is positive **THEN** maintain RCS temperature constant.		9
	B. ESTABLISH REACTIVITY CONTROL BY BORATION USING SIS.	C	9
	• **IF** RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation. **OR** • Align HPSI injection and block SIAS. • **IF** high RCS pressure is preventing SIS flow, **THEN** attempt to depressurize the RCS: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path		9 9 12
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-3.		14
	• **IF** Reactivity Control has **NOT** been established, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function in jeopardy • Restore other vital auxiliaries or components • Attempt manual operation of inoperative valves • **IF** high RCS pressure prevents SIS injection flow, **THEN** attempt to lower plant pressure • Determine the appropriate emergency response actions **PER** the ERPIP		14

NOTE: Continuously applicable steps are designated with a "C" in the DONE column

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. **IF** 500KV OFFSITE POWER HAS BEEN LOST,
THEN ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.

1. **IF** 11 13KV Service Bus is **NOT** energized,
THEN ensure the following 13KV breakers are open:

   - 11 SERV BUS 13KV FDR, 252-1104
   - 11 SERV BUS TIE, 252-1105
   - U-4000-12 13KV FDR, 252-1103
   - U-4000-11 13KV FDR, 252-1102
   - U-4000-13 13KV FDR, 252-1101
   - Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106

2. **IF** 21 13KV Service Bus is **NOT** energized,
THEN ensure the following 13KV breakers are open:

   - 21 SERV BUS 13KV FDR, 252-2104
   - 21 SERV BUS TIE, 252-2105
   - U-4000-21 13KV FDR, 252-2102
   - U-4000-22 13KV FDR, 252-2103
   - U-4000-23 13KV FDR, 252-2101
   - Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 3. **IF** 11 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions: • Ensure the following 4KV breakers are open: • 11 4KV BUS NORMAL FDR, 152-1115 • 11 4KV BUS ALT FDR, 152-1101 • SWYD 4KV SERV XFMR FDR, 152-1113 **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** • Verify the following 4KV Vital Bus load breakers are open: • No. 11 Low Press Safety Inj. Pump, 152-1104 • No. 11 Salt Water Pump, 152-1105 • No. 11 Containment Spray Pump, 152-1107 • No. 11 High Press Safety Inj. Pump, 152-1108 • No. 13 High Press Safety Inj. Pump, 152-1110 • No. 13 Service Water Pump, 152-1111 • No. 13 Salt Water Pump, 152-1112 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3 (continued) • AFW PP No. 13, 152-1116 • Place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON 4. **IF** 14 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions: • Ensure the following 4KV breakers are open: • 14 4KV BUS NORMAL FDR, 152-1414 • 14 4KV BUS ALT FDR, 152-1401 **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** • Verify the following 4KV Vital Bus load breakers are open: • No. 12 Low Press Safety Inj. Pump, 152-1404 • No. 12 Salt Water Pump, 152-1405 • No. 12 Containment Spray Pump, 152-1407 • No. 12 High Press Safety Inj. Pump, 152-1408 • No. 13 High Press Safety Inj. Pump, 152-1410 • No. 13 Service Water Pump, 152-1411 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) • No. 13 Salt Water Pump, 152-1412 • Place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON **CAUTION** **The following step provides actions to prevent water hammer damage from CAC voiding.** **CAUTION** **SRW Pumps start when power is restored to the associated 4KV Bus.** 5. IF CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. IF 11 SRW Header is idle, **THEN** restart 11 SRW Header as follows: (1) Check that Containment Pressure has remained less than 25 PSIG with 11 SRW Header idle. (2) Attempt to start the desired SRW PP on 11 SRW Header. (continue)	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions: (1) Place the SRW PP(s) aligned to 11 SRW Header in PULL TO LOCK. (2) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
b. **IF** 12 SRW Header is idle, **THEN** restart 12 SRW Header as follows:	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions:
(1) Check that Containment Pressure has remained less than 10 PSIG with 12 SRW Header idle.	**CAUTION** **1B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 1B DG.**
(2) Attempt to start the desired SRW PP on 12 SRW Header.	**WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.**
	(1) Restart 12 SRW Header:
	(a) Shut 13 CNTMT CLG U MAN SUPP FR 12 SRW SUBSYS, 1-SRW-149, located 27 ft East Pen Room south of Containment Purge Supply.
	(b) Shut 14 CNTMT CLG SUPP FR 12 SRW SUBSYS, 1-SRW-156, located 5 ft West Pen Room along west wall.
	(c) Attempt to start the desired SRW PP on 12 SRW Header.
	(d) Consult with the Plant Technical Support Center for guidance on system restoration.
(continue)	(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A.5.b (continued)	A.5.b.1 (continued) (2) **IF** 12 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 12 SRW Header in PULL TO LOCK. (b) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (c) Locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM 500KV OFFSITE POWER.	
1. **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: a. Open the Control Room panel bench board lower front covers. b. Remove the front and back covers of the Control Room DG Control Consoles. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** The Plant Computer and its associated inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 12 AND 24 battery chargers are lost. c. Determine whether Unit 1 Plant Computer is functional by observing the following: • Time indication updating on the CRT • CRT responding to function keys depressed or items selected from menu d. **IF** Unit 1 Plant Computer is functioning, **THEN** shutdown the Unit 1 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows: (1) Depress the Shift key and type "@@A". (2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt. (3) Type "GUEST1" and depress the Return key. (4) Observe the "ENTER KEY" response. (5) Depress the Return key. (6) Observe the message (8 lines) and the "TSM>" prompt. (7) Type "KILLER" and depress the Return key. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.1.d (continued)

(8) Observe the messages (several pages) and the "TSM>" prompt.

(9) Type "X" and depress the Return key.

(10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE".

(11) Depress the Shift key and type "@@P".

(12) Observe the "//" prompt.

(13) Type "HALT" and depress the Return key.

NOTE
"NNNNNNNN" in the following response may be any number.

(14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//".

e. Open the following power sources, located in the Unit 1 Cable Spreading Room:

- Instrument Bus Switch 1Y10-5 (Computer Inverter 1Y05)
- Unit 1 DAS/Computer Inverter Output Breaker at 1Y05
- Unit 1 DAS/Computer Inverter Battery Input Breaker at 1Y05
- DC INPUT breaker at 1INV1T11 (Unit 1 Turbine Controls Inverter)

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 2. **IF** the 500KV Red and Black Buses are **NOT** energized, **THEN** energize the 500KV Red Bus **OR** the 500KV Black Bus by performing the following actions: a. Verify that switching orders have been received by the Control Room Supervisor **OR** Shift Manager, from the SO-TSO, to operate the required equipment. b. Evaluate alarms associated with the 500KV switchyard. c. Verify the associated Unit Generator High Side Line Disconnect is open before closing Turbine Generator Output breakers. d. Verify the Unit-2 Generator Coast Down Lockout is reset. e. Place the SYNCHROSCOPE SEL Switch in NORMAL (1) **OR** EMERGENCY (2) position. (continue)	2.1 **IF** 500KV offsite power is **NOT** available, **THEN PROCEED** to VA-2, EMERGENCY DIESEL GENERATOR, **OR** VA-3, SMECO.

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** A Synchronizer is **NOT** required for operation of breakers 552-41 **OR** 552-43. f. Place the applicable SYNCHRONIZER SEL Switch in MANUAL position. • (552-21) 11 GEN SYNCHRONIZER SEL Switch • (552-22) 11 GEN SYNCHRONIZER SEL Switch • (552-23) 11 GEN SYNCHRONIZER SEL Switch • (552-61) 21 GEN SYNCHRONIZER SEL Switch • (552-62) 21 GEN SYNCHRONIZER SEL Switch • (552-63) 21 GEN SYNCHRONIZER SEL Switch g. Insert the sync stick in the sync jack at the breaker to be closed. h. **IF** paralleling TWO power sources, **THEN** ensure the power sources are synchronized by observing the following: • Sync lights out • Synchroscope at 12 o'clock • Running and incoming voltages are matched i. **IF** closing in on a de-energized bus, **THEN** ensure the bus is **NOT** energized. j. Close the breaker by placing the Breaker Control Handswitch in the CLOSE position **AND** release. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	**ALTERNATE ACTIONS**
B.2 (continued) k. Check the breaker has closed by observing applicable breaker indicating lights and meters, if applicable. l. Repeat steps B.1.a through B.1.k as desired to close additional breakers. m. Remove the sync stick **AND** return to Home Base. n. Verify **BOTH** SYNCHRONIZER SEL Switches in the OFF position. o. Place the SYNCHROSCOPE SEL Switch in the OFF position. p. **WHEN** operation has been completed in accordance with the switching orders, **THEN** inform the SO-TSO. q. Reset the 13KV BUS 12 **OR** 22 286 LOCKOUT/RESET DEVICE as applicable. r. Reset the applicable bus 247/B device target flags on **BOTH** undervoltage relays: 13KV BUS 12 • B-12-P • B-12-B 13KV BUS 22 • B-22-P • B-22-B (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

3. **IF** 11 and 21 13KV Service Buses are **NOT** energized,
   THEN energize the desired 13KV Service Bus by performing the following actions:

   a. **IF** it is desired to energize 11 13KV Service Bus,
      THEN perform the following actions:

      (1) Verify 12 13KV Service Bus is energized.

      (2) Energize 11 13KV Service Bus by closing 11 SERV BUS 13KV FDR, 252-1104.

      (3) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE.

      (4) Reset the 247/B device target flags on **BOTH** undervoltage relays:

      - B-11-P
      - B-11-B

      (5) **IF** MCC 116T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT:

      - 1H1101REG
      - 1H1102REG
      - 1H1103REG

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.3 (continued) b. **IF** it is desired to energize 21 13KV Service Bus, **THEN** perform the following actions: (1) Verify 22 13KV Service Bus is energized. (2) Energize 21 13KV Service Bus by closing 21 SERV BUS 13KV FDR, 252-2104. (3) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE. (4) Reset the 247/B device target flags on **BOTH** undervoltage relays: • B-21-P • B-21-B (5) **IF** MCC 216T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT: • 2H2101REG • 2H2102REG • 2H2103REG (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

CAUTION

Attempts should NOT be made to reenergize a bus if a fault is suspected.

4. Energize the desired U4000 SERV XFMRs.

   a. **IF** it is desired to energize U4000-11 SERV XFMR,
      THEN perform the following actions:

      (1) Verify the following breakers are open:

      - 14 4KV BUS ALT FDR, 152-1401
      - 11 4KV BUS NORMAL FDR, 152-1115
      - 12 4KV BUS NORMAL FDR, 152-1201
      - 13 4KV BUS NORMAL FDR, 152-1311

      (2) Close the U4000-11 SERV XFMR 13KV FDR, 252-1102.

   b. **IF** it is desired to energize U4000-21 SERV XFMR,
      THEN perform the following actions:

      (1) Verify the following breakers are open:

      - 14 4KV BUS NORMAL FDR, 152-1414
      - 11 4KV BUS ALT FDR, 152-1101
      - 12 4KV BUS ALT FDR, 152-1209
      - 13 4KV BUS ALT FDR, 152-1301

      (2) Close the U4000-21 SERV XFMR 13KV FDR, 252-2102.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

CAUTION

Attempts should NOT be made to reenergize a bus if a fault is suspected.

5. **IF** 11 and 14 4KV Vital Buses are **NOT** energized,
   THEN restore power to at least **ONE** 4KV Vital Bus from the 13KV Service Buses as follows:

   a. Shut CC CNTMT SUPPLY valve, 1-CC-3832-CV.

   b. **IF** it is desired to energize 11 4KV Vital Bus from U4000-11 SERV XFMR,
      THEN energize 11 4KV Vital Bus as follows:

      (1) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK.

      (2) Place 13 AFW PP in PULL TO LOCK.

      (3) Verify 11 4KV BUS ALT FDR, 152-1101, is open.

      (4) Insert the sync stick into the sync jack at the 11 4KV BUS NORMAL FDR, 152-1115.

      (5) Close the 11 4KV BUS NORMAL FDR, 152-1115.

      (6) Remove the sync stick
          AND return to Home Base.

      (7) **WHEN** 11 4KV Bus sequencing is complete,
          THEN place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) c. **IF** it is desired to energize 14 4KV Vital Bus from U4000-11 SERV XFMR, **THEN** energize 14 4KV Vital Bus as follows: (1) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (2) Verify the 14 4KV BUS NORMAL FDR, 152-1414, is open. (3) Insert the sync stick into the sync jack at the 14 4KV BUS ALT FDR, 152-1401. (4) Close the 14 4KV BUS ALT FDR, 152-1401. (5) Remove the sync stick **AND** return to Home Base. (6) **WHEN** 14 4KV Bus sequencing is complete, **THEN** place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) d. **IF** it is desired to energize 11 4KV Vital Bus from U4000-21 SERV XFMR, **THEN** energize 11 4KV Vital Bus as follows: (1) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK. (2) Place 13 AFW PP in PULL TO LOCK. (3) Verify 11 4KV BUS NORMAL FDR, 152-1115, is open. (4) Insert the sync stick into the sync jack at the 11 4KV BUS ALT FDR, 152-1101. (5) Close the 11 4KV BUS ALT FDR, 152-1101. (6) Remove the sync stick **AND** return to Home Base. (7) **WHEN** 11 4KV Bus sequencing is complete, **THEN** place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.5 (continued)

e. **IF** it is desired to energize 14 4KV Vital Bus from U4000-21 SERV XFMR, **THEN** energize 14 4KV Vital Bus as follows:

(1) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK.

(2) Verify 14 4KV BUS ALT FDR, 152-1401, is open.

(3) Insert the sync stick into the sync jack at the 14 4KV BUS NORMAL FDR, 152-1414.

(4) Close the 14 4KV BUS NORMAL FDR, 152-1414.

(5) Remove the sync stick **AND** return to Home Base.

(6) **WHEN** 14 4KV Bus sequencing is complete, **THEN** place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

6. **IF ANY** 125V DC Bus is less than 105 volts:

- 11
- 12
- 21
- 22

THEN concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 7. **IF** less than THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 8. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 11A and 11B • 14A and 14B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. **IF** 1Y09 and 1Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 1Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-114R is energized. (2) Close the Instrument Bus Transformer 11 Feeder Breaker, 52-11429. (3) Close the Main Feeder Breaker, 79, on 1Y09. b. Energize 1Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-104R is energized. (2) Close the Instrument Bus Transformer 12 Feeder Breaker, 52-10429. (3) Close the Main Feeder Breaker, 1, on 1Y10. 10. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, 125 VOLT VITAL DC.	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SALTWATER PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, LOSS OF SERVICE WATER • Saltwater Pumps **PER** AOP-7A, LOSS OF SALTWATER COOLING • Control Room Ventilation **PER** OI-22F, CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION • Switchgear Room Ventilation **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING • 72' Computer Room Ventilation **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION
NOTE 1B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

4. **IF** Component Cooling Flow has been lost,
   THEN restore flow.

   a. Verify CC CNTMT SUPPLY valve, 1-CC-3832-CV, is shut.

   b. Start a CC PP.

   c. Verify the CC HX in service is being supplied from an operating Saltwater Header.

NOTE
RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.

   d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:

   - 11A RCP: _____° F / _____° F
   - 11B RCP: _____° F / _____° F
   - 12A RCP: _____° F / _____° F
   - 12B RCP: _____° F / _____° F

CAUTION
Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.

   e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPPLY valve, 1-CC-3832-CV.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4 (continued) f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPPLY valve, 1-CC-3832-CV. (3) Slowly open 1-CC-284 to restore component cooling flow. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **IF** 1Y09 **OR** 1Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus as follows: a. **IF** 1Y09 is de-energized, **THEN** Tie 1Y09 to 1Y10: (1) On 1Y09, open INSTRUMENT TRANSF-11 1X08 main feeder breaker 79. (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2. (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.5 (continued) b. **IF** 1Y10 is de-energized, **THEN** Tie 1Y10 to 1Y09: (1) On 1Y10, open INSTRUMENT TRANSF-12 1X09 main feeder breaker 1. (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2. (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON. 6. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus, **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-1.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
• At least ONE 4KV Vital Bus is energized
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
• At least THREE 120V AC Vital Buses are energized:
  • 11
  • 12
  • 13
  • 14
• **EITHER** 1Y09 or 1Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN PROCEED to the next appropriate Vital Auxiliaries Success Path.

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	
1. **IF** 11 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions: • Ensure the following 4KV breakers are open: • 11 4KV BUS NORMAL FDR, 152-1115 • 11 4KV BUS ALT FDR, 152-1101 • SWYD 4KV SERV XFMR FDR, 152-1113 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.1 (continued)
 	
CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.
 	
• Verify the following 4KV Vital Bus load breakers are open:
  • No. 11 Low Press Safety Inj. Pump, 152-1104
  • No. 11 Salt Water Pump, 152-1105
  • No. 11 Containment Spray Pump, 152-1107
  • No. 11 High Press Safety Inj. Pump, 152-1108
  • No. 13 High Press Safety Inj. Pump, 152-1110
  • No. 13 Service Water Pump, 152-1111
  • No. 13 Salt Water Pump, 152-1112
  • AFW PP No. 13, 152-1116
 	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

2. **IF** 14 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:

   - Ensure the following 4KV breakers are open:

     - 14 4KV BUS NORMAL FDR, 152-1414
     - 14 4KV BUS ALT FDR, 152-1401

CAUTION

Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.

   - Verify the following 4KV Vital Bus load breakers are open:

     - No. 12 Low Press Safety Inj. Pump, 152-1404
     - No. 12 Salt Water Pump, 152-1405
     - No. 12 Containment Spray Pump, 152-1407
     - No. 12 High Press Safety Inj. Pump, 152-1408
     - No. 13 High Press Safety Inj. Pump, 152-1410
     - No. 13 Service Water Pump, 152-1411
     - No. 13 Salt Water Pump, 152-1412

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
CAUTION **The following step provides actions to prevent water hammer damage from CAC voiding.**	
CAUTION **SRW Pumps start when power is restored to the associated 4KV Bus.**	
3. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 11 SRW Header is idle, **THEN** restart 11 SRW Header as follows:	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions:
(1) Check that Containment Pressure has remained less than 25 PSIG with 11 SRW Header idle.	(1) Place the SRW PP(s) aligned to 11 SRW Header in PULL TO LOCK.
(2) Attempt to start the desired SRW PP on 11 SRW Header.	(2) Consult with the Plant Technical Support Center for guidance on system restoration.
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3 (continued) b. **IF** 12 SRW Header is idle, **THEN** restart 12 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 12 SRW Header idle. (2) Attempt to start the desired SRW PP on 12 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **1B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 1B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 12 SRW Header: (a) Shut 13 CNTMT CLG U MAN SUPP FR 12 SRW SUBSYS, 1-SRW-149, located 27 ft East Pen Room south of Containment Purge Supply. (b) Shut 14 CNTMT CLG SUPP FR 12 SRW SUBSYS, 1-SRW-156, located 5 ft West Pen Room along west wall. (c) Attempt to start the desired SRW PP on 12 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

<table>
<tr><th><u>RECOVERY ACTIONS</u></th><th><u>ALTERNATE ACTIONS</u></th></tr>
<tr><td>A.3.b (continued)</td><td>A.3.b.1 (continued)

(2) IF 12 SRW Header can NOT be restarted,
THEN perform the following actions:

(a) Place the SRW PP(s) aligned to 12 SRW Header in PULL TO LOCK.

(b) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK.

(c) Locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.

(d) Consult with the Plant Technical Support Center for guidance on system restoration.</td></tr>
<tr><td colspan="2">B. MAINTAIN VITAL AUXILIARIES USING THE DIESEL GENERATORS.</td></tr>
<tr><td>1. IF power is NOT expected to be restored to at least ONE 4KV Vital Bus within 30 minutes,
THEN perform the following actions:

a. Open the Control Room panel bench board lower front covers.

b. Remove the front and back covers of the Control Room DG Control Consoles.

(continue)</td><td></td></tr>
</table>

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.1 (continued)

NOTE

The Plant Computer and its associated inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 12 AND 24 battery chargers are lost.

c. Determine whether Unit 1 Plant Computer is functional by observing the following:

- Time indication updating on the CRT
- CRT responding to function keys depressed or items selected from menu

d. **IF** Unit 1 Plant Computer is functioning,
THEN shutdown the Unit 1 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows:

(1) Depress the Shift key and type "@@A".

(2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt.

(3) Type "GUEST1" and depress the Return key.

(4) Observe the "ENTER KEY" response.

(5) Depress the Return key.

(6) Observe the message (8 lines) and the "TSM>" prompt.

(7) Type "KILLER" and depress the Return key.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.d (continued) (8) Observe the messages (several pages) and the "TSM>" prompt. (9) Type "X" and depress the Return key. (10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". (11) Depress the Shift key and type "@@P". (12) Observe the "//" prompt. (13) Type "HALT" and depress the Return key. **NOTE** "NNNNNNNN" in the following response may be any number. (14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". e. Open the following power sources, located in the Unit 1 Cable Spreading Room: • Instrument Bus Switch 1Y10-5 (Computer Inverter 1Y05) • Unit 1 DAS/Computer Inverter Output Breaker at 1Y05 • Unit 1 DAS/Computer Inverter Battery Input Breaker at 1Y05 • DC INPUT breaker at 1INV1T11 (Unit 1 Turbine Controls Inverter) (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
2. **IF** 11 and 14 4KV Vital Buses are **NOT** energized, **THEN** perform the following actions: a. Shut CC CNTMT SUPPLY valve, 1-CC-3832-CV. b. Verify 1A DG has started **AND** its OUT BKR, 152-1703, closed. c. Verify 1B DG has started **AND** its OUT BKR, 152-1403, closed.	2.1 **IF** a Diesel Generator can **NOT** be aligned to energize at least ONE 4KV Vital Bus, **THEN PROCEED** to VA-3, SMECO.
NOTE Align the 0C DG to the unit with redundant safety related equipment out of service.	
d. **IF** the 0C DG is **NOT** supplying a vital 4KV bus **AND** it is desired to place the 0C DG on 11 4KV bus, **THEN** perform the following: (1) **IF** the 0C DG is **NOT** running, **THEN** direct an operator to perform an emergency start from the local panel **PER** OI-21C, 0C DIESEL GENERATOR. (2) Verify 07 4KV BUS FDR, 152-0704 is open. (3) Verify the 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK.	

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.d (continued) (5) Dispatch an operator to operate disconnect 189-1106 as follows: (a) Obtain the 189-1106 keys from the CR key locker. (b) Close 0C DG 11 4KV BUS DISC, 189-1106. (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 is closed. (7) **WHEN** disconnect 189-1106 is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (a) Close 07 4KV BUS TIE, 152-0701. (b) Insert the sync stick **AND** close the 0C DG 11 4KV BUS FDR, 152-1106 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. e. **IF** the 0C DG is **NOT** supplying a vital 4KV bus **AND** it is desired to place the 0C DG on 14 4KV bus, **THEN** perform the following: (1) **IF** the 0C DG is **NOT** running, **THEN** direct an operator to perform an emergency start from the local panel **PER** OI-21C, 0C DIESEL GENERATOR. (2) Verify 07 4KV BUS FDR, 152-0704 is open. (3) Verify the 0C DG 14 4KV BUS FDR, 152-1406 in PULL TO LOCK. (4) Verify 1B DG OUT BKR, 152-1403 in PULL TO LOCK. (5) Dispatch an operator to operate disconnect 189-1406 as follows: (a) Obtain the 189-1406 keys from the CR key locker. (b) Close 0C DG 14 4KV BUS DISC, 189-1406. (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 is closed. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.e (continued) (7) **WHEN** disconnect 189-1406 is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (a) Close 07 4KV BUS TIE, 152-0701. (b) Insert the sync stick **AND** close the 0C DG 14 4KV BUS FDR, 152-1406. 3. Dispatch an operator to monitor DG operation. 4. **IF ANY** 125V DC Bus is less than 105 volts: • 11 • 12 • 21 • 22 **THEN** concurrently perform AOP-7J, <u>LOSS OF 120V VITAL AC OR 125V VITAL DC POWER</u>. 5. **IF** less than THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 **THEN** concurrently perform AOP-7J, <u>LOSS OF 120V VITAL AC OR 125V VITAL DC POWER</u>. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 6. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 11A and 11B • 14A and 14B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. 7. **IF** 1Y09 and 1Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 1Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-114R is energized. (2) Close the Instrument Bus Transformer 11 Feeder Breaker, 52-11429. (3) Close the Main Feeder Breaker, 79, on 1Y09. b. Energize 1Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-104R is energized. (2) Close the Instrument Bus Transformer 12 Feeder Breaker, 52-10429. (3) Close the Main Feeder Breaker, 1, on 1Y10. 8. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, 125 VOLT VITAL DC.	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SALTWATER PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, LOSS OF SERVICE WATER • Saltwater Pumps **PER** AOP-7A, LOSS OF SALTWATER COOLING • Control Room Ventilation **PER** OI-22F, CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION • Switchgear Room Ventilation **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING • 72' Computer Room Ventilation **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION
NOTE 1B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

4. **IF** 13 AFW PP starts
   AND 11 or 12 AFW PP is operating,
   THEN secure 13 AFW PP.

5. **IF** Component Cooling Flow has been lost,
   THEN restore flow.

   a. Verify CC CNTMT SUPPLY valve, 1-CC-3832-CV, is shut.

   b. Start a CC PP.

   c. Verify the CC HX in service is being supplied from an operating Saltwater Header.

NOTE
RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.

   d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:

   - 11A RCP: _____° F / _____° F
   - 11B RCP: _____° F / _____° F
   - 12A RCP: _____° F / _____° F
   - 12B RCP: _____° F / _____° F

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.5 (continued)

CAUTION

Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.

e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPPLY valve, 1-CC-3832-CV.

f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions:

(1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room.

(2) Open CC CNTMT SUPPLY valve, 1-CC-3832-CV.

(3) Slowly open 1-CC-284 to restore component cooling flow.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

6. **IF** 1Y09 **OR** 1Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus as follows:

   a. **IF** 1Y09 is de-energized, **THEN** Tie 1Y09 to 1Y10:

      (1) On 1Y09, open INSTRUMENT TRANSF-11 1X08 main feeder breaker 79.

      (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2.

      (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON.

   b. **IF** 1Y10 is de-energized, **THEN** Tie 1Y10 to 1Y09:

      (1) On 1Y10, open INSTRUMENT TRANSF-12 1X09 main feeder breaker 1.

      (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2.

      (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON.

7. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus,
   AND a power supply is available,
   THEN energize the bus,
   AND restore the needed equipment.

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-2.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
• At least ONE 4KV Vital Bus is energized
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
• At least THREE 120V AC Vital Buses are energized:
  • 11
  • 12
  • 13
  • 14
• **EITHER** 1Y09 or 1Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN PROCEED to the next appropriate Vital Auxiliaries Success Path.

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. **IF** 500KV OFFSITE POWER HAS BEEN LOST,
THEN ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.

1. **IF** 11 13KV Service Bus is **NOT** energized,
   THEN ensure the following 13KV breakers are open:

   - 11 SERV BUS 13KV FDR, 252-1104
   - 11 SERV BUS TIE, 252-1105
   - U-4000-12 13KV FDR, 252-1103
   - U-4000-11 13KV FDR, 252-1102
   - U-4000-13 13KV FDR, 252-1101
   - Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106

2. **IF** 21 13KV Service Bus is **NOT** energized,
   THEN ensure the following 13KV breakers are open:

   - 21 SERV BUS 13KV FDR, 252-2104
   - 21 SERV BUS TIE, 252-2105
   - U-4000-21 13KV FDR, 252-2102
   - U-4000-22 13KV FDR, 252-2103
   - U-4000-23 13KV FDR, 252-2101
   - Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

3. **IF** 11 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:

   - Ensure the following 4KV breakers are open:

     - 11 4KV BUS NORMAL FDR, 152-1115
     - 11 4KV BUS ALT FDR, 152-1101
     - SWYD 4KV SERV XFMR FDR, 152-1113

CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.

   - Verify the following 4KV Vital Bus load breakers are open:

     - No. 11 Low Press Safety Inj. Pump, 152-1104
     - No. 11 Salt Water Pump, 152-1105
     - No. 11 Containment Spray Pump, 152-1107
     - No. 11 High Press Safety Inj. Pump, 152-1108
     - No. 13 High Press Safety Inj. Pump, 152-1110
     - No. 13 Service Water Pump, 152-1111
     - No. 13 Salt Water Pump, 152-1112

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.3 (continued)

- AFW PP No. 13, 152-1116

- Place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON

4. **IF** 14 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:

   - Ensure the following 4KV breakers are open:

     - 14 4KV BUS NORMAL FDR, 152-1414

     - 14 4KV BUS ALT FDR, 152-1401

CAUTION

Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.

   - Verify the following 4KV Vital Bus load breakers are open:

     - No. 12 Low Press Safety Inj. Pump, 152-1404

     - No. 12 Salt Water Pump, 152-1405

     - No. 12 Containment Spray Pump, 152-1407

     - No. 12 High Press Safety Inj. Pump, 152-1408

     - No. 13 High Press Safety Inj. Pump, 152-1410

     - No. 13 Service Water Pump, 152-1411

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) • No. 13 Salt Water Pump, 152-1412 • Place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON **CAUTION** **The following step provides actions to prevent water hammer damage from CAC voiding.** **CAUTION** **SRW Pumps start when power is restored to the associated 4KV Bus.** 5. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 11 SRW Header is idle, **THEN** restart 11 SRW Header as follows: (1) Check that Containment Pressure has remained less than 25 PSIG with 11 SRW Header idle. (2) Attempt to start the desired SRW PP on 11 SRW Header. (continue)	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions: (1) Place the SRW PP(s) aligned to 11 SRW Header in PULL TO LOCK. (2) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) b. **IF** 12 SRW Header is idle, **THEN** restart 12 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 12 SRW Header idle. (2) Attempt to start the desired SRW PP on 12 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **1B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 1B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 12 SRW Header: (a) Shut 13 CNTMT CLG U MAN SUPP FR 12 SRW SUBSYS, 1-SRW-149, located 27 ft East Pen Room south of Containment Purge Supply. (b) Shut 14 CNTMT CLG SUPP FR 12 SRW SUBSYS, 1-SRW-156, located 5 ft West Pen Room along west wall. (c) Attempt to start the desired SRW PP on 12 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.b (continued)	A.5.b.1 (continued) (2) **IF** 12 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 12 SRW Header in PULL TO LOCK. (b) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (c) Locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM THE SMECO POWER SUPPLY SYSTEM.	
1. **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: a. Open the Control Room panel bench board lower front covers. b. Remove the front and back covers of the Control Room DG Control Consoles. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** The Plant Computer and its associated inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 12 AND 24 battery chargers are lost. c. Determine whether Unit 1 Plant Computer is functional by observing the following: • Time indication updating on the CRT • CRT responding to function keys depressed or items selected from menu d. **IF** Unit 1 Plant Computer is functioning, **THEN** shutdown the Unit 1 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows: (1) Depress the Shift key and type "@@A". (2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt. (3) Type "GUEST1" and depress the Return key. (4) Observe the "ENTER KEY" response. (5) Depress the Return key. (6) Observe the message (8 lines) and the "TSM>" prompt. (7) Type "KILLER" and depress the Return key. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.d (continued) (8) Observe the messages (several pages) and the "TSM>" prompt. (9) Type "X" and depress the Return key. (10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". (11) Depress the Shift key and type "@@P". (12) Observe the "//" prompt. (13) Type "HALT" and depress the Return key. **NOTE** "NNNNNNNN" in the following response may be any number. (14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". e. Open the following power sources, located in the Unit 1 Cable Spreading Room: • Instrument Bus Switch 1Y10-5 (Computer Inverter 1Y05) • Unit 1 DAS/Computer Inverter Output Breaker at 1Y05 • Unit 1 DAS/Computer Inverter Battery Input Breaker at 1Y05 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

2. Align the SMECO Power Supply System to the 13KV Service Buses by performing the following actions:

   a. Contact the SMECO Distribution Center (301-274-9285) to ensure the following:

      - SMECO substation is in a normal lineup
      - SMECO Engineering Department is informed of possible raised demand on their 69KV - 13KV substation

WARNING
Protective equipment shall be worn when operating 13KV disconnects.

WARNING
Improper operation of disconnect can result in serious injury. Keep body and head clear of operating arc of handle. Do NOT release handle prior to full travel. When the disconnect is opened or closed, a very loud bang will be heard.

   b. **IF** SMECO is supplying the warehouses through 13KV Disconnect Switch 0SH301,
      THEN shift warehouse power supplies by performing the following:

      (1) Remove the OPS lock from 13.8KV SMECO DISCONNECT, 0SH301.

      (2) Open 13.8KV SMECO DISCONNECT, 0SH301, to remove warehouse loads.

(continue)

2.1 **IF** the SMECO Power Supply System is **NOT** available
AND EITHER 500KV Bus is available
OR the Diesel Generators are able to supply power to at least ONE 4KV Vital Bus,
THEN PROCEED to VA-1, 500KV OFFSITE POWER **OR** VA-2, EMERGENCY DIESEL GENERATOR.

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.b (continued) (3) Rotate Kirk key 20497 fully clockwise. (4) Remove the key from 13.8KV SMECO DISCONNECT, 0SH301. (5) Insert Kirk key 20497 into 13.2KV SMECO DISCONNECT, 0SH302. (6) Rotate the key counterclockwise. (7) Close 13.2KV SMECO DISCONNECT, 0SH302. (8) Place OPS lock on 13.8KV SMECO DISCONNECT, 0SH301. c. **IF** 23 13KV Service Bus is **NOT** energized from the SMECO Power Supply System, **THEN** perform the following: (1) Rack in the OFFSITE PWR SOURCE FROM SMECO 252-2301, supply feeder to 23 13KV Service Bus. (2) Ensure the close and trip circuit fuses are in the ON position. (3) Verify the following breakers are open: • 21 SERV BUS TIE, 252-2105 • 11 SERV BUS TIE, 252-1105 (4) Energize 23 13KV Service Bus by locally closing Breaker 252-2301. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) d. **IF** it is desired to align the SMECO Power Supply System to 11 13KV Service Bus, **THEN** energize 11 13KV Service Bus as follows: (1) Verify 11 13KV Service Bus is de-energized. (2) Verify the following breakers are open: • 11 SERV BUS 13KV FDR, 252-1104 • 11 SERV BUS TIE, 252-1105 • U-4000-12 13KV FDR, 252-1103 • U-4000-11 13KV FDR, 252-1102 • U-4000-13 13KV FDR, 252-1101 • 21 SERV BUS TIE, 252-2105 • Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106 (3) Energize 11 13KV Service Bus by closing 11 SERV BUS TIE, 252-1105. (4) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE. (5) Reset the 247/B device target flags on **BOTH** undervoltage relays: • B-11-P • B-11-B (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.d (continued) (6) **IF** MCC 116T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT: • 1H1101REG • 1H1102REG • 1H1103REG e. **IF** it is desired to align the SMECO Power Supply System to 21 13KV Service Bus, **THEN** energize 21 13KV Service Bus as follows: (1) Verify 21 13KV Service Bus is de-energized. (2) Verify the following breakers are open: • 21 SERV BUS 13KV FDR, 252-2104 • 21 SERV BUS TIE, 252-2105 • U-4000-21 13KV FDR, 252-2102 • U-4000-22 13KV FDR, 252-2103 • U-4000-23 13KV FDR, 252-2101 • 11 SERV BUS TIE, 252-1105 • Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106 (3) Energize 21 13KV Service Bus by closing 21 SERV BUS TIE, 252-2105. (4) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2.e (continued)

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-21-P
- B-21-B

(6) **IF** MCC 216T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT:

- 2H2101REG
- 2H2102REG
- 2H2103REG

NOTE

The SMECO Power Supply System overload capabilities are based on a 24 hour cycle. Thus, 216 AMPS or less must be maintained for at least 16 hours before using the 8 hours overload or 20 hours before using the 4 hours overload rating.

3. Limit the total current drawn on the SMECO Power Supply System as indicated on 23 Bus 13KV SMECO Feeder ammeter located on 2C17 as follows:

- 240 AMPS Continuous
- 216 AMPS for 16 hours followed by 264 AMPS for up to 8 hours, then reducing to 216 AMPS
- 216 AMPS for 20 hours followed by 295 AMPS for up to 4 hours, then reducing to 216 AMPS

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** Only two of the four engineering safety features buses may be re-energized from the SMECO Power Supply System. 4. Restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows: a. **IF NO** CC PPs are operating, **THEN** shut CC CNTMT SUPPLY valve, 1-CC-3832-CV. b. **IF** 11 13KV Service Bus is available to supply 11 4KV Vital Bus, **THEN** energize 11 4KV Vital Bus from 11 13KV Service Bus as follows: (1) Verify the following breakers are open: • 11 4KV BUS NORMAL FDR, 152-1115 • 12 4KV BUS NORMAL FDR, 152-1201 • 13 4KV BUS NORMAL FDR, 152-1311 (2) **IF** 14 4KV Bus is **NOT** being supplied from 11 13KV Service Bus, **THEN** verify 14 4KV BUS ALT FDR, 152-1401, is open. (3) Close the U-4000-11 13KV FDR, 252-1102. (4) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK. (5) Place 13 AFW PP in PULL TO LOCK. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.b (continued) (6) Verify 11 4KV BUS ALT FDR, 152-1101, is open. (7) Insert the sync stick into the sync jack at the 11 4KV BUS NORMAL FDR, 152-1115. (8) Close the 11 4KV BUS NORMAL FDR, 152-1115. (9) Return the sync stick to its normal position. c. IF 11 13KV Service Bus is available to supply 14 4KV Vital Bus, **THEN** energize 14 4KV Vital Bus from 11 13KV Service Bus as follows: (1) Verify the following breakers are open: • 14 4KV BUS ALT FDR, 152-1401 • 12 4KV BUS NORMAL FDR, 152-1201 • 13 4KV BUS NORMAL FDR, 152-1311 (2) IF 11 4KV Vital Bus is **NOT** being supplied from 11 13KV Service Bus, **THEN** verify 11 4KV BUS NORMAL FDR, 152-1115, is open. (3) Close the U-4000-11 13KV FDR, 252-1102. (4) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (5) Verify the 14 4KV BUS NORMAL FDR, 152-1414, is open. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.c (continued) (6) Insert the sync stick into the sync jack at the 14 4KV BUS ALT FDR, 152-1401. (7) Close the 14 4KV BUS ALT FDR, 152-1401. (8) Return the sync stick to its normal position. d. IF 21 13KV Service Bus is available to supply 11 4KV Vital Bus, **THEN** energize 11 4KV Vital Bus from 21 13KV Service Bus as follows: (1) Verify the following breakers are open: • 11 4KV BUS ALT FDR, 152-1101 • 12 4KV BUS ALT FDR, 152-1209 • 13 4KV BUS ALT FDR, 152-1301 (2) IF 14 4KV Bus is **NOT** being supplied from 21 13KV Service Bus, **THEN** verify 14 4KV BUS NORMAL FDR, 152-1414, is open. (3) Close the U-4000-21 13KV FDR, 252-2102. (4) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK. (5) Place 13 AFW PP in PULL TO LOCK. (6) Verify 11 4KV BUS NORMAL FDR, 152-1115, is open. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.d (continued) (7) Insert the sync stick into the sync jack at the 11 4KV BUS ALT FDR, 152-1101. (8) Close the 11 4KV BUS ALT FDR, 152-1101. (9) Return the sync stick to its normal position. e. **IF** 21 13KV Service Bus is available to supply 14 4KV Vital Bus, **THEN** energize 14 4KV Vital Bus from 21 13KV Service Bus as follows: (1) Verify the following breakers are open: • 14 4KV BUS NORMAL FDR, 152-1414 • 12 4KV BUS ALT FDR, 152-1209 • 13 4KV BUS ALT FDR, 152-1301 (2) **IF** 11 4KV Vital Bus is **NOT** being supplied from 21 13KV Service Bus, **THEN** verify 11 4KV BUS ALT FDR, 152-1101, is open. (3) Close the U-4000-21 13KV FDR, 252-2102. (4) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (5) Verify 14 4KV BUS ALT FDR, 152-1401, is open. (6) Insert the sync stick into the sync jack at the 14 4KV BUS NORMAL FDR, 152-1414. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.e (continued) (7) Close the 14 4KV BUS NORMAL FDR, 152-1414. (8) Return the sync stick to its normal position. 5. **IF ANY** 125V DC Bus is less than 105 volts: • 11 • 12 • 21 • 22 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 6. **IF** less than THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 7. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 11A and 11B • 14A and 14B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 8. **IF** 1Y09 and 1Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 1Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-114R is energized. (2) Close the Instrument Bus Transformer 11 Feeder Breaker, 52-11429. (3) Close the Main Feeder Breaker, 79, on 1Y09. b. Energize 1Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-104R is energized. (2) Close the Instrument Bus Transformer 12 Feeder Breaker, 52-10429. (3) Close the Main Feeder Breaker, 1, on 1Y10. 9. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, 125 VOLT VITAL DC.	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SALTWATER PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, <u>LOSS OF SERVICE WATER</u> • Saltwater Pumps **PER** AOP-7A, <u>LOSS OF SALTWATER COOLING</u> • Control Room Ventilation **PER** OI-22F, <u>CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION</u> • Switchgear Room Ventilation **PER** OI-22H, <u>SWITCHGEAR VENTILATION AND AIR CONDITIONING</u> • 72' Computer Room Ventilation **PER** OI-22B, <u>AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION</u>
<u>NOTE</u> 1B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, <u>INSTRUMENT AIR</u>.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 4. **IF** 13 AFW PP starts **AND** 11 or 12 AFW PP is operating, **THEN** secure 13 AFW PP. 5. **IF** Component Cooling Flow has been lost, **THEN** restore flow. a. Verify CC CNTMT SUPPLY valve, 1-CC-3832-CV, is shut. b. Start a CC PP. c. Verify the CC HX in service is being supplied from an operating Saltwater Header. **NOTE** RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9. d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 11A RCP: _____° F / _____° F • 11B RCP: _____° F / _____° F • 12A RCP: _____° F / _____° F • 12B RCP: _____° F / _____° F (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.5 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPPLY valve, 1-CC-3832-CV. f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPPLY valve, 1-CC-3832-CV. (3) Slowly open 1-CC-284 to restore component cooling flow. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

6. **IF** 1Y09 **OR** 1Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus as follows:

   a. **IF** 1Y09 is de-energized, **THEN** Tie 1Y09 to 1Y10:

      (1) On 1Y09, open INSTRUMENT TRANSF-11 1X08 main feeder breaker 79.

      (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2.

      (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON.

   b. **IF** 1Y10 is de-energized, **THEN** Tie 1Y10 to 1Y09:

      (1) On 1Y10, open INSTRUMENT TRANSF-12 1X09 main feeder breaker 1.

      (2) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2.

      (3) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON.

7. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus,
   AND a power supply is available,
   THEN energize the bus,
   AND restore the needed equipment.

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-3.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
• At least ONE 4KV Vital Bus is energized
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
• At least THREE 120V AC Vital Buses are energized:
  • 11
  • 12
  • 13
  • 14
• **EITHER** 1Y09 or 1Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN perform the following actions:
	a. Concurrently perform the recovery actions for the next safety function to be satisfied.
	b. Determine the appropriate emergency response actions **PER** the ERPIP.
	c. Evaluate further actions based on the following considerations:
	  • The urgency of other jeopardized safety functions
	  • The feasibility of restoring function to a success path by use of alternate components to implement a success path

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

VITAL AUXILIARIES PLACEKEEPER

VA-1: 500KV OFFSITE POWER

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• At least ONE 500KV Bus is available	• At least ONE 4KV vital bus is energized
	• 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts
	• At least THREE 120V AC Vital Buses are energized:
	  • 11
	  • 12
	  • 13
	  • 14
	• **EITHER** 1Y09 or 1Y10 is energized

START	FUNCTION	DONE	PAGE
	A. IF 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		1

	• Ensure breakers are open
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 11 4KV Bus in ON
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 14 4KV Bus in ON
	• **IF** a SRW Header is **NOT** in operation **THEN** attempt to restart:
	  • 11 SRW Header – CNTMT pressure less than 25 PSIG.
	  • 12 SRW Header – CNTMT pressure less than 10 PSIG.
			1
			3
			
			4
			
			4

	B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM 500KV OFFSITE POWER.		6

	NOTE: The Plant Computer and its associated inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 12 AND 24 battery chargers are lost.
	• **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions:
	  • Open Control Room panel covers
	  • Shutdown the Unit 1 Plant Computer
	• **IF** 500KV offsite power is **NOT** available, **THEN PROCEED** to VA-2 OR VA-3.
	• Verify at least ONE 125V DC Battery Charger is energized for each battery
			
			6
			
			9
			
			20

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-1: 500KV OFFSITE POWER

(continued)

START	FUNCTION	DONE	PAGE
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.		21
	• **IF** SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks. • **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284. • Tie 1Y09 and 1Y10 • **IF** equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		21 23 23 24
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-1.		25
	• **IF** Vital Auxiliaries has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Vital Auxiliaries Success Path.		25

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

VITAL AUXILIARIES PLACEKEEPER
VA-2: EMERGENCY DIESEL GENERATOR

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• 1A, 1B OR 0C Diesel Generator is available	• At least ONE 4KV vital bus is energized
	• 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts
	• At least THREE 120V AC Vital Buses are energized:
	  • 11
	  • 12
	  • 13
	  • 14
	• **EITHER** 1Y09 or 1Y10 is energized

START	FUNCTION	DONE	PAGE
	A. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		26

	• Ensure breakers are open
	• **IF** a SRW Header is **NOT** in operation
	THEN attempt to restart:
	  • 11 SRW Header – CNTMT pressure less than 25 PSIG.
	  • 12 SRW Header – CNTMT pressure less than 10 PSIG.
			26
			29

	B. MAINTAIN VITAL AUXILIARIES USING THE DIESEL GENERATORS.		31

	NOTE: The Plant Computer and its associated Inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 12 AND 24 battery chargers are lost.
	• IF power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes,
	THEN perform the following actions:
	  • Open Control Room panel covers
	  • Shutdown the Unit 1 Plant Computer
	• **IF** a Diesel Generator can **NOT** be aligned to at least ONE 4KV Vital Bus,
	THEN PROCEED to VA-3.
	• Verify at least ONE 125V DC Battery Charger is energized for each battery
			31
			
			34
			
			38

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-2: EMERGENCY DIESEL GENERATOR
(continued)

START	FUNCTION	DONE	PAGE
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	C	39
	• **IF** SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks. • **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284. • Tie 1Y09 and 1Y10 • **IF** equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		39 41 42 42
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-2.		43
	• **IF** Vital Auxiliaries has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Vital Auxiliaries Success Path.		43

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

VITAL AUXILIARIES PLACEKEEPER
VA-3: SMECO

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• SMECO Power Supply System is available	• At least ONE 4KV vital bus is energized • 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts • At least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 • **EITHER** 1Y09 or 1Y10 is energized

START	FUNCTION	DONE	PAGE
	A. IF 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		44
	• Ensure breakers are open		44
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 11 4KV Bus in ON		46
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 14 4KV Bus in ON		47
	• IF a SRW Header is **NOT** in operation **THEN** attempt to restart: • 11 SRW Header – CNTMT pressure less than 25 PSIG. • 12 SRW Header – CNTMT pressure less than 10 PSIG.		47

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-3: SMECO
(continued)

START	FUNCTION	DONE	PAGE
	B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM THE SMECO POWER SUPPLY SYSTEM.		49
	NOTE: The Plant Computer and its associated inverter, 1Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 12 AND 24 battery chargers are lost.		
	• IF power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: • Open Control Room panel covers • Shutdown the Unit 1 Plant Computer		49
	• IF SMECO is **NOT** available **AND EITHER** 500KV Bus is available **OR** the Diesel Generators are available, **THEN PROCEED** to VA-1 OR VA-2.		52
	• Verify at least ONE 125V DC Battery Charger is energized for each battery		62
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	C	63
	• IF SRW/SW cooling can **NOT** be restored to 1B DG, **THEN** locally trip the 1B DG fuel racks.		63
	• IF **ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284.		65
	• Tie 1Y09 and 1Y10		66
	• IF equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		66
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-3.		67
	• IF Vital Auxiliaries has **NOT** been satisfied, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function to be satisfied • Determine the appropriate emergency response actions **PER** the ERPIP • Evaluate further actions		67

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RCS INVENTORY CONTROL USING CVCS.	
1. Verify the normal charging path is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 1-CVC-518-CV • 1-CVC-519-CV	1.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flow path to the RCS via the AUX HPSI HDR as follows: a. Shut HPSI AUX HDR ISOL valve, 1-SI-656-MOV. b. Open **ONE** of the AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV c. Open SI TO CHG HDR valve, 1-CVC-269-MOV. d. Shut the REGEN HX CHG INLET valve, 1-CVC-183, located in the 27 ft West Penetration Room. e. Shut L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV 1.2 **IF** a charging flowpath can **NOT** be established via the AUX HPSI HDR, **THEN** perform the following: a. Verify REGEN HX CHG INLET valve, 1-CVC-183, is open. b. Charge through the Loop Charging valves Bypass Valve, 1-CVC-188.
2. Verify at least ONE CHG PP is operating.	

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
3. Verify RCS makeup flow by the following indications: • CHG HDR PRESS is greater than RCS pressure • Running current for the operating CHG PP(s) is between 75 and 95 AMPS	
4. Check pressurizer level has stabilized by observing the following: • Level is greater than 30 inches • Level is trending to 160 inches • Reactor Vessel level above the top of the hot leg	4.1 **IF** pressurizer level has **NOT** been stabilized, **THEN** operate charging and letdown to restore and maintain pressurizer level between 130 and 180 inches. 4.2 **IF** charging is unable to maintain minimum pressurizer level, **THEN PROCEED** to PIC-4, <u>SIS</u>. 4.3 **IF** letdown is **NOT** operating **AND** the AUX HPSI HDR is **NOT** being used for charging, **THEN** restore Letdown flow by performing the following:
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	**ALTERNATE ACTIONS**
A.4 (continued) (continue)	A.4.3 (continued) **WARNING** **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** a. Verify **ALL** of the following conditions: • The leak was **NOT** in the letdown line • HPSI throttle criteria are met • Charging flow path exists through LOOP CHG valves or AUX SPRAY valve • At least ONE CHG PP is operating • At least ONE CC PP is operating b. Verify selected PRZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, in Auto Remote. c. Place L/D PRESS CONTR, 1-PIC-201, in MANUAL with a 20% output. d. Place IX BYPASS valve, 1-CVC-520-CV, in BYPASS. e. Shift LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS

A.4 (continued)

(continue)

ALTERNATE ACTIONS

A.4.3 (continued)

f. **IF** the plant computer is **NOT** operating,
THEN record the following information:

- RCS T_{COLD}
- CHG OUT TEMP (1-TI-229)
- Average CNTMT ambient temperature (1-TI-5309 and 1-TI-5311)
- 27' Penetration Room temperature (1-TI-5276 and 1-TI-5280)

g. Open L/D CNTMT ISOL valves:

- 1-CVC-515-CV
- 1-CVC-516-CV

CAUTION
The setpoint of 1-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.

h. Place Letdown Pressure Controller, 1-PIC-201 in service as follows:

(1) Adjust the setpoint on 1-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature.

(2) Shift Letdown Pressure Controller, 1-PIC-201 to AUTO.

i. Adjust LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	A.4.3 (continued) j. Shift LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. k. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. l. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches. m. **IF** pressurizer level is **NOT** trending to 160 inches, **THEN** shift the selected PZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, to Auto Local **AND** adjust the setpoint to 160 inches.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	A.4.3 (continued)

n. **IF** pressurizer pressure is less than 1000 PSIA,
THEN place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service.

(1) Open **BOTH** Letdown Control Valve Inlet valves:

- 1-CVC-103
- 1-CVC-105

(2) Check open **BOTH** Letdown Control Valve Outlet valves:

- 1-CVC-104
- 1-CVC-106

(3) Open **BOTH** Backpressure Regulating Inlet valves:

- 1-CVC-108
- 1-CVC-110

(4) Check open **BOTH** Backpressure Regulating Outlet valves:

- 1-CVC-109
- 1-CVC-111

(5) Place L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH.

(6) Place BACKPRESS REG VLVS handswitch, 1-HS-201, in BOTH.

(continue)

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) (continue)	A.4 (continued) **NOTE** Core and RCS voiding may be indicated by the following: • Letdown flow greater than charging flow • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm 4.4 **IF** high pressurizer level condition appears to be caused by excessive RCS voiding, **THEN** reduce or eliminate voided area **PER** the selected heat removal success path.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 5. **IF** the RCS is water solid, **AND** it is desired to draw a bubble in the RCS, **THEN** perform the following actions: a. Energize the Pressurizer HTR(s). b. **IF EITHER** of the following conditions exist: • **BOTH** S/G pressures can be maintained less than RCS pressure • At least ONE RCP is running **THEN** draw a bubble in the RCS as follows: (1) **IF** the HPSI throttle criteria are met, **THEN** reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow. (2) Cooldown the RCS, while **NOT** exceeding 100° F in any one hour, using TBVs or ADVs. c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 and 180 inches. d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to maintain RCS level above the top of the hot leg. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
6. **IF** boration is **NOT** in progress **AND** the VCT is unable to be used to supply charging, **THEN** line up charging suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Shut VCT OUT valve, 1-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady.	
7. **IF** boration is **NOT** in progress **AND** the VCT is being used as a charging source, **THEN** maintain VCT level between 60 and 100 inches using automatic or manual makeup.	7.1 **IF** makeup is **NOT** available to the VCT **AND** VCT level approaches 60 inches, **THEN** shift Charging Pump(s) suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Shut VCT OUT valve, 1-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to VCT: (1) Open VCT OUT valve, 1-CVC-501-MOV. (2) Shut RWT CHG PP SUCT valve, 1-CVC-504-MOV.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ESTABLISH RCS PRESSURE CONTROL.	
1. **IF** Pressurizer HTRs **OR** SPRAYS are available, **THEN** control pressurizer pressure as follows:	
a. **IF** a cooldown is **NOT** in progress, **THEN** operate HTRs and SPRAYs as necessary to maintain pressurizer pressure between 1850 and 2300 PSIA **AND** is trending to 2250 PSIA.	a.1 **IF** pressurizer pressure is less than 2300 PSIA, **AND** PORV leakage is indicated by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication **THEN** perform the following: (1) Shut the appropriate PORV BLOCK valves: • 1-RC-403-MOV • 1-RC-405-MOV (2) Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 1-HS-1402 • 1-HS-1404 a.2 **IF** pressurizer pressure drops to 1725 PSIA as a result of the event, **THEN PROCEED** to PIC-4, <u>SIS</u>.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.a (continued)	B.1.a (continued)
	a.3 **IF** a Pressurizer Safety Valve is leaking, **AND** SIAS has **NOT** actuated, **THEN** attempt to reseat the Pressurizer Safety Valve by reducing pressurizer pressure to 1800 PSIA.
b. **IF** a cooldown is in progress, **THEN** perform the following:	
(1) Maintain RCS subcooling between 25 and 140° F based on CET temperatures.	(1).1 **IF** subcooling approaches 25° F, **THEN** raise subcooling by **ANY** of the following methods: (a) Operate Pressurizer HTR(s). (b) Raise the RCS cooldown rate, while **NOT** exceeding 100° F in any one hour. (1).2 **IF** subcooling approaches 140° F, **THEN** lower subcooling by **ANY** of the following methods: (a) De-energize Pressurizer HTR(s). (b) Operate Main or AUX SPRAY. (c) Lower the RCS cooldown rate.
(2) **IF** a controlled cooldown is in progress, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) c. **IF** pressure reduction is desired **AND** Main Pressurizer Spray is ineffective in controlling pressurizer pressure, **THEN** initiate AUX SPRAY as follows: **CAUTION** **If the difference between the PRZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.** (1) Record the following information: • PRZR WTR TEMP (1-TI-101) • CHG OUT TEMP (1-TI-229) (2) Open AUX SPRAY valve, 1-CVC-517-CV. (3) Operate LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 1-CVC-518-CV • 1-CVC-519-CV (4) Shift PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (5) Shut PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV (6) Maintain pressurizer cooldown rate less than 200° F/hour. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. d. **IF** Pressurizer BACKUP HTR banks have tripped on U/V, **THEN** re-energize the heaters as follows: (1) Charge closing spring using manual lever at 480V breakers 52-1127 and 52-1427. (2) Push the PUSH-TO-CLOSE button on the breaker fronts. e. Verify RCS pressure and temperature are within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

2. **IF** Pressurizer HTRs and SPRAYS are **NOT** available,
   THEN control pressurizer pressure using controlled steaming as follows:

   a. **IF** RCS boration is **NOT** in progress, **THEN** commence RCS boration as follows:

      (1) Shut VCT M/U valve, 1-CVC-512-CV.

      (2) Open BA DIRECT M/U valve, 1-CVC-514-MOV.

      (3) Open BAST GRAVITY FD valves:

      - 1-CVC-508-MOV
      - 1-CVC-509-MOV

      (4) Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL.

      (5) Start **ALL** available BA PPs.

      (6) Shut VCT OUT valve, 1-CVC-501-MOV.

      (7) Start **ALL** available CHG PPs.

   b. Record the time RCS boration was commenced: __________

   c. Record BAST levels:

   - 11 BAST: __________
   - 12 BAST: __________

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) d. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating e. **WHEN** boration is complete, **THEN** secure boration as follows: (1) Open VCT OUT valve, 1-CVC-501-MOV. (2) Stop BA PP(s). (3) Shut BA DIRECT M/U valve, 1-CVC-514-MOV. (4) Shut BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV f. Allow pressurizer level to lower during the cooldown as necessary to aid in RCS depressurization, while maintaining pressurizer level greater than 30 inches. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) g. **IF** SGIS has **NOT** actuated, **THEN** perform the following actions: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. h. **IF** SIAS has **NOT** actuated, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. i. Commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADV(s) from the unaffected S/G(s), while **NOT** exceeding 100° F in any one hour. **NOTE** If a Pressurizer Safety Valve is leaking, reducing pressurizer pressure may reseat the Pressurizer Safety Valve. j. Control the cooldown rate in order to maintain RCS pressure and temperature **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. k. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** restore and maintain subcooling between 25 and 140° F based on CET temperatures as follows: **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** (1) Raise subcooling by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (a) Energize the Pressurizer HTR(s). (b) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped. (c) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(1) (continued) (d) **IF** high pressurizer level secures the backup CHG PPs **AND** more than ONE CHG PP is required to maintain subcooling, **THEN** perform the following actions: 1) Locally initiate SIAS A6 and B6. 2) **IF** boration is **NOT** in progress, **THEN** place the BA PP handswitches in PULL TO LOCK. (2) **IF** subcooling can **NOT** be maintained above 25° F, **THEN** attempt to take the pressurizer solid to establish RCS pressure control as follows: (a) Station a dedicated pressure control watch at 1C05 and 1C06 panels. (b) Verify letdown is operating. (c) **WHEN** pressurizer level is above 305 inches, **THEN** secure **ALL** but ONE CHG PP by placing their handswitches in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(2) (continued) (d) Charge as necessary with ONE CHG PP to maintain the following: • RCS subcooling at least 25° F based on CET temperatures • RCS pressure within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (3) Lower subcooling by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) **IF ALL** RCPs are operating, **THEN** use MAIN PRESSURIZER SPRAY. (c) Lower the RCS cooldown rate. (d) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (e) Raise the letdown flow rate. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(3) (continued) (f) Initiate AUX SPRAY as follows: 1) Place the 1-IA-2080-MOV CIS OVERRIDE switch, 1-HS-2080A, in OVERRIDE. 2) Open the IA CNTMT ISOL valve, 1-IA-2080-MOV. **CAUTION** **If the difference between the PRZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.** 3) Record the following information: • PRZR WTR TEMP (1-TI-101) • CHG OUT TEMP (1-TI-229) 4) Open the AUX SPRAY valve, 1-CVC-517-CV. 5) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 1-CVC-518-CV • 1-CVC-519-CV 6) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(3)(f) (continued) 7) Shut the PRESSURIZER SPRAY VLVS by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV 8) Maintain the pressurizer cooldown rate less than 200° F/hour. l. **IF** the RCS is water solid, **THEN** restore and maintain subcooling between 25 and 140° F based on CET temperatures as follows: (1) Lower subcooling by **ANY** of the following methods: (a) Lower RCS temperature. (b) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (c) De-energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.I (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.** (2) Raise subcooling by **ANY** of the following methods: (a) Raise RCS temperature. (b) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped. **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (c) Energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** Core and RCS voiding may be indicated by the following: • Letdown flow greater than charging flow • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm m. **IF** voiding causes difficulty in depressurization, **THEN** reduce or eliminate the voided area by performing the following actions: (1) Shut the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV (2) Stop depressurizing the RCS. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.m (continued)	
CAUTION **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.**	
(3) Cycle RCS subcooling between 25 and 140° F as follows:	(3).1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RX VESS VENT valves **PER** the <u>VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT</u> section of OI-1G.
(a) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods:	
NOTE Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.	
• Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped.	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.m(3) (continued) (b) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (c) Repeat steps B.2.m.(3).(a) through B.2.m.(3).(b) as necessary. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2.m (continued)

NOTE
Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS.

CAUTION
If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.

(4) **IF** voiding is suspected in the S/G tubes,
THEN cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following:

- Steaming rate
- Feed rate
- S/G Blowdown rate

(5) Monitor Pressurizer level and Reactor Vessel level for inventory trends.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-1.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure less than the upper limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • Pressurizer level is greater than 30 inches • RCS subcooling is between 25 and 140° F based on CET temperatures • Reactor Vessel level above the top of the hot leg	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RCS INVENTORY CONTROL.	

1. **IF** pressurizer pressure is less than or equal to 1725 PSIA
   OR containment pressure is greater than or equal to 2.8 PSIG,
   THEN verify SIAS actuation.

2. **IF** pressurizer pressure is greater than 1725 PSIA
   AND containment pressure is less than 2.8 PSIG,
   THEN perform the following actions to block SIAS:

   a. Open MAIN and AUX HPSI HDR valves:

      MAIN
      - 1-SI-616-MOV
      - 1-SI-626-MOV
      - 1-SI-636-MOV
      - 1-SI-646-MOV

      AUX
      - 1-SI-617-MOV
      - 1-SI-627-MOV
      - 1-SI-637-MOV
      - 1-SI-647-MOV

   b. Start 11 and 13 HPSI PPs.

   c. Start **ALL** available CHG PPs.

   d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.

   e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.2 (continued)	
f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW.	
3. **IF** SIAS has actuated, **THEN** perform the following actions:	
a. Verify the following pumps are running: • 11 HPSI PP • 13 HPSI PP • 11 LPSI PP • 12 LPSI PP • **ALL** available CHG PPs	
b. Verify safety injection flow: • HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA • LPSI flow **PER** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW, when pressure is below 185 PSIA	b.1 Perform the following actions as necessary: • **IF** 11 HPSI PP failed, **THEN** start 12 HPSI PP. • **IF** 13 HPSI PP failed, **THEN** align 12 HPSI PP as follows: (1) Start 12 HPSI PP. (2) Open HPSI HDR XCONN valve, 1-SI-653-MOV. (3) Shut HPSI HDR XCONN valve, 1-SI-655-MOV. • Ensure electrical power is available to valves and pumps. • Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

4. **IF** HPSI PPs are operating
   AND ALL of the following conditions can be maintained:

   - At least 25° F subcooling based on CET temperatures
   - Pressurizer level greater than 101 inches {141}
   - At least ONE S/G available for heat removal
     - S/G level greater than (-)170 inches
     - capable of being supplied with feedwater
     - capable of being steamed
   - Reactor Vessel level above the top of the hot leg
   - Reactivity Control Safety Funtion Acceptance Criteria are met

   THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following:

   - RCS subcooling between 25 and 140° F based on CET temperatures
   - Pressurizer level between 101 inches {141} and 180 inches {190}

5. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
6. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	
7. Restore and maintain Pressurizer Level between 101 inches {141} and 180 inches {190} by operating SIS, charging, and if available, letdown.	7.1 **IF** pressurizer level can **NOT** be restored above 101 inches {141}, **THEN** continue to maximize safety injection flow.
8. **IF** SIAS has **NOT** actuated, **THEN** maintain VCT level between 60 and 100 inches using automatic or manual makeup.	8.1 **IF** makeup is **NOT** available to the VCT **AND** VCT level approaches 60 inches, **THEN** shift Charging Pump(s) suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Shut VCT OUT valve, 1-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to VCT: (1) Open VCT OUT valve, 1-CVC-501-MOV. (2) Shut RWT CHG PP SUCT valve, 1-CVC-504-MOV.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ESTABLISH RCS PRESSURE CONTROL USING PORVs OR PRESSURIZER VENT.	
1. **IF** pressurizer pressure rises to 2400 PSIA, **THEN** perform the following: a. Verify **BOTH** PORV OVERRIDE handswitches in the AUTO position: • 1-HS-1402 • 1-HS-1404 b. Verify **BOTH** PORV BLOCK valves are OPEN: • 1-RC-403-MOV • 1-RC-405-MOV c. Check PORVs automatically open. (continue)	1.1 **IF** PORVs do **NOT** open automatically, **THEN** perform the following: a. Place the PORV OVERRIDE handswitches in MANUAL OPEN: • 1-HS-1402 • 1-HS-1404 b. Verify **BOTH** PORVs are open. c. Reduce pressure such that: • Pressurizer pressure is less than 2300 PSIA • RCS pressure is within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS subcooling is less than 140° F based on CET temperatures d. Place the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
2. Restore and maintain RCS subcooling within the following limits: • Pressurizer pressure less than 2300 PSIA • RCS pressure within the limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • RCS subcooling between 25 and 140° F based on CET temperatures	
a. **IF** Pressurizer level is less than 305 inches, **THEN** lower pressure and subcooling with the PORVs as follows:	a.1 **IF** PORVs are **NOT** available, **THEN** depressurize the RCS with the PRZR VENT valves as follows:
(1) Verify the PORV BLOCK valves are OPEN: • 1-RC-403-MOV • 1-RC-405-MOV	(1) Open the QUENCH TK VENT TO CNTMT, 1-RC-402-SV.
(2) Place ONE PORV OVERRIDE handswitch in MANUAL OPEN: • 1-HS-1402 • 1-HS-1404	(2) Open the PRZR VENT valves to lower pressure and subcooling: • 1-RC-105-SV • 1-RC-106-SV
(3) **IF** a second PORV is needed to lower pressure **OR** subcooling, **THEN** place the other PORV OVERRIDE handswitch in MANUAL OPEN.	(3) **IF** Pressurizer level approaches 305 inches **OR** Pressurizer Vents are **NOT** required to be open, **THEN** perform the following: (a) Shut the PRZR VENT valves: • 1-RC-105-SV • 1-RC-106-SV
(4) Start **ALL** available CNTMT AIR CLRs in HIGH with maximum SRW flow.	(b) Shut the QUENCH TK VENT TO CNTMT, 1-RC-402-SV.
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) b. **IF** PORVs must remain open for heat removal **PER** HR-4, ONCE-THROUGH-COOLING, **THEN IMPLEMENT** RCS Pressure and Inventory Control Success Path PIC-4, SIS. c. **IF** Pressurizer level approaches 305 inches, **OR** PORVs are **NOT** required to be open, **THEN** close the PORVs by performing the following: (1) Place the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404 (2) **IF** the PORV(s) will **NOT** shut **OR** the Acoustic Monitor indicates flow through a PORV, **THEN** shut the affected PORV BLOCK valve. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** d. Raise subcooling by **ANY** of the following methods: (1) Ensure the PORVs and PRZR VENT valves are shut. **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.	
(2) Energize the Pressurizer HTR(s).	(2).1 **IF** Pressurizer BACKUP HTR banks have tripped on U/V, **THEN** re-energize the heaters as follows: (a) Charge closing spring using manual lever at 480V breakers 52-1127 and 52-1427. (b) Push the PUSH-TO-CLOSE button on the breaker fronts.
(3) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped. (4) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G. (5) Reduce letdown flow.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PREPARE FOR RAS ACTUATION	
1. **WHEN** RWT level drops to 4 feet, **THEN** perform the following actions:	
a. **IF** CSAS has **NOT** actuated, **THEN** place **BOTH** CS PPs in PULL TO LOCK.	
b. Place the SI PP RECIRC LOCKOUT switches in ON.	
c. Check HPSI flow is greater than 90 GPM per pump, **OR** check the HPSI PPs have been secured.	c.1 **IF** HPSI flow is less than 90 GPM per pump **AND** the HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** the CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. VERIFY CONTAINMENT SUMP LEVEL AND RAS ACTUATION.	
1. Observe Containment Sump level rises as RWT level lowers. (continue)	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 2. **WHEN** RWT level drops to 0.75 feet **OR** the "ACTUATION SYS RAS TRIP" alarm is received, **THEN** perform the following actions: a. Verify RAS actuation. b. Check a minimum containment sump level of at least 28 inches is indicated on the CNTMT WR WATER LVL indication, 1-LI-4146 or 1-LI-4147. c. Verify RAS lineup **PER** ATTACHMENT (6), RAS VERIFICATION CHECKLIST. d. **IF** RAS lineup is verified, **THEN** shut the RWT OUT valves: • 1-SI-4142-MOV • 1-SI-4143-MOV (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued)	
e. Verify Component Cooling in service as follows:	e.1 **IF NO** CC PPs are operating, **THEN** restore Component Cooling **PER** AOP-7C, <u>LOSS OF COMPONENT COOLING WATER</u>.
(1) Throttle open BOTH CC HX SALTWATER OUT valves: • 1-HIC-5206 • 1-HIC-5208	e.2 **IF** Component Cooling can **NOT** be restored, **THEN** align a CS PP for Safety Injection as follows:
(2) Verify BOTH CC HX CC OUT valves are open: • 1-CC-3824-CV • 1-CC-3826-CV	(1) Notify the Operational Support Center to check radiation levels are low enough for valve repositioning.
(3) Verify TWO CC PPs in operation.	**<u>WARNING</u>** **Do NOT continue with this step until the Operational Support Center has determined radiation levels are low enough for valve repositioning.**
	(2) Stop ONE CS PP.
	(3) Shut SDC Hx Out To CS Valve for the SDC Hx associated with the CS Pump. • (11 SDC Hx) 1-SI-319 • (12 SDC Hx) 1-SI-329
	(4) Open SDC Hx Inlet X-Conn Valve for the SDC Hx associated with the CS Pump. • (11 SDC Hx) 1-SI-452 • (12 SDC Hx) 1-SI-453
	(5) Open SDC HX LPSI INL valve, 1-SI-658-MOV.
	(6) Start the CS PP.
	(7) Stop **ALL** running HPSI PPs.
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued)	
CAUTION **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.**	
f. **IF** TWO HPSI PPs are running, **THEN** throttle HPSI flow to achieve 250 GPM through each of the four headers.	f.1 **IF** HPSI flow of 250 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers. f.2 **IF** HPSI flow indication has been lost, **THEN** perform the following: **NOTE** It is desired to secure 11 HPSI PP due to HPSI flow indication and MOV POSITION indicators associated with 11 HPSI PP are powered from 1Y09. (1) Secure ONE HPSI PP. (2) Throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
g. **IF** ONE HPSI PP is running, **THEN** throttle HPSI flow to achieve 150 GPM through each of the four headers.	g.1 **IF** HPSI flow of 150 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2.g (continued)	D.2.g (continued)
	g.2 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
h. **IF** a loss of ECCS pump suction is indicated during recirculation by **ANY** of the following: • Lower or unstable HPSI or CS flow • Lower or unstable HPSI or CS PP discharge pressure • Lower or unstable HPSI or CS PP motor current • HPSI or CS PP noise **THEN** take actions to prevent HPSI and CS PP damage, **AND** maintain adequate core cooling by performing the following:	
(1) Throttle HPSI flow equally among the four headers to the minimum allowed **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.	(1).1 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2.h (continued)	
(2) **IF** HPSI or CS PP performance is **NOT** acceptable, **THEN** perform the following:	
(a) Stop **BOTH** CS PPs.	
(b) Check acceptable HPSI PP performance.	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).
(c) Notify the Plant Technical Support Center.	
i. Commence ECCS Pump Room cooling as follows:	
(1) Open the ECCS AIR CLR INL/OUT VLVs: • 1-SW-5170-CV • 1-SW-5171-CV • 1-SW-5173-CV	
(2) Start 11 EAST and 12 WEST ECCS PP RM CLG FANs.	
j. Place the ECCS PP RM EXH FILT in service.	

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) k. Maintain SRW and Component Cooling temperatures by performing the following: (1) Adjust the CC HX SALTWATER OUT valves to maintain Component Cooling temperature less than 120° F: • 1-HIC-5206 • 1-HIC-5208 (2) **IF EITHER** SRW HX SW BYPASS valve is in AUTO, **THEN** adjust the setpoint as necessary to maintain SRW temperature less than 105° F: • 1-PIC-5154 • 1-PIC-5157 **NOTE** The current maximum SW header pressure limits are recorded on the Shift Turnover Sheet. (3) Verify SW HDR PRESS less than the maximum SW header pressure limit. l. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** m. Ensure HPSI PP flow is at least 90 GPM during recirculation.	m.1 **IF** HPSI flow is less than 90 GPM per pump during recirculation **AND** HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
E. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	
1. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. 2. **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS. 3. Notify the Plant Technical Support Center to review ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-2.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure is less than 2400 PSIA • Pressurizer pressure less than the upper limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS subcooling is between 25 and 140° F based on CET temperatures • Pressurizer level is greater than 30 inches {90} • Reactor Vessel level above the top of the hot leg	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL DURING LOSS OF VITAL AC

1. Minimize RCS inventory loss by performing the following:

   a. Shut L/D CNTMT ISOL valves:

      - 1-CVC-515-CV
      - 1-CVC-516-CV

   b. Maintain an RCP Bleedoff flowpath:

      (1) Verify RCP BLEED-OFF RELIEF ISOL, 1-CVC-507-CV, is open.

      (2) Shut RCP BLEED-OFF ISOL valves:

         - 1-CVC-505-CV
         - 1-CVC-506-CV

      (3) Open 11 RCDT DRN TO CNTMT FLOOR valve, 1-RCW-4258-SV.

   c. Shut RCS SAMPLE ISOL valve, 1-PS-5464-CV.

   d. Verify RX VESS VENT and PRZR VENT valves are shut:

      - 1-RC-103-SV
      - 1-RC-104-SV
      - 1-RC-105-SV
      - 1-RC-106-SV

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** If needed, refer to ATTACHMENT(12), PROCEDURE TO LOCALLY READ CORE EXIT THERMOCOUPLES to read CETs.	
2. **IF** RCS subcooling drops to 25° F, **THEN** cooldown the RCS **PER** the selected Heat Removal success path to maintain the following conditions: • Subcooling between 25 and 50° F • RCS cooldown rate less than 100° F in any one hour • S/G level between (-)24 and (+)30 inches • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP	2.1 **IF** 25° F subcooling can **NOT** be maintained, **THEN** continue RCS heat removal using two-phase natural circulation **PER** the selected Heat Removal success path **AND** ensure the following: • At least ONE S/G has level between (-)24 inches {0}and (+)30 inches {(+)38} **OR** S/G level is being restored by feedwater flow • CET temperatures are less than 50° F superheated
3. **IF** a controlled cooldown is in progress, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 4. **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN** restore RCP Bleedoff flowpath to the VCT by performing the following actions: a. Open RCP BLEED-OFF ISOL valves: • 1-CVC-505-CV • 1-CVC-506-CV b. Shut 11 RCDT DRN TO CNTMT FLOOR valve, 1-RCW-4258-SV. 5. **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN IMPLEMENT ONE** of the following success paths as appropriate: • PIC-1, <u>CVCS</u> • PIC-2, <u>PORVs or PRESSURIZER VENT</u> • PIC-4, <u>SIS</u>	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-3.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure less than the upper limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • RCS subcooling greater than 25 based on CET temperatures **OR** CET temperatures less than 50° F superheated • Reactor Vessel level indicates the core is covered	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL USING SIS.

1. **IF** pressurizer pressure is less than or equal to 1725 PSIA
   OR containment pressure is greater than or equal to 2.8 PSIG,
   THEN verify SIAS actuation.

2. **IF** pressurizer pressure is greater than 1725 PSIA
   AND containment pressure is less than 2.8 PSIG,
   THEN perform the following actions to block SIAS:

   a. Open MAIN and AUX HPSI HDR valves:

      MAIN
      - 1-SI-616-MOV
      - 1-SI-626-MOV
      - 1-SI-636-MOV
      - 1-SI-646-MOV

      AUX
      - 1-SI-617-MOV
      - 1-SI-627-MOV
      - 1-SI-637-MOV
      - 1-SI-647-MOV

   b. Start 11 and 13 HPSI PPs.

   c. Start **ALL** available CHG PPs.

   d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received,
      THEN block SIAS A.

   e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received,
      THEN block SIAS B.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.2 (continued) f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. 3. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 11 HPSI PP • 13 HPSI PP • 11 LPSI PP • 12 LPSI PP • **ALL** available CHG PPs (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3 (continued)	
b. Verify safety injection flow: • HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA • LPSI flow **PER** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW, when pressure is below 185 PSIA	b.1 Perform the following actions as necessary: **CAUTION** **Operation of two HPSI Pumps on 14 4KV Bus may cause 1B DG loading to exceed 3600 KW.** • **IF** 11 HPSI PP failed, **THEN** perform the following actions: (1) **IF** 1B DG is powering 14 4KV Bus, **THEN** verify DG load is less than 2960 KW. (2) Start 12 HPSI PP. • **IF** 13 HPSI PP failed, **THEN** align 12 HPSI PP as follows: (1) Start 12 HPSI PP. (2) Open HPSI HDR XCONN valve, 1-SI-653-MOV. (3) Shut HPSI HDR XCONN valve, 1-SI-655-MOV. • Ensure electrical power is available to valves and pumps. • Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 4. **IF** high RCS pressure is preventing adequate SIS flow to support heat removal, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path **NOTE** If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 5. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** maintain subcooling as low as possible **AND** within the following limits: • Between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) a. Lower subcooling by **ANY** of the following methods: (1) De-energize the Pressurizer HTR(s). (2) **IF ALL** RCPs are operating, **THEN** use MAIN PRESSURIZER SPRAY. (3) Lower the RCS cooldown rate. (4) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.a (continued) (5) Initiate AUX SPRAY as follows: (a) Place the 1-IA-2080-MOV CIS OVERRIDE switch, 1-HS-2080A, in OVERRIDE. (b) Open the IA CNTMT ISOL valve, 1-IA-2080-MOV. **CAUTION** **If the difference between the PRZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.** (c) Record the following information: • PRZR WTR TEMP (1-TI-101) • CHG OUT TEMP (1-TI-229) (d) Open the AUX SPRAY valve, 1-CVC-517-CV. (e) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 1-CVC-518-CV • 1-CVC-519-CV (f) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (g) Shut the PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.5.a(5) (continued)

(h) Maintain the pressurizer cooldown rate less than 200° F/hour.

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.

b. Raise subcooling by **ANY** of the following methods:

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

(1) Energize the Pressurizer HTR(s).

(2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped.

(3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 6. **IF** the RCS is water solid, **THEN** maintain subcooling within the following limits: • Between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS a. Lower subcooling by **ANY** of the following methods: (1) Lower RCS temperature. (2) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (3) De-energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.6 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.** b. Raise subcooling by **ANY** of the following methods: (1) Raise RCS temperature. (2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped. **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (3) Energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

7. **IF** the RCS is water solid,
   AND it is desired to draw a bubble in the RCS,
   THEN perform the following actions:

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

   a. Energize the Pressurizer HTR(s).

   b. **IF EITHER** of the following conditions exist:

      - **BOTH** S/G pressures can be maintained less than RCS pressure
      - At least ONE RCP is running

      THEN draw a bubble in the RCS as follows:

      (1) **IF** the HPSI throttle criteria are met,
      THEN reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow.

      (2) Cooldown the RCS, while **NOT** exceeding 100° F in any one hour, using TBVs or ADVs.

   c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 inches {141} and 180 inches {190}.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A.7 (continued) d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to maintain RCS level above the top of the hot leg. 8. **IF** a bubble exists in the Pressurizer **AND** HPSI flow has been secured, **THEN** restore and maintain Pressurizer Level between 101 inches {141} and 180 inches {190} by operating charging, and if available, letdown. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)
 	
9. **WHEN ALL** of the following conditions can be maintained:
 	
• At least 25° F subcooling based on CET temperatures
 	
• Pressurizer level greater than 101 inches {141}
 	
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed
 	
• Reactor Vessel level above the top of the hot leg
 	
• Reactivity Control Safety Funtion Acceptance Criteria are met
 	
THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following:
 	
• RCS subcooling between 25 and 140° F based on CET temperatures
 	
• Pressurizer level between 101 inches {141} and 180 inches {190}
 	
10. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
 	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 11. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	
B. **IF** ONCE-THROUGH-COOLING IS **NOT** IN PROGRESS, **THEN** IDENTIFY LOCATION OF LEAK.	
1. Attempt leak isolation: a. Verify L/D CNTMT ISOL valves are shut: • 1-CVC-515-CV • 1-CVC-516-CV	
b. Check there is **NO** PORV leakage by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication	b.1 **IF** PORV leakage is indicated **AND** PZR pressure is less than 2300 PSIA, **THEN** perform the following: (1) Shut the appropriate PORV BLOCK valves: • 1-RC-403-MOV • 1-RC-405-MOV (2) Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 1-HS-1402 • 1-HS-1404
c. Shut RCS SAMPLE ISOL valve, 1-PS-5464-CV. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) d. Shut RX VESS VENT valves: • 1-RC-103-SV • 1-RC-104-SV e. Shut PRZR VENT valves: • 1-RC-105-SV • 1-RC-106-SV f. **IF** leakage into Component Cooling is indicated by: • Rise on UNIT 1 CC radiation monitor, 1-RI-3819 • "CC HEAD TK LVL" high alarm **AND** shutting the L/D CNTMT ISOL valves did **NOT** isolate the leak, **THEN** perform the following: (1) Trip **ALL** RCPs. (2) Shut the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV g. **IF** the leak has been isolated **AND** SIAS has **NOT** actuated, **THEN** perform the following actions: (1) Stop the HPSI PPs **PER** step A.9. (2) Shut MAIN and AUX HPSI HDR valves. (3) Verify the Safety Function Status Check Acceptance Criteria for PIC-1, <u>CVCS</u>, are satisfied. (4) **IMPLEMENT** PIC-1, <u>CVCS</u>. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **IF** a LOCA inside containment can **NOT** be determined by: • Rise in containment temperature, pressure, humidity or sump level • UNIT 1 WIDE RANGE NOBLE GAS MON and UNIT 1 MAIN VENT GASEOUS alarms clear **THEN** perform the following actions: a. Place **BOTH** PENETRATION RM VENT FANs in service. **NOTE** Leakage location may be indicated by sump alarms, room level alarms, or area RMS alarms. b. Attempt to locate and isolate the leak. c. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source.	
3. Observe Containment Sump level rises as RWT level lowers.	3.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PREPARE FOR RAS ACTUATION	
1. **WHEN** RWT level drops to 4 feet, **THEN** perform the following actions:	
a. **IF** CSAS has **NOT** actuated, **THEN** place **BOTH** CS PPs in PULL TO LOCK.	
b. Place the SI PP RECIRC LOCKOUT switches in ON.	
c. Check HPSI flow is greater than 90 GPM per pump, **OR** check the HPSI PPs have been secured.	c.1 **IF** HPSI flow is less than 90 GPM per pump **AND** the HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** the CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
D. VERIFY RAS ACTUATION.	
1. **WHEN** RWT level drops to 0.75 feet **OR** the "ACTUATION SYS RAS TRIP" alarm is received, **THEN** perform the following actions:	
a. Verify RAS actuation.	

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued)	
b. Check a minimum containment sump level of at least 28 inches is indicated on the CNTMT WR WATER LVL indication, 1-LI-4146 or 1-LI-4147.	
c. Verify the CNTMT SUMP DISCH valves open: • 1-SI-4144-MOV • 1-SI-4145-MOV	
d. Shut the RWT OUT valves: • 1-SI-4142-MOV • 1-SI-4143-MOV	
e. Verify RAS lineup **PER** ATTACHMENT (6), <u>RAS VERIFICATION CHECKLIST</u>.	e.1 **IF** a LPSI PP does **NOT** stop, **THEN** place the LPSI PP handswitch in PULL TO LOCK. • 11 LPSI PP, 1-HS-302X • 12 LPSI PP, 1-HS-302Y <u>**CAUTION**</u> **LPSI flow must be reduced to less than 600 GPM within 4 hours post-RAS to ensure adequate HPSI NPSH.** e.2 **IF** a LPSI PP continues to run with the LPSI PP handswitch in PULL TO LOCK, **THEN** perform the following actions: (1) Attempt to locally open the LPSI PP breaker: • NO. 11 LOW PRESS SAFETY INJ PUMP, 152-1104 • NO. 12 LOW PRESS SAFETY INJ PUMP, 152-1404
(continue)	(continue)

03300

03300

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.e (continued)	D.1.e.2 (continued) (2) **IF** the LPSI PP breaker can **NOT** be opened locally, **THEN** throttle LPSI flow to 600 GPM: (a) Shut THREE LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-635-MOV • 1-SI-645-MOV (b) Throttle the remaining LPSI HDR valve to 600 GPM. 03300
f. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SALTWATER OUT valves: • 1-HIC-5206 • 1-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 1-CC-3824-CV • 1-CC-3826-CV (3) Verify TWO CC PPs in operation.	f.1 **IF NO** CC PPs are operating, **THEN** restore Component Cooling **PER** AOP-7C, <u>LOSS OF COMPONENT COOLING WATER</u>. f.2 **IF** Component Cooling can **NOT** be restored, **THEN** align a CS PP for Safety Injection as follows: (1) Notify the Operational Support Center to check radiation levels are low enough for valve repositioning. **<u>WARNING</u>** **Do NOT continue with this step until the Operational Support Center has determined radiation levels are low enough for valve repositioning.** (2) Stop ONE CS PP.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.f (continued)	D.1.f.2 (continued) (3) Shut SDC Hx Out To CS Valve for the SDC Hx associated with the CS Pump. • (11 SDC Hx) 1-SI-319 • (12 SDC Hx) 1-SI-329 (4) Open SDC Hx Inlet X-Conn Valve for the SDC Hx associated with the CS Pump. • (11 SDC Hx) 1-SI-452 • (12 SDC Hx) 1-SI-453 (5) Open SDC HX LPSI INL valve, 1-SI-658-MOV. (6) Start the CS PP. (7) Stop **ALL** running HPSI PPs.
CAUTION **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** g. **IF** TWO HPSI PPs are running, **THEN** throttle HPSI flow to achieve 250 GPM through each of the four headers.	g.1 **IF** HPSI flow of 250 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.g (continued)	D.1.g (continued) g.2 **IF** HPSI flow indication has been lost, **THEN** perform the following: **NOTE** It is desired to secure 11 HPSI PP due to HPSI flow indication and MOV POSITION indicators associated with 11 HPSI PP are powered from 1Y09. (1) Secure ONE HPSI PP. (2) Throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
h. **IF** ONE HPSI PP is running, **THEN** throttle HPSI flow to achieve 150 GPM through each of the four headers. (continue)	h.1 **IF** HPSI flow of 150 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers. h.2 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued)	
NOTE HPSI MOVs should be throttled at least 30% open throughout a large-break LOCA to prevent MOV erosion and/or plugging.	
i. Check HPSI MOVs with flow are at least 30% open.	i.1 Adjust HPSI MOV(s) as necessary while maintaining header flow at the required flow. i.2 Monitor HPSI flow for indications of MOV erosion (higher flow), and/or plugging (lower or erratic flow).
j. **IF** a loss of ECCS pump suction is indicated during recirculation by **ANY** of the following: • Lower or unstable HPSI or CS flow • Lower or unstable HPSI or CS PP discharge pressure • Lower or unstable HPSI or CS PP motor current • HPSI or CS PP noise **THEN** take actions to prevent HPSI and CS PP damage, **AND** maintain adequate core cooling by performing the following:	
(1) Throttle HPSI flow equally among the four headers to the minimum allowed **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.	(1).1 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
(continue)	

03300

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.j (continued)	
(2) **IF** HPSI or CS PP performance is **NOT** acceptable, **THEN** perform the following:	
(a) Stop **BOTH** CS PPs.	
(b) Check acceptable HPSI PP performance.	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).
(c) Notify the Plant Technical Support Center.	
k. Commence ECCS Pump Room cooling as follows:	
(1) Open the ECCS AIR CLR INL/OUT VLVs: • 1-SW-5170-CV • 1-SW-5171-CV • 1-SW-5173-CV	
(2) Start 11 EAST and 12 WEST ECCS PP RM CLG FANs.	
l. Place the ECCS PP RM EXH FILT in service.	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued) m. Maintain SRW and Component Cooling temperatures by performing the following: (1) Adjust the CC HX SALTWATER OUT valves to maintain Component Cooling temperature less than 120° F: • 1-HIC-5206 • 1-HIC-5208 (2) **IF EITHER** SRW HX SW BYPASS valve is in AUTO, **THEN** adjust the setpoint as necessary to maintain SRW temperature less than 105° F: • 1-PIC-5154 • 1-PIC-5157 **NOTE** The current maximum SW header pressure limits are recorded on the Shift Turnover Sheet. (3) Verify SW HDR PRESS less than the maximum SW header pressure limit. n. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** o. Ensure HPSI PP flow is at least 90 GPM during recirculation.	o.1 **IF** HPSI flow is less than 90 GPM per pump during recirculation **AND** HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
E. PROTECT ECCS PUMPS FROM OVERHEATING	
1. **IF ANY** ECCS Pumps are operating, **THEN** protect the ECCS Pumps from overheating by commencing ECCS Pump Room cooling as follows: a. Open the ECCS AIR CLR INL/OUT VLVs: • 1-SW-5170-CV • 1-SW-5171-CV • 1-SW-5173-CV b. Start 11 EAST and 12 WEST ECCS PP RM CLG FANs.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	
1. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. 2. **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS. 3. Notify the Plant Technical Support Center to review ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT.	
G. COMMENCE CORE FLUSH.	
1. **IF** the elapsed time from SIAS actuation is between 8 and 11 hours, **AND ANY** of the following conditions exist: • RCS subcooling is less than 25° F based on CET temperatures • Pressurizer level is less than 30 inches {90} • Reactor vessel level below the top of the hot leg **THEN** commence core flush by lining up for Pressurizer Injection as follows: a. Check TWO HPSI PPs are available. (continue)	1.1 **IF** Pressurizer Injection is **NOT** adequate **AND** the following conditions are met: • RCS pressure is less than 270 PSIA {245} • RCS pressure minus containment pressure is less than 75 PSID • HPSI PP(s) are available **THEN** line up for Hot Leg Injection as follows: a. Place the selected LPSI PP RAS OVERRIDE switch in OVERRIDE. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

G.1 (continued)

b. Open the SI TO CHG HDR valve, 1-CVC-269-MOV.

c. **IF** CIS has actuated,
AND IA CNTMT ISOL valve, 1-IA-2080-MOV is shut,
THEN perform the following actions:

(1) Place the 1-IA-2080-MOV CIS OVERRIDE switch, 1-HS-2080A, in OVERRIDE.

(2) Open IA CNTMT ISOL valve, 1-IA-2080-MOV.

d. Shut LOOP CHG valves:

- 1-CVC-518-CV
- 1-CVC-519-CV

e. Shut the PRESSURIZER SPRAY VLVS by adjusting the output of 1-HIC-100 to 0%:

- 1-RC-100E-CV
- 1-RC-100F-CV

f. Verify HPSI AUX HDR ISOL valve, 1-SI-656-MOV, is open.

g. Open AUX SPRAY valve, 1-CVC-517-CV.

(continue)

ALTERNATE ACTIONS

G.1.1 (continued)

b. Verify the CNTMT SUMP DISCH valves are open:

- 1-SI-4144-MOV
- 1-SI-4145-MOV

c. Open SDC RECIRC ISOL valve, 1-SI-399-MOV.

d. Shut LPSI HDR valves:

- 1-SI-615-MOV
- 1-SI-625-MOV
- 1-SI-635-MOV
- 1-SI-645-MOV

e. Close the power supply breakers to the SDC HDR RETURN ISOL valves:

- 1-SI-651-MOV breaker, 52-11466
- 1-SI-652-MOV breaker, 52-10424

f. Open SDC HDR RETURN ISOL valves:

- 1-SI-651-MOV
- 1-SI-652-MOV

g. Start the selected LPSI PP.

h. Maintain a flowrate of at least 150 GPM.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued)	G.1.1 (continued)

RECOVERY ACTIONS

G.1 (continued)

h. **IF** 13 HPSI PP is available,
THEN perform the following actions:

(1) Verify 13 HPSI PP is running.

(2) Verify HPSI HDR XCONN valve, 1-SI-653-MOV, is shut.

(3) Shut AUX HPSI HDR valves:

- 1-SI-617-MOV
- 1-SI-627-MOV
- 1-SI-637-MOV
- 1-SI-647-MOV

(4) Verify 11 or 12 HPSI PP is running.

(5) **IF** approximately 150 GPM is **NOT** indicated
THEN initiate Hot Leg Injection.

i. **IF** 13 HPSI PP is **NOT** available,
THEN perform the following actions:

(1) Verify 12 HPSI PP is running.

(2) Verify HPSI HDR XCONN valve, 1-SI-653-MOV, is open.

(3) Verify HPSI HDR XCONN valve, 1-SI-655-MOV, is shut.

(4) Shut AUX HPSI HDR valves:

- 1-SI-617-MOV
- 1-SI-627-MOV
- 1-SI-637-MOV
- 1-SI-647-MOV

(5) Verify 11 HPSI PP is running.

(continue)

ALTERNATE ACTIONS

G.1.1 (continued)

1.2 **IF** only ONE HPSI PP is available,
AND Hot Leg Injection is **NOT** available,
THEN commence pressurizer injection as follows:

a. Open SI TO CHG HDR valve, 1-CVC-269-MOV.

b. **IF** CIS has actuated,
AND IA CNTMT ISOL valve, 1-IA-2080-MOV is shut,
THEN perform the following actions:

(1) Place 1-IA-2080-MOV CIS OVERRIDE switch, 1-HS-2080A, in OVERRIDE.

(2) Open IA CNTMT ISOL valve, 1-IA-2080-MOV.

c. Shut LOOP CHG valves:

- 1-CVC-518-MOV
- 1-CVC-519-MOV

d. Shut the PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%:

- 1-RC-100E-CV
- 1-RC-100F-CV

e. Verify HPSI AUX HDR ISOL valve, 1-SI-656-MOV, is open.

f. Open AUX SPRAY valve, 1-CVC-517-CV.

g. Verify ONE HPSI PP is running.

h. **IF** 13 HPSI PP is running,
THEN open the HPSI HDR XCONN valve, 1-SI-653-MOV.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1.i (continued) (6) **IF** approximately 150 GPM is **NOT** indicated **THEN** initiate Hot Leg Injection. (continue)	G.1.i.1 (continued) i. **IF** 13 HPSI PP is running, **THEN** Shut AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV j. Throttle the HPSI flow to maintain cold leg injection flow **NO** more than 100 GPM above the minimum required for heat removal **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>. 1.3 **IF** a CS PP is being used for injection, **THEN** line up for Hot Leg Injection as follows: a. Verify the following conditions exist: • RCS pressure is less than 270 PSIA {245} • RCS pressure minus containment pressure is less than 75 PSID b. Open SDC RECIRC ISOL valve, 1-SI-399-MOV. c. Verify 12A LPSI HDR valve, 1-SI-635-MOV, is open. d. Shut the following LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-645-MOV (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued) (continue)	G.1.3 (continued) e. Throttle 12A LPSI HDR valve, 1-SI-635-MOV, to maintain a flowrate of 600 GPM, as indicated on 12A LPSI HDR FLOW indicator, 1-FI-332. f. Close the power supply breakers to the SDC HDR RETURN ISOL valves: • 1-SI-651-MOV breaker, 52-11466 • 1-SI-652-MOV breaker, 52-10424 g. Open SDC HDR RETURN ISOL valves: • 1-SI-651-MOV • 1-SI-652-MOV h. Maintain Cold Leg Injection flowrate of 600 GPM, as indicated on 12A LPSI HDR FLOW indicator, 1-FI-332. i. Ensure CET temperatures remain constant or lowering.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **WHEN** Pressurizer Injection **OR** Hot Leg Injection is in progress, **AND** HPSI PPs are being used for Cold Leg Injection, **THEN** perform the following actions: a. Balance the flow between Pressurizer or Hot Leg Injection and Cold Leg Injection by throttling the MAIN HPSI HDR valves: • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV b. Maintain the minimum flow required to remove decay heat **PER** <u>ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW</u>. c. Ensure CET temperatures remain constant or lowering.	
H. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-4.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE CHG PP operating (continue)	1.1 **IF** RCS Pressure and Inventory Control has **NOT** been satisfied, **THEN** perform the following actions: a. Concurrently perform the recovery actions for the next safety function to be satisfied. b. Determine the appropriate emergency response actions **PER** the ERPIP. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

H.1 (continued)

NOTE
LPSI Pumps are **NOT** required post-RAS.

NOTE
Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met.

- HPSI and LPSI PPs are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW
- Reactor Vessel level indicates the core is covered

(continue)

ALTERNATE ACTIONS

H.1.1 (continued)

CAUTION
Cool ECCS water may cause thermal shock to the fuel pins and result in fuel damage. Injection flow should be restored gradually.

CAUTION
Initiating flow to an overheated core will cause rapid steam production and an RCS pressure spike, which may cause creep rupture failure of the RCS, including steam generator tubes. Injection flow should be restored gradually to minimize the RCS pressure spike.

c. **IF ALL** Safety Injection flow has been lost,
THEN consider consulting the Technical Support Center prior to reinitiating Safety Injection flow.

CAUTION
To prevent loss of Core heat removal while RCS inventory control is lost, it is important to maintain RCS heat removal via the Steam Generators to support single or two-phase natural circulation.

d. Maximize RCS heat removal via the Steam Generators **PER** the selected Core And RCS Heat Removal success path.

e. **IF** high RCS pressure is preventing adequate SIS flow,
THEN attempt to depressurize the RCS to obtain adequate SIS flow by operating the PORVs or Pressurizer Vents **PER** PIC-2, PORVs or PRESSURIZER VENT.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1 (continued)
	f. Verify **ALL** available CNTMT AIR CLRs are operating.
	g. **IF** RAS actuated, **THEN** perform the following:
	(1) Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning.
	(2) Contact the Plant Technical Support Center for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT **PER** ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS.
	(3) **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1 (continued)

RECOVERY ACTIONS

H.1 (continued)

(continue)

ALTERNATE ACTIONS

H.1.1 (continued)

h. **IF ALL** Safety Injection flow has been lost,
AND ALL the following conditions have been established:

- **ALL** ECCS pumps aligned to the Containment Sump are stopped
- Plant Technical Support Center concurrance obtained
- Alignment of the selected pump has been verified
- The selected pump has been vented as required

THEN attempt to re-establish Safety Injection flow to the RCS from the Containment Sump:

(1) Throttle injection valve(s).

(2) Verify the MINI FLOW RETURN TO RWT ISOL MOVs are shut:

- 1-SI-659-MOV
- 1-SI-660-MOV

(3) Start the selected pump.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1.h (continued) (4) **IF** a loss of pump suction is indicated by **ANY** of the following: • Lower or unstable flow • Lower or unstable discharge pressure • Lower or unstable motor current • Pump noise **THEN** stop the pump. (5) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1 (continued) i. **IF** there is inventory in the SITs, **THEN** discharge SIT inventory as needed to replenish RCS inventory: (1) Ensure RCS pressure is less than SIT pressure by performing the following: • Operate the TBVs or ADVs **PER** the selected Core And RCS Heat Removal success path. • Operate the PORVs or Pressurizer Vents **PER** PIC-2, PORVs or PRESSURIZER VENT. (2) Ensure selected SIT outlet isolation valve is open. (3) Verify Reactor Vessel level rises as SIT level lowers. (4) **WHEN** Reactor Vessel level is greater than or equal to the bottom of the hot leg, **THEN** shut the SIT outlet isolation valve. (5) Repeat steps (1) through (4) above as needed to control RCS inventory at the bottom of the hot leg. (6) **WHEN** the SIT is empty, **THEN** isolate the SIT. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1 (continued) **CAUTION** **Injecting additional inventory into the Containment may submerge equipment and/or instrumentation desired to mitigate or monitor the event. Submerged equipment/instrumentation may be rendered inoperable.** j. **IF** RAS actuated, **AND ALL** the following conditions have been established: • Recirculation capability via the Containment Sump has been lost • Usable inventory is available in the RWT • RWT boron concentration verified to be acceptable for current plant conditions • RCS pressure is less than selected pump shutoff head **THEN** inject to the RCS as necessary to control Reactor Vessel level greater than or equal to the bottom of the hot leg: (1) Ensure pump suction from the Containment Sump is isolated. (2) Align suction for selected pump to RWT: • HPSI PP • LPSI PP • Charging PP • CS PP (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1.j (continued) (3) Align discharge to RCS: • Hot or Cold Leg injection • Normal or Alternate charging path (4) Operate the selected pump as needed. (5) Monitor pump performance. (6) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1 (continued) **CAUTION** **Injecting additional inventory into the Containment may submerge equipment and/or instrumentation desired to mitigate or monitor the event. Submerged equipment/instrumentation may be rendered inoperable.** k. **IF** RAS actuated, **AND ALL** the following conditions have been established: • Recirculation capability via the Containment Sump has been lost • An alternate method to inject directly to the RCS bypassing the RWT has been selected (refer to ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS) • Boron concentration of makeup water source verified to be acceptable for current plant conditions • RCS pressure is less than selected pump shutoff head **THEN** inject to the RCS as necessary to control Reactor Vessel level greater than or equal to the bottom of the hot leg: (1) Ensure pump suction from the Containment Sump is isolated. (2) Align suction for selected pump. (3) Align discharge to RCS. (4) Operate the selected pump as needed. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1.k (continued) (5) Monitor pump performance. (6) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg. l. Evaluate further actions based on the following considerations: (1) The rate of change of pressure and potential for damage to the RCS. (2) The urgency of other jeopardized safety functions. (3) The feasibility of restoring function to a success path by performing **ANY** of the following: • Restoring the vital auxiliaries necessary to operate components or systems in the success paths • Manual operation of valves • Use of alternate components to implement a success path • Depressurization or cooling of the RCS to raise or establish SIS flow
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-1: CVCS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• Charging pump is available
• Charging path is available via normal flow path or SIS flow path
• A charging source is available:
  • VCT
  • BAST
  • RWT
• A method of pressurizer pressure control is available:
  • Pressurizer heaters
  • Main Spray
  • Aux Spray
  • Controlled Steaming
• SIAS has **NOT** actuated **OR** has been reset
	• Pressurizer pressure less than the upper limits of Att. (1)
	• Pressurizer level greater than 30 inches
	• RCS subcooling is between 25°F and 140°F based on CET temperatures
	• Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS INVENTORY CONTROL USING CVCS.		1
	• **IF** charging is unable to maintain pressurizer level greater than 30 inches, **THEN PROCEED** to PIC-4 • Restore letdown flow • **IF** the RCS is water solid, **THEN** draw a bubble		2 2 8
	B. ESTABLISH RCS PRESSURE CONTROL.	C	10
	• Pressurizer HTRs **OR** SPRAYs • Controlled steaming • Block SGIS/SIAS		10 14
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-1.		27
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		27

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-2: PORVs or PRESSURIZER VENT

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• PORV or Pressurizer Vent required to reduce pressure • PORV or Pressurizer Vent available to control pressure • Charging and letdown and/or SIS is available to control pressurizer level • Once-Through-Cooling is **NOT** in progress	• Pressurizer pressure less than 2400 PSIA • Pressurizer pressure less than the upper limits of Att. (1) • RCS subcooling is between 25°F and 140°F based on CET temperatures • Pressurizer level greater than 30 inches {90} • Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS INVENTORY CONTROL.	C	28
	• **IF** RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation.		28
	OR		
	• Align HPSI injection and block SIAS.		28
	• **IF ALL** of the following conditions can be maintained: • At least 25 °F subcooling based on CET temperatures • Pressurizer level greater than 101 inches {141} • At least ONE S/G available for heat removal • Reactor Vessel level is above the top of the hot leg • Reactivity Control Safety Function Acceptance Criteria are met **THEN** HPSI flow may be reduced.		30
	• Maintain Pressurizer Level between **101 inches {141} and 180 inches {190}**		31

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

PIC-2: PORVs or PRESSURIZER VENT
(continued)

START	FUNCTION	DONE	PAGE
	B. ESTABLISH RCS PRESSURE CONTROL USING PORVs OR PRESSURIZER VENT.	C	32
	• IF pressurizer pressure rises to 2400 PSIA, **THEN** verify **BOTH** PORVs open		32
	• Restore and maintain RCS subcooling using PORVs or PRZR VENT valves		33
	• IF pressurizer level approaches 305 inches **OR** PORVs are **NOT** required to be open, **THEN** close the PORVs		34
	C. PREPARE FOR RAS ACTUATION.	C	36
	• RWT level drops to 4 feet		36
	D. VERIFY CONTAINMENT SUMP LEVEL AND RAS ACTUATION.	C	37
	E. IF RAS ACTUATED, **THEN** REFILL THE RWT.	C	44
	• Notify the Plant Technical Support Center to review ERPIP-611.		44
	F. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-2.		45
	• IF RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		45

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-3: LOSS OF VITAL AC

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• A loss of **ALL** 4KV Vital Buses has occurred • SIAS has **NOT** actuated **OR** has been reset	• Pressurizer pressure less than the upper limits of Att. (1) • RCS subcooling is greater than 25°F based on CET temperatures **OR** CET temperatures less than 50°F superheated • Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL DURING LOSS OF VITAL AC.	C	46
	• Minimize RCS inventory loss		46

	• **IF** RCS subcooling drops to 25°F, **THEN** cooldown the RCS to maintain:
	  • RCS subcooling **25 - 50°F**
	  • RCS cooldown rate less than **100°F in any one hour**
	  • S/G level **(-)24 - (+)30 inches**
	  • SUR negative, or SUR zero with WRNI Power **less than 10^{-4}**
	  • T_{COLD} greater than NEOP-13 curve
			47

	• **IF** a controlled cooldown is in progress, **THEN** block SIAS		47
	• **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN IMPLEMENT** PIC-1, PIC-2 **OR** PIC-4		48
	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-3.		49
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		49

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-4: SIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• SIAS has actuated **OR** SIS is able to be used to supply RCS makeup	• **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA **THEN** at least ONE Charging Pump operating • HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) • Reactor Vessel level indicates the core is covered

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL USING SIS.	C	50
	• **IF** RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation **OR** • Align HPSI injection and block SIAS		50 50
	• **IF** high RCS pressure is preventing SIS flow, **THEN** attempt to depressurize the RCS: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path		53
	• **WHEN ALL** of the following conditions can be maintained: • At least 25°F subcooling based on CET temperatures • Pressurizer level greater than 101 inches {141} • At least ONE S/G available for heat removal • Reactor Vessel level is above the top of the hot leg • Reactivity Control Safety Function Acceptance Criteria are met **THEN** HPSI flow may be reduced.		61
	• **IF** pressurizer pressure is greater than 200 PSIA and **EITHER** constant or rising, **THEN** the operating LPSI PPs may be stopped		61

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

PIC-4: SIS
(continued)

START	FUNCTION	DONE	PAGE
	B. **IF** ONCE-THROUGH-COOLING IS **NOT** IN PROGRESS, **THEN** IDENTIFY LOCATION OF LEAK.		62
	C. PREPARE FOR RAS ACTUATION.	C	65
	• RWT level drops to 4 feet		65
	D. VERIFY RAS ACTUATION.	C	65
	E. PROTECT ECCS PUMPS FROM OVERHEATING.		73
	F. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	C	74
	• Notify the Plant Technical Support Center to review ERPIP-611.		74
	G. COMMENCE CORE FLUSH.	C	74
	• **8 to 11 hours** after SIAS was actuated		74
	H. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-4.		79
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function to be satisfied • Determine the appropriate emergency response actions **PER** the ERPIP • **IF ALL** Safety Injection has been lost, **THEN** consider consulting the Technical Support Center prior to reinitiating Safety Injection Flow • Maximize RCS heat removal via the SGs • Contact the Plant Technical Support Center for alternate methods **PER** ERPIP-611 • Attempt to re-establish SI flow to the RCS from the Containment Sump • Discharge SIT inventory • Inject additional inventory to the RCS from the RWT • Inject additional inventory to the RCS via an alternate method • Evaluate further actions		79 79 80 80 81 82 84 85 87 88

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CORE AND RCS HEAT REMOVAL.	

1. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure and minimize S/G inventory loss.

   a. Shut **BOTH** MSIVs.

   b. Shut the S/G B/D valves:

   - 1-BD-4010-CV
   - 1-BD-4011-CV
   - 1-BD-4012-CV
   - 1-BD-4013-CV

2. **IF**, at **ANY** time, Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored, **THEN** perform the following actions:

   a. Trip **ALL** RCPs.

   b. Shut the S/G B/D valves:

   - 1-BD-4010-CV
   - 1-BD-4011-CV
   - 1-BD-4012-CV
   - 1-BD-4013-CV

3. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, ONCE-THROUGH-COOLING.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
4. **IF** at least ONE 4KV Vital Bus is energized, **THEN** commence RCS boration as follows:	
a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 1-CVC-518-CV • 1-CVC-519-CV	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the AUX HPSI HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 1-SI-656-MOV. (2) Open **ONE** of the AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (3) Open SI TO CHG HDR valve, 1-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 1-CVC-183, located in the 27 ft West Penetration Room. (5) Shut L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the AUX HPSI HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 1-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 1-CVC-188.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	
b. Commence RCS boration from the BAST using the CVCS as follows: (1) Ensure BAST levels remain greater than 10 inches. (2) Shut VCT M/U valve, 1-CVC-512-CV. (3) Open BA DIRECT M/U valve, 1-CVC-514-MOV. (4) Open BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV (5) Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. (6) Start **ALL** available BA PPs. (7) Shut VCT OUT valve, 1-CVC-501-MOV. (8) Start **ALL** available CHG PPs. (9) Ensure CHG HDR PRESS is greater than RCS pressure.	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows: (1) Ensure RWT level is greater than 2 feet. (2) Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. (3) Shut VCT OUT valve, 1-CVC-501-MOV. (4) Start **ALL** available CHG PPs. (5) Ensure CHG HDR PRESS is greater than RCS pressure.
c. Record the time RCS boration was commenced: __________	
d. Record BAST levels: • 11 BAST: __________ • 12 BAST: __________	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) e. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches. (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating (continue)	

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APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown rate greater than the Technical Specification Limits.**	
5. **IF** condenser vacuum is greater than 20 InHg, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions using the TURB BYP valves as follows: a. Ensure the ADVs are shut. b. Operate the TURB BYP valves from the control room. c. **IF** the TURB BYP valves can **NOT** be operated from the Control Room, **THEN** station an operator to manually position the TURB BYP valves **PER** OI-8C, MAIN STEAM AND MSR VENTS AND DRAINS. d. Maintain RCS cooldown less than 100° F in any one hour. e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP (continue)	5.1 Cooldown the RCS to establish Shutdown Cooling entry conditions using the ADVs as follows: a. Prior to determining if a tube rupture exists and isolating the affected S/G, record the ADV open and close times, for dose calculations. b. Shift the ADV controller to MANUAL. c. Operate the ADVs from the control room. d. **IF** the ADVs will **NOT** operate from the Control Room, **THEN** perform **ONE** of the following: (1) Operate the ADVs from 1C43 as follows: (a) Verify the ADV controllers on 1C43 are set at 0% output: • (11 ADV) 1-HC-4056A • (12 ADV) 1-HC-4056B (b) Align the ADV Hand Transfer Valves to 1C43 (POSITION 2): 11 S/G • 1-HV-3938A • 1-HV-3938B 12 S/G • 1-HV-3939A • 1-HV-3939B (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	A.5.1.d(1) (continued)

RECOVERY ACTIONS

A.5 (continued)

(continue)

ALTERNATE ACTIONS

A.5.1.d(1) (continued)

(c) Operate the ADVs from 1C43.

NOTE
The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut.

(2) Locally operate the ADVs from the 45ft level of the Aux Building.

e. Maintain RCS cooldown less than 100° F in any one hour.

f. **IF ALL** 4KV Vital Buses are de-energized
AND boration has **NOT** been commenced,
THEN maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP

CAUTION
The following step may blow out the Condenser Rupture Disks and may cause equipment damage.

5.2 **IF** the ADVs are **NOT** available,
AND condenser vacuum has been lost,
THEN cooldown the RCS to establish Shutdown Cooling entry conditions by opening the TURB BYP valves:

a. Open **ALL** doors to the outside on the 45 ft level of the Turbine Building.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	A.5.2 (continued) b. Notify personnel to evacuate the 45 ft level of the Turbine Building. c. **IF BOTH** MSIVs are shut, **THEN** perform the following: (1) Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428 (2) Open the MSIV BYP valves: • 1-MS-4045-MOV • 1-MS-4052-MOV d. Shut the SGFPT EXH valves. e. Station an operator to manually operate the TURB BYP valve(s) **PER** OI-8C, <u>MAIN STEAM AND MSR VENTS AND DRAINS</u>, as directed by the Control Room. f. Maintain RCS cooldown less than 100° F in any one hour. g. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, <u>MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP</u>
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) (continue)	A.5 (continued) **CAUTION** **The following step may blow out the Condenser Rupture Disks and may cause equipment damage.** 5.3 **IF** RCS cooldown has **NOT** been established, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions by aligning the steam drains to the condenser as follows: a. Open the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in OPEN. b. Open the MS LINE DRN VLVS by placing handswitch 1-HS-6600 in OPEN. c. **IF BOTH** MSIVs are shut, **THEN** perform the following: (1) Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428 (2) Open the MSIV BYP valves: • 1-MS-4045-MOV • 1-MS-4052-MOV d. Maintain RCS cooldown less than 100° F in any one hour. (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	A.5.3 (continued) e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP
6. **IF** a controlled cooldown is in progress, **THEN** block SGIS and SIAS: • **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. • **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. • **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
NOTE Verification of RCS temperature response to a plant change during natural circulation takes approximately 5 to 15 minutes following the action due to increased loop cycle times.	
7. **IF ALL** RCPs are secured, **THEN** verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 25° F based on CET temperatures • T_{HOT} minus T_{COLD} less than 50° F • T_{COLD} constant or lowering • T_{HOT} constant or lowering • CET temperatures trend consistent with T_{HOT} • Steaming rate affects RCS temperatures	7.1 **IF** subcooled Natural Circulation can **NOT** be verified, **THEN PROCEED** to HR-2, S/G HEAT SINK WITH SIS OPERATION.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. DETERMINE IF A SGTR EXISTS.	

1. **IF** a SGTR has occurred, as indicated by **ANY** of the following:
   - S/G samples
   - RMS trends:
     - UNIT 1 CNDSR OFF-GAS (1-RI-1752)
     - UNIT 1 S/G B/D (1-RI-4014)
     - UNIT 1 MAIN VENT GASEOUS (1-RI-5415)
     - MAIN STEAM EFFL RAD MONITOR (1-RIC-5421 **OR** 1-RIC-5422)
   - S/G level change when **NOT** feeding
   - Post-Trip S/G level trends
   - Mismatch in feed flow prior to the trip
   - Steam flow vs. Feed flow mismatch prior to the trip

   THEN identify the most affected S/G.

2. **IF** indications of a SGTR are **NOT** observed,
   THEN PROCEED to Block Step C.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
B. (continued) **<u>NOTE</u>** Maintaining RCS subcooling takes precedence over equalizing RCS pressure and affected S/G pressure. 3. Depressurize the RCS **PER** the selected Pressure and Inventory Control success path to maintain the following: • Subcooling between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure 4. Dispatch an operator to standby in the Unit 1 45 ft Switchgear Room to shut the affected S/G ADV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
5. **WHEN** T_{HOT} is less than 515° F, **THEN** isolate the most affected S/G.	
a. **IF** 11 S/G is the most affected S/G, **THEN** isolate 11 S/G by performing the following actions:	
(1) Shut 11 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 11 ADV will **NOT** shut from 1C43, **THEN** shut 11 ADV Manual Isolation Valve, 1-MS-101.
(a) **IF** 11 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 11 ADV controller, 1-HC-4056A, at 1C43 is set at 0% output.	
(c) Align 11 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3938A • 1-HV-3938B	
(2) Shut 11 MSIV.	
(3) Verify 11 MSIV BYP valve, 1-MS-4045-MOV, is shut.	
(4) Verify 11 SG FW ISOL valve 1-FW-4516-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.a (continued) (5) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV. (6) Shut 11 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV (7) Shut 11 S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued)	
b. **IF** 12 S/G is the most affected S/G, **THEN** isolate 12 S/G by performing the following actions:	
(1) Shut 12 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.
(a) **IF** 12 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 12 ADV controller, 1-HC-4056B, at 1C43 is set at 0% output.	
(c) Align 12 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3939A • 1-HV-3939B	
(2) Shut 12 MSIV.	
(3) Verfiy 12 MSIV BYP valve, 1-MS-4052-MOV, is shut.	
(4) Verify 12 SG FW ISOL valve 1-FW-4517-MOV, is shut.	
(5) Shut 12 SG AFW STM SUPP & BYPASS valves, 1-MS-4071-CV and 1-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.b (continued) (6) Shut 12 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (7) Shut 12 S/G B/D valves: • 1-BD-4012-CV • 1-BD-4013-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
6. Ensure the affected S/G Safety Valves remain shut.	
a. Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428	
b. Maintain the affected S/G pressure less than 920 PSIA by performing the following:	
CAUTION **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.**	
(1) **IF** the affected S/G pressure approaches 920 PSIA **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV	
(2) **IF** the MSIV BYP valve can **NOT** maintain S/G pressure less than 920 PSIA, **THEN** steam the affected S/G to atmosphere from 1C43 as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 1C43 as necessary. (continue)	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

7. Verify the most affected S/G is isolated by checking the following:
• S/G sample activity higher in the affected S/G
• RMS trends:
  • UNIT 1 CNDSR OFF-GAS (1-RI-1752)
  • UNIT 1 S/G B/D (1-RI-4014)
  • UNIT 1 MAIN VENT GASEOUS (1-RI-5415)
• Unaffected S/G level change consistent with feed flow
• S/G pressures
• RCS loop T_{COLD} trends
	7.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions:
	CAUTION
	A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.
	a. Restore feeding and steaming capability to the least affected S/G.
	b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step B.5.

8. Verify the motor driven train S/G AFW BLOCK valves are open with the handswitches in OPEN on the S/G which is unaffected by **EITHER** a SGTR **OR** an ESDE: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. Contact the Operational Support Center to perform periodic samples for the following: • RCS boron concentration at least once per hour • RCS activity • S/Gs boron concentration and activity • Turbine Building Sumps activity • Condensate and CSTs activity • Air samples and radiation surveys throughout the plant to determine the spread of contamination 10. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 11. **IF ALL** RCPs are secured, **THEN** disable RCPs in the affected loop to prevent inadvertant start. a. **IF** 11 S/G is the affected S/G, **THEN** disable 11A and 11B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 11A RCP 252-11P01 • 11A RCP 252-11P02 • 11B RCP 252-13P01 • 11B RCP 252-13P02 b. **IF** 12 S/G is the affected S/G, **THEN** disable 12A and 12B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 12A RCP 252-12P01 • 12A RCP 252-12P02 • 12B RCP 252-14P01 • 12B RCP 252-14P02 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

NOTE
If available, narrow range S/G level indication should be used to control the affected S/G level.

NOTE
Affected S/G level control steps are listed in order of preference and should be performed in the order listed.

12. Maintain the affected S/G level between 0 and (+)50 inches by performing **ANY** of the following:

    a. Maintain the affected S/G level by controlling RCS pressure with backflow to the RCS as follows:

        (1) **IF** the affected S/G level is high, **THEN** reduce RCS pressure below the affected S/G pressure by **ANY** of the following methods:

            (a) De-energize the Pressurizer HTR(s).

            (b) Use MAIN or AUX SPRAY.

            (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure.

        (2) Control RCS pressure to maintain the affected S/G level approximately constant.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued)	

b. Maintain the affected S/G level by blowdown to the MWS as follows:

(1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS.

(2) Place UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, in OPER alarm at 1C22G:

(a) Verify 1-HS-4095B/S1 - OPER BYPASS in OFF.

(b) Highlight Stop Pump **AND** press SELECT.

(c) Verify the CH 1 green OPER LED extinguishes.

(d) Bypass annunciator alarms.

(3) Verify open B/D Recovery DISCH TO MWS, 1-BD-4097-CV.

(4) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV.

(5) Verify shut B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV.

(6) Shut S/G Combined B/D Header Throttle Valves:

- 1-BD-102
- 1-BD-104

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
B.12.b (continued) (7) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (8) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (9) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D. (10) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) c. Maintain the affected S/G level by blowdown to the Condenser as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (7) Bypass UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095: (a) Place 1-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 1-HS-4095B/S1 - OPER BYPASS in BYPASS. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.c (continued) (8) Verify shut B/D Recovery DISCH TO MWS, 1-BD-4097-CV. (9) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV. (10) Verify open B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV. (11) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (12) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (13) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) d. Maintain the affected S/G level by steaming to the condenser as follows: (1) Ensure the condenser vacuum is greater than 20 InHg. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (7) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.d (continued) **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.** (8) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV	
e. Maintain the affected S/G level by steaming to atmosphere as follows:	
(1) Steam the affected S/G to atmosphere from 1C43 as follows:	(1).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 1C43 as necessary. (continue)	(b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.12 (continued)

f. **IF** the following conditions can be maintained:

- RCS pressure remains below 900 PSIA
- MSIV, ADV and MSIV BYP valves remain shut

THEN the affected S/G may be allowed to fill to the MSIV.

NOTE
If available, narrow range S/G level indication should be used to control the affected S/G level.

NOTE
Affected S/G pressure control steps are listed in order of preference and should be performed in the order listed.

13. Cool and depressurize the affected S/G as necessary by performing **ANY** of the following:

a. **IF ANY** RCP is operating,
THEN cool and depressurize the affected S/G by feeding and backflow to the RCS as follows:

(1) Verify Letdown is operating.

(2) **IF** S/G level is less than (+)50 inches,
THEN feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.

(3) Ensure RCS Boron concentration at least 116 percent of the shutdown margin requirement **PER** the NEOPs.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) **CAUTION** **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.** (4) Verify the affected S/G AFW BLOCK valves are shut with the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV **CAUTION** **Maintain RCS pressure greater than the minimum pump operating limits PER ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS.** (5) Lower the affected S/G level to 0 inches by reducing RCS pressure below the affected S/G pressure by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) Use MAIN or AUX SPRAY. (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) (6) **WHEN** the affected S/G level is 0 inches, **THEN** control RCS pressure to maintain the affected S/G level approximately constant. (7) Repeat steps (1) through (6) as necessary. b. Cool and depressurize the affected S/G by steaming to the condenser as follows: (1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches. (2) Ensure the condenser vacuum is greater than 20 InHg. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.b (continued) (8) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary. **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.** (9) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.13 (continued)

c. Cool and depressurize the affected S/G by feeding and blowdown to the MWS as follows:

(1) **IF** S/G level is less than (+)50 inches,
THEN feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.

(2) **IF** AFAS has actuated,
THEN reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS.

(3) Place UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, in OPER alarm at 1C22G:

(a) Verify 1-HS-4095B/S1 - OPER BYPASS in OFF.

(b) Highlight Stop Pump **AND** press SELECT.

(c) Verify the CH 1 green OPER LED extinguishes.

(d) Bypass annunciator alarms.

(4) Verify open B/D Recovery DISCH TO MWS, 1-BD-4097-CV.

(5) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV.

(6) Verify shut B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued) (7) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (8) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (9) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (10) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D. (11) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (12) Lower the affected S/G level to 0 inches by S/G blowdown to the MWS. (13) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued) (14) Repeat steps (12) and (13) as necessary. d. Cool and depressurize the affected S/G by feeding and blowdown to the Condenser as follows: (1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued) (8) Bypass UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095: (a) Place 1-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 1-HS-4095B/S1 - OPER BYPASS in BYPASS. (9) Verify shut B/D Recovery DISCH TO MWS, 1-BD-4097-CV. (10) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV. (11) Verify open B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV. (12) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (13) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (14) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued)	
(15) Lower the affected S/G level to 0 inches by S/G blowdown to the Condenser.	
(16) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(17) Repeat steps (15) and (16) as necessary.	
e. Cool and depressurize the affected S/G by steaming to atmosphere as follows:	
(1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches.	
(2) Steam the affected S/G to atmosphere from 1C43 as follows:	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 1C43 as necessary.	(b) Direct throttling open of the affected ADV Manual Isolation Valve to lower the affected S/G pressure: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

B. (continued)

CAUTION
If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.

14. **IF** feedwater flow to the affected S/G is required,
    AND 13 AFW PP is available,
    THEN establish Auxiliary Feedwater flow as follows:

    a. Open the affected S/G motor driven train S/G AFW BLOCK valves:

       11 S/G
       - 1-AFW-4522-CV
       - 1-AFW-4523-CV

       12 S/G
       - 1-AFW-4532-CV
       - 1-AFW-4533-CV

    b. **IF** 13 AFW PP is **NOT** being used to feed the unaffected S/G,
       THEN perform the following:

       (1) Shut the motor driven train S/G AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

           11 S/G
           - 1-AFW-4522-CV
           - 1-AFW-4523-CV

           12 S/G
           - 1-AFW-4532-CV
           - 1-AFW-4533-CV

       (2) Start 13 AFW PP.

(continue)

ALTERNATE ACTIONS

14.1 **IF** 13 AFW PP is **NOT** available,
     THEN establish Auxiliary Feedwater flow using 11 or 12 AFW PP as follows:

     a. Open the affected S/G steam driven train S/G AFW BLOCK valves:

        11 S/G
        - 1-AFW-4520-CV
        - 1-AFW-4521-CV

        12 S/G
        - 1-AFW-4530-CV
        - 1-AFW-4531-CV

     b. **IF** 11 or 12 AFW PP is **NOT** being used to feed the unaffected S/G,
        THEN shut the steam driven train S/G AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

        11 S/G
        - 1-AFW-4520-CV
        - 1-AFW-4521-CV

        12 S/G
        - 1-AFW-4530-CV
        - 1-AFW-4531-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

B.14 (continued)

CAUTION
The 13 AFW PP flow limit is 575 GPM.

c. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the S/G FLOW CONTR valve:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

ALTERNATE ACTIONS

B.14.1 (continued)

CAUTION
An unmonitored radiation release could occur if the SG AFW STM SUPP & BYPASS valves from the affected S/G are open.

c. Verify the SG AFW STM SUPP & BYPASS valves from the unaffected S/G are open:

- (11 SG)1-MS-4070-CV, 1-MS-4070A-CV
- (12 SG)1-MS-4071-CV, 1-MS-4071A-CV

d. Adjust and maintain 11 or 12 AFW PP discharge pressure at least 100 PSI greater than the affected S/G pressure:

- (11 AFW PP SPEED CONTR) 1-HC-3987A
- (12 AFW PP SPEED CONTR) 1-HC-3989A

e. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the S/G FLOW CONTR valve:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

f. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. DETERMINE IF AN ESDE EXISTS.	
1. **IF** an ESDE has occurred, by considering **ALL** of the following: • High steam flow from S/G • Lowering S/G pressure • Lowering S/G level • Lowering RCS T_{COLD} • Lowering PZR pressure • Lowering PZR level **THEN** identify the most affected S/G.	
2. **IF** indications of an ESDE are **NOT** observed, **THEN PROCEED** to Block Step D.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
3. Isolate the most affected S/G.	
a. **IF** 11 S/G is the most affected S/G, **THEN** isolate 11 S/G by performing the following actions:	
(1) Shut 11 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 11 ADV will **NOT** shut from 1C43, **THEN** shut 11 ADV Manual Isolation Valve, 1-MS-101.
(a) **IF** 11 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 11 ADV controller, 1-HC-4056A, at 1C43 is set at 0% output.	
(c) Align 11 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3938A • 1-HV-3938B	
(2) Verify 11 MSIV is shut.	
(3) Verify 11 SG FW ISOL valve 1-FW-4516-MOV, is shut.	
(4) Verify 11 MSIV BYP valve, 1-MS-4045-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.a (continued) (5) Shut 11 S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV (6) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV. (7) Shut 11 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued)	
b. **IF** 12 S/G is the most affected S/G, **THEN** isolate 12 S/G by performing the following actions:	
(1) Shut 12 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.
(a) **IF** 12 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 12 ADV controller, 1-HC-4056B, at 1C43 is set at 0% output.	
(c) Align 12 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3939A • 1-HV-3939B	
(2) Verify 12 MSIV is shut.	
(3) Verify 12 SG FW ISOL valve 1-FW-4517-MOV, is shut.	
(4) Verify 12 MSIV BYP valve, 1-MS-4052-MOV, is shut.	
(5) Shut 12 S/G B/D valves: • 1-BD-4012-CV • 1-BD-4013-CV	
(6) Shut 12 SG AFW STM SUPP & BYPASS valves, 1-MS-4071-CV and 1-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

C.3.b (continued)

(7) Shut 12 S/G AFW BLOCK valves by placing the handswitches in SHUT:

- 1-AFW-4530-CV
- 1-AFW-4531-CV
- 1-AFW-4532-CV
- 1-AFW-4533-CV

(8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE.

(9) Observe locally, the S/G Safety Valves are **NOT** leaking.

4. Verify the most affected S/G was isolated by checking the following:

- S/G pressure lower for the affected S/G
- RCS loop T_{COLD} lower in the affected loop
- S/G level lowering for the affected S/G and stabilized for the unaffected S/G

(continue)

ALTERNATE ACTIONS

4.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions:

CAUTION
A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.

a. Restore feeding and steaming capability to the least affected S/G.

b. **WHEN** RCS heat removal has been re-established to the least affected S/G,
THEN isolate the most affected S/G **PER** step C.3.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **NOTE** The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure. 5. **IF** the difference between unaffected S/G temperature and CET temperature exceeds 25° F during the blowdown, **THEN** cool the unaffected S/G to within 25° F of CET temperature using the unaffected S/G ADV. **NOTE** The remainder of this procedure may be performed while waiting for the S/G to blowdown. **CAUTION** **A heatup of the RCS following an excessive cooldown rate can result in a rise in RCS pressure and the potential for pressurized thermal shock.** 6. **WHEN** the RCS cooldown due to blowdown of the affected S/G has stopped, **THEN** operate the unaffected S/G ADV to stabilize RCS temperatures as follows: a. Establish the unaffected S/G temperature within 25° F of the lowest CET temperature during blowdown. b. **WHEN** unaffected S/G temperature is within 25° F of the lowest CET temperature during blowdown, **THEN** maintain the following: • Unaffected S/G pressure approximately constant • T_{COLD} approximately constant	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D. DETERMINE IF A LOAF EXISTS.

1. Determine if a LOAF has occurred, by considering **ANY** of the following:
   - Lowering S/G level, S/G low level alarm, Reactor Trip on Low S/G level
   - AFAS actuation on low S/G level
   - "SGFPT TRIP" alarms

2. **IF** indications of a LOAF are **NOT** observed,
   THEN PROCEED to Block Step E.

3. **IF** Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored,
   THEN verify the following actions have been performed:
   a. Trip **ALL** RCPs.
   b. Shut the S/G B/D valves:
      - 1-BD-4010-CV
      - 1-BD-4011-CV
      - 1-BD-4012-CV
      - 1-BD-4013-CV

4. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches
   OR T_{COLD} rises uncontrollably 5° F or greater,
   THEN IMPLEMENT HR-4, <u>ONCE-THROUGH-COOLING</u>.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued)	
5. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
6. **IF** AFW is available, **THEN** attempt to establish AFW flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.	
a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected S/G AFW BLOCK valves in OPEN: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater flow. Each available method can be attempted until auxiliary feed flow is successfully established.

b. Establish AFW flow with 13 AFW PP as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(2) Start 13 AFW PP by placing its handswitch in START.

(3) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(continue)

ALTERNATE ACTIONS

b.1 Start 13 AFW PP locally as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(2) Verify 13 AFW PP handswitch is in AUTO.

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 13 breaker, 152-1116, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued) (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (continue)	D.6.b.1(3) (continued) **CAUTION** **Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.** (4) **IF** the breaker fails to close, **THEN**, with the approval of the SM/CRS, perform the following actions: (a) Remove the breaker control power fuses. (b) **IF** necessary, **THEN** manually charge the breaker closing spring. (c) Press the CLOSE button at AFW PP No. 13 breaker, 152-1116. (d) Ensure normal pump running current less than 70 AMPS. (5) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6.b (continued)

c. Establish AFW flow with 11 or 12 AFW PP as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(2) Verify open 11 and 12 AFW PP Main Steam Supply Valves:

- 1-MS-109
- 1-MS-107

(3) Verify open 11 **OR** 12 THROTTLE/STOP valve:

- 1-MS-3986
- 1-MS-3988

(continue)

ALTERNATE ACTIONS

D.6.b.1 (continued)

(6) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between (-)24 and (+)30 inches
- RCS cooldown rate less than 100° F in any one hour

c.1 Start 11 or 12 AFW PP locally as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(2) Turn the turbine governor control knob counterclockwise to the minimum position.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6.c (continued)

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(4) Open the SG AFW STM SUPP & BYPASS valves from a S/G **NOT** affected by a SGTR:

- (11 S/G)1-MS-4070-CV, 1-MS-4070A-CV
- (12 S/G)1-MS-4071-CV, 1-MS-4071A-CV

WARNING
The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.

(5) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN align Liquid N_2 System to supply S/G FLOW CONTR valves by opening the following valves located in SRW Room:

- N_2 Supply To AFW Amplifier Air System, 0-N2-105
- AFW amplifier Air System N_2 Backup Supply, I-IA-182

(6) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN assign an operator to control AFW discharge pressure locally as follows:

(a) Establish communications between the operator and the control room.

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

11 AFW PP

- 1-AFW-3987A I/P ISOL, 1-IA-24
- 1-AFW-3987B I/P ISOL, 1-IA-23

12 AFW PP

- 1-AFW-3989A I/P ISOL, 1-IA-22
- 1-AFW-3989B I/P ISOL, 1-IA-21

(4) Open the air filter drains on controllers to allow local control.

(5) Verify open 11 and 12 AFW PP Main Steam Supply Valves:

- 1-MS-109
- 1-MS-107

(6) Verify open 11 **OR** 12 THROTTLE/STOP valve:

- 1-MS-3986
- 1-MS-3988

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(7) Open the AFW Steam Supply Bypass Valves from a S/G **NOT** affected by a SGTR:

- 1-MS-102
- 1-MS-105

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6.c(6) (continued)

(b) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

11 AFW PP
- 1-AFW-3987A I/P ISOL, 1-IA-24
- 1-AFW-3987B I/P ISOL, 1-IA-23

12 AFW PP
- 1-AFW-3989A I/P ISOL, 1-IA-22
- 1-AFW-3989B I/P ISOL, 1-IA-21

(c) Adjust 11 or 12 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure.

(7) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (11 AFW PP SPEED CONTR) 1-HC-3987A
- (12 AFW PP SPEED CONTR) 1-HC-3989A

(8) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(continue)

ALTERNATE ACTIONS

D.6.c(6).1 (continued)

(8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob.

(9) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(10) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between (-)24 and (+)30 inches
- RCS cooldown rate less than 100° F in any one hour

(11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.c (continued) (9) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (10) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6 (continued) d. Establish AFW flow with 23 AFW PP as follows: (1) Shut the Unit 2 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV (2) Open the U-2 TO U-1 XCONN valve, 2-AFW-4550-CV. (3) Establish AFW flow with 23 AFW PP as follows: (a) Shut the Unit 1 S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV **CAUTION** **The 23 AFW PP flow limit is 575 GPM.** (b) Start 23 AFW PP by placing its handswitch in START. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.d(3) (continued) (c) Adjust the Unit 1 S/G FLOW CONTR valves to approximately 150 GPM per S/G: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 7. **IF** Booster Pump Injection is available, **THEN** attempt to establish flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. **IF** an ESDE has **NOT** occurred, **THEN** block SGIS as follows: • **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. b. **IF** SGIS has actuated **AND** indications of an ESDE are **NOT** observed, **THEN** reset SGIS as follows: (1) Place the COND BSTR PPs in PULL TO LOCK. (2) Match handswitch positions **PER** ATTACHMENT (7), <u>SGIS VERIFICATION CHECKLIST</u>. (3) Block SGIS. (4) Reset the SGIS signal. (5) Open the MSIV(s). (6) Open the SG FW ISOL valve(s): • 1-FW-4516-MOV • 1-FW-4517-MOV (7) Start a COND BSTR PP. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.**	
c. Commence a rapid RCS cooldown to T_{COLD} less than 465° F using the TURB BYP valves **OR** ADVs, while maintaining the following: • Cooldown less than 100° F in any one hour • Subcooling between 25 and 140° F based on CET temperatures • Pressurizer level between 50 and 180 inches	c.1 **IF** subcooling exceeds 140° F, **THEN** depressurize the RCS **PER** the selected Pressure and Inventory Control success path.
d. Shut the MAIN SG FW REG valves.	
e. Shift the SG FW REG BYPASS controllers to Manual.	
f. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0.	
g. Depress the S/G FRV BYP RESET buttons.	
h. Manually adjust the SG FW REG BYPASS valve controllers to 0%.	
i. Open the SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV	
j. Open the PRECOAT SYS BYP valve, 1-CD-5818-CV.	
k. Open the COND DEMIN BYP valve, 1-CD-4439-MOV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D.7 (continued)

l. Verify at least ONE COND PP is running.

m. Verify ONE COND BSTR PP is running.

n. Place BOTH HTR DRN PP Handswitches in PULL TO LOCK.

NOTE
Feedwater flow to S/Gs should start when RCS cooldown has resulted in the S/G pressures dropping to less than the Condensate Booster Pump shut-off head of approximately 500 PSIA.

CAUTION
Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.

o. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW.

p. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between (-)24 and (+)30 inches
- RCS cooldown rate less than 100° F in any one hour

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 8. **IF** Main Feedwater is available, **THEN** attempt to establish Main Feed flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. Shut the MAIN SG FW REG valves. b. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. c. Depress the S/G FRV BYP RESET buttons. d. Manually adjust the SG FW REG BYPASS valve controllers to 0%. e. Open the SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued)	
f. **IF** at least ONE SGFP is **NOT** operating, **THEN**, with the approval of the SM/CRS, attempt to start a SGFP.	
(1) Verify shut the SGFPT HP and LP STOP VLVs.	
(2) Check the DEMAND MIN indicator is illuminated at the OCS.	(2).1 **IF** the DEMAND MIN indicator is **NOT** illuminated, **THEN** depress the down arrow until the DEMAND MIN indicator illuminates.
(3) Reset the SGFP Vacuum Trip **AND** Turbine Trip.	
(4) Depress the DIRECT GOVNR VLV pushbutton at the OCS.	
(5) Raise the speed of the SGFP, until the discharge pressure is sufficient to feed the SGs, by depressing the "up" SPEED arrow at the OCS.	
<u>CAUTION</u> **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.**	
g. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), <u>MAIN FEEDWATER GOOSENECK PURGE FLOW</u>.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued) h. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour	
E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	
1. Ensure the TBVs **OR** ADVs are controlling T_{COLD} less than 535° F.	
2. Ensure adequate RCS heat removal with at least ONE S/G by observing **BOTH** of the following conditions exist: • At least ONE S/G level is greater than (-)350 inches • T_{COLD} is stable or lowering	2.1 **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 4. **IF** AFW is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. 5. **IF** Booster Pump Injection is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. b. Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. c. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 6. **IF** Main Feedwater is feeding the least affected S/G(s), **THEN** perform the following: a. Establish a shutdown feed system lineup as follows: • ONE operating SGFP • ONE operating COND BSTR PP • TWO operating COND PPs • BOTH HTR DRN PPs secured b. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. c. **WHEN** manual control of feed flow is desired **OR** S/G level is between (-)24 and (+)30 inches, **THEN** perform the following actions: (1) Shift the SG FW REG BYPASS controllers to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the S/G FRV BYP RESET buttons. (4) Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. d. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 7. **IF** the Main Feedwater System is **NOT** to be used to feed a S/G, **THEN** secure the Main Feed system. a. Trip the SGFPs. b. Place the COND BSTR PPs in PULL TO LOCK. c. Place TWO COND PPs in PULL TO LOCK. d. Place the HTR DRN PPs in PULL TO LOCK. e. Shut SG FW ISOL valve: • 1-FW-4516-MOV • 1-FW-4517-MOV f. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 1-LIC-4405 to MANUAL with 50% output. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E.7 (continued) g. **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer: (1) Verify the S/G B/D valves are shut: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV **NOTE** 1-CD-410 is located east of 11A Drain Cooler. 1-CD-411 is located west of 13 CBP. (2) Shut the 11 B/D HX HDR ISOL valves: • 1-CD-410 • 1-CD-411	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

F. SECURE RCS BORATION.

1. **WHEN** RCS boration has been completed,
   THEN shift the charging pump suction to a lower boric acid concentration source as follows:

   a. **IF** boration was from the BASTs,
   THEN secure boration as follows:

   (1) Open VCT OUT valve, 1-CVC-501-MOV.

   (2) Stop BA PP(s).

   (3) Shut BA DIRECT M/U valve, 1-CVC-514-MOV.

   (4) Shut BAST GRAVITY FD valves:

   - 1-CVC-508-MOV
   - 1-CVC-509-MOV

   b. **IF** boration was from a RWT,
   THEN secure boration as follows:

   (1) Open VCT OUT valve, 1-CVC-501-MOV.

   (2) Shut RWT CHG PP SUCT valve, 1-CVC-504-MOV.

   c. Return makeup to the VCT **PER** OI-2B, BORATION, DILUTION AND MAKEUP.

   d. Ensure boric acid concentration in makeup water is adequate to maintain required shutdown margin.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. EVALUATE RESTORING FORCED CIRCULATION.

1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following:
   - Verify electrical power is available to the RCPs
     - RCP BUS
     - MCC-115 (ALL RCPs)
     - MCC-105 (11A/11B RCP)
   - Adequacy of RCS and Core Heat Removal using natural circulation
   - Existing RCS pressure and temperatures
   - RCP Controlled Bleed-off temperatures
   - The capability to supply Main **OR** Auxiliary Feedwater to at least ONE S/G
   - The possibility of dilute pockets of water in the RCS due to flow stagnation in the affected loop

2. **IF** at least ONE RCP is operating in each loop
   OR RCP operation is **NOT** desired,
   THEN PROCEED to step H.

3. **IF** T_{COLD} is less than 369° F,
   THEN PROCEED to step H.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. 5. **IF** Component Cooling has been isolated to Containment, **THEN** restore cooling flow **PER** CE-2, CONTAINMENT ISOLATION, **OR** CE-3, CONTAINMENT SPRAY. **CAUTION** **If a RCP Controlled Bleed-off temperature exceeds 250° F, the affected seal must be rebuilt before the RCP can be operated. Do NOT restart ANY RCP whose Controlled Bleed-off temperature has exceeded 250° F.** 6. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 7. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 8. Restore Pressurizer level to between 155 and 180 inches. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)
 	
9. Verify the RCP restart criteria are met by **ALL** of the following:
• Electrical power is available to the RCPs
• 12/22 SERV BUS VOLTS is less than 14.8 KV
• 4KV Vital Bus voltage is greater than 4100 volts
• RCP Controlled Bleed-off temperatures are less than 200° F
• RCS subcooling is greater than 25° F based on CET temperatures
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed
• Pressurizer level is greater than 155 inches and **NOT** lowering
• T_{COLD} is less than 525° F
• RCS temperature and pressure are greater than the minimum operating limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, for the pumps to be started
 	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>

G. (continued)

<u>CAUTION</u>

Starting an RCP may cause the following:

- **A pressurizer level transient**
- **A high pressure transient if an RCP is started in a loop in which NO S/G is available for heat removal**
- **Initiation of SIAS if RCS pressure is greater than the SIAS pressurizer pressure setpoint**
- **A reactivity excursion due to dilute pockets of water, if an RCP is restarted in the affected loop, OR boration is NOT complete prior to restarting an RCP in the unaffected loop**

10. **WHEN** RCP restart is desired
    AND the RCP restart criteria are met,
    THEN start ONE RCP in a loop with an operating S/G as follows:

    a. **IF** a SGTR has been diagnosed,
       AND the RCS pressure has dropped below the affected S/G pressure,
       OR the level in the affected S/G has lowered after isolation,
       THEN verify RCS boration is complete.

    b. Verify the RCP BLEED-OFF ISOL valves are open:

       - 1-CVC-505-CV
       - 1-CVC-506-CV

    c. Verify the "CCW FLOW LO" alarm is clear.

    d. Start the associated OIL LIFT PP.

    e. Verify the "OIL LIFT PP PRESS LO" alarm is cleared.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.10 (continued) f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. h. Verify the synchroscope on panel 1C19 is **NOT** rotating. i. Start the RCP. j. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 12. Monitor RCP seal parameters following pump restart. 13. Allow backflow to equalize temperatures in the opposite loop. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 14. Start a second RCP in the opposite loop: a. **IF** the Reactor Coolant Pump Breaker CLOSE CIR fuses have been removed, **THEN** replace the CLOSE CIR fuses on the selected Reactor Coolant Pump Breaker. • 11A RCP 252-11P01 • 11A RCP 252-11P02 • 11B RCP 252-13P01 • 11B RCP 252-13P02 • 12A RCP 252-12P01 • 12A RCP 252-12P02 • 12B RCP 252-14P01 • 12B RCP 252-14P02 b. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>. c. Start RCP **PER** step G.10 above. d. Monitor RCP seal parameters following pump restart.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

H. CONTROL CORE AND RCS VOIDING.

NOTE

Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization,
   THEN reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 1-CVC-515-CV
      - 1-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 25 and 140° F as follows: (1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. • Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped. (continue)	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RX VESS VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

H.1.c (continued)

(2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods:

- De-energize the Pressurizer HTR(s)
- Operate Pressurizer SPRAY
- Secure RCS cooldown
- **IF** HPSI throttle criteria are met,
THEN throttle the HPSI HDR valves,
OR stop the HPSI PPs one at a time

(3) Repeat steps H.1.c.(1) through H.1.c.(2) as necessary.

NOTE
Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS.

CAUTION
If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.

d. **IF** voiding is suspected in the S/G tubes,
THEN cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following:

- Steaming rate
- Feed rate
- S/G Blowdown rate

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	
I. PERFORM LOW TEMPERATURE ACTIONS.	
1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required: • SGFP • COND BSTR PP **NOTE** If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication. 2. **WHEN** T_{COLD} is less than 385° F, **THEN** establish LTOP control by performing the following: a. Place **ALL** HPSI PPs in PULL TO LOCK. (continue)	2.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate MAIN SPRAY, AUX SPRAY or PRZR VENT valves to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.2 (continued) b. Shut **ALL** HPSI HDR valves and place their handswitches in PULL-TO-OVERRIDE: MAIN • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV AUX • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV **CAUTION** **Only ONE HPSI Pump shall be operable prior to cooldown to less than 365° F T_{COLD}.** c. Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) **CAUTION** **PORVs must be in MPT ENABLE before T_{COLD} is less than 365° F.** 3. **WHEN** T_{COLD} is less than 369° F, **THEN** establish MPT protection as follows: a. Verify the PORV BLOCK valves are OPEN: • 1-RC-403-MOV • 1-RC-405-MOV b. Verify PZR LO RANGE PRESS, 1-PI-103 is less than VLTOP PORV SETPOINT, 1-ZI-103. c. Verify PZR LO RANGE PRESS, 1-PI-103-1 is less than VLTOP PORV SETPOINT, 1-ZI-103-1. **CAUTION** **PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 396 PSIA.** d. Place the PORV MPT PROTECTION handswitches in VARIABLE MPT ENABLE: • 1-HS-1406 • 1-HS-1408 e. Verify the PORV OVERRIDE handswitches in the AUTO position: • 1-HS-1402 • 1-HS-1404 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued)	

4. **WHEN** RCS temperature is less than 350° F,
   THEN verify that **NO** more than TWO RCPs are in operation.

5. **WHEN** RCS temperature is less than 300° F
   AND RCS pressure is less than 300 PSIA,
   THEN perform the following actions:

NOTE
Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists.

   a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available.

   b. Close SIT OUT breakers:

      - (1-SI-614-MOV) 52-11442
      - (1-SI-624-MOV) 52-11443
      - (1-SI-634-MOV) 52-10442
      - (1-SI-644-MOV) 52-10443

   c. Shut SIT OUT valves:

      - 1-SI-614-MOV
      - 1-SI-624-MOV
      - 1-SI-634-MOV
      - 1-SI-644-MOV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
1.5 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (2) Place 13 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW STM SUPP & BYPASS valves: • (11 SG)1-MS-4070-CV, 1-MS-4070A-CV • (12 SG)1-MS-4071-CV, 1-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-1.	
1. Check Core and RCS Heat Removal is satisfied by the following indications: • At least ONE S/G has level between (-)24 and (+)30 inches **OR** S/G level is being restored by feedwater flow • **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10° F • **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50° F • RCS subcooling greater than 25° F based on CET temperatures • Reactor Vessel level above the top of the hot leg	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.
2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CORE AND RCS HEAT REMOVAL WITH SIS OPERATION.	

1. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure and minimize S/G inventory loss.

   a. Shut **BOTH** MSIVs.

   b. Shut the S/G B/D valves:

   - 1-BD-4010-CV
   - 1-BD-4011-CV
   - 1-BD-4012-CV
   - 1-BD-4013-CV

2. **IF**, at **ANY** time, Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored, **THEN** perform the following actions:

   a. Trip **ALL** RCPs.

   b. Shut the S/G B/D valves:

   - 1-BD-4010-CV
   - 1-BD-4011-CV
   - 1-BD-4012-CV
   - 1-BD-4013-CV

3. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, ONCE-THROUGH-COOLING.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
4. **IF** pressurizer pressure is less than or equal to 1725 PSIA **OR** containment pressure is greater than or equal to 2.8 PSIG, **THEN** verify SIAS actuation.	
5. **IF** pressurizer pressure is greater than 1725 PSIA **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions to block SIAS:	
a. Open MAIN and AUX HPSI HDR valves: MAIN • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV AUX • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV	
b. Start 11 and 13 HPSI PPs.	
c. Start **ALL** available CHG PPs.	
d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.	
e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. 6. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 11 HPSI PP • 13 HPSI PP • 11 LPSI PP • 12 LPSI PP • **ALL** available CHG PPs (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

A.6 (continued)

b. Verify safety injection flow:

- HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA
- LPSI flow **PER** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW, when pressure is below 185 PSIA

(continue)

ALTERNATE ACTIONS

b.1 Perform the following actions as necessary:

CAUTION

Operation of two HPSI Pumps on 14 4KV Bus may cause 1B DG loading to exceed 3600 KW.

- **IF** 11 HPSI PP failed,
  THEN perform the following actions:
  (1) **IF** 1B DG is powering 14 4KV Bus,
  THEN verify DG load is less than 2960 KW.
  (2) Start 12 HPSI PP.
- **IF** 13 HPSI PP failed,
  THEN align 12 HPSI PP as follows:
  (1) Start 12 HPSI PP.
  (2) Open HPSI HDR XCONN valve, 1-SI-653-MOV.
  (3) Shut HPSI HDR XCONN valve, 1-SI-655-MOV.
- Ensure electrical power is available to valves and pumps.
- Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
7. **IF** high RCS pressure is preventing adequate SIS flow to support heat removal, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path	
8. **IF** at least ONE 4KV Vital Bus is energized, **THEN** commence RCS boration as follows:	
a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 1-CVC-518-CV • 1-CVC-519-CV	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the AUX HPSI HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 1-SI-656-MOV. (2) Open **ONE** of the AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (3) Open SI TO CHG HDR valve, 1-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 1-CVC-183, located in the 27 ft West Penetration Room.
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.a (continued)	A.8.a.1 (continued) (5) Shut L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the AUX HPSI HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 1-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 1-CVC-188.
b. Verify RCS boration from the BAST using the CVCS is in progress as follows: (1) BAST levels remain greater than 10 inches. (2) VCT M/U valve, 1-CVC-512-CV, is shut. (3) BA DIRECT M/U valve, 1-CVC-514-MOV, is open. (4) BAST GRAVITY FD valves, are open: • 1-CVC-508-MOV • 1-CVC-509-MOV (5) Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. (6) **ALL** available BA PPs are running. (7) VCT OUT valve, 1-CVC-501-MOV, is shut. (continue)	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows: (1) Ensure RWT level is greater than 2 feet. (2) Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. (3) Shut VCT OUT valve, 1-CVC-501-MOV. (4) Start **ALL** available CHG PPs. (5) Ensure CHG HDR PRESS is greater than RCS pressure.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.8.b (continued)

(8) **ALL** available CHG PPs are running.

(9) Ensure CHG HDR PRESS is greater than RCS pressure.

c. Record the time RCS boration was commenced: __________

d. Record BAST levels:

- 11 BAST: __________
- 12 BAST: __________

CAUTION

To prevent boric acid precipitation, do NOT continue boration for greater than the following:

- **134 inches from the BAST**
- **60 minutes if THREE CHG PPs are operating**
- **90 minutes if TWO CHG PPs are operating**
- **180 minutes if ONE CHG PP is operating**

e. Continue boration until **ONE** of the following conditions is met:

(1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs.

(2) BAST level has been lowered a total of 108 inches. 03102

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.e (continued) (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating	
CAUTION **RCS temperature must be closely monitored to avoid a cooldown rate greater than the Technical Specification Limits.**	
9. **IF** condenser vacuum is greater than 20 InHg, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions using the TURB BYP valves as follows: a. Ensure the ADVs are shut. b. Operate the TURB BYP valves from the control room.	9.1 Cooldown the RCS to establish Shutdown Cooling entry conditions using the ADVs as follows: a. Prior to determining if a tube rupture exists and isolating the affected S/G, record the ADV open and close times, for dose calculations. b. Shift the ADV controller to MANUAL.
(continue)	(continue)

03102

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

A.9 (continued)

c. **IF** the TURB BYP valves can **NOT** be operated from the Control Room, **THEN** station an operator to manually position the TURB BYP valves **PER** OI-8C, MAIN STEAM AND MSR VENTS AND DRAINS.

d. Maintain RCS cooldown less than 100° F in any one hour.

e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP

(continue)

ALTERNATE ACTIONS

A.9.1 (continued)

c. Operate the ADVs from the control room.

d. **IF** the ADVs will **NOT** operate from the Control Room, **THEN** perform **ONE** of the following:

(1) Operate the ADVs from 1C43 as follows:

(a) Verify the ADV controllers on 1C43 are set at 0% output:

- (11 ADV) 1-HC-4056A
- (12 ADV) 1-HC-4056B

(b) Align the ADV Hand Transfer Valves to 1C43 (POSITION 2):

11 S/G
- 1-HV-3938A
- 1-HV-3938B

12 S/G
- 1-HV-3939A
- 1-HV-3939B

(c) Operate the ADVs from 1C43.

NOTE
The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut.

(2) Locally operate the ADVs from the 45ft level of the Aux Building.

e. Maintain RCS cooldown less than 100° F in any one hour.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued)	A.9.1 (continued)

RECOVERY ACTIONS

A.9 (continued)

(continue)

ALTERNATE ACTIONS

A.9.1 (continued)

f. **IF ALL** 4KV Vital Buses are de-energized
AND boration has **NOT** been commenced,
THEN maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP

CAUTION
The following step may blow out the Condenser Rupture Disks and may cause equipment damage.

9.2 **IF** the ADVs are **NOT** available,
AND condenser vacuum has been lost,
THEN cooldown the RCS to establish Shutdown Cooling entry conditions by opening the TURB BYP valves:

a. Open **ALL** doors to the outside on the 45 ft level of the Turbine Building.

b. Notify personnel to evacuate the 45 ft level of the Turbine Building.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued)	A.9.2 (continued)
	c. **IF BOTH** MSIVs are shut, **THEN** perform the following:
	(1) Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428
	(2) Open the MSIV BYP valves: • 1-MS-4045-MOV • 1-MS-4052-MOV
	d. Shut the SGFPT EXH valves.
	e. Station an operator to manually operate the TURB BYP valve(s) **PER** OI-8C, <u>MAIN STEAM AND MSR VENTS AND DRAINS</u>, as directed by the Control Room.
	f. Maintain RCS cooldown less than 100° F in any one hour.
	g. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, <u>MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP</u>
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued) (continue)	A.9 (continued) **CAUTION** **The following step may blow out the Condenser Rupture Disks and may cause equipment damage.** 9.3 **IF** RCS cooldown has **NOT** been established, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions by aligning the steam drains to the condenser as follows: a. Open the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in OPEN. b. Open the MS LINE DRN VLVS by placing handswitch 1-HS-6600 in OPEN. c. **IF BOTH** MSIVs are shut, **THEN** perform the following: (1) Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428 (2) Open the MSIV BYP valves: • 1-MS-4045-MOV • 1-MS-4052-MOV d. Maintain RCS cooldown less than 100° F in any one hour. (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued)	A.9.3 (continued) e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-13, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP
NOTE Verification of RCS temperature response to a plant change during natural circulation takes approximately 5 to 15 minutes following the action due to increased loop cycle times.	

10. **IF ALL** RCPs are secured, **THEN** verify Natural Circulation in at least ONE loop by the following:
• RCS subcooling is at least 25° F based on CET temperatures
• T_{HOT} minus T_{COLD} less than 50° F
• T_{COLD} constant or lowering
• T_{HOT} constant or lowering
• CET temperatures trend consistent with T_{HOT}
• Steaming rate affects RCS temperatures
 	
(continue)
	10.1 **IF** subcooled natural circulation can **NOT** be verified, **THEN** verify adequate RCS cooling flow by the following:
	• **ALL** available CHG PPs are operating
	• SIS flow is appropriate **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW
	• At least ONE S/G available for heat removal
	  • S/G level greater than (-)170 inches
	  • capable of being supplied with feedwater
	  • capable of being steamed
	• CET temperatures are less than 50° F superheated

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 11. **IF** a controlled cooldown is in progress, **THEN** block SGIS and SIAS: • **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. • **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. • **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. DETERMINE IF A SGTR EXISTS.

1. **IF** a SGTR has occurred, as indicated by **ANY** of the following:

   - S/G samples
   - RMS trends:
     - UNIT 1 CNDSR OFF-GAS (1-RI-1752)
     - UNIT 1 S/G B/D (1-RI-4014)
     - UNIT 1 MAIN VENT GASEOUS (1-RI-5415)
     - MAIN STEAM EFFL RAD MONITOR (1-RIC-5421 **OR** 1-RIC-5422)
   - S/G level change when **NOT** feeding
   - Post-Trip S/G level trends
   - Mismatch in feed flow prior to the trip
   - Steam flow vs. Feed flow mismatch prior to the trip

   THEN identify the most affected S/G.

2. **IF** indications of a SGTR are **NOT** observed,
   THEN PROCEED to Block Step C.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** Maintaining RCS subcooling takes precedence over equalizing RCS pressure and affected S/G pressure. 3. Depressurize the RCS **PER** the selected Pressure and Inventory Control success path to maintain the following: • Subcooling between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS pressure less than 850 PSIA • RCS pressure approximately equal to affected S/G pressure 4. Dispatch an operator to standby in the Unit 1 45 ft Switchgear Room to shut the affected S/G ADV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
5. **WHEN** T_{HOT} is less than 515° F, **THEN** isolate the most affected S/G.	
a. **IF** 11 S/G is the most affected S/G, **THEN** isolate 11 S/G by performing the following actions:	
(1) Shut 11 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 11 ADV will **NOT** shut from 1C43, **THEN** shut 11 ADV Manual Isolation Valve, 1-MS-101.
(a) **IF** 11 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 11 ADV controller, 1-HC-4056A, at 1C43 is set at 0% output.	
(c) Align 11 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3938A • 1-HV-3938B	
(2) Shut 11 MSIV.	
(3) Verify 11 MSIV BYP valve, 1-MS-4045-MOV, is shut.	
(4) Verify 11 SG FW ISOL valve 1-FW-4516-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.5.a (continued)

(5) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV.

(6) Shut 11 S/G AFW BLOCK valves by placing the handswitches in SHUT:

- 1-AFW-4520-CV
- 1-AFW-4521-CV
- 1-AFW-4522-CV
- 1-AFW-4523-CV

(7) Shut 11 S/G B/D valves:

- 1-BD-4010-CV
- 1-BD-4011-CV

(8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE.

(9) Observe locally, the S/G Safety Valves are **NOT** leaking.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued)	
b. **IF** 12 S/G is the most affected S/G, **THEN** isolate 12 S/G by performing the following actions:	
(1) Shut 12 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.
(a) **IF** 12 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 12 ADV controller, 1-HC-4056B, at 1C43 is set at 0% output.	
(c) Align 12 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3939A • 1-HV-3939B	
(2) Shut 12 MSIV.	
(3) Verfiy 12 MSIV BYP valve, 1-MS-4052-MOV, is shut.	
(4) Verify 12 SG FW ISOL valve 1-FW-4517-MOV, is shut.	
(5) Shut 12 SG AFW STM SUPP & BYPASS valves, 1-MS-4071-CV and 1-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.b (continued) (6) Shut 12 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (7) Shut 12 S/G B/D valves: • 1-BD-4012-CV • 1-BD-4013-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
B. (continued) 6. Ensure the affected S/G Safety Valves remain shut. a. Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428 b. Maintain the affected S/G pressure less than 920 PSIA by performing the following: **<u>CAUTION</u>** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches {(+)50}.** (1) **IF** the affected S/G pressure approaches 920 PSIA **AND** S/G level is less than (+)55 inches {(+)50}, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV	
(2) **IF** the MSIV BYP valve can **NOT** maintain S/G pressure less than 920 PSIA, **THEN** steam the affected S/G to atmosphere from 1C43 as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 1C43 as necessary. (continue)	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

7. Verify the most affected S/G is isolated by checking the following:
• S/G sample activity higher in the affected S/G
• RMS trends:
  • UNIT 1 CNDSR OFF-GAS (1-RI-1752)
  • UNIT 1 S/G B/D (1-RI-4014)
  • UNIT 1 MAIN VENT GASEOUS (1-RI-5415)
• Unaffected S/G level change consistent with feed flow
• S/G pressures
• RCS loop T_{COLD} trends
	7.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions:
	CAUTION
	A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.
	a. Restore feeding and steaming capability to the least affected S/G.
	b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step B.5.

8. Verify the motor driven train S/G AFW BLOCK valves are open with the handswitches in OPEN on the S/G which is unaffected by **EITHER** a SGTR **OR** an ESDE: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. Contact the Operational Support Center to perform periodic samples for the following: • RCS boron concentration at least once per hour • RCS activity • S/Gs boron concentration and activity • Turbine Building Sumps activity • Condensate and CSTs activity • Air samples and radiation surveys throughout the plant to determine the spread of contamination 10. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 11. **IF ALL** RCPs are secured, **THEN** disable RCPs in the affected loop to prevent inadvertant start. a. **IF** 11 S/G is the affected S/G, **THEN** disable 11A and 11B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 11A RCP 252-11P01 • 11A RCP 252-11P02 • 11B RCP 252-13P01 • 11B RCP 252-13P02 b. **IF** 12 S/G is the affected S/G, **THEN** disable 12A and 12B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 12A RCP 252-12P01 • 12A RCP 252-12P02 • 12B RCP 252-14P01 • 12B RCP 252-14P02 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

NOTE
If available, narrow range S/G level indication should be used to control the affected S/G level.

NOTE
Affected S/G level control steps are listed in order of preference and should be performed in the order listed.

12. Maintain the affected S/G level between 0 and (+)50 inches by performing **ANY** of the following:

    a. Maintain the affected S/G level by controlling RCS pressure with backflow to the RCS as follows:

        (1) **IF** the affected S/G level is high, **THEN** reduce RCS pressure below the affected S/G pressure by **ANY** of the following methods:

            (a) De-energize the Pressurizer HTR(s).

            (b) Use MAIN or AUX SPRAY.

            (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure.

        (2) Control RCS pressure to maintain the affected S/G level approximately constant.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.12 (continued)

b. Maintain the affected S/G level by blowdown to the MWS as follows:

(1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS.

(2) Place UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, in OPER alarm at 1C22G:

(a) Verify 1-HS-4095B/S1 - OPER BYPASS in OFF.

(b) Highlight Stop Pump **AND** press SELECT.

(c) Verify the CH 1 green OPER LED extinguishes.

(d) Bypass annunciator alarms.

(3) Verify open B/D Recovery DISCH TO MWS, 1-BD-4097-CV.

(4) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV.

(5) Verify shut B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV.

(6) Shut S/G Combined B/D Header Throttle Valves:

- 1-BD-102
- 1-BD-104

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.b (continued) (7) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (8) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (9) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D. (10) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) c. Maintain the affected S/G level by blowdown to the Condenser as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (7) Bypass UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095: (a) Place 1-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 1-HS-4095B/S1 - OPER BYPASS in BYPASS. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.c (continued) (8) Verify shut B/D Recovery DISCH TO MWS, 1-BD-4097-CV. (9) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV. (10) Verify open B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV. (11) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (12) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (13) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) d. Maintain the affected S/G level by steaming to the condenser as follows: (1) Ensure the condenser vacuum is greater than 20 InHg. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (7) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.d (continued) **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches {(+)50}.** (8) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches {(+)50}, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV e. Maintain the affected S/G level by steaming to atmosphere as follows:	
(1) Steam the affected S/G to atmosphere from 1C43 as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 1C43 as necessary. (continue)	(1).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) f. **IF** the following conditions can be maintained: • RCS pressure remains below 850 PSIA • MSIV, ADV and MSIV BYP valves remain shut **THEN** the affected S/G may be allowed to fill to the MSIV. **NOTE** If available, narrow range S/G level indication should be used to control the affected S/G level. **NOTE** Affected S/G pressure control steps are listed in order of preference and should be performed in the order listed. 13. Cool and depressurize the affected S/G as necessary by performing **ANY** of the following: a. **IF ANY** RCP is operating, **THEN** cool and depressurize the affected S/G by feeding and backflow to the RCS as follows: (1) Verify Letdown is operating. (2) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (3) Ensure RCS Boron concentration at least 116 percent of the shutdown margin requirement **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) **CAUTION** **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.** (4) Verify the affected S/G AFW BLOCK valves are shut with the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV **CAUTION** **Maintain RCS pressure greater than the minimum pump operating limits PER ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS.** (5) Lower the affected S/G level to 0 inches by reducing RCS pressure below the affected S/G pressure by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) Use MAIN or AUX SPRAY. (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) (6) **WHEN** the affected S/G level is 0 inches, **THEN** control RCS pressure to maintain the affected S/G level approximately constant. (7) Repeat steps (1) through (6) as necessary. b. Cool and depressurize the affected S/G by steaming to the condenser as follows: (1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches. (2) Ensure the condenser vacuum is greater than 20 InHg. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.b (continued) (8) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary. **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches {(+)50}.** (9) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches {(+)50}, **THEN** operate the MSIV BYP valve on the affected S/G: • (11 S/G) 1-MS-4045-MOV • (12 S/G) 1-MS-4052-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.13 (continued)

c. Cool and depressurize the affected S/G by feeding and blowdown to the MWS as follows:

(1) **IF** S/G level is less than (+)50 inches,
THEN feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.

(2) **IF** AFAS has actuated,
THEN reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS.

(3) Place UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, in OPER alarm at 1C22G:

(a) Verify 1-HS-4095B/S1 - OPER BYPASS in OFF.

(b) Highlight Stop Pump **AND** press SELECT.

(c) Verify the CH 1 green OPER LED extinguishes.

(d) Bypass annunciator alarms.

(4) Verify open B/D Recovery DISCH TO MWS, 1-BD-4097-CV.

(5) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV.

(6) Verify shut B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued) (7) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (8) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (9) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (10) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D. (11) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (12) Lower the affected S/G level to 0 inches by S/G blowdown to the MWS. (13) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued) (14) Repeat steps (12) and (13) as necessary. d. Cool and depressurize the affected S/G by feeding and blowdown to the Condenser as follows: (1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), <u>RESET AFAS START SIGNALS AT THE ACTUATION CABINETS</u>. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 1-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 1-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HOTWELL valves, 1-FW-134 and 1-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CNDSR HI LVL DUMP CV-4405 INLET valve, 1-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued) (8) Bypass UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095: (a) Place 1-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 1-HS-4095B/S1 - OPER BYPASS in BYPASS. (9) Verify shut B/D Recovery DISCH TO MWS, 1-BD-4097-CV. (10) Verify shut B/D Recovery DISCH TO CIRC WTR, 1-BD-4015-CV. (11) Verify open B/D Recovery DISCH TO CNDSR, 1-BD-4096-CV. (12) Shut S/G Combined B/D Header Throttle Valves: • 1-BD-102 • 1-BD-104 (13) Open the affected S/G BOT B/D valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 S/G) 1-BD-4011-CV • (12 S/G) 1-BD-4013-CV (14) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 11 B/D Heat Exchanger outlet temperature less than 200° F: • (11 S/G) 1-BD-102 • (12 S/G) 1-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued)	
(15) Lower the affected S/G level to 0 inches by S/G blowdown to the Condenser.	
(16) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(17) Repeat steps (15) and (16) as necessary.	
e. Cool and depressurize the affected S/G by steaming to atmosphere as follows:	
(1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches.	
(2) Steam the affected S/G to atmosphere from 1C43 as follows:	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 1C43 as necessary.	(b) Direct throttling open of the affected ADV Manual Isolation Valve to lower the affected S/G pressure: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
CAUTION **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.**	
14. **IF** feedwater flow to the affected S/G is required, **AND** 13 AFW PP is available, **THEN** establish Auxiliary Feedwater flow as follows:	14.1 **IF** 13 AFW PP is **NOT** available, **THEN** establish Auxiliary Feedwater flow using 11 or 12 AFW PP as follows:
a. Open the affected S/G motor driven train S/G AFW BLOCK valves: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV	a. Open the affected S/G steam driven train S/G AFW BLOCK valves: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV
b. **IF** 13 AFW PP is **NOT** being used to feed the unaffected S/G, **THEN** perform the following: (1) Shut the motor driven train S/G AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV	b. **IF** 11 or 12 AFW PP is **NOT** being used to feed the unaffected S/G, **THEN** shut the steam driven train S/G AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

B.14.b (continued)

(2) Start 13 AFW PP.

CAUTION
The 13 AFW PP flow limit is 575 GPM.

c. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the S/G FLOW CONTR valve:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

ALTERNATE ACTIONS

B.14.b.1 (continued)

CAUTION
An unmonitored radiation release could occur if the SG AFW STM SUPP & BYPASS valves from the affected S/G are open.

c. Verify the SG AFW STM SUPP & BYPASS valves from the unaffected S/G are open:

- (11 SG)1-MS-4070-CV, 1-MS-4070A-CV
- (12 SG)1-MS-4071-CV, 1-MS-4071A-CV

d. Adjust and maintain 11 or 12 AFW PP discharge pressure at least 100 PSI greater than the affected S/G pressure:

- (11 AFW PP SPEED CONTR) 1-HC-3987A
- (12 AFW PP SPEED CONTR) 1-HC-3989A

e. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the S/G FLOW CONTR valve:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

f. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. DETERMINE IF AN ESDE EXISTS.

1. **IF** an ESDE has occurred, by considering **ALL** of the following:

   - High steam flow from S/G
   - Lowering S/G pressure
   - Lowering S/G level
   - Lowering RCS T_{COLD}
   - Lowering PZR pressure
   - Lowering PZR level

   THEN identify the most affected S/G.

2. **IF** indications of an ESDE are **NOT** observed,
   THEN PROCEED to Block Step D.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
3. Isolate the most affected S/G.	
a. **IF** 11 S/G is the most affected S/G, **THEN** isolate 11 S/G by performing the following actions:	
(1) Shut 11 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 11 ADV will **NOT** shut from 1C43, **THEN** shut 11 ADV Manual Isolation Valve, 1-MS-101.
(a) **IF** 11 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 11 ADV controller, 1-HC-4056A, at 1C43 is set at 0% output.	
(c) Align 11 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3938A • 1-HV-3938B	
(2) Verify 11 MSIV is shut.	
(3) Verify 11 SG FW ISOL valve 1-FW-4516-MOV, is shut.	
(4) Verify 11 MSIV BYP valve, 1-MS-4045-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.a (continued) (5) Shut 11 S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV (6) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV. (7) Shut 11 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued)	
b. **IF** 12 S/G is the most affected S/G, **THEN** isolate 12 S/G by performing the following actions:	
(1) Shut 12 ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.
(a) **IF** 12 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 12 ADV controller, 1-HC-4056B, at 1C43 is set at 0% output.	
(c) Align 12 S/G Hand Transfer Valves to 1C43 (POSITION 2): • 1-HV-3939A • 1-HV-3939B	
(2) Verify 12 MSIV is shut.	
(3) Verify 12 SG FW ISOL valve 1-FW-4517-MOV, is shut.	
(4) Verify 12 MSIV BYP valve, 1-MS-4052-MOV, is shut.	
(5) Shut 12 S/G B/D valves: • 1-BD-4012-CV • 1-BD-4013-CV	
(6) Shut 12 SG AFW STM SUPP & BYPASS valves, 1-MS-4071-CV and 1-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.b (continued) (7) Shut 12 S/G AFW BLOCK valves by placing the handswitches in SHUT: • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (8) Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking.	
4. Verify the most affected S/G was isolated by checking the following: • S/G pressure lower for the affected S/G • RCS loop T_{COLD} lower in the affected loop • S/G level lowering for the affected S/G and stabilized for the unaffected S/G (continue)	4.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions: **CAUTION** **A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** a. Restore feeding and steaming capability to the least affected S/G. b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step C.3.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **NOTE** The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure. 5. **IF** the difference between unaffected S/G temperature and CET temperature exceeds 25° F during the blowdown, **THEN** cool the unaffected S/G to within 25° F of CET temperature using the unaffected S/G ADV. **NOTE** The remainder of this procedure may be performed while waiting for the S/G to blowdown. **CAUTION** **A heatup of the RCS following an excessive cooldown rate can result in a rise in RCS pressure and the potential for pressurized thermal shock.** 6. **WHEN** the RCS cooldown due to blowdown of the affected S/G has stopped, **THEN** operate the unaffected S/G ADV to stabilize RCS temperatures as follows: a. Establish the unaffected S/G temperature within 25° F of the lowest CET temperature during blowdown. b. **WHEN** unaffected S/G temperature is within 25° F of the lowest CET temperature during blowdown, **THEN** maintain the following: • unaffected S/G pressure approximately constant • T_{COLD} approximately constant	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D. DETERMINE IF A LOAF EXISTS.

1. Determine if a LOAF has occurred, by considering **ANY** of the following:
   - Lowering S/G level, S/G low level alarm, Reactor Trip on Low S/G level
   - AFAS actuation on low S/G level
   - "SGFPT TRIP" alarms

2. **IF** indications of a LOAF are **NOT** observed,
   THEN PROCEED to Block Step E.

3. **IF** Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored,
   THEN verify the following actions have been performed:

   a. Trip **ALL** RCPs.

   b. Shut the S/G B/D valves:
      - 1-BD-4010-CV
      - 1-BD-4011-CV
      - 1-BD-4012-CV
      - 1-BD-4013-CV

4. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches
   OR T_{COLD} rises uncontrollably 5° F or greater,
   THEN IMPLEMENT HR-4, ONCE-THROUGH-COOLING.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued)	
5. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
6. **IF** AFW is available, **THEN** attempt to establish AFW flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.	
a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected S/G AFW BLOCK valves in OPEN: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater flow. Each available method can be attempted until auxiliary feed flow is successfully established.

b. Establish AFW flow with 13 AFW PP as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(2) Start 13 AFW PP by placing its handswitch in START.

(3) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(continue)

ALTERNATE ACTIONS

b.1 Start 13 AFW PP locally as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(2) Verify 13 AFW PP handswitch is in AUTO.

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 13 breaker, 152-1116, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6.b (continued)

(4) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between 0 and (+)38 inches
- RCS cooldown rate less than 100° F in any one hour

(continue)

ALTERNATE ACTIONS

D.6.b.1(3) (continued)

CAUTION
Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.

(4) **IF** the breaker fails to close,
THEN, with the approval of the SM/CRS, perform the following actions:

(a) Remove the breaker control power fuses.

(b) **IF** necessary,
THEN manually charge the breaker closing spring.

(c) Press the CLOSE button at AFW PP No. 13 breaker, 152-1116.

(d) Ensure normal pump running current less than 70 AMPS.

(5) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued)	D.6.b.1 (continued)
	(6) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour
c. Establish AFW flow with 11 or 12 AFW PP as follows: (1) Shut the S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (2) Verify open 11 and 12 AFW PP Main Steam Supply Valves: • 1-MS-109 • 1-MS-107 (3) Verify open 11 **OR** 12 THROTTLE/STOP valve: • 1-MS-3986 • 1-MS-3988	c.1 Start 11 or 12 AFW PP locally as follows: (1) Shut the S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (2) Turn the turbine governor control knob counterclockwise to the minimum position.
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6.c (continued)

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(4) Open the 12 SG AFW STM SUPP & BYPASS valves from a S/G **NOT** affected by a SGTR:

- (11 S/G)1-MS-4070-CV, 1-MS-4070A-CV
- (12 S/G)1-MS-4071-CV, 1-MS-4071A-CV

WARNING
The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.

(5) **IF** a loss of **ALL** Vital 4KV busses has occurred, **THEN** align Liquid N_2 System to supply S/G FLOW CONTR valves by opening the following valves located in SRW Room:

- N_2 Supply To AFW Amplifier Air System, 0-N2-105
- AFW amplifier Air System N_2 Backup Supply, I-IA-182

(6) **IF** a loss of **ALL** Vital 4KV busses has occurred, **THEN** assign an operator to control AFW discharge pressure locally as follows:

(a) Establish communications between the operator and the control room.

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

11 AFW PP

- 1-AFW-3987A I/P ISOL, 1-IA-24
- 1-AFW-3987B I/P ISOL, 1-IA-23

12 AFW PP

- 1-AFW-3989A I/P ISOL, 1-IA-22
- 1-AFW-3989B I/P ISOL, 1-IA-21

(4) Open the air filter drains on controllers to allow local control.

(5) Verify open 11 and 12 AFW PP Main Steam Supply Valves:

- 1-MS-109
- 1-MS-107

(6) Verify open 11 **OR** 12 THROTTLE/STOP valve:

- 1-MS-3986
- 1-MS-3988

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(7) Open the AFW Steam Supply Bypass Valves:

- 1-MS-102
- 1-MS-105

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6.c(6) (continued)

(b) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

11 AFW PP
- 1-AFW-3987A I/P ISOL, 1-IA-24
- 1-AFW-3987B I/P ISOL, 1-IA-23

12 AFW PP
- 1-AFW-3989A I/P ISOL, 1-IA-22
- 1-AFW-3989B I/P ISOL, 1-IA-21

(c) Adjust 11 or 12 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure.

(7) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (11 AFW PP SPEED CONTR) 1-HC-3987A
- (12 AFW PP SPEED CONTR) 1-HC-3989A

(8) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(continue)

ALTERNATE ACTIONS

D.6.c(6).1 (continued)

(8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob.

(9) Adjust the S/G FLOW CONTR valves to approximately 150 GPM per S/G:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(10) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between 0 and (+)38 inches
- RCS cooldown rate less than 100° F in any one hour

(11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.c (continued) (9) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (10) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6 (continued) d. Establish AFW flow with 23 AFW PP as follows: (1) Shut the Unit 2 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV (2) Open the U-2 TO U-1 XCONN valve, 2-AFW-4550-CV. (3) Establish AFW flow with 23 AFW PP as follows: (a) Shut the Unit 1 S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV **CAUTION** **The 23 AFW PP flow limit is 575 GPM.** (b) Start 23 AFW PP by placing its handswitch in START. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.d(3) (continued) (c) Adjust the Unit 1 S/G FLOW CONTR valves to approximately 150 GPM per S/G: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 7. **IF** Booster Pump Injection is available, **THEN** attempt to establish flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. **IF** an ESDE has **NOT** occurred, **THEN** block SGIS as follows: • **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. b. **IF** SGIS has actuated **AND** indications of an ESDE are **NOT** observed, **THEN** reset SGIS as follows: (1) Place the COND BSTR PPs in PULL TO LOCK. (2) Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST. (3) Block SGIS. (4) Reset the SGIS signal. (5) Open the MSIV(s). (6) Open the SG FW ISOL valve(s): • 1-FW-4516-MOV • 1-FW-4517-MOV (7) Start a COND BSTR PP. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.**	
c. Commence a rapid RCS cooldown to T_{COLD} less than 465° F using the TURB BYP valves **OR** ADVs, while maintaining the following: • Cooldown less than 100° F in any one hour • Subcooling less than 140° F based on CET temperatures	c.1 **IF** subcooling exceeds 140° F, **THEN** depressurize the RCS **PER** the selected Pressure and Inventory Control success path.
d. Shut the MAIN SG FW REG valves.	
e. Shift the SG FW REG BYPASS controllers to Manual.	
f. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0.	
g. Depress the S/G FRV BYP RESET buttons.	
h. Manually adjust the SG FW REG BYPASS valve controllers to 0%.	
i. Open the SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV	
j. Open the PRECOAT SYS BYP valve, 1-CD-5818-CV.	
k. Open the COND DEMIN BYP valve, 1-CD-4439-MOV.	
l. Verify at least ONE COND PP is running. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued) m. Verify ONE COND BSTR PP is running. n. Place BOTH HTR DRN PP Handswitches in PULL TO LOCK. **NOTE** Feedwater flow to S/Gs should start when RCS cooldown has resulted in the S/G pressures dropping to less than the Condensate Booster Pump shut-off head of approximately 500 PSIA. **CAUTION** **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.** o. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW. p. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 8. **IF** Main Feedwater is available, **THEN** attempt to establish Main Feed flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. Shut the MAIN SG FW REG valves. b. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. c. Depress the S/G FRV BYP RESET buttons. d. Manually adjust the SG FW REG BYPASS valve controllers to 0%. e. Open the SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued)	
f. **IF** at least ONE SGFP is **NOT** operating, **THEN**, with the approval of the SM/CRS, attempt to start a SGFP.	
(1) Verify shut the SGFPT HP and LP STOP VLVs.	
(2) Check the DEMAND MIN indicator is illuminated at the OCS.	(2).1 **IF** the DEMAND MIN indicator is **NOT** illuminated, **THEN** depress the down arrow until the DEMAND MIN indicator illuminates.
(3) Reset the SGFP Vacuum Trip **AND** Turbine Trip.	
(4) Depress the DIRECT GOVNR VLV pushbutton at the OCS.	
(5) Raise the speed of the SGFP, until the discharge pressure is sufficient to feed the SGs, by depressing the "up" SPEED arrow at the OCS.	
CAUTION **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.**	
g. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued) h. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour	
E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	
1. Ensure the TBVs **OR** ADVs are controlling T_{COLD} less than 535° F.	
2. Ensure adequate RCS heat removal with at least ONE S/G by observing **BOTH** of the following conditions exist: • At least ONE S/G level is greater than (-)350 inches • T_{COLD} is stable or lowering	2.1 **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 4. **IF** AFW is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. 5. **IF** Booster Pump Injection is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. b. Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. c. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 6. **IF** Main Feedwater is feeding the least affected S/G(s), **THEN** perform the following: a. Establish a shutdown feed system lineup as follows: • ONE operating SGFP • ONE operating COND BSTR PP • TWO operating COND PPs • BOTH HTR DRN PPs secured b. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. c. **WHEN** manual control of feed flow is desired **OR** S/G level is between 0 and (+)38 inches, **THEN** perform the following actions: (1) Shift the SG FW REG BYPASS controllers to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the S/G FRV BYP RESET buttons. (4) Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. d. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 7. **IF** the Main Feedwater System is **NOT** to be used to feed a S/G, **THEN** secure the Main Feed system. a. Trip the SGFPs. b. Place the COND BSTR PPs in PULL TO LOCK. c. Place TWO COND PPs in PULL TO LOCK. d. Place the HTR DRN PPs in PULL TO LOCK. e. Shut SG FW ISOL valve: • 1-FW-4516-MOV • 1-FW-4517-MOV f. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 1-LIC-4405 to MANUAL with 50% output. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E.7 (continued) g. **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer: (1) Verify the S/G B/D valves are shut: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV **NOTE** 1-CD-410 is located east of 11A Drain Cooler. 1-CD-411 is located west of 13 CBP. (2) Shut the 11 B/D HX HDR ISOL valves: • 1-CD-410 • 1-CD-411	
F. SECURE RCS BORATION.	
1. **WHEN** RCS boration has been completed, **THEN** shift the charging pump suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Shut VCT OUT valve, 1-CVC-501-MOV. c. Place the BA PPs in PULL TO LOCK. d. Ensure the BAST levels are steady.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. EVALUATE RESTORING FORCED CIRCULATION.

1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following:
   - Verify electrical power is available to the RCPs
     - RCP BUS
     - MCC-115 (ALL RCPs)
     - MCC-105 (11A/11B RCP)
   - Adequacy of RCS and Core Heat Removal using natural circulation
   - Existing RCS pressure and temperatures
   - RCP Controlled Bleed-off temperatures
   - The capability to supply Main **OR** Auxiliary Feedwater to at least ONE S/G
   - The possibility of dilute pockets of water in the RCS due to flow stagnation in the affected loop

2. **IF** at least ONE RCP is operating in each loop **OR** RCP operation is **NOT** desired, **THEN PROCEED** to step H.

3. **IF** T_{COLD} is less than 369° F, **THEN PROCEED** to step H.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. 5. **IF** Component Cooling has been isolated to Containment, **THEN** restore cooling flow **PER** CE-2, CONTAINMENT ISOLATION, **OR** CE-3, CONTAINMENT SPRAY. **CAUTION** **If a RCP Controlled Bleed-off temperature exceeds 250° F, the affected seal must be rebuilt before the RCP can be operated. Do NOT restart ANY RCP whose Controlled Bleed-off temperature has exceeded 250° F.** 6. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 7. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 8. Restore Pressurizer level to between 155 and 180 inches. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)
 	
9. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Electrical power is available to the RCPs
 	
• 12/22 SERV BUS VOLTS is less than 14.8 KV
 	
• 4KV Vital Bus voltage is greater than 4100 volts
 	
• RCP Controlled Bleed-off temperatures are less than 200° F
 	
• RCS subcooling is greater than 25° F based on CET temperatures
 	
• At least ONE S/G available for heat removal
    • S/G level greater than (-)170 inches
    • capable of being supplied with feedwater
    • capable of being steamed
 	
• Pressurizer level is greater than 155 inches and **NOT** lowering
 	
• T_{COLD} is less than 525° F
 	
• RCS temperature and pressure are greater than the minimum operating limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, for the pumps to be started
 	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)

CAUTION
Starting an RCP may cause the following:

- **A pressurizer level transient**
- **A high pressure transient if an RCP is started in a loop in which NO S/G is available for heat removal**
- **Initiation of SIAS if RCS pressure is greater than the SIAS pressurizer pressure setpoint**
- **A reactivity excursion due to dilute pockets of water, if an RCP is restarted in the affected loop, OR boration is NOT complete prior to restarting an RCP in the unaffected loop**

10. **WHEN** RCP restart is desired
AND the RCP restart criteria are met,
THEN start ONE RCP in a loop with an operating S/G as follows:

    a. **IF** a SGTR has been diagnosed,
    AND the RCS pressure has dropped below the affected S/G pressure,
    OR the level in the affected S/G has lowered after isolation,
    THEN verify RCS boration is complete.

    b. Verify the RCP BLEED-OFF ISOL valves are open:

    - 1-CVC-505-CV
    - 1-CVC-506-CV

    c. Verify the "CCW FLOW LO" alarm is clear.

    d. Start the associated OIL LIFT PP.

    e. Verify the "OIL LIFT PP PRESS LO" alarm is cleared.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.10 (continued) f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. h. Verify the synchroscope on panel 1C19 is **NOT** rotating. i. Start the RCP. j. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 12. Monitor RCP seal parameters following pump restart. 13. Allow backflow to equalize temperatures in the opposite loop. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 14. Start a second RCP in the opposite loop: a. **IF** the Reactor Coolant Pump Breaker CLOSE CIR fuses have been removed, **THEN** replace the CLOSE CIR fuses on the selected Reactor Coolant Pump Breaker. • 11A RCP 252-11P01 • 11A RCP 252-11P02 • 11B RCP 252-13P01 • 11B RCP 252-13P02 • 12A RCP 252-12P01 • 12A RCP 252-12P02 • 12B RCP 252-14P01 • 12B RCP 252-14P02 b. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>. c. Start RCP **PER** step G.10 above. d. Monitor RCP seal parameters following pump restart.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

H. CONTROL CORE AND RCS VOIDING.

NOTE
Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization,
   THEN reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 1-CVC-515-CV
      - 1-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 25 and 140° F as follows: (1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. • Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped. (continue)	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RX VESS VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1.c (continued) (2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (3) Repeat steps H.1.c.(1) through H.1.c.(2) as necessary. **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** d. **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) e. Monitor pressurizer level and RVLMS for inventory trends.	
I. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	
1. Observe Containment Sump level rises as RWT level lowers.	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.
2. Ensure steps associated with RAS are performed **PER** the selected RCS Pressure and Inventory Control success path.	
3. Ensure Core Flush is initiated **PER** PIC-4, SIS as required.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

J. PERFORM LOW TEMPERATURE ACTIONS.

1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required:
   - SGFP
   - COND BSTR PP

CAUTION
PORVs must be in MPT ENABLE before T_{COLD} is less than 365° F.

2. **WHEN** T_{COLD} is less than 369° F, **THEN** establish MPT protection as follows:
   a. Verify the PORV BLOCK valves are OPEN:
      - 1-RC-403-MOV
      - 1-RC-405-MOV
   b. Verify PZR LO RANGE PRESS, 1-PI-103 is less than VLTOP PORV SETPOINT, 1-ZI-103.
   c. Verify PZR LO RANGE PRESS, 1-PI-103-1 is less than VLTOP PORV SETPOINT, 1-ZI-103-1.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (continued) **CAUTION** **PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 396 PSIA.** d. Place the PORV MPT PROTECTION handswitches in VARIABLE MPT ENABLE: • 1-HS-1406 • 1-HS-1408 e. Verify the PORV OVERRIDE handswitches in the AUTO position: • 1-HS-1402 • 1-HS-1404 3. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than **TWO** RCPs are in operation. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. **WHEN** RCS temperature is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. b. Close SIT OUT breakers: • (1-SI-614-MOV) 52-11442 • (1-SI-624-MOV) 52-11443 • (1-SI-634-MOV) 52-10442 • (1-SI-644-MOV) 52-10443 c. Shut SIT OUT valves: • 1-SI-614-MOV • 1-SI-624-MOV • 1-SI-634-MOV • 1-SI-644-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.4 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (2) Place 13 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW STM SUPP & BYPASS valves: • (11 SG)1-MS-4070-CV, 1-MS-4070A-CV • (12 SG)1-MS-4071-CV, 1-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-2.	
1. Check Core and RCS Heat Removal is satisfied by the following indications: • At least ONE S/G has level between 0 and (+)38 inches **OR** S/G level is being restored by feedwater flow • CET temperatures are less than 50° F superheated • **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE CHG PP operating **NOTE** LPSI Pumps are **NOT** required post-RAS. **NOTE** Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met. • HPSI and LPSI Pumps are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.
2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. PERFORM LOW TEMPERATURE ACTIONS.	
1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required: • SGFP • COND BSTR PP	
NOTE If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication.	
2. **IF** HPSI system is **NOT** in operation, **AND** T_{COLD} is less than 385° F, **THEN** establish LTOP control by performing the following: a. Place **ALL** HPSI PPs in PULL TO LOCK. b. Shut **ALL** HPSI HDR valves and place their handswitches in PULL-TO-OVERRIDE: MAIN • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV AUX • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (continue)	2.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate MAIN SPRAY, AUX SPRAY or PRZR VENT valves to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.2 (continued)

CAUTION

Only ONE HPSI Pump shall be operable prior to cooldown to less than 365° F T_{COLD}.

c. Rack out the breakers for the TWO HPSI PPs **NOT** required.

CAUTION

PORVs must be in MPT ENABLE before T_{COLD} is less than 365° F.

3. **WHEN** T_{COLD} is less than 369° F, **THEN** establish MPT protection as follows:

   a. Verify the PORV BLOCK valves are OPEN:

      - 1-RC-403-MOV
      - 1-RC-405-MOV

   b. Verify PZR LO RANGE PRESS, 1-PI-103 is less than VLTOP PORV SETPOINT, 1-ZI-103.

   c. Verify PZR LO RANGE PRESS, 1-PI-103-1 is less than VLTOP PORV SETPOINT, 1-ZI-103-1.

CAUTION

PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 396 PSIA.

   d. Place the PORV MPT PROTECTION handswitches in VARIABLE MPT ENABLE:

      - 1-HS-1406
      - 1-HS-1408

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3 (continued) e. Verify the PORV OVERRIDE handswitches in the AUTO position: • 1-HS-1402 • 1-HS-1404 4. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than TWO RCPs are in operation. 5. **WHEN** RCS temperature is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. b. Close SIT OUT breakers: • (1-SI-614-MOV) 52-11442 • (1-SI-624-MOV) 52-11443 • (1-SI-634-MOV) 52-10442 • (1-SI-644-MOV) 52-10443 c. Shut SIT OUT valves: • 1-SI-614-MOV • 1-SI-624-MOV • 1-SI-634-MOV • 1-SI-644-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (2) Place 13 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW STM SUPP & BYPASS valves: • (11 SG)1-MS-4070-CV, 1-MS-4070A-CV • (12 SG)1-MS-4071-CV, 1-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. CONTROL CORE AND RCS VOIDING.

NOTE
Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization,
   THEN reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 1-CVC-515-CV
      - 1-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued)	
CAUTION **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.**	
c. Cycle RCS subcooling between 25 and 140° F as follows:	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RX VESS VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.
(1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods:	
NOTE Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.	
• Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.c (continued) (2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (3) Repeat steps B.1.c.(1) through B.1.c.(2) as necessary. **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** d. **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) e. Monitor pressurizer level and RVLMS for inventory trends.	
C. ESTABLISH CORE AND RCS HEAT REMOVAL BY SHUTDOWN COOLING.	
1. Verify RCS pressure and temperature is within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS 2. **WHEN** the following conditions exist: • CET temperatures are less than 300° F • Pressurizer pressure is less than 270 PSIA • Pressurizer level is greater than 101 inches • RCS subcooling is greater than 25° F based on CET temperatures **THEN** perform the following actions: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.2 (continued) c. Operate HPSI, and Charging and Letdown to maintain the following: • Pressurizer level between 101 and 180 inches • RCS pressure within the specified limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS 3. **IF** the following conditions exist: • CET temperatures are less than 300° F • Conditions for establishing shutdown cooling can **NOT** be met • Recirculation via the Containment Sump is in progress • CNTMT WR WATER LVL indicator 1-LI-4146, or 1-LI-4147 indicates at least 28 inches • Component Cooling system is available as a heat sink • **BOTH** CS PPs are secured **THEN** commence alternate shutdown cooling as follows: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Verify RCS pressure minus containment pressure is less than 160 PSID. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) c. **IF** the plant computer is **NOT** operating, **THEN** record the following information: • RCS T_{COLD} • PZR PRESS • SDC HX OUTLET TEMP (1-TI-303X and 1-TI-303Y) • Average CNTMT ambient temperature (1-TI-5309 and 1-TI-5311) • 27' Penetration Room temperature (1-TI-5276 and 1-TI-5280) • Steady State SDC flow rate (1-FIC-306) (following initiation) d. Shut 11 CS PP DISCH valve, 1-SI-314. e. Shut 12 CS PP DISCH valve, 1-SI-324. f. Shut 11 SDC HX OUT TO CS valve, 1-SI-319. g. Shut 12 SDC HX OUT TO CS valve, 1-SI-329. h. Open 11 SDC HX INLET XCONN valve, 1-SI-452. i. Open 11 SDC HX OUTLET TO LPSI HDR valve, 1-SI-456. j. Open 12 SDC HX INLET XCONN valve, 1-SI-453. k. Open 12 SDC HX OUTLET TO LPSI HDR valve, 1-SI-457. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) l. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SALTWATER OUT valves: • 1-HIC-5206 • 1-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 1-CC-3824-CV • 1-CC-3826-CV (3) Verify TWO CC PPs in operation. m. Open 11 SDC HX CC OUT valve, 1-CC-3828-CV. n. Open 12 SDC HX CC OUT valve, 1-CC-3830-CV. o. Open SDC HX LPSI INL valve, 1-SI-658-MOV. p. Place the keyswitch for SDC FLOW CONTR, 1-SI-306-CV in AUTO. q. Shift 1-FIC-306 to MANUAL with a 95% output signal. r. **IF** Hot Leg Injection is being used for core flush, **THEN** verify 12A LPSI HDR valve, 1-SI-635-MOV, is shut. s. **IF** Pressurizer Injection is being used for core flush, **THEN** open 12A LPSI HDR valve, 1-SI-635-MOV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued)	

t. Open LPSI HDR valves:

- 1-SI-615-MOV
- 1-SI-625-MOV
- 1-SI-645-MOV

u. Verfiy the CNTMT SUMP DISCH valves are open:

- 1-SI-4144-MOV
- 1-SI-4145-MOV

v. Shut MINI FLOW RETURN TO RWT ISOL valves:

- 1-SI-659-MOV
- 1-SI-660-MOV

CAUTION
The possibility of cavitation rises when taking suction from the Containment sump.

w. **IF** the LPSI PPs are **NOT** operating, **THEN** clear RAS from ONE operable LPSI PP and start as follows:

(1) Place the selected LPSI PP RAS OVERRIDE switch in OVERRIDE.

(2) Start the selected LPSI PP.

CAUTION
The cooldown limit changes from 100° F in any one hour period to 40° F in any one hour period when RCS temperatures are below 256° F.

x. Adjust the signal on 1-FIC-306 to raise flow to 3000 GPM, while maintaining cooldown rate within limits.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) y. Place the keyswitch for the SDC TEMP CONTR, 1-SI-657-CV, in AUTO. **CAUTION** **The heatup rate limit for the Shutdown Cooling Heat Exchangers is 14° F/m.** z. Adjust 1-SI-657-CV to obtain less than 14° F/m heatup rate at SDC HX OUTLET TEMP, 1-TI-303X and 1-TI-303Y. aa. **IF** a second LPSI PP is desired, **THEN** perform the following actions: (1) Place the second LPSI PP RAS OVERRIDE switch in OVERRIDE. (2) Start the second LPSI PP and adjust 1-FIC-306 to 6000 GPM. ab. Adjust S/D COOLING TEMP CONTR valve, 1-SI-657-CV, to obtain the desired cooldown rate. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 4. **IF** recirculation via the Containment Sump has been lost **AND** the following conditions exist: • CET temperatures are less than 300° F **AND** less than 50° F superheated • Pressurizer pressure is less than 270 PSIA • Reactor Vessel level above the middle of the hot leg **THEN** perform the following actions: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 5. **IF** core flush is in progress **AND** CET temperatures are less than 200° F, **THEN** secure core flush as follows: a. **IF** Pressurizer Injection is being used, **THEN** perform the following actions: (1) **IF** HPSI PPs are **NOT** required for RCS pressure or level control, **THEN** secure HPSI PPs. **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** (2) Shut SI TO CHG HDR valve, 1-CVC-269-MOV. (3) Open LOOP CHG valves: • 1-CVC-518-CV • 1-CVC-519-CV (4) Shut AUX SPRAY valve, 1-CVC-517-CV. b. **IF** Hot Leg Injection is being used, **THEN** perform the following actions: (1) Shut SDC RECIRC ISOL valve, 1-SI-399-MOV. (2) Open 12A LPSI HDR valve, 1-SI-635-MOV.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-3.	
1. Verify Core And RCS Heat Removal is satisfied by the following indications: • CET temperatures are less than 300° F, and less than 50° F superheated **NOTE** The limits of ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if the HPSI throttle criteria are met. • HPSI PPs are injecting water into RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW • Pressurizer pressure is less than 270 PSIA {245} • Reactor Vessel level indicates the core is covered 2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CORE AND RCS HEAT REMOVAL BY ONCE-THROUGH-COOLING.	
1. Ensure **ALL** RCPs are tripped.	
2. Minimize S/G inventory losses by ensuring the S/G B/D valves are shut: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV	
3. **IF EITHER** S/G level is greater than (-)350 inches, **THEN** attempt to maintain RCS temperature constant using the TURB BYP valves **OR** the ADV(s).	
4. **IF** SGIS has **NOT** actuated, **THEN** perform the following: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B.	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of A.5 may be performed, and in any order. **NOTE** *Perform steps A.5 and A.6 concurrently.* **CAUTION** **If S/Gs have become ineffective in removing heat, Once-Through-Cooling must be initiated prior to CET temperatures reaching 560° F to ensure adequate RCS and Core Heat Removal.** 5. **IF**, at **ANY** time, **ANY** of the following conditions exists: • BOTH S/G levels are less than (-)350 inches • T_{COLD} rises uncontrollably 5° F or greater • Once-Through-Cooling has been determined to be required for heat removal **THEN** initiate Once-Through-Cooling as follows: a. Place **ALL** Pressurizer HTR handswitches in OFF. b. Shut the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV c. Start **ALL** available CHG PPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

<table>
<tr><th>RECOVERY ACTIONS</th><th>ALTERNATE ACTIONS</th></tr>
<tr><td>A.5 (continued)

d. Open BOTH PORVs as follows:

(1) WHEN the "PZR PRESS BLOCK A PERMITTED" alarm is received,
THEN block SIAS A.

(2) WHEN the "PZR PRESS BLOCK B PERMITTED" alarm is received,
THEN block SIAS B.

(3) Verify BOTH PORV BLOCK valves are OPEN:
• 1-RC-403-MOV
• 1-RC-405-MOV

(4) Place the PORV OVERRIDE handswitches in MANUAL OPEN:
• 1-HS-1402
• 1-HS-1404

(5) Verify BOTH PORVs are open.</td><td></td></tr>
<tr><td>e. Start ALL THREE HPSI PPs.

(continue)</td><td>e.1 IF 13 HPSI PP will NOT start,
AND 14 4KV Bus is de-energized,
THEN perform the following:

(1) Align the 13 HPSI PP disconnect to 11 4KV Bus PER OI-27C.

(2) Start 13 HPSI PP.</td></tr>
</table>

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
f. Open the MAIN and AUX HPSI HDR valves: MAIN • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV AUX • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV	f.1 **IF** the MAIN **OR** AUX HPSI HDR valves will **NOT** open, **THEN** open the HPSI HDR XCONN valve, 1-SI-653-MOV.
g. Open **ALL** CNTMT CLR EMER OUT valves.	
h. Start **ALL** available CNTMT AIR CLRs in HIGH.	
i. **WHEN** RCS pressure is less than 1270 PSIA, **THEN** verify initiation of Once-Through-Cooling by observing the following: • HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u> • CET temperatures constant or lowering	i.1 **IF** HPSI flow is **NOT PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>, **THEN** perform the following actions as necessary: (1) Ensure electrical power is available to valves and pumps. (2) Verify safety injection system lineup **PER ATTACHMENT** (2), <u>SIAS VERIFICATION CHECKLIST</u>.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
j. **IF** SIAS has **NOT** actuated, **THEN** prevent high pressurizer level from securing the backup CHG PPs by performing the following actions:	
(1) Locally initiate SIAS A6 and B6.	
(2) **IF** boration is **NOT** in progress, **THEN** place the BA PP handswitches in PULL TO LOCK.	
k. Verify minimum equipment to ensure successful Once-Through-Cooling is available **PER** ATTACHMENT(17), ONCE-THROUGH-COOLING MATRIX.	k.1 **IF** minimum equipment to ensure successful Once-Through-Cooling is **NOT** available, **THEN** verify **BOTH** S/Gs are isolated **PER** step A.6, **AND PROCEED** to Step G.1.1.
6. Prevent S/G dryout.	
a. **WHEN EACH** S/G level lowers to (-)380 inches, **THEN** isolate the S/G by performing the following actions:	
• Shut the MSIV(s): • (11 S/G) 11 MSIV • (12 S/G) 12 MSIV	
• Shut the SG AFW STM SUPP & BYPASS valves: • (11 S/G)1-MS-4070-CV, 1-MS-4070A-CV • (12 S/G)1-MS-4071-CV, 1-MS-4071A-CV	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.6.a (continued)
 	
• Verify the S/G B/D valves are shut:
  • 1-BD-4010-CV
  • 1-BD-4011-CV
  • 1-BD-4012-CV
  • 1-BD-4013-CV
 	
• Verify the MSIV BYP valves are shut:
  • 1-MS-4045-MOV
  • 1-MS-4052-MOV
 	
• Shut the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE
 	
• **WHEN** at least **ONE** S/G level is less than (-)380 inches, **AND BOTH** S/G levels are less than (-)350 inches, **THEN** ensure the ADVs are shut	

B. ESTABLISH FEEDWATER SOURCE.	

1. Determine the desirability of restoring feed capability to a S/G by considering:
 	
  • Plant Status
  • Integrity of the S/Gs
  • Condensate inventory
  • Time remaining until Shutdown Cooling entry conditions are established
  • Adequacy of the cooldown while on Once-Through-Cooling
 	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **IF** Once-Through-Cooling is in progress **AND** feedwater will **NOT** be restored to **ANY** S/Gs, **THEN** perform the following actions to isolate **BOTH** S/Gs: a. Shut SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV b. Shut S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued)	
c. Shut the ADVs using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows:	c.1 **IF** the ADV will **NOT** shut from 1C43, **THEN** shut the affected ADV Manual Isolation Valve: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104
(1) Verify the ADV controller on 1C43 is set at 0% output: • (11 ADV) 1-HC-4056A • (12 ADV) 1-HC-4056B	
(2) Align the Hand Transfer Valves to 1C43 (POSITION 2): 11 S/G • 1-HV-3938A • 1-HV-3938B 12 S/G • 1-HV-3939A • 1-HV-3939B	
d. **PROCEED** to Block Step D.	
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>.	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
NOTE The following steps are alternative methods to establish a feedwater source. Each available method can be attempted until a feedwater source is successfully established.	
4. Attempt to establish AFW.	
a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected S/G AFW BLOCK valves in OPEN: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS

B.4 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater. Each available method can be attempted until auxiliary feed is successfully established.

b. Establish AFW with 13 AFW PP as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(2) Start 13 AFW PP by placing its handswitch in START.

(continue)

ALTERNATE ACTIONS

b.1 Start 13 AFW PP locally as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

(2) Verify 13 AFW PP handswitch is in AUTO.

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 13 breaker, 152-1116, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.b (continued) (continue)	B.4.b.1 (continued) **CAUTION** **Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.** (4) **IF** the breaker fails to close, **THEN**, with the approval of the SM/CRS, perform the following actions: (a) Remove the breaker control power fuses. (b) **IF** necessary, **THEN** manually charge the breaker closing spring. (c) Press the CLOSE button at AFW PP No. 13 breaker, 152-1116. (d) Ensure normal pump running current less than 70 AMPS.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS

B.4 (continued)

c. Establish AFW with 11 or 12 AFW PP as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(2) Verify open 11 and 12 AFW PP Main Steam Supply Valves:

- 1-MS-109
- 1-MS-107

(3) Verify open 11 **OR** 12 THROTTLE/STOP valve:

- 1-MS-3986
- 1-MS-3988

CAUTION

An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(4) Open the 12 SG AFW STM SUPP & BYPASS valves from a S/G **NOT** affected by a SGTR:

- (11 S/G)1-MS-4070-CV, 1-MS-4070A-CV
- (12 S/G)1-MS-4071-CV, 1-MS-4071A-CV

(continue)

ALTERNATE ACTIONS

c.1 Start 11 or 12 AFW PP locally as follows:

(1) Shut the S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4511-CV
- (12 S/G) 1-AFW-4512-CV

(2) Turn the turbine governor control knob counterclockwise to the minimum position.

(3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

11 AFW PP

- 1-AFW-3987A I/P ISOL, 1-IA-24
- 1-AFW-3987B I/P ISOL, 1-IA-23

12 AFW PP

- 1-AFW-3989A I/P ISOL, 1-IA-22
- 1-AFW-3989B I/P ISOL, 1-IA-21

(4) Open the air filter drains on controllers to allow local control.

(5) Verify open 11 and 12 AFW PP Main Steam Supply Valves:

- 1-MS-109
- 1-MS-107

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS

B.4.c (continued)

(5) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (11 AFW PP SPEED CONTR) 1-HC-3987A
- (12 AFW PP SPEED CONTR) 1-HC-3989A

(6) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

(continue)

ALTERNATE ACTIONS

B.4.c.1 (continued)

(6) Verify open 11 **OR** 12 THROTTLE/STOP valve:

- 1-MS-3986
- 1-MS-3988

CAUTION

An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(7) Open the AFW Steam Supply Bypass Valves:

- 1-MS-102
- 1-MS-105

(8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob.

(9) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.4 (continued)

d. Establish AFW with 23 AFW PP as follows:

(1) Shut the Unit 2 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

(2) Open the U-2 TO U-1 XCONN valve, 2-AFW-4550-CV.

(3) Establish AFW with 23 AFW PP as follows:

(a) Shut the Unit 1 S/G FLOW CONTR valves:

- (11 S/G) 1-AFW-4525-CV
- (12 S/G) 1-AFW-4535-CV

<u>CAUTION</u>
The 23 AFW PP flow limit is 575 GPM.

(b) Start 23 AFW PP by placing its handswitch in START.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

5. **IF** T_{COLD} is less than 465° F,
   THEN attempt to establish Booster Pump Injection.

   a. **IF** SGIS has actuated
      AND indications of an ESDE are **NOT** observed,
      THEN reset SGIS as follows:

      (1) Place the COND BSTR PPs in PULL TO LOCK.

      (2) Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST.

      (3) Block SGIS.

      (4) Reset the SGIS signal.

      (5) Open the MSIV(s).

   b. Shut the MAIN SG FW REG valves.

   c. Shift the SG FW REG BYPASS controllers to Manual.

   d. Depress the S/G FRV BYP RESET buttons.

   e. Manually adjust the SG FW REG BYPASS valve controllers to 0%.

   f. Verify **BOTH** SG FW ISOL valves are shut:

      - (11 S/G) 1-FW-4516-MOV
      - (12 S/G) 1-FW-4517-MOV

   g. Open the PRECOAT SYS BYP valve, 1-CD-5818-CV.

   h. Open the COND DEMIN BYP valve, 1-CD-4439-MOV.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) i. Verify at least ONE COND PP is running. j. Verify ONE COND BSTR PP is running. k. Place BOTH HTR DRN PP Handswitches in PULL TO LOCK. 6. **IF** a feedwater source can **NOT** be established, **THEN PROCEED** to Block Step D.	
C. ESTABLISH S/G HEAT SINK.	
1. **IF** feedwater capability is restored **AND** Once-Through-Cooling is in progress, **THEN** evaluate feeding a S/G by considering the following: • Plant Status • Auxiliary systems availability • Condensate inventory • Time remaining until Shutdown Cooling entry conditions are established • Adequacy of the cooldown while on Once-Through-Cooling 2. **IF NEITHER** S/G is to be fed, **THEN PROCEED** to Block Step D. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	

NOTE

The decision to feed a S/G should be made by the Plant Technical Support Center or the Shift Manager.

CAUTION

If ANY S/G has indicated level, then only the S/G with the highest level should be fed. If BOTH S/Gs are dry, then only ONE S/G should be fed to initiate RCS heat removal.

3. **IF** the Plant Technical Support Center or Shift Manager recommends feeding a S/G,
   THEN isolate the S/G which is **NOT** to be fed as follows:

   a. Shut the SG FW ISOL valve for the S/G to be isolated:

      - (11 S/G) 1-FW-4516-MOV
      - (12 S/G) 1-FW-4517-MOV

   b. Shut the S/G AFW BLOCK valves for the S/G to be isolated by placing the handswitches in SHUT:

      11 S/G
      - 1-AFW-4520-CV
      - 1-AFW-4521-CV
      - 1-AFW-4522-CV
      - 1-AFW-4523-CV

      12 S/G
      - 1-AFW-4530-CV
      - 1-AFW-4531-CV
      - 1-AFW-4532-CV
      - 1-AFW-4533-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) c. Shut the ADV for the S/G to be isolated using the Hand Transfer Valves on the West wall of the Unit 1 45 ft Switchgear Room as follows: (1) Verify the ADV controller on 1C43 is set at 0% output: • (11 ADV) 1-HC-4056A • (12 ADV) 1-HC-4056B (2) Align the Hand Transfer Valves to 1C43 (POSITION 2): 11 S/G • 1-HV-3938A • 1-HV-3938B 12 S/G • 1-HV-3939A • 1-HV-3939B (continue)	c.1 **IF** the ADV will **NOT** shut from 1C43, **THEN** shut the affected ADV Manual Isolation Valve: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If voids exist in the S/G tubes, a rapid RCS pressure reduction will occur when the voids collapse.**	
4. Establish feed to the selected S/G.	
a. Verify the ADV is shut.	
b. **IF** AFW has been restored, **THEN** perform the following actions:	
(1) **IF** AFW has been restored using 13 **OR** 23 AFW PP, **THEN** adjust S/G FLOW CONTR valve to approximately 150 GPM to the appropriate S/G: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV	(1).1 **IF** the S/G FLOW CONTR valve(s) will **NOT** open, **THEN** locally throttle open the appropriate bypass valve(s), located in the SRW Room: • (11 S/G) 1-AFW-195 • (12 S/G) 1-AFW-196
(2) **IF** AFW has been restored using 11 or 12 AFW PP, **THEN** adjust S/G FLOW CONTR valve to approximately 150 GPM to the appropriate S/G: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV	(2).1 **IF** the S/G FLOW CONTR valve(s) will **NOT** open, **THEN** locally throttle open the appropriate bypass valve(s), located in the 27 ft East Penetration Room: • (11 S/G) 1-AFW-163 • (12 S/G) 1-AFW-165

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.4.b (continued)

(3) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending towards 0 inches
- RCS cooldown rate less than 100° F in any one hour

CAUTION
Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.

c. **IF** Booster Pump Injection has been restored,
THEN perform the following for the S/G to be fed:

(1) Open the appropriate SG FW ISOL valve:

- (11 S/G) 1-FW-4516-MOV
- (12 S/G) 1-FW-4517-MOV

(2) Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4.c (continued) (3) **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending towards 0 inches • RCS cooldown rate less than 100° F in any one hour **CAUTION** **The RCS may be solid. Any action involving RCS cooldown or heatup should be closely monitored to prevent rapid pressure excursions.** 5. Establish a secondary heat sink as follows: a. Adjust the ADV to establish RCS temperature control. b. Restore and maintain the level of the S/G being fed to between (-)170 and (+)30 inches. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 6. **WHEN** a secondary heat sink has been established, **THEN** reduce Once-Through-Cooling flow as follows: a. **IF** THREE HPSI PPs are operating, **AND** HPSI throttle criteria are met **THEN** stop ONE HPSI PP. b. Stop **ALL** but ONE CHG PP. **CAUTION** **HPSI flow must be closely monitored to prevent a rapid pressure excursion when the PORV Block Valve is shut.** c. Shut the BLOCK valve for ONE PORV. d. Adjust the HPSI flow to maintain RCS subcooling between 25 and 140° F using CET temperatures. e. Adjust the ADV to establish RCS temperature control. 7. **IF** a S/G heat sink can **NOT** be established, **THEN** continue RCS cooldown using Once-Through-Cooling until shutdown cooling entry conditions are reached.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	

1. **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained:
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed
• Reactor Vessel level above the top of the hot leg
• Reactivity Control Safety Funtion Acceptance Criteria are met
THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain RCS subcooling between 25 and 140° F based on CET temperatures.	

2. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 3. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	
E. IF A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	
1. **WHEN** S/G level is greater than (-)170 inches, **THEN** secure Once-Through-Cooling as follows: a. Ensure Once-Through-Cooling flow has been reduced **PER** step C.6. b. Verify the HPSI throttle criteria are met. c. Secure the HPSI PPs. d. Shut the HPSI HDR valves. e. Place the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404 f. Adjust charging and letdown to maintain RCS subcooling between 25 and 140° F using CET temperatures. 2. Adjust the ADV to establish natural circulation, and maintain CET temperatures constant or lowering. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 3. Verify **BOTH** PORV BLOCK valves are OPEN: • 1-RC-403-MOV • 1-RC-405-MOV 4. Restore and maintain the level of the S/G being fed between (-)24 inches {0} and (+)30 inches {(+)38}.	
F. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	
1. Observe Containment Sump level rises as RWT level lowers. 2. Ensure steps associated with RAS are performed **PER** the selected RCS Pressure and Inventory Control success path.	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-4.

1. Check Core and RCS Heat Removal is satisfied by the following indications:

   - CET temperatures less than 50° F superheated
   - **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met, **THEN ALL** available Charging Pumps operating

NOTE
LPSI Pumps are **NOT** required post-RAS.

NOTE
Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met.

   - HPSI and LPSI Pumps are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW
   - Pressurizer Pressure less than 1270 PSIA **OR** is lowering

(continue)

1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN** perform the following actions:

a. Concurrently perform the recovery actions for the next safety function to be satisfied.

b. Determine the appropriate emergency response actions **PER** the ERPIP.

c. **IF** SIS flow is adequate, **THEN** perform **ANY** of the following as necessary to transfer additional heat through the S/Gs:

(1) Restore vital auxiliaries necessary to feed at least ONE S/G.

(2) **IF** remote valve operation fails, **THEN** operate failed valves locally.

(3) Feed the S/Gs from **ANY** of the following water supplies:

- Condensate
- DI Water
- Well Water System
- Fire System
- Bay Water

(4) Steam the S/G through **ANY** of the following paths:

- TURB BYP valves
- ADVs
- SGFPs or AFW PPs
- MSIV Bypass valves

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued) (continue)	G.1.1.c(4) (continued) • Upstream drains d. **IF** SIS flow is **NOT** adequate, **THEN IMPLEMENT** a Core and RCS Heat Removal success path by performing **ANY** of the following as necessary: (1) Restore vital auxiliaries necessary to regain needed components or subsystems. (2) **IF** remote valve operation fails, **THEN** operate failed valves locally. (3) Fill the RCS from an alternate source. (4) Depressurize or cool the RCS to raise or establish SIS flow. (5) Steam and feed S/Gs from alternate sources. e. **IF BOTH** of the following conditions exist: • AC power is **NOT** available • RCS subcooling can **NOT** be maintained **THEN** perform **BOTH** of the following to maintain two-phase natural circulation: (1) S/G steaming and feeding are properly controlled. (2) Maintain CET temperatures less than 50° F superheated

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• At least ONE S/G level greater than (-)350 inches
• Feedwater is available.
  ▪ Main Feedwater
  ▪ AFW
  ▪ Booster Pump Injection
• SIAS has NOT actuated OR has been reset
• SIS operation NOT required
	• At least ONE S/G has level between (-)24 inches and (+)30 inches
	OR
	S/G level is being restored by feedwater flow
	• IF RCPs are operating, THEN T_{HOT} minus T_{COLD} is less than 10°F
	• IF RCPs are NOT operating, THEN T_{HOT} minus T_{COLD} is less than 50°F
	• RCS subcooling greater than 25°F based on CET temperatures
	• Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CORE AND RCS HEAT REMOVAL.	C	1
	• IF 500KV offsite power lost, THEN shut the MSIVs AND isolate S/G B/D		1
	• IF Main and AFW are lost to BOTH S/Gs, THEN trip ALL RCPs. AND isolate S/G B/D		1
	• IF, at ANY time, BOTH S/G levels are less than (-)350 inches, OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4		1
	• Commence Boration		2
	• Commence RCS Cooldown at less than 100°F in any one hour		5
	• IF a controlled cooldown is in progress, THEN block SGIS/SIAS		9

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-1: S/G HEAT SINK WITH NO SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	B. DETERMINE IF A SGTR EXISTS.	C	10

	• Identify the most affected S/G:
	  • S/G samples
	  • RMS trends
	  • S/G level change when NOT feeding
	  • Post-Trip S/G level trends
	  • Mismatch in feed flow prior to the trip
	  • Steam flow vs. Feed flow mismatch prior to the trip
			10

	• Depressurize the RCS:
	  • Subcooling 25 - 140°F
	  • RCP NPSH limits
	  • RCS pressure less than 900 PSIA
	  • RCS pressure approximately equal to affected S/G pressure
			11

	• WHEN T_{HOT} is less than 515°F, THEN isolate the most affected S/G		12
	• Ensure boron concentration remains above 116% of the required shutdown margin		19
	• Maintain affected S/G level between 0 and (+)50 inches		21
	C. DETERMINE IF AN ESDE EXISTS	C	39

	• Identify the most affected S/G
	  • High steam flow from S/G
	  • Lowering S/G pressure
	  • Lowering S/G level
	  • Lowering RCS T_{COLD}
	  • Lowering PZR pressure
	  • Lowering PZR level
			39

	• Isolate the affected S/G		40
	• Cool the unaffected S/G to within 25°F of CETs during the blowdown		44

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-1: S/G HEAT SINK WITH NO SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	D. DETERMINE IF A LOAF EXISTS.	C	45
	• Trip ALL RCPs, AND isolate S/G B/D		45
	• IF, at ANY time, BOTH S/G levels are less than (-)350 inches OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4		45.
	• Attempt to establish AFW flow		46
	• Attempt to establish Booster Pump Injection		55
	• Attempt to establish Main Feed flow		58
	E VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	C	60
	• Ensure the TBVs OR ADVs are controlling T_{COLD} less than 535°F		60
	• Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches		61
	F. SECURE RCS BORATION.	C	65
	G. EVALUATE RESTORING FORCED CIRCULATION.	C	66
	H. CONTROL CORE AND RCS VOIDING.	C	72
	I PERFORM LOW TEMPERATURE ACTIONS.	C	75
	• WHEN T_{COLD} is less than 385°F, THEN establish LTOP control		75
	• WHEN T_{COLD} is less than 369°F, THEN establish MPT protection.		77
	J. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-1		80
	• IF Core and RCS Heat Removal has NOT been satisfied, THEN PROCEED to the next appropriate Core and RCS Heat Removal Success Path.		80

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-2: S/G HEAT SINK WITH SIS OPERATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• At least ONE S/G level greater than (-)350 inches • Feedwater is available: • Main Feedwater • AFW • Booster Pump Injection • SIAS has actuated or SIS operation required	• At least ONE S/G has level between 0 inches and (+)38 inches OR S/G level is being restored by feedwater flow • CET temperatures less than 50°F superheated • IF RAS has NOT occurred, AND pressurizer pressure is greater than 1270 PSIA THEN at least ONE Charging Pump operating • HPSI and LPSI Pumps are injecting water into the RCS PER Atts. (10) and (11)

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CORE AND RCS HEAT REMOVAL WITH SIS OPERATION	C	81
	• IF 500KV offsite power lost, THEN shut the MSIVs AND isolate S/G B/D		81
	• IF Main and AFW are lost to BOTH S/Gs, THEN trip ALL RCPs, AND isolate S/G B/D		81
	• IF, at ANY time, BOTH S/G levels are less than (-)350 inches, OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4		81
	• IF RCS pressure is less than 1725 PSIA, OR containment pressure is greater than 2.8 PSIG THEN verify SIAS actuation OR		82
	• Align HPSI injection and block SIAS.		82
	• Commence Boration		85
	• Commence RCS Cooldown at less than 100°F in any one hour		88
	• IF a controlled cooldown is in progress, THEN block SGIS/SIAS		94

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-2: S/G HEAT SINK WITH SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	B. DETERMINE IF A SGTR EXISTS.	C	95
	• Identify the most affected S/G. • S/G samples • RMS trends • S/G level change when NOT feeding • Post-Trip S/G level trends • Mismatch in feed flow prior to the trip • Steam flow vs. Feed flow mismatch prior to the trip		95
	• Depressurize the RCS: • Subcooling 25 - 140°F • RCP NPSH limits • RCS pressure less than 850 PSIA • RCS pressure approximately equal to affected S/G pressure		96
	• WHEN T_{HOT} is less than 515°F, THEN isolate the most affected S/G		97
	• Ensure boron concentration remains above 116% of the required shutdown margin		103
	• Maintain affected S/G level between 0 and (+)50 inches		105
	C. DETERMINE IF AN ESDE EXISTS.	C	123
	• Identify the most affected S/G. • High steam flow from S/G • Lowering S/G pressure • Lowering S/G level • Lowering RCS T_{COLD} • Lowering PZR pressure • Lowering PZR level		123
	• Isolate the affected S/G		124
	• Cool the unaffected S/G to within 25°F of CETs during the blowdown		128

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-2: S/G HEAT SINK WITH SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	D. DETERMINE IF A LOAF EXISTS	C	129
	• Trip ALL RCPs, AND isolate S/G B/D		129
	• IF, at ANY time, BOTH S/G levels are less than (-)350 inches OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4		129
	• Attempt to establish AFW flow		130
	• Attempt to establish Booster Pump Injection		139
	• Attempt to establish Main Feed flow		142
	E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	C	144
	• Ensure the TBVs OR ADVs are controlling T_{COLD} less than 535°F		144
	• Ensure feed flow is restoring S/G level to between 0 and (+)38 inches		145
	F. SECURE RCS BORATION	C	148
	G. EVALUATE RESTORING FORCED CIRCULATION.	C	149
	H. CONTROL CORE AND RCS VOIDING.	C	155
	I. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	C	158
	J. PERFORM LOW TEMPERATURE ACTIONS.		159
	• WHEN T_{COLD} is less than 369°F, THEN establish MPT protection		159
	K. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-2.		163
	• IF Core and RCS Heat Removal has NOT been satisfied, THEN PROCEED to the next appropriate Core and RCS Heat Removal Success Path		163

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-3: SHUTDOWN COOLING SYSTEM

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• CET Temperatures less than 300°F • *Radiation levels are* low enough to allow valve repositioning	• CET Temperatures less than 300°F and less than 50°F superheated • HPSI Pumps are injecting water into the RCS **PER** Att. (10) • Pressurizer pressure less than 270{245} • Reactor Vessel level indicates the core is covered

START	FUNCTION	DONE	PAGE
	A. PERFORM LOW TEMPERATURE ACTIONS.	C	164
	• **WHEN** TCOLD is less than 385°F, **THEN** establish LTOP control		164
	• **WHEN** TCOLD is less than 369°F, **THEN** establish MPT protection.		165
	B. CONTROL CORE AND RCS VOIDING.	C	168
	C. ESTABLISH CORE AND RCS HEAT REMOVAL BY SHUTDOWN COOLING.	C	171
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-3.		179
	• **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.		179

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER

HR-4: ONCE-THROUGH-COOLING

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• HPSI pumps are available • BOTH PORVs are available • Flow path is available • RWT is available as a makeup source	• CET Temperatures less than 50°F superheated • **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met **THEN ALL** available Charging Pumps operating • HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) • Pressurizer pressure less than 1270 PSIA **OR** is lowering

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CORE AND RCS HEAT REMOVAL BY ONCE-THROUGH-COOLING.	C	180
	• Ensure **ALL** RCPs are tripped		180
	• Isolate S/G B/D		180
	• Attempt to maintain RCS temperature constant		180
	• **IF** SGIS has **NOT** actuated, **THEN** block SGIS		180
	NOTE: Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of A.5 may be performed, and in any order. Perform S/G dryout step concurrently with initiation of Once-Through-Cooling.		
	• **IF**, at **ANY** time, **ANY** of the following conditions exist: ◦ **BOTH** S/G levels are less than (-)350 inches ◦ T_{COLD} rises uncontrollably 5°F or greater, ◦ Once-Through-Cooling has been determined to be required for heat removal **THEN** initiate Once-Through-Cooling ◦ Verify **BOTH** PORVs are open ◦ Block SIAS		181
	• **WHEN EACH** S/G level is less than (-)380 inches, **THEN** prevent S/G dryout		184
	B. ESTABLISH FEEDWATER SOURCE.	C	185
	• **IF** feedwater will **NOT** be restored, **THEN** isolate **BOTH** S/Gs		186
	• Attempt to establish AFW		188
	• Attempt to establish Booster Pump Injection		194

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-4: ONCE-THROUGH-COOLING

(continued)

START	FUNCTION	DONE	PAGE
	C. ESTABLISH S/G HEAT SINK.	C	195
	• Isolate the S/G which is **NOT** to be fed		196
	• Establish Feed flow ◦ Verify ADV is shut		198
	• Establish a secondary heat sink ◦ Adjust ADV ◦ Restore and maintain S/G level between **(-)170 and (+)30 inches**		200
	• Reduce Once-Through-Cooling flow		201
	D. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION	C	202
	• **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained: ◦ At least 25°F subcooling based on CET temperatures ◦ Pressurizer level greater than 101 inches {141} ◦ At least ONE S/G available for heat removal ◦ Reactor Vessel level above the top of the hot leg ◦ Reactivity Control Safety Function Acceptance Criteria are met **THEN** HPSI flow may be reduced.		202
	• **IF** pressurizer pressure is greater than 200 PSIA and **EITHER** constant or rising, **THEN** the operating LPSI PPs may be stopped		202
	E. IF A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.		203
	F. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	C	204
	G. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-4.		205
	• **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN** perform the following actions: ◦ Concurrently perform the Recovery actions for the next safety function to be satisfied ◦ Determine the appropriate emergency response actions **PER** the ERPIP ◦ Evaluate further actions		205

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT WITH CONTAINMENT FANS.	
1. Verify **ALL** available CNTMT AIR CLRs are operating.	
2. **IF** containment pressure exceeds 0.7 PSIG, **OR** containment temperature exceeds 120° F, **THEN** open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. • 1-SRW-1582-CV • 1-SRW-1585-CV • 1-SRW-1590-CV • 1-SRW-1593-CV	
3. Check containment radiation monitor alarms are clear with **NO** unexplained rise.	3.1 Verify **ALL** available IODINE FILT FANs are running, **AND PROCEED** to CE-2, <u>CONTAINMENT ISOLATION</u>.
4. Verify SRW Pump Room Ventilation is in service **PER** the <u>SRW Pump Room Ventilation</u> section of OI-15.	

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 5. **IF** SIAS has actuated, **THEN** perform the following actions: **NOTE** Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklist. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** a. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST. b. Block the pressurizer pressure signals. **NOTE** 1B Diesel Generator non-essential trips are enabled when SIAS is reset. c. Reset the SIAS signals. d. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST to the desired condition. e. Evaluate the Charging Pump suction supply. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 6. **IF** SIAS has actuated **AND** has been reset, **THEN** restore auxiliaries. a. Restore Service Water to the Turbine Building as follows: (1) Verify 21 PA COMPR is operating. (2) Verify the Plant Air To Plant Air Header Valve, 1-PA-2059-CV, is shut. (3) Verify the PA TO IA HDR XCONN valve, 1-PA-2061-CV, is open. (4) Open SRW HDR TURB BLDG ISOL valves: • 1-SRW-1600-CV • 1-SRW-1637-CV • 1-SRW-1638-CV • 1-SRW-1639-CV b. Restore an IA COMPR to service as follows: (1) **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears: • (11 IA COMPR) 1-HS-2063 • (12 IA COMPR) 1-HS-2065 (2) Start at least ONE IA COMPR. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.6 (continued) c. Restore Instrument Air to the Containment as follows: (1) Open IA CNTMT ISOL valve, 1-IA-2080-MOV. **NOTE** 1-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #85 from the Control Room Key Locker. (2) Open Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN. 7. **IF** Component Cooling has been secured to containment, **THEN** restore flow. **NOTE** RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9. a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 11A RCP: _____° F / _____° F • 11B RCP: _____° F / _____° F • 12A RCP: _____° F / _____° F • 12B RCP: _____° F / _____° F b. Verify CIS has **NOT** actuated or is reset. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV (3) Slowly open 1-CC-284 to restore component cooling flow.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

<u>**RECOVERY ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-1.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 2.8 PSIG • Containment temperature less than 220° F • Containment radiation alarms are clear with **NO** unexplained rise	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.
2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT ISOLATION.	
1. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS	
2. **IF** CIS has actuated, **THEN** trip **ALL** RCPs.	
3. Verify **ALL** available CNTMT AIR CLRs are operating.	
4. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs: • 1-SRW-1582-CV • 1-SRW-1585-CV • 1-SRW-1590-CV • 1-SRW-1593-CV	
5. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15.	
(continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** 6. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** the following checklists as appropriate: • ATTACHMENT (2), SIAS VERIFICATION CHECKLIST • ATTACHMENT (4), CIS VERIFICATION CHECKLIST 7. Verify **ALL** available IODINE FILT FANs are running. 8. Ensure Chemistry has been directed to place the Hydrogen Monitors in service. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 9. Establish containment ventilation to prevent local hydrogen accumulation as follows: a. Verify **ALL** available CNTMT AIR CLRs are operating. b. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. **NOTE** Pressurizer Ventilation Fan handswitches are located in the 45 ft East Pen Room and 27 ft Switchgear Room. c. Verify **ALL** available Pressurizer Ventilation Fans are operating. 10. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. 11. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 12. **IF** the Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, HYDROGEN PURGE SYSTEM OPERATION, until the Plant Technical Support Center recommends its termination.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. RESTORE THE CONTAINMENT ENVIRONMENT.	

1. **WHEN** containment pressure drops to less than 2.8 PSIG,
   THEN perform the following actions:

   a. Block the pressurizer pressure signals.

NOTE
1B Diesel Generator non-essential trips are enabled when SIAS is reset.

   b. Reset the SIAS signals.

   c. Reset the CIS signals.

CAUTION
At least ONE Containment Spray Pump shall remain in operation until Containment temperature can be maintained less than 120° F by the Containment Air Coolers.

   d. Secure ONE CS PP.

   e. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition.

   f. Evaluate the Charging Pump suction supply.

   g. **WHEN** the Plant Technical Support Center recommends securing Containment Spray,
      THEN secure the remaining CS PP.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. Restore Service Water to the Turbine Building as follows: a. Verify 21 PA COMPR is operating. b. Verify the Plant Air To Plant Air Header Valve, 1-PA-2059-CV, is shut. c. Verify the PA TO IA HDR XCONN valve, 1-PA-2061-CV, is open. d. Open SRW HDR TURB BLDG ISOL valves: • 1-SRW-1600-CV • 1-SRW-1637-CV • 1-SRW-1638-CV • 1-SRW-1639-CV 3. Restore an IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears: • (11 IA COMPR) 1-HS-2063 • (12 IA COMPR) 1-HS-2065 b. Start at least ONE IA COMPR. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

4. Restore Instrument Air to the Containment as follows:

   a. Open IA CNTMT ISOL valve, 1-IA-2080-MOV.

NOTE
1-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #85 from the Control Room Key Locker.

   b. Open Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN.

5. Restore Component Cooling flow to the containment.

NOTE
RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.

   a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:

      - 11A RCP: _____° F / _____° F
      - 11B RCP: _____° F / _____° F
      - 12A RCP: _____° F / _____° F
      - 12B RCP: _____° F / _____° F

   b. Verify CIS is reset.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV (3) Slowly open 1-CC-284 to restore component cooling flow.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-2.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 4.25 PSIG • **ALL** available CNTMT AIR CLRs are operating with maximum SRW flow • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Support recommendation	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.
2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT SPRAY.	
1. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS	
2. **IF** CIS has actuated, **THEN** trip **ALL** RCPs.	
3. Verify **ALL** available CNTMT AIR CLRs are operating.	
4. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs: • 1-SRW-1582-CV • 1-SRW-1585-CV • 1-SRW-1590-CV • 1-SRW-1593-CV	
5. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15.	
6. **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS has actuated and spray flow is approximately 1350 GPM per pump by flow indicators: • (11 CS HDR FLOW) 1-FI-4148 • (12 CS HDR FLOW) 1-FI-4149 (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS

A. (continued)

CAUTION
The following step provides actions to prevent water hammer damage from CAC voiding.

CAUTION
SRW Pumps start when power is restored to the associated 4KV Bus.

7. **IF** CSAS has actuated,
   AND EITHER SRW Header is **NOT** in operation,
   THEN perform the following actions:

   a. **IF** 11 SRW Header is idle,
      THEN restart 11 SRW Header as follows:

      (1) Check that Containment Pressure has remained less than 25 PSIG with 11 SRW Header idle.

      (2) Attempt to start the desired SRW PP on 11 SRW Header.

(continue)

ALTERNATE ACTIONS

a.1 **IF** Containment Pressure exceeded 25 PSIG,
THEN perform the following actions:

(1) Place the SRW PP(s) aligned to 11 SRW Header in PULL TO LOCK.

(2) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7 (continued) b. **IF** 12 SRW Header is idle, **THEN** restart 12 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 12 SRW Header idle. (2) Attempt to start the desired SRW PP on 12 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **1B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 1B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 12 SRW Header: (a) Shut 13 CNTMT CLG U MAN SUPP FR 12 SRW SUBSYS, 1-SRW-149, located 27 ft East Pen Room south of Containment Purge Supply. (b) Shut 14 CNTMT CLG SUPP FR 12 SRW SUBSYS, 1-SRW-156, located 5 ft West Pen Room along west wall. (c) Attempt to start the desired SRW PP on 12 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7.b (continued)	A.7.b.1 (continued) (2) **IF** 12 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 12 SRW Header in PULL TO LOCK. (b) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK. (c) Locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
NOTE Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** 8. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** the following checklists as appropriate: • ATTACHMENT (2), SIAS VERIFICATION CHECKLIST • ATTACHMENT (3), CSAS VERIFICATION CHECKLIST • ATTACHMENT (4), CIS VERIFICATION CHECKLIST (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
9. Verify **ALL** available IODINE FILT FANs are running.	
10. Ensure Chemistry has been directed to place the Hydrogen Monitors in service.	
11. Establish containment ventilation to prevent local hydrogen accumulation as follows:	
a. Verify **ALL** available CNTMT AIR CLRs are operating.	
b. Verify ONE CAV CLG and ONE CEDM CLG fan running if available.	
NOTE Pressurizer Ventilation Fan handswitches are located in the 45 ft East Pen Room and 27 ft Switchgear Room.	
c. Verify **ALL** available Pressurizer Ventilation Fans are operating.	
12. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, <u>HYDROGEN RECOMBINERS</u>.	
13. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners.	
(continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 14. **IF** the Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, HYDROGEN PURGE SYSTEM OPERATION, until the Plant Technical Support Center recommends its termination.	
B. RESTORE THE CONTAINMENT ENVIRONMENT.	
1. **WHEN** containment pressure drops to less than 4.0 PSIG, **THEN** perform the following actions: a. Verify the CS HDR handswitches, 1-HS-4150 and 1-HS-4151 in OPEN. b. Reset the CSAS signals. c. Verify **ALL** available CNTMT AIR CLRs are operating to reduce containment temperature. d. Restore the equipment listed in ATTACHMENT (3), CSAS VERIFICATION CHECKLIST to the desired condition. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **WHEN** containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions: a. Block the pressurizer pressure signals. **NOTE** 1B Diesel Generator non-essential trips are enabled when SIAS is reset. b. Reset the SIAS signals. c. Reset the CIS signals. **CAUTION** **At least ONE Containment Spray Pump shall remain in operation until Containment temperature can be maintained less than 120° F by the Containment Air Coolers.** d. Secure ONE CS PP. e. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition. f. Evaluate the Charging Pump suction supply. g. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 3. Restore Service Water to the Turbine Building as follows: a. Verify 21 PA COMPR is operating. b. Verify the Plant Air To Plant Air Header Valve, 1-PA-2059-CV, is shut. c. Verify the PA TO IA HDR XCONN valve, 1-PA-2061-CV, is open. d. Open SRW HDR TURB BLDG ISOL valves: • 1-SRW-1600-CV • 1-SRW-1637-CV • 1-SRW-1638-CV • 1-SRW-1639-CV 4. Restore an IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears: • (11 IA COMPR) 1-HS-2063 • (12 IA COMPR) 1-HS-2065 b. Start at least ONE IA COMPR. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 5. Restore Instrument Air to the Containment as follows: a. Open IA CNTMT ISOL valve, 1-IA-2080-MOV. **NOTE** 1-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #85 from the Control Room Key Locker. b. Open Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN. 6. Restore Component Cooling flow to the containment. **NOTE** RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9. a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 11A RCP: _____° F / _____° F • 11B RCP: _____° F / _____° F • 12A RCP: _____° F / _____° F • 12B RCP: _____° F / _____° F b. Verify CIS is reset. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.6 (continued)

CAUTION
Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.

c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPPLY and RETURN valves:

- 1-CC-3832-CV
- 1-CC-3833-CV

d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows:

(1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room.

(2) Open CC CNTMT SUPPLY and RETURN valves:

- 1-CC-3832-CV
- 1-CC-3833-CV

(3) Slowly open 1-CC-284 to restore component cooling flow.

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-3.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 50 PSIG • **ALL** available CNTMT AIR CLRs are operating with maximum SRW flow • Containment spray flow is greater than 1350 GPM per pump, if operating • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Support recommendation (continue)	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN** perform the following actions: a. Concurrently perform the recovery actions for the next safety function to be satisfied. b. Determine the appropriate emergency response actions **PER** the ERPIP. c. **IF** Containment Cooling has been lost, **THEN** consider consulting the Technical Support Center about deinerting the Containment prior to reinitiating Containment Cooling. d. Evaluate further actions based on the following considerations: (1) The urgency of other jeopardized safety functions. (2) Rate of change of containment temperature and pressure, and potential for damage to the containment. (3) Rate of change of containment hydrogen concentration, and potential for hydrogen burn. (continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.1 (continued) 2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	C.1.1.d (continued) (4) The feasibility of restoring a success path by performing **ANY** of the following: • Restoring the vital auxiliaries necessary to operate components or systems in the success paths • Manual operation of valves • Use of alternate components to implement a success path

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-1: NO CIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure less than 2.8 PSIG • CIS has **NOT** actuated **OR** has been reset • Containment radiation alarms are clear with **NO** unexplained rise	• Containment pressure less than 2.8 PSIG • Containment temperature less than 220°F • Containment radiation alarms are clear with **NO** unexplained rise

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT WITH CONTAINMENT FANS.	C	1

	• Verify **ALL** available CNTMT AIR CLRs are operating
	• **IF** SIAS has actuated, **THEN** perform the following actions:
	  • SIAS VERIFICATION CHECKLIST
	  • Reset SIAS
			1
			2

	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-1.		6
	• **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.		6

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-2: CONTAINMENT ISOLATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure less than 4.25 PSIG • CSAS has **NOT** actuated **OR** has been reset	• Containment pressure less than 4.25 PSIG • **ALL** available CNTMT AIR CLRs are operating with maximum SRW flow • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR** **ALL** available hydrogen recombiners are energized with hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Suppport recommendation

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT ISOLATION.	C	7
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify SIAS and CIS.		7
	• **IF** CIS has actuated, **THEN** trip **ALL** RCPs		7
	• Verify **ALL** available CNTMT AIR CLRs are operating		7
	• SIAS VERIFICATION CHECKLIST		8
	• CIS VERIFICATION CHECKLIST		8
	• Prevent local hydrogen accumulation		9
	B. RESTORE THE CONTAINMENT ENVIRONMENT.	C	10
	• **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP		10
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-2.		14
	• **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.		14

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-3: CONTAINMENT SPRAY

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure greater than 4.25 PSIG	• Containment pressure less than 50 PSIG • ALL available CNTMT AIR CLRs are operating with maximum SRW flow • Containment spray flow is greater than1350 GPM per pump, if operating • ALL containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% OR ALL available hydrogen recombiners are energized with hydrogen concentration less than 4.0% OR Hydrogen purge operation per Tech Suppport recommendation

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT SPRAY.	C	15
	• IF pressure rises to 2.8 PSIG, THEN verify SIAS and CIS.		15
	• IF CIS has actuated, THEN trip ALL RCPs		15
	• Verify ALL available CNTMT AIR CLRs are operating		15
	• IF pressure rises to 4.25 PSIG, THEN verify CSAS		15
	• IF a SRW Header is NOT in operation THEN attempt to restart: • 11 SRW Header – CNTMT pressure less than 25 PSIG. • 12 SRW Header – CNTMT pressure less than 10 PSIG.		16
	• SIAS VERIFICATION CHECKLIST		18
	• CSAS VERIFICATION CHECKLIST		18
	• CIS VERIFICATION CHECKLIST		18
	• Prevent local hydrogen accumulation		19

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

CE-3: CONTAINMENT SPRAY
(continued)

START	FUNCTION	DONE	PAGE
	B. RESTORE THE CONTAINMENT ENVIRONMENT.	C	20
	• WHEN pressure is less than 4.0 PSIG, THEN reset CSAS AND verify ALL available CNTMT AIR CLRs are operating		20
	• WHEN pressure is less than 2.8 PSIG, THEN reset SIAS, CIS AND secure ONE CS PP		21
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-3.		25
	• IF Containment Environment has NOT been satisfied, THEN perform the following actions: • Concurrently perform the Recovery actions for the next safety function to be satisfied • Determine the appropriate emergency response actions PER the ERPIP • IF containment cooling has been lost, THEN consider consulting the Technical Support Center about deinerting the Containment prior to reinitiating Containment Cooling • Evaluate further actions		25

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-1:NORMAL LEVELS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. VERIFY NORMAL RADIATION LEVELS EXTERNAL TO CONTAINMENT.	
1. Check the following RMS alarms are clear with **NO** unexplained rise: • "U-1 WIDE RANGE NOBLE GAS MON" (1-RIC-5415) • "UNIT 1 CNDSR OFF-GAS" (1-RI-1752) • "UNIT 1 S/G B/D" (1-RI-4014) • "UNIT 1 MAIN VENT GASEOUS" (1-RI-5415)	1.1 **IF** a valid "UNIT 1 CNDSR OFF-GAS" or "UNIT 1 S/G B/D" alarm is received, **THEN** secure S/G Blowdown. 1.2 **IMPLEMENT** RLEC-2, CONTAINMENT ISOLATED.
2. **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify the following containment isolation valves are shut: • CNTMT NORMAL SUMP DRN, 1-EAD-5462-MOV • CNTMT NORMAL SUMP DRN, 1-EAD-5463-MOV • H_2 PURGE INBD ISOL, 1-HP-6900-MOV • H_2 PURGE OUTBD ISOL, 1-HP-6901-MOV	2.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 2.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 1-HP-6901-MOV.
3. **IF** containment pressure exceeds 2.8 PSIG, **THEN IMPLEMENT** RLEC-2, CONTAINMENT ISOLATED.	
4. **IF** 500KV Offsite Power was lost, **AND** power has been restored, **THEN** restore the associated Radiation Monitors to service.	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-1:NORMAL LEVELS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-1.	
1. Check Radiation Levels External to Containment is satisfied by the following indications: • "U-1 WIDE RANGE NOBLE GAS MON" (1-RIC-5415) alarm clear with NO unexplained rise • "UNIT 1 CNDSR OFF-GAS" (1-RI-1752) alarm clear with NO unexplained rise • "UNIT 1 S/G B/D" (1-RI-4014) alarm clear with NO unexplained rise • "UNIT 1 MAIN VENT GASEOUS" (1-RI-5415) alarm clear with NO unexplained rise	1.1 **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Radiation Levels External to Containment Success Path.
2. **IF** Radiation Levels External to Containment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RADIATION LEVELS EXTERNAL TO CONTAINMENT BY CONTAINMENT ISOLATION.	
1. Check the following RMS alarms are clear with **NO** unexplained rise: • "U-1 WIDE RANGE NOBLE GAS MON" (1-RIC-5415) • "UNIT 1 CNDSR OFF-GAS" (1-RI-1752) • "UNIT 1 S/G B/D" (1-RI-4014) • "UNIT 1 MAIN VENT GASEOUS" (1-RI-5415) (continue)	1.1 **IF** a valid "UNIT 1 CNDSR OFF-GAS" or "UNIT 1 S/G B/D" alarm is received, **THEN** secure S/G Blowdown.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

2. **IF** leakage into Component Cooling is indicated by:
   - Rise on UNIT 1 CC radiation monitor, 1-RI-3819
   - "CC HEAD TK LVL" high alarm

   THEN perform the following:

   a. Verify L/D CNTMT ISOL valves are shut:
      - 1-CVC-515-CV
      - 1-CVC-516-CV

   b. **IF** shutting the L/D CNTMT ISOL valves did **NOT** isolate the leak, **THEN** perform the following:

      (1) Trip **ALL** RCPs.

      (2) Shut the CC CNTMT SUPPLY and RETURN valves:
         - 1-CC-3832-CV
         - 1-CC-3833-CV

3. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following:
   - SIAS
   - CIS

4. **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS has actuated.

(continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
5. **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify the following containment isolation valves are shut: • CNTMT NORMAL SUMP DRN, 1-EAD-5462-MOV • CNTMT NORMAL SUMP DRN, 1-EAD-5463-MOV • H_2 PURGE INBD ISOL, 1-HP-6900-MOV • H_2 PURGE OUTBD ISOL, 1-HP-6901-MOV	5.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 5.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 1-HP-6901-MOV.

6. **IF** a SGTR has occurred as indicated by **ANY** of the following:
• S/G samples
• RMS trends:
  • UNIT 1 CNDSR OFF-GAS (1-RI-1752)
  • UNIT 1 S/G B/D (1-RI-4014)
  • UNIT 1 MAIN VENT GASEOUS (1-RI-5415)
  • MAIN STEAM EFFL RAD MONITOR (1-RIC-5421 **OR** 1-RIC-5422)
• S/G level change when **NOT** feeding
• Post-Trip S/G level trends
• Mismatch in feed flow prior to the trip
• Steam flow vs. Feed flow mismatch prior to the trip
 	
THEN identify the most affected S/G.
 	
(continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
7. **IF** a tube rupture is identified in a S/G, **THEN** commence working the appropriate Heat Removal success path until the affected **OR** most affected S/G is isolated.	
CAUTION **The following step provides actions to prevent water hammer damage from CAC voiding.**	
CAUTION **SRW Pumps start when power is restored to the associated 4KV Bus.**	
8. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 11 SRW Header is idle, **THEN** restart 11 SRW Header as follows:	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions:
(1) Check that Containment Pressure has remained less than 25 PSIG with 11 SRW Header idle.	(1) Place the SRW PP(s) aligned to 11 SRW Header in PULL TO LOCK.
(2) Attempt to start the desired SRW PP on 11 SRW Header.	(2) Consult with the Plant Technical Support Center for guidance on system restoration.
(continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8 (continued) b. **IF** 12 SRW Header is idle, **THEN** restart 12 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 12 SRW Header idle. (2) Attempt to start the desired SRW PP on 12 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **1B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 1B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 12 SRW Header: (a) Shut 13 CNTMT CLG U MAN SUPP FR 12 SRW SUBSYS, 1-SRW-149, located 27 ft East Pen Room south of Containment Purge Supply. (b) Shut 14 CNTMT CLG SUPP FR 12 SRW SUBSYS, 1-SRW-156, located 5 ft West Pen Room along west wall. (c) Attempt to start the desired SRW PP on 12 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS

A.8.b (continued)

NOTE
Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists.

CAUTION
To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.

9. Verify ESFAS equipment is aligned correctly
   AND handswitches are matched **PER** the following checklists as appropriate:

   - ATTACHMENT (2), SIAS VERIFICATION CHECKLIST
   - ATTACHMENT (3), CSAS VERIFICATION CHECKLIST
   - ATTACHMENT (4), CIS VERIFICATION CHECKLIST

(continue)

ALTERNATE ACTIONS

A.8.b.1 (continued)

(2) **IF** 12 SRW Header can **NOT** be restarted,
THEN perform the following actions:

   (a) Place the SRW PP(s) aligned to 12 SRW Header in PULL TO LOCK.

   (b) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK.

   (c) Locally trip the 1B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.

   (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 10. **IF ANY** automatic Containment Isolation valve fails to shut, **OR ANY** manual Containment Isolation valve is open, **THEN** shut the affected valve(s) **OR** the next valve out from the appropriate penetration. 11. **IF** a tube rupture is identified in a S/G, **THEN** control secondary system contamination. a. Minimize the spread of contamination by performing the following: (1) Ensure the Unit 1 Turbine Building Sump Pumps are in STOP. (2) Isolate Condensate Dump to 11 CST by verifying the following valves are shut: • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 1-CD-232 • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 BYPASS VALVE, 1-CD-234 (3) Verify CONDENSER MAKEUP CV-4406 BYPASS VALVE, 1-CD-238, is shut. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.a (continued) (4) Reduce moisture carryover into the CAR Discharge Header by fully opening the CONDENSER VACUUM PUMP SERVICE WATER OUTLET VALVEs: • (11 CAR) 1-SRW-211 • (12 CAR) 1-SRW-215 • (13 CAR) 1-SRW-219 • (14 CAR) 1-SRW-223 (5) Ensure Condensate to Circ Water Dump is isolated by verifying the following valves shut: • CONDENSER DUMP TO CIRCULATING WATER ISOLATION VALVE, 1-CD-239 • CONDENSATE DUMP TO CIRCULATING WATER BYPASS VALVE, 1-CD-455 (6) Ensure condenser expansion joints are **NOT** overflowing by verifying the CONDENSER EXPANSION JOINT FILL VALVEs are shut: • (11 Condenser) 1-CD-306 • (12 Condenser) 1-CD-307 • (13 Condenser) 1-CD-308 (7) Verify shut SRW HEAD TANK MAKEUP ISOLATION VALVE, 1-CD-144. (8) Verify shut COMPONENT COOLING SYSTEM MAKEUP ISOLATION VALVE, 1-CD-145. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.a (continued) (9) Notify Plant Chemistry to secure the Hotwell sample pumps and isolate the Condensate Demin and Turbine Plant sample sinks. b. Control the volume of contaminated condensate inventory by performing the following: **CAUTION** **Operating CAR PPs with condenser hotwell level greater than 12 feet may draw excessive water into the CAR PPs.** **CAUTION** **Operating a SGFP with condenser hotwell level greater than 12 feet may actuate the high exhaust casing level trip.** (1) **IF** condenser hotwell level exceeds 12 feet, **THEN** perform the following: (a) Ensure Auxiliary Feedwater flow is established to the unaffected S/G. (b) **IF** a SGFP is in operation, **THEN** secure the SGFP. (c) Secure the CAR PPs. (2) **IF** condenser hotwell level exceeds 14 feet, **THEN** shut the COND SHELL STOPs: • 1-CAR-101 • 1-CAR-102 • 1-CAR-103 • 1-CAR-104 • 1-CAR-105 • 1-CAR-106 (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.b (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater will enable greater cooldown capability without raising contaminated condensate inventory. **CAUTION** **An unmonitored radiation release could occur if the ADVs are in use and Condensate/Main Feedwater is used to feed the unaffected S/G.** (3) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure. (4) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** shut the Hotwell Makeup CV by shifting 1-LIC-4405 to MANUAL with 100% output. (5) Ensure the Auxiliary Boiler Condensate returns are aligned to Unit 2 by verifying the following: (a) 0-AHB-211, DEAERATOR OVERFLOW TO 21 CONDENSER ISOLATION VALVE, is open. (b) 0-AHB-210, DEARATOR OVERFLOW TO 11 CONDENSER ISOLATION VALVE, is shut. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.b (continued) (6) Ensure the RC Waste Evaporators are aligned to Unit 2 or the Auxiliary Boilers **PER** OI-17E, REACTOR COOLANT WASTE EVAPORATOR OPERATION. (7) Ensure Plant Heating is aligned to Unit 2 Reheat Steam or the Auxiliary Boilers **PER** OI-40, PLANT HEATING SYSTEM. 12. **IF** 500KV Offsite Power was lost, **AND** power has been restored, **THEN** restore the associated Radiation Monitors to service.	

B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-2.

1. Check Radiation Levels External to Containment is satisfied by **EITHER** of the following indications: • **ALL** of the following alarms are clear with **NO** unexplained rise: • "U-1 WIDE RANGE NOBLE GAS MON" (1-RIC-5415) • "UNIT 1 CNDSR OFF-GAS" (1-RI-1752) • "UNIT 1 S/G B/D" (1-RI-4014) • "UNIT 1 MAIN VENT GASEOUS" (1-RI-5415) (continue)	1.1 **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN** perform the following actions: a. Concurrently perform the recovery actions for the next safety function to be satisfied. b. Determine the appropriate emergency response actions **PER** the ERPIP. c. Evaluate further actions based on the following considerations: (1) The urgency of other jeopardized safety functions. (continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **OR** • **ALL** containment penetrations required to be shut have an isolation valve shut. **IF** a tube rupture is identified in a S/G: • **ALL** release paths from the affected S/G to the environment are isolated • Affected S/G pressure less than 920 PSIA 2. **IF** Radiation Levels External to Containment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	B.1.1.c (continued) (2) The risk to plant personnel and the public of leaving certain containment penetrations unisolated (3) The feasibility of isolating the containment penetration(s) by alternate methods (4) The feasibility of restoring a success path by performing **ANY** of the following: • Restoring the vital auxiliaries necessary to operate components or systems in the success paths • Manual operation of valves • Use of alternate components to implement a success path

RADIATION LEVELS EXTERNAL TO CONTAINMENT PLACEKEEPER

RLEC-1: NORMAL LEVELS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Normal Radiation levels exist outside of containment • Containment pressure less than 2.8 PSIG • A loss of **ALL** Vital 4KV Buses may have occurred	• Noble Gas Monitor (1-RIC-5415) alarm clear with **NO** unexplained rise • Condenser Off-Gas RMS (1-RI-1752) alarm clear with **NO** unexplained rise • S/G B/D RMS (1-RI-4014) alarm clear with **NO** unexplained rise • Main Vent Gaseous RMS (1-RI-5415) alarm clear with **NO** unexplained rise

START	FUNCTION	DONE	PAGE
	A. VERIFY NORMAL RADIATION LEVELS EXTERNAL TO CONTAINMENT.	C	1
	• **IF** radiation detected outside containment, **THEN IMPLEMENT** RLEC-2 • **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify Containment Normal Sump and H_2 Purge Isolation valves are shut • **IF** containment pressure exceeds 2.8 PSIG, **THEN IMPLEMENT** RLEC-2		1 1 1
	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-1.		2
	• **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Radiation Levels External to Containment Success Path.		2

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RADIATION LEVELS EXTERNAL TO CONTAINMENT PLACEKEEPER
RLEC-2: CONTAINMENT ISOLATED

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Radiation detected outside containment • Containment pressure greater than 2.8 PSIG	• **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (1-RIC-5415) • Condenser Off-Gas RMS (1-RI-1752) • S/G B/D RMS (1-RI-4014) • Main Vent Gaseous RMS (1-RI-5415) **OR** • **ALL** containment penetrations required to be shut have an isolation valve shut **IF** a tube rupture is identified in a S/G, • **ALL** release paths from the affected S/G to the environment are isolated • Affected S/G pressure less than 920 PSIA

START	FUNCTION	DONE	PAGE
	A. VERIFY RADIATION LEVELS EXTERNAL TO CONTAINMENT BY CONTAINMENT ISOLATION.	C	3
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify SIAS and CIS		4
	• **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS		4
	• **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify Containment Normal Sump and H_2 Purge Isolation valves are shut		5
	• **IF** a tube rupture is identified, **THEN** perform the following: • Commence working the appropriate Heat Removal success path until the affected **OR** most affected S/G is isolated		6
	• **IF** a SRW Header is **NOT** in operation **THEN** attempt to restart: • 11 SRW Header – CNTMT pressure less than 25 PSIG. • 12 SRW Header – CNTMT pressure less than 10 PSIG.		6
	• SIAS VERIFICATION CHECKLIST		8
	• CSAS VERIFICATION CHECKLIST		8
	• CIS VERIFICATION CHECKLIST		8
	• **IF** a tube rupture is identified, **THEN** control secondary system contamination		9

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

RLEC-2: CONTAINMENT ISOLATED
(continued)

START	FUNCTION	DONE	PAGE
	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-2.		13
	• **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function to be satisfied • Determine the appropriate emergency response actions **PER** the ERPIP • Evaluate further actions		13

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-8

FUNCTIONAL RECOVERY PROCEDURE

REVISION 30

Safety Related

Approval Authority: Tim Riti 8/31/09
signature/date

Effective Date: 9/3/09

LIST OF EFFECTIVE PAGES

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TABLE OF CONTENTS

I. PURPOSE

This procedure provides the operator actions to be completed after events which are unable to be diagnosed, or for events where an Optimal Recovery Procedure is **NOT** sufficient. The actions in this procedure provide a systematic and structured response to plant casualties, based on the safety functions, and are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to prevent core damage by satisfying safety functions at risk while minimizing any radiological releases to the environment.

II. ENTRY CONDITIONS

The following conditions exist:

A. Post-Trip Immediate Actions are completed.

B. **ANY** of the following conditions exist:

- Something more than an uncomplicated reactor trip has occurred for which a single event diagnosis is **NOT** possible utilizing the diagnostic flowchart of EOP-0, POST-TRIP IMMEDIATE ACTIONS.
- Something more than an uncomplicated reactor trip has occurred for which an Optimal Recovery Procedure is **NOT** available.
- An Optimal Recovery Procedure has been implemented but ONE or MORE Safety Function Acceptance Criteria are **NOT** satisfied, and actions directed within the Optimal Recovery Procedure are **NOT** returning the parameter(s) to within their Acceptance Criteria.

III. PRECAUTIONS

The following specific precautions apply prior to or throughout this procedure.

A. **WARNINGS**

None

B. **CAUTIONS**

1. SUR and WRNI Power should be continuously monitored during any RCS temperature changes until adequate shutdown margin can be established. RCS temperature should **NOT** be lowered if SUR approaches zero and/or WRNI Power level stabilizes above 10^{-4}%.

2. Feedwater should **NOT** be added to a dry S/G if the other S/G still contains water. If both S/Gs become dry, only ONE S/G should be refilled to initiate Natural Circulation. A dry S/G is indicated by wide range S/G level indication off-scale low or by S/G pressure less than saturation pressure for existing T_{AVE} .

3. ESFAS actuated safety features should only be overridden to support a threatened safety function or when directed by the procedure.

4. Solid water operation of the RCS should only be attempted in order to maintain a subcooled margin of 25° F. Pressurizer level limits may be exceeded to restore RCS subcooling. If solid water operation of the RCS is undertaken, any functions or actions directly affecting makeup, letdown, system heatup or cooldown should be closely monitored to avoid rapid pressure excursions.

5. If the initial cooldown rate exceeds Technical Specification Limits, there may be a potential for pressurized thermal shock of the reactor vessel. Pressure/Temperature Limits of ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS should be maintained.

6. Maintaining subcooling of 25° F takes precedence over PTS considerations. If there is a conflict between maintaining adequate core cooling and complying with pressure/temperature limits, then maintenance of adequate core cooling should be given the higher priority.

7. The use of equipment in the containment building should be minimized when containment hydrogen concentration is greater than 4.0% to reduce the possibility of hydrogen ignition.

8. Common failure of a standby pump or component is possible if started following a pump or component failure. The cause of the failure should be determined prior to starting or restarting a standby pump or component.

(continue)

III.B (continued)

9. There is a possibility of RCS voiding throughout this procedure. Steps to eliminate voiding should be taken anytime voiding causes heat removal or inventory control to be threatened. Void elimination should be started soon enough to ensure heat removal and inventory control are **NOT** lost.

10. After the required shutdown boron concentration is attained in the RCS, makeup water added to the RCS during the cooldown should be at least equal to the shutdown boron concentration to prevent **ANY** dilution of RCS boron concentration.

11. There is a possibility for excessive DG loading if a SIAS is received and the LOCI Sequencer actuates. To prevent this from occurring, the operator should **NOT** energize any non-essential loads unless specifically allowed within this procedure. The maximum steady state 2A or 2B DG load limit is 3300 KW. The SMECO load limit is 240 AMPS Continuous.

12. The number of auxiliary spray cycles should be minimized when the temperature differential is greater than 400° F to minimize spray nozzle thermal stress accumulation factor.

13. If VCT pressure is reduced by greater than 5 PSIG, the idle Charging Pumps may become gas bound if **NOT** started or vented.

(continue)

III. (continued)

C. **NOTES**

1. Hot and cold leg RTD and CET temperature indications may be influenced by charging pump or SIS injection water temperatures. Multiple RTD and CET indications should be used when injection is occurring.

2. During a depressurization event, pressurizer level may **NOT** provide an accurate indication of RCS inventory due to the formation of voids. Pressurizer level when combined with RCS subcooling based on CET temperatures will indicate the core is covered.

3. High energy line breaks may cause erratic instrumentation response depending on the magnitude and location of the break.

4. Harsh Containment Environment conditions will affect instrument indications. When necessary, modified parameter values designated by braces {} are used to compensate the indicated value for Harsh Containment Environment conditions. Harsh Containment Environment conditions exist when containment pressure is greater than 4.25 PSIG.

5. If cooling down by natural circulation with an isolated steam generator, an inverted delta T (T_{COLD} higher than T_{HOT}) may be observed in the idle loop. This is due to a small amount of reverse heat transfer in the isolated steam generator. The inverted delta T is **NOT** expected to have any significant effect on natural circulation flow in the operating steam generator loop.

6. An incident may cause inconsistencies between instruments. At least TWO independent indications should be used, when available, to evaluate and verify a specific plant condition.

7. Do **NOT** adopt manual operation of automatically controlled systems unless a malfunction is apparent or the automatic system operation will **NOT** support the maintenance of a safety function.

8. Systems shifted to manual operation must be monitored frequently to ensure correct operation.

9. Personnel should be prepared for the possibility of inadequate lighting in access areas and equipment rooms.

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. DETERMINE APPROPRIATE EMERGENCY REPSONSE ACTIONS PER THE ERPIP.	
WARNING **Dropping the Transfer Cask may spill fuel bundles in the Auxiliary Building causing high radiation levels.** 1. **IF** a Transfer Cask loaded with irradiated fuel assemblies has been dropped in the Auxiliary Building, **THEN** perform actions concurrently **PER** AOP-6D, FUEL HANDLING INCIDENT. 2. Determine the appropriate emergency response actions **PER** the ERPIP.	
B. OBTAIN FUNCTIONAL RECOVERY ENTRY PLACEKEEPER AND RECORD TIME.	

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PERFORM THE RCP TRIP STRATEGY.	
NOTE Subsequent operations to depressurize the plant under operator control are **NOT** considered a result of the event. 1. **IF** RCS pressure drops to 1725 PSIA as a result of the event, **THEN** trip RCPs so **EITHER** of the following pairs remain running: • 21A and 22B RCPs • 21B and 22A RCPs 2. **IF** CIS has actuated, **OR** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** trip **ALL** RCPs. 3. **IF** RCS pressure drops below the minimum pump operating limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.	
D. MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS.	
1. Direct Chemistry to perform qualitative samples on **BOTH** S/Gs for activity **PER** CP-436. 2. Direct Chemistry to place the Hydrogen Monitors in service.	

IV. FUNCTIONAL RECOVERY ENTRY

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
E. DETERMINE STATUS OF SAFETY FUNCTIONS (STA).	
1. Identify success paths for **ALL** Safety Functions **PER** Section VI., <u>RESOURCE ASSESSMENT TABLE</u>.	
2. Confirm the selected success paths with the CRS.	
3. Commence the Safety Function Status Checks for **ALL** selected success paths.	3.1 **IF** Safety Function Acceptance Criteria are **NOT** met, **THEN** determine the appropriate emergency response actions **PER** the ERPIP.
F. PERFORM RECOVERY ACTIONS.	
1. Identify success paths **AND** determine if Acceptance Criteria are met for **ALL** Safety Functions **PER** Section VI., <u>RESOURCE ASSESSMENT TABLE</u>.	1.1 **IF** a success path can **NOT** be identified **PER** Section VI., <u>RESOURCE ASSESSMENT TABLE</u>, **THEN** select the highest numbered success path for that Safety Function (e.g.; HR-4).
2. **IF** entry is from an Optimal Recovery Procedure, **THEN** Exit the Optimal Recovery Procedure.	

(continue)

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS

F. (continued)

NOTE

Safety Functions are presented in order of importance. Selected success paths should be commenced in accordance with the Safety Function hierarchy.

3. Commence the Recovery Actions **PER** APPENDIX (1), REACTIVITY CONTROL to APPENDIX (6), RADIATION LEVELS EXTERNAL TO CONTAINMENT with the following priority:

   a. Safety Functions that are **NOT** meeting their EOP-8 Acceptance Criteria.

   b. Safety Functions that were **NOT** met in EOP-0,
   AND Safety Functions that were **NOT** met in an Optimal Recovery Procedure.

   c. **ALL** remaining Safety Functions.

4. **IF**, at any time, a Safety Function is **NOT** being satisfied,
   THEN commence the Recovery Actions for the success path of the unsatisfied Safety Function, in accordance with the Safety Function hierarchy.

5. **IF**, at any time, **ANY** success path is unable to meet the acceptance criteria,
   THEN IMPLEMENT an appropriate success path as determined **PER** Section VI., RESOURCE ASSESSMENT TABLE.

(continue)

IV. FUNCTIONAL RECOVERY ENTRY

RECOVERY ACTIONS	ALTERNATE ACTIONS

F. (continued)

NOTE
Safety Function success paths are listed in order of preference, success path #1 (e.g.; HR-1) being most preferred.

6. **IF**, at any time, a lower numbered success path is able to be implemented for **ANY** safety function,
   THEN, as time permits, perform the following actions:

   a. Verify the lower numbered success path is available using the Resource Assessment Table.

   b. Commence performance of the lower numbered success path.

   c. Exit the original success path as appropriate.

7. **WHEN** the following conditions are met:

   - The Recovery Actions for the selected success paths are being performed
   - The Acceptance Criteria for each selected Safety Function success path is satisfied

   THEN PROCEED to Section V., <u>LONG TERM ACTIONS</u>.

END of Section IV

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. DETERMINE PLANT STATUS.	
1. Determine the current status of the plant by identifying the following: • Present RCS conditions, including inventory, temperature, pressure and radiation levels • Selected success paths for fulfilling each safety function • Adequacy of core cooling • Plant area radiation levels • Rates of radioactivity release to the environment	
B. ATTEMPT TO DETERMINE SPECIFIC EVENT.	
1. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** entry into the appropriate Optimal Recovery Procedure may be made provided the following conditions are met: • The Safety Function Status Checks, for **ALL** safety functions, for EOP-8, FUNCTIONAL RECOVERY PROCEDURE are satisfied • The Safety Function Status Checks Intermediate Acceptance Criteria for the Optimal Recovery Procedure are satisfied	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. **IF** 500KV OFFSITE POWER WAS LOST, **THEN** ATTEMPT TO RESTORE POWER TO PLANT LOADS.	
1. Call the SO-TSO to determine when power is expected.	
2. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION.	
3. Verify power is available to the switchyard auxiliaries: • **IF** SWYD SERV XFMR SX-20 is **NOT** energized, **AND** 21 4KV Vital Bus is energized, **THEN** close SWYD SERV XFMR 4KV FDR, 152-2113. • **IF** SWYD SERV XFMR SX-10 is **NOT** energized, **AND** 11 4KV Vital Bus is energized, **THEN** close SWYD 4KV SERV XFMR FDR, 152-1113. • Verify SP-10 and SP-20 are energized **PER** OI-28, OPERATION OF 500KV SWITCHYARD.	

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

4. **IF** MCC-204R or MCC-214R is de-energized,
   THEN perform the following actions:

   a. **IF** MCC-214R is energized
      AND MCC-204R is **NOT** energized,
      THEN tie MCC-204R to MCC-214R as follows:

      (1) Open MCC-204R Main Feeder Breaker, 52-20401.

      (2) Rotate the bottom key on the MCC-204R Main Feeder Breaker, and remove **BOTH** interlock keys.

      (3) Insert the appropriate interlock key into MCC-204R Tie breaker, 52-20420.

      (4) Turn the key in the clockwise direction.

      (5) Close MCC-204R Tie Breaker, 52-20420.

      (6) Insert the appropriate interlock key into MCC-214R Tie Breaker, 52-21420.

      (7) Turn the key in the clockwise direction.

      (8) Close MCC-214R Tie Breaker, 52-21420.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4 (continued)	
CAUTION **Loads must be stripped from MCC-214R and MCC-204R to ensure 204R REACTOR MCC breaker, 52-2409 will NOT be overloaded.**	
b. IF MCC-214R is **NOT** energized **AND** MCC-204R is energized, **THEN** tie MCC-214R to MCC-204R as follows:	
(1) Open the following MCC breakers: • BORIC ACID BATCH TANK HEATER 21, 52-21410 • BORIC ACID BATCH TANK MIXER 21, 52-21425	
(2) Verify SALTWATER SYSTEM AIR COMPRESSOR 22 is available, **AND** open the SALTWATER SYSTEM AIR COMPRESSOR 21 breaker, 52-21405.	(2).1 IF SALTWATER SYSTEM AIR COMPRESSOR 22 is **NOT** available, **THEN** verify SALTWATER SYSTEM AIR COMPRESSOR 22 breaker, 52-20405 is open.
(3) Verify BORIC ACID PUMP 22 is available, **AND** open the BORIC ACID PUMP 21 breaker, 52-21406.	(3).1 IF BORIC ACID PUMP 22 is **NOT** available, **THEN** verify BORIC ACID PUMP 22 breaker, 52-20406 is open.
(4) Open MCC-214R Main Feeder Breaker, 52-21401.	
(5) Rotate the left key on the MCC-214R Main Feeder Breaker, and remove **BOTH** interlock keys.	
(6) Insert the appropriate interlock key into MCC-214R Tie Breaker, 52-21420.	
(7) Turn the key in the clockwise direction.	
(continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4.b (continued) (8) Close MCC-214R Tie Breaker, 52-21420. (9) Insert the appropriate interlock key into MCC-204R Tie Breaker, 52-20420. (10) Turn the key in the clockwise direction. (11) Close MCC-204R Tie Breaker, 52-20420. 5. Verify the Emergency DC PPs are operating: • Turbine EMERGENCY BRG OIL PP • EMERGENCY AIR SIDE SEAL OIL PP • SGFP EMERGENCY OIL PPs (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

NOTE

Operation of the equipment in this procedure will **NOT** cause 2A or 2B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.

CAUTION

SMECO Power Supply System load shall be limited as follows:

- **240 AMPS Continuous**
- **216 AMPS for 16 hours followed by 264 AMPS for up to 8 hours, then reducing to 216 AMPS**
- **216 AMPS for 20 hours followed by 295 AMPS for up to 4 hours, then reducing to 216 AMPS**

6. Energize the following support equipment as necessary to facilitate shutdown, while maintaining load within the power source's ratings:

   a. Start a MAIN EXH FAN.

   b. Start the CAC(s) in LOW as necessary to restore and maintain containment temperature below 120° F.

   c. Start the SRW Room Ventilation **PER** OI-15, SERVICE WATER SYSTEM.

   d. **IF** the "SFP TEMP HI" alarm is received,
   THEN start the SFP CLG PP(s) **PER** the appropriate OI-24 series procedure.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

7. Restore power to MCC-201AT and MCC-201BT loads, while remaining within the power source's ratings, as follows:

   a. Strip **ALL** loads from MCC-201AT and MCC-201BT by opening individual MCC breakers.

   b. **IF** 21A 480V BUS is energized, **THEN** restore power to MCC-201AT from 21 4KV Vital Bus by closing normal feeder breaker 52-2109.

   c. **IF** 24B 480V BUS is energized, **THEN** restore power to MCC-201BT from 24 4KV Vital Bus by closing normal feeder breaker 52-2419.

   d. **IF** 21 4KV Vital Bus is energized **AND** 24 4KV Vital Bus is **NOT** energized, **THEN** tie MCC-201BT to MCC-201AT as follows:

      (1) Open MCC-201BT Main Feeder Breaker, 52-20141.

      (2) Rotate the bottom key on the MCC-201BT Main Feeder Breaker, and remove **BOTH** interlock keys.

      (3) Insert the appropriate interlock key into MCC-201BT Tie Breaker, 52-20160.

      (4) Turn the key in the clockwise direction.

      (5) Close MCC-201BT Tie Breaker, 52-20160.

      (6) Insert the appropriate interlock key into MCC-201AT Tie Breaker, 52-20120.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.7.d (continued) (7) Turn the key in the clockwise direction. (8) Close MCC-201AT Tie Breaker, 52-20120. e. **IF** 21 4KV Vital Bus is **NOT** energized **AND** 24 4KV Vital Bus is energized, **THEN** tie MCC-201AT to MCC-201BT as follows: (1) Open MCC-201AT Main Feeder Breaker, 52-20101. (2) Rotate the bottom key on the MCC-201AT Main Feeder Breaker, and remove **BOTH** interlock keys. (3) Insert the appropriate interlock key into MCC-201AT Tie Breaker, 52-20120. (4) Turn the key in the clockwise direction. (5) Close MCC-201AT Tie Breaker, 52-20120. (6) Insert the appropriate interlock key into MCC-201BT Tie Breaker, 52-20160. (7) Turn the key in the clockwise direction. (8) Close MCC-201BT Tie Breaker, 52-20160. (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.7 (continued)

f. Energize MCC-201AT and MCC-201BT loads by shutting the following breakers:

- Distribution Panel 21 Breaker, 52-20116
- AFW PP Room Air Conditioner Breaker, 52-20150

CAUTION

3600 KW is the maximum load limit for 2A and 2B DG and is the setting of the DG fuel rack stop. 2A and 2B DG loading should be maintained below 3300 KW to prevent the DG RPMs from falling due to automatic load variations.

8. **IF** SIAS actuates
AND 2A **OR** 2B DG loading exceeds 3600 KW,
THEN perform rapid DG load reduction as follows:

a. **IF** 2A DG loading exceeds 3600 KW, **THEN** perform the following:

(1) Open the 21A 480V BUS FDR breaker, 52-2112.

(2) Stop 21 MAIN EXH FAN.

(3) Locally open MCC-201AT Main Feeder Breaker, 52-20101.

(4) Close the 21A 480V BUS FDR breaker, 52-2112.

(continue)

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.8 (continued) b. **IF** 2B DG loading exceeds 3600 KW, **THEN** perform the following: (1) Open the 24B 480V BUS FDR breaker, 52-2413. (2) Stop 22 MAIN EXH FAN. (3) Stop 12 SFP CLG PP. (4) Locally open MCC-201BT Main Feeder Breaker, 52-20141. (5) Close the 24B 480V BUS FDR breaker, 52-2413. 9. **IF** SIAS actuates **AND** 2A **OR** 2B DG loading exceeds 3300 KW, **THEN** secure the following DG loads as necessary to lower DG load below 3300 KW: a. **IF** 2A DG loading exceeds 3300 KW, **THEN** perform the following: (1) Stop 21 MAIN EXH FAN. (2) Locally open MCC-201AT Main Feeder Breaker, 52-20101. b. **IF** 2B DG loading exceeds 3300 KW, **THEN** perform the following: (1) Stop 22 MAIN EXH FAN. (2) Stop 12 SFP CLG PP. (3) Locally open MCC-201BT Main Feeder Breaker, 52-20141. (continue)	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 10. Lower the Main Generator Hydrogen Pressure to 2 PSIG by performing the following actions: a. Throttle open the GENERATOR BOTTOM VENT TO ATMOSPHERE ISOLATION VALVE, 2-G-06. b. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: (1) Shut 2-G-06. (2) Secure the EMERGENCY AIR SIDE SEAL OIL PP. 11. Minimize the 250V DC Battery discharge by closing the 15 Battery Charger remote supply breaker, 52-1107, **OR** 25 Battery Charger remote supply breaker, 52-2107, to energize the Battery Charger on 13 250V DC Bus.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

D. DETERMINE IF RCS COOLDOWN SHOULD CONTINUE.

1. Determine if RCS cooldown to cold shutdown is required based on the following considerations:

   a. **IF** a high radioactivity release rate to the environment exists,
   THEN ensure cooldown is in progress **PER** the selected Heat Removal success path,
   AND dump steam to the condenser if possible.

   b. **IF** the available inventory approaches the minimum required for cooldown **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN
   AND is lowering due to insufficent makeup
   THEN ensure cooldown is in progress **PER** the selected Heat Removal success path.

   c. **IF** a loss of **ANY** vital auxiliaries may be anticipated, including a loss of electric power, compressed air, or cooling water supplies,
   THEN ensure cooldown is in progress **PER** the selected Heat Removal success path.

   d. **IF** a cooldown is necessary to make repairs,
   THEN ensure cooldown is in progress **PER** the selected Heat Removal success path.

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. ENSURE EQUIPMENT AVAILABILITY AND PLANT CONDITIONS TO SUPPORT RCS COOLDOWN.	
1. Determine equipment availability and plant conditons to support RCS cooldown based on the following considerations: • Status of failed equipment or conditions which may prevent or inhibit a cooldown, such as a loss of **ALL** pressurizer sprays or inability to dump steam • Availability of condensate inventory	
2. **IF** repairs to equipment are required, **THEN** establish plant conditions to support making the necessary repairs.	
3. **IF** insufficient inventory is available **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN, **THEN** attempt to raise the inventory or obtain additional sources of feedwater.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. PERFORM PLANT COOLDOWN	
NOTE If a cooldown is to be performed, then guidance from the Plant Technical Support Center may be required. Standard Cooldown methods may require modification due to the nature of the event.	
1. **IF** a plant cooldown is to be performed, **THEN** conduct a RCS cooldown to less than 300° F using any method described in the Heat Removal success paths **OR** as prescribed by the Technical Support Center.	1.1 **IF** a cooldown is **NOT** required, **THEN** continue to maintain the safety functions until guidance is provided by the Plant Technical Support Center or an approved procedure can be implemented.
2. **IF** RCS activity will **NOT** result in unacceptable radiological consequences outside containment, **AND** CET temperatures are less than 300° F, **THEN** evaluate initiating Shutdown Cooling **PER** HR-3, SHUTDOWN COOLING SYSTEM.	

V. LONG TERM ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. IMPLEMENT THE APPROPRIATE PROCEDURE

1. **WHEN** the following conditions are met:

   - The Safety Function Status Checks Acceptance Criteria, for **ALL** safety functions, for EOP-8, FUNCTIONAL RECOVERY PROCEDURE are met
   - An appropriate, approved procedure is available for implementation

   THEN perform the following:

   a. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.

   b. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.

   c. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.

END of Section V

VI. RESOURCE ASSESSMENT TABLE

REACTIVITY CONTROL	**SAFETY FUNCTION SUCCESS PATH DETERMINATION**	
SUCCESS PATH	**RESOURCE CONDITIONS**	**ACCEPTANCE CRITERIA**
RC-1: CEA Insertion	a. CEAs are able to be inserted, and SUR is negative **OR** b. A loss of **ALL** Vital 4KV Buses may have occurred	1. **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering, **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero
RC-2: Boration Using CVCS	a. Charging pump is available for boron addition b. Boric acid source is available: • BAST • RWT c. Charging path is available via normal flow path or SIS flow path	1. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero
RC-3: Boration Using SIS	a. HPSI pump is available for boron addition b. RWT is available as boric acid source c. A flow path is available	1. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** 2. WRNI power below 10^{-4}% and SUR is negative or zero

VI. RESOURCE ASSESSMENT TABLE

VITAL AUXILIARIES SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
VA-1: 500KV Offsite Power	a. At least ONE 500KV Bus is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 4. **EITHER** 2Y09 or 2Y10 is energized
VA-2: Diesel Generators	a. 2A, 2B OR 0C Diesel Generator is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 4. **EITHER** 2Y09 or 2Y10 is energized

(continue)

VI. RESOURCE ASSESSMENT TABLE

VITAL AUXILIARIES (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
VA-3: SMECO	a. SMECO Power Supply System is available	1. At least ONE 4KV vital bus is energized 2. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts 3. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 4. **EITHER** 2Y09 or 2Y10 is energized

VI. RESOURCE ASSESSMENT TABLE

RCS PRESSURE AND INVENTORY CONTROL SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION RESOURCE CONDITIONS	 ACCEPTANCE CRITERIA
PIC-1: CVCS	a. Charging pump is available b. Charging path is available via normal flow path or SIS flow path c. A charging source is available: • VCT • BAST • RWT d. A method of pressurizer pressure control is available: • Pressurizer heaters • Main Spray • Aux Spray • Controlled Steaming e. SIAS has **NOT** actuated **OR** has been reset	1. Pressurizer pressure less than the upper limits of Att. (1) 2. Pressurizer level greater than 30 inches 3. RCS subcooling is between 25°F and 140°F based on CET temperatures 4. Reactor Vessel level above the top of the hot leg
PIC-2: PORVs or Pressurizer Vent	a. PORV or Pressurizer Vent required to reduce pressure b. PORV or Pressurizer Vent available to control pressure c. Charging and letdown and/or SIS is available to control pressurizer level d. Once-Through-Cooling is **NOT** in progress (continue)	1. Pressurizer pressure less than 2400 PSIA 2. Pressurizer pressure less than the upper limits of Att. (1) 3. RCS subcooling is between 25°F and 140°F based on CET temperatures 4. Pressurizer level greater than 30 inches {90} 5. Reactor Vessel level above the top of the hot leg

VI. RESOURCE ASSESSMENT TABLE

RCS PRESSURE AND INVENTORY CONTROL (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
PIC-3: Loss Of Vital AC	a. A loss of **ALL** 4KV Vital Buses has occurred b. SIAS has **NOT** actuated **OR** has been reset	1. Pressurizer pressure less than the upper limits of Att. (1) 2. RCS subcooling greater than 25°F based on CET temperatures (1) **OR** CET temperatures less than 50°F superheated (1) 3. Reactor Vessel level indicates the core is covered
PIC-4: SIS	a. SIAS has actuated **OR** SIS is able to be used to supply RCS makeup	1. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating 2. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3) 3. Reactor Vessel level indicates the core is covered

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
HR-1: S/G Heat Sink With **NO** SIS Operation	a. At least ONE S/G level greater than (-)350 inches b. Feedwater is available: • Main Feedwater • AFW • Booster Pump Injection c. SIAS has **NOT** actuated **OR** has been reset d. SIS operation **NOT** required	1. At least ONE S/G has level between (-)24 inches and (+)30 inches **OR** S/G level is being restored by feedwater flow 2. **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10°F 3. **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50°F 4. RCS subcooling greater than 25°F based on CET temperatures (1) 5. Reactor Vessel level above the top of the hot leg

(1) If needed, refer to Attachment (12) to read CETs.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
HR-2: SG Heat Sink With SIS Operation	a. At least ONE S/G level greater than (-)350 inches b. Feedwater is available: • Main Feedwater • AFW • Booster Pump Injection c. SIAS has actuated or SIS Operation required	1. At least ONE S/G has level between 0 inches and (+)38 inches **OR** S/G level is being restored by feedwater flow 2. CET temperatures less than 50°F superheated (1) 3. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating 4. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CORE AND RCS HEAT REMOVAL (continued) **SUCCESS PATH**	**SAFETY FUNCTION SUCCESS PATH DETERMINATION** **RESOURCE CONDITIONS**	 **ACCEPTANCE CRITERIA**
HR-3: Shutdown Cooling System	a. CET temperatures less than 300°F b. Radiation levels are low enough to allow valve repositioning	1. CET temperatures less than 300°F and less than 50°F superheated (1) 2. HPSI Pumps are injecting water into the RCS **PER** Att. (10) (2) 3. Pressurizer pressure less than 270 PSIA {245} 4. Reactor Vessel level indicates the core is covered
HR-4: Once-Through-Cooling	a. HPSI pumps are available b. BOTH PORVs are available c. Flow path is available d. RWT is available as a makeup source	1. CET temperatures less than 50°F superheated (1) 2. **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met, **THEN ALL** available Charging Pumps operating 3. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3) 4. Pressurizer pressure less than 1270 PSIA **OR** is lowering

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION: RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
CE-1: **NO** CIS	a. Containment pressure less than 2.8 PSIG	1. Containment pressure less than 2.8 PSIG
	b. CIS has **NOT** actuated **OR** has been reset	2. Containment temperature less than 220°F (1)
	c. Containment radiation alarms are clear with **NO** unexplained rise (2)	3. Containment radiation alarms are clear with **NO** unexplained rise (2)

(1) **NOT** available if 2Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
CE-2: Containment Isolation	a. Containment pressure less than 4.25 PSIG b. CSAS has **NOT** actuated **OR** has been reset	1. Containment pressure less than 4.25 PSIG 2. **ALL** available Containment Air Coolers are operating with maximum SRW flow 3. **ALL** containment penetrations required to be shut have an isolation valve shut 4. Hydrogen concentration less than 0.5% (1) **OR** **ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1) **OR** Hydrogen purge operation per Tech Support recommendation (1)

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

(continue)

VI. RESOURCE ASSESSMENT TABLE

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
CE-3: Containment Spray	a. Containment pressure greater than 4.25 PSIG	1. Containment pressure less than 50 PSIG 2. **ALL** available Containment Air Coolers are operating with maximum SRW flow 3. Containment spray flow is greater than 1350 GPM per pump, if operating 4. **ALL** containment penetrations required to be shut have an isolation valve shut 5. Hydrogen concentration less than 0.5% (1) **OR** **ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1) **OR** Hydrogen purge operation per Tech Support recommendation (1)

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

VI. RESOURCE ASSESSMENT TABLE

RADIATION LEVELS EXTERNAL TO CONTAINMENT SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
RLEC-1:Normal Levels	a. Normal Radiation levels exist outside of containment b. Containment pressure less than 2.8 PSIG c. A loss of **ALL** Vital 4KV Buses may have occurred	1. Noble Gas Monitor (2-RIC-5415) alarm clear with **NO** unexplained rise 2. Condenser Off-Gas RMS (2-RI-1752) alarm clear with **NO** unexplained rise (1) 3. S/G B/D RMS (2-RI-4014) alarm clear with **NO** unexplained rise (1) 4. Main Vent Gaseous RMS (2-RI-5415) alarm clear with **NO** unexplained rise (1)

(1) **NOT** applicable if OOS due to loss of power.

(continue)

VI. RESOURCE ASSESSMENT TABLE

RADIATION LEVELS EXTERNAL TO CONTAINMENT (continued) SUCCESS PATH	SAFETY FUNCTION SUCCESS PATH DETERMINATION	
	RESOURCE CONDITIONS	**ACCEPTANCE CRITERIA**
RLEC-2: Containment Isolated	a. Radiation detected outside containment **OR** Containment pressure greater than 2.8 PSIG	1. **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (2-RIC-5415) • Condenser Off-Gas RMS (2-RI-1752) • S/G B/D RMS (2-RI-4014) • Main Vent Gaseous RMS (2-RI-5415) **OR** 2. **ALL** containment penetrations required to be shut have an isolation valve shut **IF** a tube rupture is identified in a S/G, • **ALL** release paths from the affected S/G to the environment are isolated • Affected S/G pressure less than 920 PSIA

VII. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the safety function status checks.

B. Perform safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being met, promptly upon discovery.

REACTIVITY CONTROL SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	 STATUS CHECK
RC-1: CEA Insertion	a. **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	
RC-2: Boration Using CVCS	a. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	
RC-3: Boration Using SIS	a. Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative	
	OR	
	b. WRNI power below 10^{-4}% and SUR is negative or zero	

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
VA-1: 500KV Offsite Power	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24	
	d. **EITHER** 2Y09 or 2Y10 is energized	
VA-2: Diesel Generators	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24	
	d. **EITHER** 2Y09 or 2Y10 is energized	

(continue)

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
VA-3: SMECO	a. At least ONE 4KV vital bus is energized	
	b. 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts	
	c. At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24	
	d. **EITHER** 2Y09 or 2Y10 is energized	

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY CONTROL	SAFETY FUNCTION ACCEPTANCE CRITERIA	
SUCCESS PATH	ACCEPTANCE CRITERIA	STATUS CHECK
PIC-1: CVCS	a. Pressurizer pressure less than the upper limits of Att. (1)	
	b. Pressurizer level greater than 30 inches	
	c. RCS subcooling is between 25°F and 140°F based on CET temperatures	
	d. Reactor Vessel level above the top of the hot leg	
PIC-2: PORVs or Pressurizer Vent	a. Pressurizer pressure less than 2400 PSIA	
	b. Pressurizer pressure less than the upper limits of Att. (1)	
	c. RCS subcooling is between 25°F and 140°F based on CET temperatures	
	d. Pressurizer level greater than 30 inches {90}	
	e. Ractor Vessel level above the top of the hot leg	

(continue)

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY CONTROL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA — ACCEPTANCE CRITERIA	STATUS CHECK
PIC-3: Loss Of Vital AC	a. Pressurizer pressure less than the upper limits of Att. (1)	
	b. RCS subcooling greater than 25°F based on CET temperatures (1)	
	OR	
	CET temperatures less than 50°F superheated (1)	
	c. Reactor Vessel level indicates the core is covered	
PIC-4: SIS	a. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating	
	b. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	
	c. Reactor Vessel level indicates the core is covered	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
HR-1: SG Heat Sink With **NO** SIS Operation	a. At least ONE S/G has level between (-)24 inches and (+)30 inches	
	OR	
	S/G level is being restored by feedwater flow	
	b. **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10°F	
	c. **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50°F	
	d. RCS subcooling greater than 25°F based on CET temperatures (1)	
	e. Reactor Vessel level above the top of the hot leg	

(1) If needed, refer to Attachment (12) to read CETs.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	**STATUS CHECK**
HR-2: SG Heat Sink With SIS Operation	a. At least ONE S/G has level between 0 inches and (+)38 inches	
	OR	
	S/G level is being restored by feedwater flow	
	b. CET temperatures less than 50°F superheated (1)	
	c. **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE Charging Pump operating	
	d. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
HR-3: Shutdown Cooling System	a. CET temperatures less than 300°F and less than 50°F superheated (1)	
	b. HPSI Pumps are injecting water into the RCS **PER** Att. (10) (2)	
	c. Pressurizer pressure less than 270 PSIA {245}	
	d. Reactor Vessel level indicates the core is covered	
HR-4: Once-Through-Cooling	a. CET temperatures less than 50°F superheated (1)	
	b. **IF** RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met, **THEN ALL** available Charging Pumps operating	
	c. HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) (2) (3)	
	d. Pressurizer pressure less than 1270 PSIA **OR** is lowering	

(1) If needed, refer to Attachment (12) to read CETs.
(2) Limits in Attachments (10) and (11) are not required to be met if SIS throttle criteria are met.
(3) LPSI Pumps are **NOT** required post-RAS.

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
CE-1: **NO** CIS	a. Containment pressure less than 2.8 PSIG	
	b. Containment temperature less than 220°F (1)	
	c. Containment radiation alarms are clear with **NO** unexplained rise (2)	

(1) **NOT** available if 2Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT (continued) **SUCCESS PATH**	**SAFETY FUNCTION ACCEPTANCE CRITERIA** — **ACCEPTANCE CRITERIA**	**STATUS CHECK**
CE-2: Containment Isolation	a. Containment pressure less than 4.25 PSIG	
	b. **ALL** available Containment Air Coolers are operating with maximum SRW flow	
	c. **ALL** containment penetrations required to be shut have an isolation valve shut	
	d. Hydrogen concentration less than 0.5% (1)	
	OR	
	ALL available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1)	
	OR	
	Hydrogen purge operation per Tech Support recommendation (1)	

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA: ACCEPTANCE CRITERIA	STATUS CHECK
CE-3: Containment Spray	a. Containment pressure less than 50 PSIG	
	b. **ALL** available Containment Air Coolers are operating with maximum SRW flow	
	c. Containment spray flow is greater than 1350 GPM per pump, if operating	
	d. **ALL** containment penetrations required to be shut have an isolation valve shut	
	e. Hydrogen concentration less than 0.5% (1)	
	OR	
	ALL available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% (1)	
	OR	
	Hydrogen purge operation per Tech Support recommendation (1)	

(1) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
RLEC-1:Normal Levels	a. Noble Gas Monitor (2-RIC-5415) alarm clear with **NO** unexplained rise	
	b. Condenser Off-Gas RMS (2-RI-1752) alarm clear with **NO** unexplained rise (1)	
	c. S/G B/D RMS (2-RI-4014) alarm clear with **NO** unexplained rise (1)	
	d. Main Vent Gaseous RMS (2-RI-5415) alarm clear with **NO** unexplained rise (1)	

(1) **NOT** applicable if OOS due to loss of power.

(continue)

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT (continued) SUCCESS PATH	SAFETY FUNCTION ACCEPTANCE CRITERIA ACCEPTANCE CRITERIA	STATUS CHECK
RLEC-2:Containment Isolated	a. **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (2-RIC-5415) • Condenser Off-Gas RMS (2-RI-1752) • S/G B/D RMS (2-RI-4014) • Main Vent Gaseous RMS (2-RI-5415)	
	OR	
	b. **ALL** containment penetrations required to be shut have an isolation valve shut	
	IF a tube rupture is identified in a S/G:	
	• **ALL** release paths from the affected S/G to the environment are isolated	
	• Affected S/G pressure less than 920 PSIA	

VII. SAFETY FUNCTION STATUS CHECK

STATUS CHECK NUMBER	COMPLETED AT TIME
1	
2	
3	
4	
5	
6	
7	
8	

PLACEKEEPER
FUNCTIONAL RECOVERY ENTRY

INITIAL ENTRY	RECOVERY ACTIONS
• PERFORM THE RCP TRIP STRATEGY • MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS • IDENTIFY **ALL** SUCCESS PATHS • DETERMINE IF ACCEPTANCE CRITERIA ARE MET	• RECOVERY ACTION PRIORITY • Safety Functions **NOT** meeting their EOP-8 Acceptance Criteria • Safety Functions **NOT** met in EOP-0, **AND** Safety Functions **NOT** met in an Optimal Recovery Procedure • **ALL** remaining Safety Functions • IMPLEMENT LONG TERM ACTIONS

START	FUNCTION	DONE	PAGE
	A. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS **PER** THE ERPIP.	C	8
	B. OBTAIN FUNCTIONAL RECOVERY ENTRY PLACEKEEPER **AND** RECORD TIME. ______		8
	C. PERFORM THE RCP TRIP STRATEGY.	C	9
	D. MONITOR S/G ACTIVITY AND CONTAINMENT HYDROGEN LEVELS.		9
	E. DETERMINE STATUS OF SAFETY FUNCTIONS (STA).	C	10
	F. PERFORM RECOVERY ACTIONS.	C	10
	• Identify success paths **AND** determine if the Acceptance Criteria are met for **ALL** Safety Functions		10
	• Exit the Optimal Recovery Procedure		10
	• Commence the Recovery Actions with the following priority • Safety Functions **NOT** meeting their EOP-8 Acceptance Criteria • Safety Functions **NOT** met in EOP-0, **AND** Safety Functions **NOT** met in an Optimal Recovery Procedure • **ALL** remaining Safety Functions		11
	• **WHEN** the Recovery Actions are being performed **AND** the Acceptance Criteria for each Safety Function is satisfied, **THEN PROCEED** to Section V., <u>LONG TERM ACTIONS</u>		12

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

LONG TERM ACTIONS

START	FUNCTION	DONE	PAGE
	A. DETERMINE PLANT STATUS.	C	13
	B. ATTEMPT TO DETERMINE SPECIFIC EVENT.	C	13
	• **IF** a specific event can be identified, **THEN** entry into the Optimal Recovery Procedure may be made.		13
	C. **IF** 500KV OFFSITE POWER WAS LOST, **THEN** ATTEMPT TO RESTORE POWER TO PLANT LOADS.	C	14
	• Tie MCC-204 and 214 • Restore power to MCC-201AT and 201BT		15 19
	D. DETERMINE IF RCS COOLDOWN SHOULD CONTINUE.	C	24
	E. ENSURE EQUIPMENT AVAILABILITY AND PLANT CONDITIONS TO SUPPORT RCS COOLDOWN.	C	25
	F. PERFORM PLANT COOLDOWN.		26
	• **IF** RCS activity will **NOT** result in unacceptable radiological consequences outside containment, **AND** CET temperatures are less than 300°F, **THEN** evaluate initiating Shutdown Cooling **PER** HR-3 SHUTDOWN COOLING SYSTEM.		26
	G. IMPLEMENT THE APPROPRIATE PROCEDURE.		27

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RESOURCE ASSESSMENT

Safety Functions **NOT** met in EOP-0 or Optimal Recovery Procedure

___ ___ ___ ___ ___ ___

RC-1	VA-1	PIC-1	HR-1	CE-1	RLEC-1
RC-2	VA-2	PIC-2	HR-2	CE-2	RLEC-2
RC-3	VA-3	PIC-3	HR-3	CE-3	
		PIC-4	HR-4		

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. MAINTAIN RCS TEMPERATURE.

1. **IF EITHER** of the following conditions exist:

   - WRNI Power greater than 10^{-4}%
   - SUR is positive

   THEN maintain RCS temperature constant.

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. ESTABLISH REACTIVITY CONTROL BY CEA INSERTION.

1. Ensure the Reactor has tripped by performing **ANY** of the following:
   - Depress the four local Emergency Trip Buttons on the Trip Circuit Breakers in the Unit 2 Cable Spreading Room
   - Depress **ONE** set of Manual Reactor Trip Buttons
   - De-energize the CEDM Motor Generator Sets as follows:
     - Open 22A 480V BUS FDR
     - Open 22A/22B 480V BUS TIE
     - Open 23A 480V BUS FDR
     - Open 23A/23B 480V BUS TIE

NOTE
When re-energizing 22A and 23A 480V Buses, the breaker lineup should be returned to that existing prior to the trip.

   - Energize 22A and 23A 480V Buses as follows:
     a. Energize 22A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.
     b. Energize 23A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.

(continue)

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. Check **NO** more than ONE CEA **NOT** fully inserted.	2.1 **IF ALL** CEA indications are lost, **THEN** perform the following actions: a. Ensure WRNI Power lowering and SUR is negative **OR** WRNI Power below 10^{-4}% and SUR is negative or zero. b. **WHEN** at least **ONE** Vital 4KV Bus has been restored, **THEN** establish reactivity control as follows: (1) Sample the RCS to determine boron concentration. (2) Determine if RCS boration is required **PER** the NEOPs. (3) **IF** RCS boration is required, **THEN** borate the RCS to achieve the required shutdown margin **PER** the selected Core and RCS Heat Removal success path. 2.2 **IF** more than ONE CEA fails to fully insert, **THEN PROCEED** to RC-2, <u>BORATION USING CVCS</u>, **OR** RC-3, <u>BORATION USING SIS</u>.

APPENDIX (1) REACTIVITY CONTROL

RC-1: CEA INSERTION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-1.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • **NO** more than ONE CEA **NOT** fully inserted, WRNI power is lowering and SUR is negative. **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. MAINTAIN RCS TEMPERATURE.	
1. **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.	
B. ESTABLISH REACTIVITY CONTROL BY BORATION USING CVCS.	
1. Commence boration by performing the following: a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 2-CVC-518-CV • 2-CVC-519-CV (continue)	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the AUX HPSI HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 2-SI-656-MOV. (2) Open **ONE** of the HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV (3) Open SI TO CHG HDR valve, 2-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 2-CVC-183, located in the 27 ft West Penetration Room. (continue)

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.a (continued)	B.1.a.1 (continued) (5) Shut L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the HPSI AUX HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 2-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 2-CVC-188.
b. Commence RCS boration from the BAST using the CVCS as follows: (1) Ensure BAST levels remain greater than 10 inches. (2) Shut VCT M/U valve, 2-CVC-512-CV. (3) Open BA DIRECT M/U valve, 2-CVC-514-MOV. (4) Open BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV (5) Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. (6) Start **ALL** available BA PPs. (7) Shut VCT OUT valve, 2-CVC-501-MOV. (8) Start **ALL** available CHG PPs. (9) Ensure CHG HDR PRESS is greater than RCS pressure. (continue)	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows: (1) Ensure RWT level is greater than 2 feet. (2) Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. (3) Shut VCT OUT valve, 2-CVC-501-MOV. (4) Start **ALL** available CHG PPs. (5) Ensure CHG HDR PRESS is greater than RCS pressure.

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) c. **IF** more than ONE CEA failed to fully insert, **THEN** borate the RCS to at least 2300 ppm. d. **WHEN** boration is complete **AND** WRNI power is less than 10^{-4}% and SUR is negative or zero, **THEN** secure boration as follows: (1) **IF** boration was from the BASTs, **THEN** perform the following actions: (a) Open VCT OUT valve, 2-CVC-501-MOV. (b) Stop the BA PP(s). (c) Shut BA DIRECT M/U valve, 2-CVC-514-MOV. (d) Shut BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV (2) **IF** boration was from a RWT, **THEN** perform the following actions: (a) Open VCT OUT valve, 2-CVC-501-MOV. (b) Shut RWT CHG PP SUCT valve, 2-CVC-504-MOV. (3) Return makeup to the VCT **PER** OI-2B, BORATION, DILUTION AND MAKEUP. 2. Ensure boric acid concentration in makeup water is adequate to maintain required shutdown margin.	

APPENDIX (1) REACTIVITY CONTROL

RC-2: BORATION USING CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-2.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • Boration rate greater than or equal to 40 GPM, WRNI power is lowering and SUR is negative **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. MAINTAIN RCS TEMPERATURE.	
1. **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.	
B. ESTABLISH REACTIVITY CONTROL BY BORATION USING SIS.	
1. **IF** pressurizer pressure is less than or equal to 1725 PSIA as a result of the event **OR** containment pressure is greater than or equal to 2.8 PSIG, **THEN** verify SIAS actuation.	
2. **IF** SIAS has **NOT** actuated, **THEN** establish HPSI flow by performing the following actions: a. Open HPSI MAIN and AUX HDR valves: MAIN • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV AUX • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV (continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) b. Start 21 and 23 HPSI PPs. c. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. d. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. e. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. 3. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 21 HPSI PP • 23 HPSI PP (continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.3 (continued) b. Verify safety injection flow: • HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA (continue)	b.1 Perform the following actions as necessary: **CAUTION** **Operation of two HPSI Pumps on 24 4KV Bus may cause 2B DG loading to exceed 3600 KW.** • **IF** 21 HPSI PP failed, **THEN** perform the following actions: (1) **IF** 2B DG is powering 24 4KV Bus, **THEN** verify DG load is less than 2960 KW. (2) Start 22 HPSI PP. • **IF** 23 HPSI PP failed, **THEN** align 22 HPSI PP as follows: (1) Start 22 HPSI PP. (2) Open HPSI HDR XCONN valve, 2-SI-653-MOV. (3) Shut HPSI HDR XCONN valve, 2-SI-655-MOV. • Ensure electrical power is available to valves and pumps. • Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
4. Check SIS flow rate is greater than 40 GPM.	4.1 **IF** high RCS pressure is preventing adequate SIS flow, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path

5. **WHEN ALL** of the following conditions can be maintained:
• WRNI power is less than 10^{-4}% and SUR is negative or zero
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed	

(continue)	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) • Reactor Vessel level above the top of the hot leg **THEN** HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following: • RCS subcooling between 25 and 140° F based on CET temperatures • Pressurizer level between 101 inches {141} and 180 inches {190} 6. **IF** the HPSI throttle criteria can **NOT** be maintained after the pumps are throttled **OR** secured, **THEN** restart the appropriate pumps **AND** restore full flow.	

APPENDIX (1) REACTIVITY CONTROL

RC-3: BORATION USING SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-3.	
1. Check Reactivity Control has been established by **EITHER** of the following indications: • Boration rate greater than or equal to 40 GPM, WRNI power is lowering and SUR is negative. **OR** • WRNI power below 10^{-4}% and SUR is negative or zero	1.1 **IF** Reactivity Control has **NOT** been established, **THEN** perform the following actions: a. Concurrently perform the Recovery Actions for the next safety function in jeopardy while continuing efforts to establish reactivity control. b. Energize or restore other vital auxiliaries or components necessary to support the reactivity control success paths. c. Attempt manual operation of inoperative valves. d. **IF** high RCS pressure is preventing adequate SIS flow, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path e. Determine the appropriate emergency response actions **PER** the ERPIP.
2. **WHEN** Reactivity Control has been established, **THEN PROCEED** to the next Safety Function to be performed.	

REACTIVITY CONTROL PLACEKEEPER
RC-1: CEA INSERTION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• CEAs are able to be inserted and SUR is negative **OR** • A loss of **ALL** Vital 4KV Buses may have occurred	• **NO** more than ONE CEA **NOT** fully inserted, and WRNI power is lowering **OR** • WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		1
	• **IF EITHER** of the following conditions exist: • WRNI Power greater than $10^{-4\%}$ • SUR is positive **THEN** maintain RCS temperature constant.		1
	B. ESTABLISH REACTIVITY CONTROL BY CEA INSERTION.		2
	• Check **NO** more than ONE CEA **NOT** fully inserted		3
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-1.		4
	• **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.		4

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

REACTIVITY CONTROL PLACEKEEPER
RC-2: BORATION USING CVCS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• Charging pump is available for boron addition
• Boric acid source is available:
  • BAST
  • RWT
• Charging path is available via normal flow path or SIS flow path
	• Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative
	OR
	• WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		5

	• **IF EITHER** of the following conditions exist:
	  • WRNI Power greater than 10^{-4}%
	  • SUR is positive
	THEN maintain RCS temperature constant.
			5

	B. ESTABLISH REACTIVITY CONTROL BY BORATION USING CVCS.		5
	• Commence boration		5
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-2.		8
	• **IF** Reactivity Control has **NOT** been established, **THEN PROCEED** to the next appropriate Reactivity Control Success Path.		8

NOTE: Continuously applicable steps are designated with a "C" in the DONE column

REACTIVITY CONTROL PLACEKEEPER
RC-3: BORATION USING SIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• HPSI pump is available for boron addition • RWT is available as boric acid source • A flow path is available	• Boration rate greater than or equal to 40 GPM, WRNI power is lowering, and SUR is negative **OR** • WRNI power below 10^{-4}% and SUR is negative or zero

START	FUNCTION	DONE	PAGE
	A. MAINTAIN RCS TEMPERATURE.		9
	• **IF EITHER** of the following conditions exist: • WRNI Power greater than 10^{-4}% • SUR is positive **THEN** maintain RCS temperature constant.		9
	B. ESTABLISH REACTIVITY CONTROL BY BORATION USING SIS.	C	9
	• **IF** RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation. **OR** • Align HPSI injection and block SIAS. • **IF** high RCS pressure is preventing SIS flow, **THEN** attempt to depressurize the RCS: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path		9 9 12
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH RC-3.		14
	• **IF** Reactivity Control has **NOT** been established, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function in jeopardy • Restore other vital auxiliaries or components • Attempt manual operation of inoperative valves • **IF** high RCS pressure prevents SIS injection flow, **THEN** attempt to lower plant pressure • Determine the appropriate emergency response actions **PER** the ERPIP		14

NOTE: Continuously applicable steps are designated with a "C" in the DONE column

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. IF 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	

1. **IF** 21 13KV Service Bus is **NOT** energized,
   THEN ensure the following 13KV breakers are open:

   - 21 SERV BUS 13KV FDR, 252-2104
   - 21 SERV BUS TIE, 252-2105
   - U-4000-21 13KV FDR, 252-2102
   - U-4000-22 13KV FDR, 252-2103
   - U-4000-23 13KV FDR, 252-2101
   - Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

2. **IF** 11 13KV Service Bus is **NOT** energized,
   THEN ensure the following 13KV breakers are open:

   - 11 SERV BUS 13KV FDR, 252-1104
   - 11 SERV BUS TIE, 252-1105
   - U-4000-12 13KV FDR, 252-1103
   - U-4000-11 13KV FDR, 252-1102
   - U-4000-13 13KV FDR, 252-1101
   - Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 3. **IF** 21 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions: • Ensure the following 4KV breakers are open: • 21 4KV BUS NORMAL FDR, 152-2101 • 21 4KV BUS ALT FDR, 152-2115 • SWYD SERV XFMR 4KV FDR, 152-2113 **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** • Verify the following 4KV Vital Bus load breakers are open: • No. 21 Low Press Safety Inj. Pump, 152-2104 • No. 21 Salt Water Pump, 152-2105 • No. 21 Containment Spray Pump, 152-2107 • No. 21 High Press Safety Inj. Pump, 152-2108 • No. 23 High Press Safety Inj. Pump, 152-2110 • No. 23 Service Water Pump, 152-2111 • No. 23 Salt Water Pump, 152-2112 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.3 (continued)
 	
• Place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON
 	
4. **IF** 24 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:
 	
• Ensure the following 4KV breakers are open:
  • 24 4KV BUS NORMAL FDR, 152-2401
  • 24 4KV BUS ALT FDR, 152-2414
 	
CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.
 	
• Verify the following 4KV Vital Bus load breakers are open:
  • No. 22 Low Press Safety Inj. Pump, 152-2404
  • No. 22 Salt Water Pump, 152-2405
  • No. 22 Containment Spray Pump, 152-2407
  • No. 22 High Press Safety Inj. Pump, 152-2408
  • No. 23 High Press Safety Inj. Pump, 152-2410
  • No. 23 Service Water Pump, 152-2411
 	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) • No. 23 Salt Water Pump, 152-2412 • AFW PP No. 23, 152-2415 • Place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
CAUTION **The following step provides actions to prevent water hammer damage from CAC voiding.**	
CAUTION **SRW Pumps start when power is restored to the associated 4KV Bus.**	
5. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 21 SRW Header is idle, **THEN** restart 21 SRW Header as follows:	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions:
(1) Check that Containment Pressure has remained less than 25 PSIG with 21 SRW Header idle.	**CAUTION** **2A DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2A DG.**
(2) Attempt to start the desired SRW PP on 21 SRW Header.	**WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.**
	(1) Restart 21 SRW Header: (a) Shut 21 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-135, located 27 ft East Pen Room. (b) Shut 22 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-142, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 21 SRW Header.
(continue)	(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.a (continued) (continue)	A.5.a.1(1) (continued) (d) Consult with the Plant Technical Support Center for guidance on system restoration. (2) IF 21 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 21 SRW Header in PULL TO LOCK. (b) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (c) Locally trip the 2A DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS

A.5 (continued)

b. **IF** 22 SRW Header is idle,
THEN restart 22 SRW Header as follows:

(1) Check that Containment Pressure has remained less than 10 PSIG with 22 SRW Header idle.

(2) Attempt to start the desired SRW PP on 22 SRW Header.

(continue)

ALTERNATE ACTIONS

b.1 **IF** Containment Pressure exceeded 10 PSIG,
THEN perform the following actions:

CAUTION
2B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2B DG.

WARNING
High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.

(1) Restart 22 SRW Header:

(a) Shut 23 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-149, located 27 ft East Pen Room.

(b) Shut 24 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-156, located 5 ft West Pen Room.

(c) Attempt to start the desired SRW PP on 22 SRW Header.

(d) Consult with the Plant Technical Support Center for guidance on system restoration.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.b (continued)	A.5.b.1 (continued) (2) **IF** 22 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 22 SRW Header in PULL TO LOCK. (b) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (c) Locally trip the 2B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM 500KV OFFSITE POWER.	
1. **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: a. Open the Control Room panel bench board lower front covers. b. Remove the front and back covers of the Control Room DG Control Consoles. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 22 AND 14 battery chargers are lost. c. Determine whether Unit 2 Plant Computer is functional by observing the following: • Time indication updating on the CRT • CRT responding to function keys depressed or items selected from menu d. **IF** Unit 2 Plant Computer is functioning, **THEN** shutdown the Unit 2 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows: (1) Depress the Shift key and type "@@A". (2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt. (3) Type "GUEST1" and depress the Return key. (4) Observe the "ENTER KEY" response. (5) Depress the Return key. (6) Observe the message (8 lines) and the "TSM>" prompt. (7) Type "KILLER" and depress the Return key. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.d (continued) (8) *Observe the messages (several pages) and the "TSM>" prompt.* (9) Type "X" and depress the Return key. (10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". (11) Depress the Shift key and type "@@P". (12) Observe the "//" prompt. (13) Type "HALT" and depress the Return key. **NOTE** "NNNNNNNN" in the following response may be any number. (14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". e. Open the following power sources, located in the Unit 2 Cable Spreading Room: • Instrument Bus Switch 2Y10-80 (Computer Inverter 2Y05) • Unit 2 DAS/Computer Inverter Output Breaker at 2Y05 • Unit 2 DAS/Computer Inverter Battery Input Breaker at 2Y05 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **CAUTION** **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 2. **IF** the 500KV Red and Black Buses are **NOT** energized, **THEN** energize the 500KV Red Bus **OR** the 500KV Black Bus by performing the following actions: a. Verify that switching orders have been received by the Control Room Supervisor **OR** Shift Manager, from the SO-TSO, to operate the required equipment. b. Evaluate alarms associated with the 500KV switchyard. c. Verify the associated Unit Generator High Side Line Disconnect is open before closing Turbine Generator Output breakers. d. Verify the Unit-2 Generator Coast Down Lockout is reset. e. Place the SYNCHROSCOPE SEL Switch in NORMAL (1) **OR** EMERGENCY (2) position. (continue)	 2.1 **IF** 500KV offsite power is **NOT** available, **THEN PROCEED** to VA-2, EMERGENCY DIESEL GENERATOR, **OR** VA-3, SMECO.

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** A Synchronizer is **NOT** required for operation of breakers 552-41 **OR** 552-43. f. Place the applicable SYNCHRONIZER SEL Switch in MANUAL position. • (552-21) 11 GEN SYNCHRONIZER SEL Switch • (552-22) 11 GEN SYNCHRONIZER SEL Switch • (552-23) 11 GEN SYNCHRONIZER SEL Switch • (552-61) 21 GEN SYNCHRONIZER SEL Switch • (552-62) 21 GEN SYNCHRONIZER SEL Switch • (552-63) 21 GEN SYNCHRONIZER SEL Switch g. Insert the sync stick in the sync jack at the breaker to be closed. h. **IF** paralleling TWO power sources, **THEN** ensure the power sources are synchronized by observing the following: • Sync lights out • Synchroscope at 12 o'clock • Running and incoming voltages are matched i. **IF** closing in on a de-energized bus, **THEN** ensure the bus is **NOT** energized. j. Close the breaker by placing the Breaker Control Handswitch in the CLOSE position **AND** release. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) k. Check the breaker has closed by observing applicable breaker indicating lights and meters, if applicable. l. Repeat steps B.1.a through B.1.k as desired to close additional breakers. m. Remove the sync stick **AND** return to Home Base. n. Verify **BOTH** SYNCHRONIZER SEL Switches in the OFF position. o. Place the SYNCHROSCOPE SEL Switch in the OFF position. p. **WHEN** operation has been completed in accordance with the switching orders, **THEN** inform the SO-TSO. q. Reset the 13KV BUS 22 **OR** 12 286 LOCKOUT/RESET DEVICE as applicable. r. Reset the applicable bus 247/B device target flags on **BOTH** undervoltage relays: 13KV BUS 22 • B-22-P • B-22-B 13KV BUS 12 • B-12-P • B-12-B (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

3. **IF** 21 and 11 13KV Service Buses are **NOT** energized,
   THEN energize the desired 13KV Service Bus by performing the following actions:

   a. **IF** it is desired to energize 21 13KV Service Bus,
      THEN perform the following actions:

      (1) Verify 22 13KV Service Bus is energized.

      (2) Energize 21 13KV Service Bus by closing 21 SERV BUS 13KV FDR, 252-2104.

      (3) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE.

      (4) Reset the 247/B device target flags on **BOTH** undervoltage relays:

      - B-21-P
      - B-21-B

      (5) **IF** MCC 216T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT:

      - 2H2101REG
      - 2H2102REG
      - 2H2103REG

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.3 (continued) b. **IF** it is desired to energize 11 13KV Service Bus, **THEN** perform the following actions: (1) Verify 12 13KV Service Bus is energized. (2) Energize 11 13KV Service Bus by closing 11 SERV BUS 13KV FDR, 252-1104. (3) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE. (4) Reset the 247/B device target flags on **BOTH** undervoltage relays: • B-11-P • B-11-B (5) **IF** MCC 116T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT: • 1H1101REG • 1H1102REG • 1H1103REG (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **CAUTION** **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 4. Energize the desired U4000 SERV XFMRs. a. **IF** it is desired to energize U4000-22 SERV XFMR, **THEN** perform the following actions: (1) Verify the following breakers are open: • 24 4KV BUS NORMAL FDR, 152-2401 • 21 4KV BUS ALT FDR, 152-2115 • 22 4KV BUS NORMAL FDR, 152-2201 • 23 4KV BUS NORMAL FDR, 152-2311 (2) Close the U4000-22 SERV XFMR 13KV FDR, 252-2103. b. **IF** it is desired to energize U4000-12 SERV XFMR, **THEN** perform the following actions: (1) Verify the following breakers are open: • 24 4KV BUS ALT FDR, 152-2414 • 21 4KV BUS NORMAL FDR, 152-2101 • 22 4KV BUS ALT FDR, 152-2209 • 23 4KV BUS ALT FDR, 152-2301 (2) Close the U4000-12 SERV XFMR 13KV FDR, 252-1103. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **CAUTION** **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 5. **IF** 21 and 24 4KV Vital Buses are **NOT** energized, **THEN** restore power to at least **ONE** 4KV Vital Bus from the 13KV Service Buses as follows: a. Shut CC CNTMT SUPP valve, 2-CC-3832-CV. b. **IF** it is desired to energize 21 4KV Vital Bus from U4000-22 SERV XFMR, **THEN** energize 21 4KV Vital Bus as follows: (1) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (2) Verify 21 4KV BUS NORMAL FDR, 152-2101, is open. (3) Insert the sync stick into the sync jack at the 21 4KV BUS ALT FDR, 152-2115. (4) Close the 21 4KV BUS ALT FDR, 152-2115. (5) Remove the sync stick **AND** return to Home Base. (6) **WHEN** 21 4KV Bus sequencing is complete, **THEN** place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) c. **IF** it is desired to energize 24 4KV Vital Bus from U4000-22 SERV XFMR, **THEN** energize 24 4KV Vital Bus as follows: (1) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (2) Place 23 AFW PP in PULL TO LOCK. (3) Verify the 24 4KV BUS ALT FDR, 152-2414, is open. (4) Insert the sync stick into the sync jack at the 24 4KV BUS NORMAL FDR, 152-2401. (5) Close the 24 4KV BUS NORMAL FDR, 152-2401. (6) Remove the sync stick **AND** return to Home Base. (7) **WHEN** 24 4KV Bus sequencing is complete, **THEN** place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) d. **IF** it is desired to energize 21 4KV Vital Bus from U4000-12 SERV XFMR, **THEN** energize 21 4KV Vital Bus as follows: (1) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (2) Verify 21 4KV BUS ALT FDR, 152-2115, is open. (3) Insert the sync stick into the sync jack at the 21 4KV BUS NORMAL FDR, 152-2101. (4) Close the 21 4KV BUS NORMAL FDR, 152-2101. (5) Remove the sync stick **AND** return to Home Base. (6) **WHEN** 21 4KV Bus sequencing is complete, **THEN** place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) e. **IF** it is desired to energize 24 4KV Vital Bus from U4000-12 SERV XFMR, **THEN** energize 24 4KV Vital Bus as follows: (1) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (2) Place 23 AFW PP in PULL TO LOCK. (3) Verify 24 4KV BUS NORMAL FDR, 152-2401, is open. (4) Insert the sync stick into the sync jack at the 24 4KV BUS ALT FDR, 152-2414. (5) Close the 24 4KV BUS ALT FDR, 152-2414. (6) Remove the sync stick **AND** return to Home Base. (7) **WHEN** 24 4KV Bus sequencing is complete, **THEN** place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM. 6. **IF ANY** 125V DC Bus is less than 105 volts: • 11 • 12 • 21 • 22 **THEN** concurrently perform AOP-7J, <u>LOSS OF 120V VITAL AC OR 125V VITAL DC POWER</u>. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 7. **IF** less than THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 8. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 21A and 21B • 24A and 24B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. **IF** 2Y09 and 2Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 2Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-214R is energized. (2) Close the Instrument Bus Transformer 21 Feeder Breaker, 52-21429. (3) Close the Main Feeder Breaker, 1, on 2Y09. b. Energize 2Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-204R is energized. (2) Close the Transformer 2X09 Inst. AC Bus 22 (2Y10) Feeder Breaker, 52-20429. (3) Close the Main Feeder Breaker, 77, on 2Y10. 10. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, 125 VOLT VITAL DC.	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	**ALTERNATE ACTIONS**
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SW PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, LOSS OF SERVICE WATER • Saltwater Pumps **PER** AOP-7A, LOSS OF SALTWATER COOLING • Control Room Ventilation **PER** OI-22F, CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION • Switchgear Room Ventilation **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING • 72' Computer Room Ventilation **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION
NOTE 2A or 2B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 2A or 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to a running DG, **THEN** locally trip the DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
4. **IF** Component Cooling Flow has been lost, **THEN** restore flow.	
a. Verify CC CNTMT SUPP valve, 2-CC-3832-CV, is shut.	
b. Start a CC PP.	
c. Verify the CC HX in service is being supplied from an operating Saltwater Header.	
NOTE RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.	
d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 21A RCP: _____°F / _____°F • 21B RCP: _____°F / _____°F • 22A RCP: _____°F / _____°F • 22B RCP: _____°F / _____°F	

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPP valve, 2-CC-3832-CV. f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPP valve, 2-CC-3832-CV. (3) Slowly open 2-CC-284 to restore component cooling flow. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **IF** 2Y09 **OR** 2Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus as follows: a. **IF** 2Y09 is de-energized, **THEN** Tie 2Y09 to 2Y10: (1) On 2Y09, open INSTR. TRANSF. 21 2X08 main feeder breaker 1. (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78. (3) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON. b. **IF** 2Y10 is de-energized, **THEN** Tie 2Y10 to 2Y09: (1) On 2Y10, open INSTR. TRANSF. 22 2X09 main feeder breaker 77. (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78. (3) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON. 6. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus, **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.	

APPENDIX (2) VITAL AUXILIARIES

VA-1: 500KV OFFSITE POWER

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-1.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
• At least ONE 4KV Vital Bus is energized
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
• At least THREE 120V AC Vital Buses are energized:
  • 21
  • 22
  • 23
  • 24
• **EITHER** 2Y09 or 2Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN PROCEED to the next appropriate Vital Auxiliaries Success Path.

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	
1. **IF** 21 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions: • Ensure the following 4KV breakers are open: • 21 4KV BUS NORMAL FDR, 152-2101 • 21 4KV BUS ALT FDR, 152-2115 • SWYD SERV XFMR 4KV FDR, 152-2113 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.1 (continued) **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** • Verify the following 4KV Vital Bus load breakers are open: • No. 21 Low Press Safety Inj. Pump, 152-2104 • No. 21 Salt Water Pump, 152-2105 • No. 21 Containment Spray Pump, 152-2107 • No. 21 High Press Safety Inj. Pump, 152-2108 • No. 23 High Press Safety Inj. Pump, 152-2110 • No. 23 Service Water Pump, 152-2111 • No. 23 Salt Water Pump, 152-2112 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)
 	
2. **IF** 24 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:
 	
• Ensure the following 4KV breakers are open:
  • 24 4KV BUS NORMAL FDR, 152-2401
  • 24 4KV BUS ALT FDR, 152-2414
 	
CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.
 	
• Verify the following 4KV Vital Bus load breakers are open:
  • No. 22 Low Press Safety Inj. Pump, 152-2404
  • No. 22 Salt Water Pump, 152-2405
  • No. 22 Containment Spray Pump, 152-2407
  • No. 22 High Press Safety Inj. Pump, 152-2408
  • No. 23 High Press Safety Inj. Pump, 152-2410
  • No. 23 Service Water Pump, 152-2411
  • No. 23 Salt Water Pump, 152-2412
  • AFW PP No. 23, 152-2415
 	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS

A. (continued)

CAUTION
The following step provides actions to prevent water hammer damage from CAC voiding.

CAUTION
SRW Pumps start when power is restored to the associated 4KV Bus.

3. **IF** CSAS has actuated,
   AND EITHER SRW Header is **NOT** in operation,
   THEN perform the following actions:

   a. **IF** 21 SRW Header is idle,
      THEN restart 21 SRW Header as follows:

      (1) Check that Containment Pressure has remained less than 25 PSIG with 21 SRW Header idle.

      (2) Attempt to start the desired SRW PP on 21 SRW Header.

(continue)

ALTERNATE ACTIONS

a.1 **IF** Containment Pressure exceeded 25 PSIG,
    THEN perform the following actions:

CAUTION
2A DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2A DG.

WARNING
High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.

   (1) Restart 21 SRW Header:

      (a) Shut 21 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-135, located 27 ft East Pen Room.

      (b) Shut 22 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-142, located 5 ft West Pen Room.

      (c) Attempt to start the desired SRW PP on 21 SRW Header.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3.a (continued) (continue)	A.3.a.1(1) (continued) (d) Consult with the Plant Technical Support Center for guidance on system restoration. (2) **IF** 21 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 21 SRW Header in PULL TO LOCK. (b) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (c) Locally trip the 2A DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3 (continued) b. **IF** 22 SRW Header is idle, **THEN** restart 22 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 22 SRW Header idle. (2) Attempt to start the desired SRW PP on 22 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **2B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 22 SRW Header: (a) Shut 23 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-149, located 27 ft East Pen Room. (b) Shut 24 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-156, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 22 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.3.b (continued)	A.3.b.1 (continued) (2) **IF** 22 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 22 SRW Header in PULL TO LOCK. (b) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (c) Locally trip the 2B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
B. MAINTAIN VITAL AUXILIARIES USING THE DIESEL GENERATORS.	
1. **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: a. Open the Control Room panel bench board lower front covers. b. Remove the front and back covers of the Control Room DG Control Consoles. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.1 (continued)

NOTE
The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 22 AND 14 battery chargers are lost.

c. Determine whether Unit 2 Plant Computer is functional by observing the following:

- Time indication updating on the CRT
- CRT responding to function keys depressed or items selected from menu

d. **IF** Unit 2 Plant Computer is functioning,
THEN shutdown the Unit 2 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows:

(1) Depress the Shift key and type "@@A".

(2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt.

(3) Type "GUEST1" and depress the Return key.

(4) Observe the "ENTER KEY" response.

(5) Depress the Return key.

(6) Observe the message (8 lines) and the "TSM>" prompt.

(7) Type "KILLER" and depress the Return key.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.1.d (continued)

(8) Observe the messages (several pages) and the "TSM>" prompt.

(9) Type "X" and depress the Return key.

(10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE".

(11) Depress the Shift key and type "@@P".

(12) Observe the "//" prompt.

(13) Type "HALT" and depress the Return key.

NOTE
"NNNNNNNN" in the following response may be any number.

(14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//".

e. Open the following power sources, located in the Unit 2 Cable Spreading Room:

- Instrument Bus Switch 2Y10-80 (Computer Inverter 2Y05)
- Unit 2 DAS/Computer Inverter Output Breaker at 2Y05
- Unit 2 DAS/Computer Inverter Battery Input Breaker at 2Y05

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
2. **IF** 21 and 24 4KV Vital Buses are **NOT** energized, **THEN** perform the following actions:	2.1 **IF** a Diesel Generator can **NOT** be aligned to energize at least ONE 4KV Vital Bus, **THEN PROCEED** to VA-3, SMECO.
a. Shut CC CNTMT SUPP valve, 2-CC-3832-CV.	
b. Verify 2A DG has started **AND** its OUT BKR, 152-2103, closed.	
c. Verify 2B DG has started **AND** its OUT BKR, 152-2403, closed.	
NOTE Align the 0C DG to the unit with redundant safety related equipment out of service.	
d. **IF** the 0C DG is **NOT** supplying a vital 4KV bus **AND** it is desired to place the 0C DG on 21 4KV bus, **THEN** perform the following:	
(1) **IF** the 0C DG is **NOT** running, **THEN** direct an operator to perform an emergency start from the local panel **PER** OI-21C, 0C DIESEL GENERATOR.	
(2) Verify 07 4KV BUS FDR, 152-0704 is open.	
(3) Verify the 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK.	
(4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK.	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.d (continued) (5) Dispatch an operator to operate disconnect 189-2106 as follows: (a) Obtain the 189-2106 keys from the CR key locker. (b) Close 0C DG 21 4KV BUS DISC, 189-2106. (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 is closed. (7) **WHEN** disconnect 189-2106 is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (a) Close 07 4KV BUS TIE, 152-0701. (b) Insert the sync stick **AND** close the 0C DG 21 4KV BUS FDR, 152-2106 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. e. **IF** the 0C DG is **NOT** supplying a vital 4KV bus **AND** it is desired to place the 0C DG on 24 4KV bus, **THEN** perform the following: (1) **IF** the 0C DG is **NOT** running, **THEN** direct an operator to perform an emergency start from the local panel **PER** OI-21C, 0C DIESEL GENERATOR. (2) Verify 07 4KV BUS FDR, 152-0704 is open. (3) Verify the 0C DG 24 4KV BUS FDR, 152-2406 in PULL TO LOCK. (4) Verify 2B DG OUT BKR, 152-2403 in PULL TO LOCK. (5) Dispatch an operator to operate disconnect 189-2406 as follows: (a) Obtain the 189-2406 keys from the CR key locker. (b) Close 0C DIESEL GENERATOR TO BUS 24, 189-2406. (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 is closed. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.e (continued) (7) **WHEN** disconnect 189-2406 is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (a) Close 07 4KV BUS TIE, 152-0701. (b) Insert the sync stick **AND** close the 0C DG 24 4KV BUS FDR, 152-2406. 3. Dispatch an operator to monitor DG operation. 4. **IF ANY** 125V DC Bus is less than 105 volts: • 11 • 12 • 21 • 22 **THEN** concurrently perform AOP-7J, <u>LOSS OF 120V VITAL AC OR 125V VITAL DC POWER</u>. 5. **IF** less than THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 **THEN** concurrently perform AOP-7J, <u>LOSS OF 120V VITAL AC OR 125V VITAL DC POWER</u>. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 6. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 21A and 21B • 24A and 24B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. 7. **IF** 2Y09 and 2Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 2Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-214R is energized. (2) Close the Instrument Bus Transformer 21 Feeder Breaker, 52-21429. (3) Close the Main Feeder Breaker, 1, on 2Y09. b. Energize 2Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-204R is energized. (2) Close the Transformer 2X09 Inst AC Bus 22 (2Y10) Feeder Breaker, 52-20429. (3) Close the Main Feeder Breaker, 77, on 2Y10. 8. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, 125 VOLT VITAL DC.	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SW PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, LOSS OF SERVICE WATER • Saltwater Pumps **PER** AOP-7A, LOSS OF SALTWATER COOLING • Control Room Ventilation **PER** OI-22F, CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION • Switchgear Room Ventilation **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING • 72' Computer Room Ventilation **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION
NOTE 2A or 2B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 2A or 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to a running DG, **THEN** locally trip the DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
4. **IF** 23 AFW PP starts **AND** 21 or 22 AFW PP is operating, **THEN** secure 23 AFW PP.	
5. **IF** Component Cooling Flow has been lost, **THEN** restore flow.	
a. Verify CC CNTMT SUPP valve, 2-CC-3832-CV, is shut.	
b. Start a CC PP.	
c. Verify the CC HX in service is being supplied from an operating Saltwater Header.	
NOTE RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.	
d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 21A RCP: _____° F / _____° F • 21B RCP: _____° F / _____° F • 22A RCP: _____° F / _____° F • 22B RCP: _____° F / _____° F	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.5 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPP valve, 2-CC-3832-CV. f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPP valve, 2-CC-3832-CV. (3) Slowly open 2-CC-284 to restore component cooling flow. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 6. **IF** 2Y09 **OR** 2Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus *as follows:* a. **IF** 2Y09 is de-energized, **THEN** Tie 2Y09 to 2Y10: (1) On 2Y09, open INSTR. TRANSF. 21 2X08 main feeder breaker 1. (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78. (3) Place the *2Y09-2Y10 BUS TIE* Switch 2SY09, located between 2Y09 and 2Y10, to ON. b. **IF** 2Y10 is de-energized, **THEN** Tie 2Y10 to 2Y09: (1) On 2Y10, open INSTR. TRANSF. 22 2X09 main feeder breaker 77. (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78. (3) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON. 7. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus, **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.	

APPENDIX (2) VITAL AUXILIARIES

VA-2: EMERGENCY DIESEL GENERATOR

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-2.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
 	
• At least ONE 4KV Vital Bus is energized
 	
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
 	
• At least THREE 120V AC Vital Buses are energized:
  • 21
  • 22
  • 23
  • 24
 	
• **EITHER** 2Y09 or 2Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN PROCEED to the next appropriate Vital Auxiliaries Success Path.

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	
1. **IF** 21 13KV Service Bus is **NOT** energized, **THEN** ensure the following 13KV breakers are open: • 21 SERV BUS 13KV FDR, 252-2104 • 21 SERV BUS TIE, 252-2105 • U-4000-21 13KV FDR, 252-2102 • U-4000-22 13KV FDR, 252-2103 • U-4000-23 13KV FDR, 252-2101 • Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106	
2. **IF** 11 13KV Service Bus is **NOT** energized, **THEN** ensure the following 13KV breakers are open: • 11 SERV BUS 13KV FDR, 252-1104 • 11 SERV BUS TIE, 252-1105 • U-4000-12 13KV FDR, 252-1103 • U-4000-11 13KV FDR, 252-1102 • U-4000-13 13KV FDR, 252-1101 • Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106	

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	**ALTERNATE ACTIONS**

A. (continued)
 	
3. **IF** 21 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:
 	
• Ensure the following 4KV breakers are open:
  • 21 4KV BUS NORMAL FDR, 152-2101
  • 21 4KV BUS ALT FDR, 152-2115
  • SWYD SERV XFMR 4KV FDR, 152-2113
 	
CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.
 	
• Verify the following 4KV Vital Bus load breakers are open:
  • No. 21 Low Press Safety Inj. Pump, 152-2104
  • No. 21 Salt Water Pump, 152-2105
  • No. 21 Containment Spray Pump, 152-2107
  • No. 21 High Press Safety Inj. Pump, 152-2108
  • No. 23 High Press Safety Inj. Pump, 152-2110
  • No. 23 Service Water Pump, 152-2111
  • No. 23 Salt Water Pump, 152-2112
 	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.3 (continued)

- Place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON

4. **IF** 24 4KV Vital Bus is **NOT** energized, **THEN** perform the following actions:

    - Ensure the following 4KV breakers are open:

        - 24 4KV BUS NORMAL FDR, 152-2401
        - 24 4KV BUS ALT FDR, 152-2414

CAUTION
Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.

- Verify the following 4KV Vital Bus load breakers are open:

    - No. 22 Low Press Safety Inj. Pump, 152-2404
    - No. 22 Salt Water Pump, 152-2405
    - No. 22 Containment Spray Pump, 152-2407
    - No. 22 High Press Safety Inj. Pump, 152-2408
    - No. 23 High Press Safety Inj. Pump, 152-2410
    - No. 23 Service Water Pump, 152-2411

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) • No. 23 Salt Water Pump, 152-2412 • AFW PP No. 23, 152-2415 • Place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
CAUTION **The following step provides actions to prevent water hammer damage from CAC voiding.**	
CAUTION **SRW Pumps start when power is restored to the associated 4KV Bus.**	
5. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 21 SRW Header is idle, **THEN** restart 21 SRW Header as follows:	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions:
(1) Check that Containment Pressure has remained less than 25 PSIG with 21 SRW Header idle.	**CAUTION** **2A DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2A DG.**
(2) Attempt to start the desired SRW PP on 21 SRW Header.	**WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.**
	(1) Restart 21 SRW Header:
	(a) Shut 21 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-135, located 27 ft East Pen Room.
	(b) Shut 22 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-142, located 5 ft West Pen Room.
	(c) Attempt to start the desired SRW PP on 21 SRW Header.
(continue)	(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.a (continued) (continue)	A.5.a.1(1) (continued) (d) Consult with the Plant Technical Support Center for guidance on system restoration. (2) IF 21 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 21 SRW Header in PULL TO LOCK. (b) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (c) Locally trip the 2A DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) b. **IF** 22 SRW Header is idle, **THEN** restart 22 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 22 SRW Header idle. (2) Attempt to start the desired SRW PP on 22 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **<u>CAUTION</u>** **2B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2B DG.** **<u>WARNING</u>** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 22 SRW Header: (a) Shut 23 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-149, located 27 ft East Pen Room. (b) Shut 24 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-156, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 22 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.b (continued)	A.5.b.1 (continued) (2) **IF** 22 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 22 SRW Header in PULL TO LOCK. (b) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (c) Locally trip the 2B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM THE SMECO POWER SUPPLY SYSTEM.	
1. **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: a. Open the Control Room panel bench board lower front covers. b. Remove the front and back covers of the Control Room DG Control Consoles. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, **OR** if 22 AND 14 battery chargers are lost. c. Determine whether Unit 2 Plant Computer is functional by observing the following: • Time indication updating on the CRT • CRT responding to function keys depressed or items selected from menu d. **IF** Unit 2 Plant Computer is functioning, **THEN** shutdown the Unit 2 Plant Computer at the Digital Decwriter III, located in the 45 ft computer room, as follows: (1) Depress the Shift key and type "@@A". (2) Observe the message and the "ENTER YOUR OWNERNAME:" prompt. (3) Type "GUEST1" and depress the Return key. (4) Observe the "ENTER KEY" response. (5) Depress the Return key. (6) Observe the message (8 lines) and the "TSM>" prompt. (7) Type "KILLER" and depress the Return key. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.d (continued) (8) Observe the messages (several pages) and the "TSM>" prompt. (9) Type "X" and depress the Return key. (10) Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". (11) Depress the Shift key and type "@@P". (12) Observe the "//" prompt. (13) Type "HALT" and depress the Return key. **NOTE** "NNNNNNNN" in the following response may be any number. (14) Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". e. Open the following power sources, located in the Unit 2 Cable Spreading Room: • Instrument Bus Switch 2Y10-80 (Computer Inverter 2Y05) • Unit 2 DAS/Computer Inverter Output Breaker at 2Y05 • Unit 2 DAS/Computer Inverter Battery Input Breaker at 2Y05 (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
2. Align the SMECO Power Supply System to the 13KV Service Buses by performing the following actions:	2.1 **IF** the SMECO Power Supply System is **NOT** available **AND EITHER** 500KV Bus is available **OR** the Diesel Generators are able to supply power to at least ONE 4KV Vital Bus, **THEN PROCEED** to VA-1, <u>500KV OFFSITE POWER</u> **OR** VA-2, <u>EMERGENCY DIESEL GENERATOR</u>.
a. Contact the SMECO Distribution Center (301-274-9285) to ensure the following:	
• SMECO substation is in a normal lineup	
• SMECO Engineering Department is informed of possible raised demand on their 69KV - 13KV substation	
<u>WARNING</u> **Protective equipment shall be worn when operating 13KV disconnects.**	
<u>WARNING</u> **Improper operation of disconnect can result in serious injury. Keep body and head clear of operating arc of handle. Do NOT release handle prior to full travel. When the disconnect is opened or closed, a very loud bang will be heard.**	
b. **IF** SMECO is supplying the warehouses through 13KV Disconnect Switch 0SH301, **THEN** shift warehouse power supplies by performing the following:	
(1) Remove the OPS lock from 13.8KV SMECO DISCONNECT, 0SH301.	
(2) Open 13.8KV SMECO DISCONNECT, 0SH301, to remove warehouse loads.	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.b (continued) (3) Rotate Kirk key 20497 fully clockwise. (4) Remove the key from 13.8KV SMECO DISCONNECT, 0SH301. (5) Insert Kirk key 20497 into 13.2KV SMECO DISCONNECT, 0SH302. (6) Rotate the key counterclockwise. (7) Close 13.2KV SMECO DISCONNECT, 0SH302. (8) Place OPS lock on 13.8KV SMECO DISCONNECT, 0SH301. c. IF 23 13KV Service Bus is **NOT** energized from the SMECO Power Supply System, **THEN** perform the following: (1) Rack in the OFFSITE PWR SOURCE FROM SMECO 252-2301, supply feeder to 23 13KV Service Bus. (2) Ensure the close and trip circuit fuses are in the ON position. (3) Verify the following breakers are open: • 21 SERV BUS TIE, 252-2105 • 11 SERV BUS TIE, 252-1105 (4) Energize 23 13KV Service Bus by locally closing Breaker 252-2301. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2 (continued)

d. **IF** it is desired to align the SMECO Power Supply System to 21 13KV Service Bus,
THEN energize 21 13KV Service Bus as follows:

(1) Verify 21 13KV Service Bus is de-energized.

(2) Verify the following breakers are open:

- 21 SERV BUS 13KV FDR, 252-2104
- 21 SERV BUS TIE, 252-2105
- U-4000-21 13KV FDR, 252-2102
- U-4000-22 13KV FDR, 252-2103
- U-4000-23 13KV FDR, 252-2101
- 11 SERV BUS TIE, 252-1105
- Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

(3) Energize 21 13KV Service Bus by closing 21 SERV BUS TIE, 252-2105.

(4) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE.

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-21-P
- B-21-B

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.d (continued) (6) **IF** MCC 216T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT: • 2H2101REG • 2H2102REG • 2H2103REG e. **IF** it is desired to align the SMECO Power Supply System to 11 13KV Service Bus, **THEN** energize 11 13KV Service Bus as follows: (1) Verify 11 13KV Service Bus is de-energized. (2) Verify the following breakers are open: • 11 SERV BUS 13KV FDR, 252-1104 • 11 SERV BUS TIE, 252-1105 • U-4000-12 13KV FDR, 252-1103 • U-4000-11 13KV FDR, 252-1102 • U-4000-13 13KV FDR, 252-1101 • 21 SERV BUS TIE, 252-2105 • Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106 (3) Energize 11 13KV Service Bus by closing 11 SERV BUS TIE, 252-1105. (4) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2.e (continued)

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-11-P
- B-11-B

(6) **IF** MCC 116T is de-energized, **THEN** place the following LTC Drive Power Selector Switches in ALT:

- 1H1101REG
- 1H1102REG
- 1H1103REG

NOTE

The SMECO Power Supply System overload capabilities are based on a 24 hour cycle. Thus, 216 AMPS or less must be maintained for at least 16 hours before using the 8 hours overload or 20 hours before using the 4 hours overload rating.

3. Limit the total current drawn on the SMECO Power Supply System as indicated on 23 Bus 13KV SMECO Feeder ammeter located on 2C17 as follows:

- 240 AMPS Continuous
- 216 AMPS for 16 hours followed by 264 AMPS for up to 8 hours, then reducing to 216 AMPS
- 216 AMPS for 20 hours followed by 295 AMPS for up to 4 hours, then reducing to 216 AMPS

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

NOTE
Only two of the four engineering safety features buses may be re-energized from the SMECO Power Supply System.

4. Restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows:

   a. **IF NO** CC PPs are operating,
   THEN shut CC CNTMT SUPP valve, 2-CC-3832-CV.

   b. **IF** 21 13KV Service Bus is available to supply 21 4KV Vital Bus,
   THEN energize 21 4KV Vital Bus from 21 13KV Service Bus as follows:

      (1) Verify the following breakers are open:

      - 21 4KV BUS ALT FDR, 152-2115
      - 22 4KV BUS NORMAL FDR, 152-2201
      - 23 4KV BUS NORMAL FDR, 152-2311

      (2) **IF** 24 4KV Bus is **NOT** being supplied from 21 13KV Service Bus,
      THEN verify 24 4KV BUS NORMAL FDR, 152-2401, is open.

      (3) Close the U-4000-22 13KV FDR, 252-2103.

      (4) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK.

      (5) Verify 21 4KV BUS ALT FDR, 152-2101, is open.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.b (continued) (6) Insert the sync stick into the sync jack at the 21 4KV BUS ALT FDR, 152-2115. (7) Close the 21 4KV BUS ALT FDR, 152-2115. (8) Return the sync stick to its normal position. c. **IF** 21 13KV Service Bus is available to supply 24 4KV Vital Bus, **THEN** energize 24 4KV Vital Bus from 21 13KV Service Bus as follows: (1) Verify the following breakers are open: • 24 4KV BUS NORMAL FDR, 152-2401 • 22 4KV BUS NORMAL FDR, 152-2201 • 23 4KV BUS NORMAL FDR, 152-2311 (2) **IF** 21 4KV Vital Bus is **NOT** being supplied from 21 13KV Service Bus, **THEN** verify 21 4KV BUS ALT FDR, 152-2115, is open. (3) Close the U-4000-22 13KV FDR, 252-2203. (4) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (5) Place 23 AFW PP in PULL TO LOCK. (6) Verify the 24 4KV BUS ALT FDR, 152-2414, is open. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.c (continued) (7) Insert the sync stick into the sync jack at the 24 4KV BUS NORMAL FDR, 152-2401. (8) Close the 24 4KV BUS NORMAL FDR, 152-2401. (9) Return the sync stick to its normal position. d. **IF** 11 13KV Service Bus is available to supply 21 4KV Vital Bus, **THEN** energize 21 4KV Vital Bus from 11 13KV Service Bus as follows: (1) Verify the following breakers are open: • 21 4KV BUS NORMAL FDR, 152-2101 • 22 4KV BUS ALT FDR, 152-2209 • 23 4KV BUS ALT FDR, 152-2301 (2) **IF** 24 4KV Bus is **NOT** being supplied from 11 13KV Service Bus, **THEN** verify 24 4KV BUS ALT FDR, 152-2414, is open. (3) Close the U-4000-12 13KV FDR, 252-1103. (4) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (5) Verify 21 4KV BUS ALT FDR, 152-2115, is open. (6) Insert the sync stick into the sync jack at the 21 4KV BUS NORMAL FDR, 152-2101. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.d (continued) (7) Close the 21 4KV BUS NORMAL FDR, 152-2101. (8) Return the sync stick to its normal position. e. **IF** *11 13KV Service Bus is available to supply 24 4KV Vital Bus,* **THEN** energize 24 4KV Vital Bus from 11 13KV Service Bus as follows: (1) Verify the following breakers are open: • 24 4KV BUS ALT FDR, 152-2414 • 22 4KV BUS ALT FDR, 152-2209 • 23 4KV BUS ALT FDR, 152-2301 (2) **IF** 21 4KV Vital Bus is **NOT** being supplied from 11 13KV Service Bus, **THEN** verify 21 4KV BUS NORMAL FDR, 152-2101, is open. (3) Close the U-4000-12 13KV FDR, 252-1103. (4) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (5) Place 23 AFW PP in PULL TO LOCK. (6) Verify 24 4KV BUS NORMAL FDR, 152-2401, is open. (7) Insert the sync stick into the sync jack at the 24 4KV BUS ALT FDR, 152-2414. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.e (continued) (8) Close the 24 4KV BUS ALT FDR, 152-2414. (9) Return the sync stick to its normal position. 5. **IF ANY** 125V DC Bus is less than 105 volts: • 11 • 12 • 21 • 22 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 6. **IF** less than THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 **THEN** concurrently perform AOP-7J, LOSS OF 120V VITAL AC OR 125V VITAL DC POWER. 7. **IF** at least ONE set of 480V Vital AC Buses is **NOT** energized: • 21A and 21B • 24A and 24B **THEN** restore power to at least ONE set of buses concurrently **PER** OI-27D, STATION POWER 480V SYSTEM. (continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 8. **IF** 2Y09 and 2Y10 are **NOT** energized, **THEN** restore power to at least ONE bus as follows: a. Energize 2Y09 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-214R is energized. (2) Close the Instrument Bus Transformer 21 Feeder Breaker, 52-21429. (3) Close the Main Feeder Breaker, 1, on 2Y09. b. Energize 2Y10 through its Main Feeder Breaker by performing the following actions: (1) Verify MCC-204R is energized. (2) Close the Transformer 2X09 Inst. AC Bus 22 (2Y10) Feeder Breaker, 52-20429. (3) Close the Main Feeder Breaker, 77, on 2Y10. 9. Verify at least ONE 125V DC Battery Charger is energized for each battery **PER** OI-26A, <u>125 VOLT VITAL DC</u>.	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SW PP on the same header • 11 or 12 Control Room Ventilation • Switchgear Room Ventilation • 72' Computer Room Ventilation	1.1 Concurrently restore the appropriate equipment as follows: • Service Water Pumps **PER** AOP-7B, LOSS OF SERVICE WATER • Saltwater Pumps **PER** AOP-7A, LOSS OF SALTWATER COOLING • Control Room Ventilation **PER** OI-22F, CONTROL ROOM AND CABLE SPREADING ROOMS VENTILATION • Switchgear Room Ventilation **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING • 72' Computer Room Ventilation **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION
NOTE 2A or 2B DG will require a SRW and a SW Pump running on its associated supply header.	
2. **IF** 2A or 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	2.1 **IF** SRW/SW cooling can **NOT** be restored to a running DG, **THEN** locally trip the DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
3. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	3.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
4. **IF** 23 AFW PP starts **AND** 21 or 22 AFW PP is operating, **THEN** secure 23 AFW PP.	
5. **IF** Component Cooling Flow has been lost, **THEN** restore flow.	
a. Verify CC CNTMT SUPP valve, 2-CC-3832-CV, is shut.	
b. Start a CC PP.	
c. Verify the CC HX in service is being supplied from an operating Saltwater Header.	
NOTE RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.	
d. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:	
• 21A RCP: _____° F / _____° F	
• 21B RCP: _____° F / _____° F	
• 22A RCP: _____° F / _____° F	
• 22B RCP: _____° F / _____° F	
(continue)	

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.5 (continued)

CAUTION

Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.

e. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** open CC CNTMT SUPP valve, 2-CC-3832-CV.

f. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **AND** the RCP Controlled Bleed-off temperatures have been recorded, **THEN** perform the following actions:

(1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room.

(2) Open CC CNTMT SUPP valve, 2-CC-3832-CV.

(3) Slowly open 2-CC-284 to restore component cooling flow.

(continue)

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

6. **IF** 2Y09 **OR** 2Y10 is **NOT** energized, **THEN** restore the affected Instrument Bus as follows:

   a. **IF** 2Y09 is de-energized, **THEN** Tie 2Y09 to 2Y10:

      (1) On 2Y09, open INSTR. TRANSF. 21 2X08 main feeder breaker 1.

      (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78.

      (3) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON.

   b. **IF** 2Y10 is de-energized, **THEN** Tie 2Y10 to 2Y09:

      (1) On 2Y10, open INSTR. TRANSF. 22 2X09 main feeder breaker 77.

      (2) On 2Y10, close BUS TIE 208/120V INSTR. BUS 21 Breaker 78.

      (3) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON.

7. **IF** equipment needed to maintain Safety Functions is available from a de-energized bus, **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.

APPENDIX (2) VITAL AUXILIARIES

VA-3: SMECO

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-3.	

1. Check Vital Auxiliaries has been satisfied by the following indications:
• At least ONE 4KV Vital Bus is energized
• 11, 12, 21 and 22 125V DC BUS VOLTS **ALL** greater than 105 volts
• At least THREE 120V AC Vital Buses are energized:
  • 21
  • 22
  • 23
  • 24
• **EITHER** 2Y09 or 2Y10 is energized
	1.1 **IF** Vital Auxiliaries has **NOT** been satisfied,
	THEN perform the following actions:
	a. Concurrently perform the recovery actions for the next safety function to be satisfied.
	b. Determine the appropriate emergency response actions **PER** the ERPIP.
	c. Evaluate further actions based on the following considerations:
	  • The urgency of other jeopardized safety functions
	  • The feasibility of restoring function to a success path by use of alternate components to implement a success path

2. **WHEN** Vital Auxiliaries has been established, **THEN PROCEED** to the next Safety Function to be performed.	

VITAL AUXILIARIES PLACEKEEPER
VA-1: 500KV OFFSITE POWER

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• At least ONE 500KV Bus is available	• At least ONE 4KV vital bus is energized • 11, 12, 21 and 22 125V DC Buses, **ALL** greater than 105 volts • At least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 • EITHER 2Y09 or 2Y10 is energized

START	FUNCTION	DONE	PAGE
	A. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		1
	• Ensure breakers are open		1
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 21 4KV Bus in ON		3
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 24 4KV Bus in ON		4
	• **IF** a SRW Header is **NOT** in operation **THEN** attempt to restart: • 21 SRW Header – CNTMT pressure less than 25 PSIG. • 22 SRW Header – CNTMT pressure less than 10 PSIG.		5
	B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM 500KV OFFSITE POWER.		8
	NOTE: The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 22 AND 14 battery chargers are lost.		
	• **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions: • Open Control Room panel covers • Shutdown the Unit 2 Plant Computer		8
	• **IF** 500KV offsite power is **NOT** available, **THEN PROCEED** to VA-2 OR VA-3.		11
	• Verify at least ONE 125V DC Battery Charger is energized for each battery		22

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-1: 500KV OFFSITE POWER
(continued)

START	FUNCTION	DONE	PAGE
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.		23
	• **IF** SRW/SW cooling can **NOT** be restored to 2A or 2B DG, **THEN** locally trip the 2A or 2B DG fuel racks.		23
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284.		25
	• Tie 2Y09 and 2Y10		26
	• **IF** equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		26
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-1.		27
	• **IF** Vital Auxiliaries has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Vital Auxiliaries Success Path.		27

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

VITAL AUXILIARIES PLACEKEEPER
VA-2: EMERGENCY DIESEL GENERATOR

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• 2A, 2B OR 0C Diesel Generator is available	• At least ONE 4KV vital bus is energized
	• 11, 12, 21 and 22 125V DC Buses, ALL greater than 105 volts
	• At least THREE 120V AC Vital Buses are energized:
	  • 21
	  • 22
	  • 23
	  • 24
	• EITHER 2Y09 or 2Y10 is energized

START	FUNCTION	DONE	PAGE
	A. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		28

	• Ensure breakers are open
	• **IF** a SRW Header is **NOT** in operation
	THEN attempt to restart:
	  • 21 SRW Header – CNTMT pressure less than 25 PSIG.
	  • 22 SRW Header – CNTMT pressure less than 10 PSIG.
			28
			31

	B. MAINTAIN VITAL AUXILIARIES USING THE DIESEL GENERATORS.		34

	NOTE: The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 22 AND 14 battery chargers are lost.
	• **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes,
	THEN perform the following actions:
	  • Open Control Room panel covers
	  • Shutdown the Unit 2 Plant Computer
	• **IF** a Diesel Generator can **NOT** be aligned to at least ONE 4KV Vital Bus,
	THEN PROCEED to VA-3.
	• Verify at least ONE 125V DC Battery Charger is energized for each battery
			34
			
			37
			
			41

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-2: EMERGENCY DIESEL GENERATOR
(continued)

START	FUNCTION	DONE	PAGE
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING **AND** RESTORE AUXILIARIES.	C	42
	• **IF** SRW/SW cooling can **NOT** be restored to 2A or 2B DG, **THEN** locally trip the 2A or 2B DG fuel racks. • **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284. • Tie 2Y09 and 2Y10 • **IF** equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		42 42 45 45
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-2.		46
	• **IF** Vital Auxiliaries has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Vital Auxiliaries Success Path.		46

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

VITAL AUXILIARIES PLACEKEEPER
VA-3: SMECO

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• SMECO Power Supply System is available	• At least ONE 4KV vital bus is energized
	• 11, 12, 21 and 22 125V DC Buses, ALL greater than 105 volts
	• At least THREE 120V AC Vital Buses are energized:
	  • 21
	  • 22
	  • 23
	  • 24
	• EITHER 2Y09 or 2Y10 is energized

START	FUNCTION	DONE	PAGE
	A. IF 500KV OFFSITE POWER HAS BEEN LOST, THEN ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		47
	• Ensure breakers are open		47
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 21 4KV Bus in ON		49
	• Place 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch for 24 4KV Bus in ON		50

	• IF a SRW Header is NOT in operation THEN attempt to restart:
	  • 21 SRW Header – CNTMT pressure less than 25 PSIG.
	  • 22 SRW Header – CNTMT pressure less than 10 PSIG.
			51

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

VA-3: SMECO
(continued)

START	FUNCTION	DONE	PAGE
	B. MAINTAIN VITAL AUXILIARIES BY SUPPLYING POWER FROM THE SMECO POWER SUPPLY SYSTEM.		54
	NOTE: The Plant Computer and its associated inverter, 2Y05A, must be shed from the DC buses within 30 minutes into the blackout if control room air conditioning is lost, OR if 22 AND 14 battery chargers are lost.		

	• **IF** power is **NOT** expected to be restored to at least ONE 4KV Vital Bus within 30 minutes, **THEN** perform the following actions:
	  • Open Control Room panel covers
	  • Shutdown the Unit 2 Plant Computer
			54

	• **IF** SMECO is **NOT** available **AND EITHER** 500KV Bus is available **OR** the Diesel Generators are available, **THEN PROCEED** to VA-1 OR VA-2.		57
	• Verify at least ONE 125V DC Battery Charger is energized for each battery		67
	C. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING AND RESTORE AUXILIARIES.	C	68
	• **IF** SRW/SW cooling can **NOT** be restored to 2A or 2B DG, **THEN** locally trip the 2A or 2B DG fuel racks.		68
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284.		70
	• Tie 2Y09 and 2Y10		71
	• **IF** equipment needed to maintain Safety Functions is available from a de-energized bus **AND** a power supply is available, **THEN** energize the bus, **AND** restore the needed equipment.		71
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH VA-3.		72

	• **IF** Vital Auxiliaries has **NOT** been satisfied, **THEN** perform the following actions:
	  • Concurrently perform the Recovery actions for the next safety function to be satisfied
	  • Determine the appropriate emergency response actions **PER** the ERPIP
	  • Evaluate further actions
			72

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RCS INVENTORY CONTROL USING CVCS.	
1. Verify the normal charging path is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 2-CVC-518-CV • 2-CVC-519-CV	1.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flow path to the RCS via the HPSI AUX HDR as follows: a. Shut HPSI AUX HDR ISOL valve, 2-SI-656-MOV. b. Open **ONE** of the HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV c. Open SI TO CHG HDR valve, 2-CVC-269-MOV. d. Shut the REGEN HX CHG INLET valve, 2-CVC-183, located in the 27 ft West Penetration Room. e. Shut L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV 1.2 **IF** a charging flowpath can **NOT** be established via the HPSI AUX HDR, **THEN** perform the following: a. Verify REGEN HX CHG INLET valve, 2-CVC-183, is open. b. Charge through the Loop Charging valves Bypass Valve, 2-CVC-188.
2. Verify at least ONE CHG PP is operating. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
3. Verify RCS makeup flow by the following indications: • CHG HDR PRESS is greater than RCS pressure • Running current for the operating CHG PP(s) is between 75 and 95 AMPS	
4. Check pressurizer level has stabilized by observing the following: • Level is greater than 30 inches • Level is trending to 160 inches • Reactor Vessel level above the top of the hot leg	4.1 **IF** pressurizer level has **NOT** been stabilized, **THEN** operate charging and letdown to restore and maintain pressurizer level between 130 and 180 inches. 4.2 **IF** charging is unable to maintain minimum pressurizer level, **THEN PROCEED** to PIC-4, SIS. 4.3 **IF** letdown is **NOT** operating **AND** the HPSI AUX HDR is **NOT** being used for charging, **THEN** restore Letdown flow by performing the following:
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) (continue)	A.4.3 (continued) **WARNING** **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** a. Verify **ALL** of the following conditions: • The leak was **NOT** in the letdown line • HPSI throttle criteria are met • Charging flow path exists through LOOP CHG valves or AUX SPRAY valve • At least ONE CHG PP is operating • At least ONE CC PP is operating b. Verify the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, in Auto Remote. c. Place Letdown Pressure Controller, 2-PIC-201, in MANUAL with a 20% output. d. Place IX BYP valve, 2-CVC-520-CV, in BYPASS. e. Shift LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	A.4.3 (continued)

RECOVERY ACTIONS

A.4 (continued)

(continue)

ALTERNATE ACTIONS

A.4.3 (continued)

f. **IF** the plant computer is **NOT** operating,
THEN record the following information:

- RCS T_{COLD}
- CHG OUT TEMP (2-TI-229)
- Average CNTMT ambient temperature (2-TI-5309 and 2-TI-5311)
- 27' Penetration Room temperature (2-TI-5276 and 2-TI-5280)

g. Open L/D CNTMT ISOL valves:

- 2-CVC-515-CV
- 2-CVC-516-CV

CAUTION
The setpoint of 2-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.

h. Place Letdown Pressure Controller, 2-PIC-201 in service as follows:

(1) Adjust the setpoint on 2-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature.

(2) Shift Letdown Pressure Controller, 2-PIC-201 to AUTO.

i. Adjust LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	A.4.3 (continued) j. Shift LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. k. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. l. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches. m. **IF** pressurizer level is **NOT** trending to 160 inches, **THEN** shift the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, to Auto Local **AND** adjust the setpoint to 160 inches.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) (continue)	A.4.3 (continued) n. **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. (1) Open **BOTH** Letdown Control Valve Inlet valves: • 2-CVC-103 • 2-CVC-105 (2) Check open **BOTH** Letdown Control Valve Outlet valves: • 2-CVC-104 • 2-CVC-106 (3) Open **BOTH** Backpressure Regulating Inlet valves: • 2-CVC-108 • 2-CVC-110 (4) Check open **BOTH** Backpressure Regulating Outlet valves: • 2-CVC-109 • 2-CVC-111 (5) Place L/D CONTR VLVS handswitch, 2-HS-110-1, in BOTH. (6) Place BACKPRESSURE REG VLVS handswitch, 2-HS-201, in BOTH. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) (continue)	A.4 (continued) **NOTE** Core and RCS voiding may be indicated by the following: • Letdown flow greater than charging flow • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm 4.4 **IF** high pressurizer level condition appears to be caused by excessive RCS voiding, **THEN** reduce or eliminate voided area **PER** the selected heat removal success path.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 5. **IF** the RCS is water solid, **AND** it is desired to draw a bubble in the RCS, **THEN** perform the following actions: a. Energize the Pressurizer HTR(s). b. **IF EITHER** of the following conditions exist: • **BOTH** S/G pressures can be maintained less than RCS pressure • At least ONE RCP is running **THEN** draw a bubble in the RCS as follows: (1) **IF** the HPSI throttle criteria are met, **THEN** reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow. (2) Cooldown the RCS, while **NOT** exceeding 100° F in any one hour, using TBVs or ADVs. c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 and 180 inches. d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to maintain RCS level above the top of the hot leg. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
6. **IF** boration is **NOT** in progress **AND** the VCT is unable to be used to supply charging, **THEN** line up charging suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut VCT OUT valve, 2-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady.	
7. **IF** boration is **NOT** in progress **AND** the VCT is being used as a charging source, **THEN** maintain VCT level between 60 and 100 inches using automatic or manual makeup.	7.1 **IF** makeup is **NOT** available to the VCT **AND** VCT level approaches 60 inches, **THEN** shift Charging Pump(s) suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut VCT OUT valve, 2-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to VCT: (1) Open VCT OUT valve, 2-CVC-501-MOV. (2) Shut RWT CHG PP SUCT valve, 2-CVC-504-MOV.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ESTABLISH RCS PRESSURE CONTROL.	
1. **IF** Pressurizer HTRs **OR** SPRAYS are available, **THEN** control pressurizer pressure as follows:	
a. **IF** a cooldown is **NOT** in progress, **THEN** operate HTRs and SPRAYs as necessary to maintain pressurizer pressure between 1850 and 2300 PSIA **AND** is trending to 2250 PSIA.	a.1 **IF** pressurizer pressure is less than 2300 PSIA, **AND** PORV leakage is indicated by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication **THEN** perform the following: (1) Shut the appropriate PORV BLOCK valves: • 2-RC-403-MOV • 2-RC-405-MOV (2) Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 2-HS-1402 • 2-HS-1404 a.2 **IF** pressurizer pressure drops to 1725 PSIA as a result of the event, **THEN PROCEED** to PIC-4, <u>SIS</u>.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.a (continued)	B.1.a (continued)
	a.3 **IF** a Pressurizer Safety Valve is leaking, **AND** SIAS has **NOT** actuated, **THEN** attempt to reseat the Pressurizer Safety Valve by reducing pressurizer pressure to 1800 PSIA.
b. **IF** a cooldown is in progress, **THEN** perform the following:	
(1) Maintain RCS subcooling between 25 and 140° F based on CET temperatures.	(1).1 **IF** subcooling approaches 25° F, **THEN** raise subcooling by **ANY** of the following methods: (a) Operate Pressurizer HTR(s). (b) Raise the RCS cooldown rate, while **NOT** exceeding 100° F in any one hour. (1).2 **IF** subcooling approaches 140° F, **THEN** lower subcooling by **ANY** of the following methods: (a) De-energize Pressurizer HTR(s). (b) Operate Main or AUX SPRAY. (c) Lower the RCS cooldown rate.
(2) **IF** a controlled cooldown is in progress, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued)	

c. **IF** pressure reduction is desired **AND** Main Pressurizer Spray is ineffective in controlling pressurizer pressure, **THEN** initiate AUX SPRAY as follows:

CAUTION

If the difference between the PZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.

(1) Record the following information:

- PZR WTR TEMP (2-TI-101)
- CHG OUT TEMP (2-TI-229)

(2) Open AUX SPRAY valve, 2-CVC-517-CV.

(3) Operate LOOP CHG valves as necessary to adjust AUX SPRAY flow:

- 2-CVC-518-CV
- 2-CVC-519-CV

(4) Shift PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL.

(5) Shut PZR SPRAY VLVs by adjusting the output of 2-HIC-100 to 0%:

- 2-RC-100E-CV
- 2-RC-100F-CV

(6) Maintain pressurizer cooldown rate less than 200° F/hour.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. d. **IF** Pressurizer B/U HTR banks have tripped on U/V, **THEN** re-energize the heaters as follows: (1) Charge closing spring using manual lever at 480V breakers 52-2127 and 52-2427. (2) Push the PUSH-TO-CLOSE button on the breaker fronts. e. Verify RCS pressure and temperature are within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

2. **IF** Pressurizer HTRs and SPRAYS are **NOT** available,
   THEN control pressurizer pressure using controlled steaming as follows:

   a. **IF** RCS boration is **NOT** in progress, **THEN** commence RCS boration as follows:

      (1) Shut VCT M/U valve, 2-CVC-512-CV.

      (2) Open BA DIRECT M/U valve, 2-CVC-514-MOV.

      (3) Open BAST GRAVITY FD valves:

      - 2-CVC-508-MOV
      - 2-CVC-509-MOV

      (4) Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL.

      (5) Start **ALL** available BA PPs.

      (6) Shut VCT OUT valve, 2-CVC-501-MOV.

      (7) Start **ALL** available CHG PPs.

   b. Record the time RCS boration was commenced: __________

   c. Record BAST levels:

   - 21 BAST: __________
   - 22 BAST: __________

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) d. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating e. **WHEN** boration is complete, **THEN** secure boration as follows: (1) Open VCT OUT valve, 2-CVC-501-MOV. (2) Stop BA PP(s). (3) Shut BA DIRECT M/U valve, 2-CVC-514-MOV. (4) Shut BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV f. Allow pressurizer level to lower during the cooldown as necessary to aid in RCS depressurization, while maintaining pressurizer level greater than 30 inches. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) g. **IF** SGIS has **NOT** actuated, **THEN** perform the following actions: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. h. **IF** SIAS has **NOT** actuated, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. i. Commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADV(s) from the unaffected S/G(s), while **NOT** exceeding 100° F in any one hour. NOTE If a Pressurizer Safety Valve is leaking, reducing pressurizer pressure may reseat the Pressurizer Safety Valve. j. Control the cooldown rate in order to maintain RCS pressure and temperature **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2 (continued)

NOTE
If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid.

k. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** restore and maintain subcooling between 25 and 140° F based on CET temperatures as follows:

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.

(1) Raise subcooling by **ANY** of the following methods:

NOTE
Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS.

(a) Energize the Pressurizer HTR(s).

(b) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped.

(c) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(1) (continued) (d) **IF** high pressurizer level secures the backup CHG PPs **AND** more than ONE CHG PP is required to maintain subcooling, **THEN** perform the following actions: 1) Locally initiate SIAS A6 and B6. 2) **IF** boration is **NOT** in progress, **THEN** place the BA PP handswitches in PULL TO LOCK. (2) **IF** subcooling can **NOT** be maintained above 25° F, **THEN** attempt to take the pressurizer solid to establish RCS pressure control as follows: (a) Station a dedicated pressure control watch at 2C05 and 2C06 panels. (b) Verify letdown is operating. (c) **WHEN** pressurizer level is above 305 inches, **THEN** secure **ALL** but ONE CHG PP by placing their handswitches in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(2) (continued) (d) Charge as necessary with ONE CHG PP to maintain the following: • RCS subcooling at least 25° F based on CET temperatures • RCS pressure within the limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> (3) Lower subcooling by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) **IF ALL** RCPs are operating, **THEN** use Main PRESSURIZER SPRAY. (c) Lower the RCS cooldown rate. (d) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (e) Raise the letdown flow rate. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(3) (continued) (f) Initiate AUX SPRAY as follows: 1) Place the CIS OVERRIDE switch, 2-HS-2080A, in OVERRIDE. 2) Open the IA CNTMT ISOL valve, 2-IA-2080-MOV. **CAUTION** **If the difference between the PZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.** 3) Record the following information: • PZR WTR TEMP (2-TI-101) • CHG OUT TEMP (2-TI-229) 4) Open the AUX SPRAY valve, 2-CVC-517-CV. 5) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 2-CVC-518-CV • 2-CVC-519-CV 6) Shift the PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.k(3)(f) (continued) 7) Shut the PZR SPRAY VLVS by adjusting the output of 2-HIC-100 to 0%: • 2-RC-100E-CV • 2-RC-100F-CV 8) Maintain the pressurizer cooldown rate less than 200° F/hour. l. **IF** the RCS is water solid, **THEN** restore and maintain subcooling between 25 and 140° F based on CET temperatures as follows: (1) Lower subcooling by **ANY** of the following methods: (a) Lower RCS temperature. (b) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (c) De-energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.2.I (continued)

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.

(2) Raise subcooling by **ANY** of the following methods:

(a) Raise RCS temperature.

(b) **IF** HPSI flow has been reduced,
THEN raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped.

NOTE
Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS.

(c) Energize the Pressurizer HTR(s).

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) **NOTE** Core and RCS voiding may be indicated by the following: • Letdown flow greater than charging flow • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm m. **IF** voiding causes difficulty in depressurization, **THEN** reduce or eliminate the voided area by performing the following actions: (1) Shut the L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV (2) Stop depressurizing the RCS. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.m (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** (3) Cycle RCS subcooling between 25 and 140° F as follows: (a) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. • Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped. (continue)	(3).1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RX VESS VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.m(3) (continued) (b) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (c) Repeat steps B.2.m.(3).(a) through B.2.m.(3).(b) as necessary. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2.m (continued) **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** (4) **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (5) Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-1: CVCS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-1.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure less than the upper limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • Pressurizer level is greater than 30 inches • RCS subcooling is between 25 and 140° F based on CET temperatures • Reactor Vessel level above the top of the hot leg	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RCS INVENTORY CONTROL.	
1. **IF** pressurizer pressure is less than or equal to 1725 PSIA **OR** containment pressure is greater than or equal to 2.8 PSIG, **THEN** verify SIAS actuation.	
2. **IF** pressurizer pressure is greater than 1725 PSIA **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions to block SIAS: a. Open HPSI MAIN and AUX HDR valves: MAIN • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV AUX • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV b. Start 21 and 23 HPSI PPs. c. Start **ALL** available CHG PPs. d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.2 (continued) f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.	
3. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 21 HPSI PP • 23 HPSI PP • 21 LPSI PP • 22 LPSI PP • **ALL** available CHG PPs	
b. Verify safety injection flow: • HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>, when pressure is below 1270 PSIA • LPSI flow **PER** ATTACHMENT(11), <u>LOW PRESSURE SAFETY INJECTION FLOW</u>, when pressure is below 185 PSIA	b.1 Perform the following actions as necessary: • **IF** 21 HPSI PP failed, **THEN** start 22 HPSI PP. • **IF** 23 HPSI PP failed, **THEN** align 22 HPSI PP as follows: (1) Start 22 HPSI PP. (2) Open HPSI HDR XCONN valve, 2-SI-653-MOV. (3) Shut HPSI HDR XCONN valve, 2-SI-655-MOV. • Ensure electrical power is available to valves and pumps. • Verify safety injection system lineup **PER** ATTACHMENT (2), <u>SIAS VERIFICATION CHECKLIST</u>.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)
 	
4. **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained:
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
    • S/G level greater than (-)170 inches
    • capable of being supplied with feedwater
    • capable of being steamed
• Reactor Vessel level above the top of the hot leg
• Reactivity Control Safety Function Acceptance Criteria are met
 	
THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following:
• RCS subcooling between 25 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}
 	
5. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
 	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
6. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	
7. Restore and maintain Pressurizer Level between 101 inches {141} and 180 inches {190} by operating SIS, charging, and if available, letdown.	7.1 **IF** pressurizer level can **NOT** be restored above 101 inches {141}, **THEN** continue to maximize safety injection flow.
8. **IF** SIAS has **NOT** actuated, **THEN** maintain VCT level between 60 and 100 inches using automatic or manual makeup.	8.1 **IF** makeup is **NOT** available to the VCT **AND** VCT level approaches 60 inches, **THEN** shift Charging Pump(s) suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut VCT OUT valve, 2-CVC-501-MOV. c. Observe VCT level is rising. d. Ensure CHG PP(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to VCT: (1) Open VCT OUT valve, 2-CVC-501-MOV. (2) Shut RWT CHG PP SUCT valve, 2-CVC-504-MOV.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ESTABLISH RCS PRESSURE CONTROL USING PORVs OR PRESSURIZER VENT.	
1. **IF** pressurizer pressure rises to 2400 PSIA, **THEN** perform the following: a. Verify **BOTH** PORV OVERRIDE handswitches in the AUTO position: • 2-HS-1402 • 2-HS-1404 b. Verify **BOTH** PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV c. Check PORVs automatically open. (continue)	1.1 **IF** PORVs do **NOT** open automatically, **THEN** perform the following: a. Place the PORV OVERRIDE handswitches in MANAUL OPEN: • 2-HS-1402 • 2-HS-1404 b. Verify **BOTH** PORVs are open. c. Reduce pressure such that: • Pressurizer pressure is less than 2300 PSIA • RCS pressure is within the limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • RCS subcooling is less than 140° F based on CET temperatures d. Place the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. Restore and maintain RCS subcooling within the following limits: • Pressurizer pressure less than 2300 PSIA • RCS pressure within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS subcooling between 25 and 140° F based on CET temperatures	
a. **IF** Pressurizer level is less than 305 inches, **THEN** lower pressure and subcooling with the PORVs as follows: (1) Verify the PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV (2) Place ONE PORV OVERRIDE handswitch in MANUAL OPEN: • 2-HS-1402 • 2-HS-1404 (3) **IF** a second PORV is needed to lower pressure **OR** subcooling, **THEN** place the other PORV OVERRIDE handswitch in MANUAL OPEN. (4) Start **ALL** available CACs in HIGH with maximum SRW flow. (continue)	a.1 **IF** PORVs are **NOT** available, **THEN** depressurize the RCS with the PZR VENT valves as follows: (1) Open the QUENCH TK VENT TO CNTMT, 2-RC-402-SV. (2) Open the PZR VENT valves to lower pressure and subcooling: • 2-RC-105-SV • 2-RC-106-SV (3) **IF** Pressurizer level approaches 305 inches **OR** Pressurizer Vents are **NOT** required to be open, **THEN** perform the following: (a) Shut the PZR VENT valves: • 2-RC-105-SV • 2-RC-106-SV (b) Shut the QUENCH TK VENT TO CNTMT, 2-RC-402-SV.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued) b. **IF** PORVs must remain open for heat removal **PER** HR-4, ONCE-THROUGH-COOLING, **THEN IMPLEMENT** RCS Pressure and Inventory Control Success Path PIC-4, SIS. c. **IF** Pressurizer level approaches 305 inches, **OR** PORVs are **NOT** required to be open, **THEN** close the PORVs by performing the following: (1) Place the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404 (2) **IF** the PORV(s) will **NOT** shut **OR** the Acoustic Monitor indicates flow through a PORV, **THEN** shut the affected PORV BLOCK valve. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued)	
CAUTION **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.**	
d. Raise subcooling by **ANY** of the following methods:	
(1) Ensure the PORVs and PZR VENT valves are shut.	
NOTE Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS.	
(2) Energize the Pressurizer HTR(s).	(2).1 **IF** Pressurizer B/U HTR banks have tripped on U/V, **THEN** re-energize the heaters as follows: (a) Charge closing spring using manual lever at 480V breakers 52-2127 and 52-2427. (b) Push the PUSH-TO-CLOSE button on the breaker fronts.
(3) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped.	
(4) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G.	
(5) Reduce letdown flow.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PREPARE FOR RAS ACTUATION	
1. **WHEN** RWT level drops to 4 feet, **THEN** perform the following actions:	
a. **IF** CSAS has **NOT** actuated, **THEN** place **BOTH** CS PPs in PULL TO LOCK.	
b. Place the SI PP RECIRC LOCKOUT switches in ON.	
c. Check HPSI flow is greater than 90 GPM per pump, **OR** check the HPSI PPs have been secured.	c.1 **IF** HPSI flow is less than 90 GPM per pump **AND** the HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** the CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. VERIFY CONTAINMENT SUMP LEVEL AND RAS ACTUATION.	
1. Observe Containment Sump level rises as RWT level lowers. (continue)	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 2. **WHEN** RWT level drops to 0.75 feet **OR** the "ACTUATION SYS RAS TRIP" alarm is received, **THEN** perform the following actions: a. Verify RAS actuation. b. Check a minimum containment sump level of at least 28 inches is indicated on the CNTMT WIDE RANGE WTR LVL indication, 2-LI-4146 or 2-LI-4147. c. Verify RAS lineup **PER** ATTACHMENT (6), <u>RAS VERIFICATION CHECKLIST</u>. d. **IF** RAS lineup is verified, **THEN** shut the RWT OUT valves: • 2-SI-4142-MOV • 2-SI-4143-MOV (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) e. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SW OUT valves: • 2-HIC-5206 • 2-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 2-CC-3824-CV • 2-CC-3826-CV (3) Verify TWO CC PPs in operation. (continue)	e.1 **IF NO** CC PPs are operating, **THEN** restore Component Cooling **PER** AOP-7C, <u>LOSS OF COMPONENT COOLING WATER</u>. e.2 **IF** Component Cooling can **NOT** be restored, **THEN** align a CS PP for Safety Injection as follows: (1) Notify the Operational Support Center to check radiation levels are low enough for valve repositioning. **<u>WARNING</u>** **Do NOT continue with this step until the Operational Support Center has determined radiation levels are low enough for valve repositioning.** (2) Stop ONE CS PP. (3) Shut SDC Hx Out To CS Valve for the SDC Hx associated with the CS Pump. • (21 SDC Hx) 2-SI-319 • (22 SDC Hx) 2-SI-329 (4) Open SDC Hx Inlet Cross Connect Valve for the SDC Hx associated with the CS Pump. • (21 SDC Hx) 2-SI-452 • (22 SDC Hx) 2-SI-453 (5) Open SDC HX LPSI INL valve, 2-SI-658-MOV. (6) Start the CS PP. (7) Stop **ALL** running HPSI PPs.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.**	
f. **IF** TWO HPSI PPs are running, **THEN** throttle HPSI flow to achieve 250 GPM through each of the four headers.	f.1 **IF** HPSI flow of 250 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers. f.2 **IF** HPSI flow indication has been lost, **THEN** perform the following: **NOTE** It is desired to secure 21 HPSI PP due to HPSI flow indication and MOV POSITION indicators associated with 21 HPSI PP are powered from 2Y09. (1) Secure ONE HPSI PP. (2) Throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
g. **IF** ONE HPSI PP is running, **THEN** throttle HPSI flow to achieve 150 GPM through each of the four headers.	g.1 **IF** HPSI flow of 150 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2.g (continued)	D.2.g (continued)
	g.2 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
h. **IF** a loss of ECCS pump suction is indicated during recirculation by **ANY** of the following: • Lower or unstable HPSI or CS flow • Lower or unstable HPSI or CS PP discharge pressure • Lower or unstable HPSI or CS PP motor current • HPSI or CS PP noise **THEN** take actions to prevent HPSI and CS PP damage, **AND** maintain adequate core cooling by performing the following:	
(1) Throttle HPSI flow equally among the four headers to the minimum allowed **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.	(1).1 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2.h (continued)	
(2) **IF** HPSI or CS PP performance is **NOT** acceptable, **THEN** perform the following:	
(a) Stop **BOTH** CS PPs.	
(b) Check acceptable HPSI PP performance.	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).
(c) Notify the Plant Technical Support Center.	
i. Commence ECCS Pump Room cooling as follows:	
(1) Open the ECCS AIR CLR INL/OUT VLVs: • 2-SW-5170-CV • 2-SW-5171-CV • 2-SW-5173-CV	
(2) Start 21 EAST and 22 WEST ECCS PP RM CLG FANs.	
j. Place the ECCS PP RM EXH FILT in service.	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) k. Maintain SRW and Component Cooling temperatures by performing the following: (1) Adjust the CC HX SW OUT valves to maintain Component Cooling temperature less than 120° F: • 2-HIC-5206 • 2-HIC-5208 (2) **IF EITHER** SRW HX SW BYPASS valve is in AUTO, **THEN** adjust the setpoint as necessary to maintain SRW temperature less than 105° F: • 2-PIC-5154 • 2-PIC-5157 **NOTE** The current maximum SW header pressure limits are recorded on the Shift Turnover Sheet. (3) Verify SW HDR PRESS less than the maximum SW header pressure limit. l. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** m. Ensure HPSI PP flow is at least 90 GPM during recirculation.	m.1 **IF** HPSI flow is less than 90 GPM per pump during recirculation **AND** HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
E. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	
1. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. 2. **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS. 3. Notify the Plant Technical Support Center to review ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-2: PORVs or PRESSURIZER VENT

F. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-2.

RECOVERY ACTIONS	ALTERNATE ACTIONS
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure is less than 2400 PSIA • Pressurizer pressure less than the upper limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS subcooling is between 25 and 140° F based on CET temperatures • Pressurizer level is greater than 30 inches {90} • Reactor Vessel level above the top of the hot leg	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS | **ALTERNATE ACTIONS**

A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL DURING LOSS OF VITAL AC

1. Minimize RCS inventory loss by performing the following:

   a. Shut L/D CNTMT ISOL valves:

      - 2-CVC-515-CV
      - 2-CVC-516-CV

   b. Maintain an RCP Bleedoff flowpath:

      (1) Verify RCP CBO RELIEF ISOL, 2-CVC-507-CV, is open.

      (2) Shut RCP CBO INBD and OUTBD ISOL valves:

         - 2-CVC-505-CV
         - 2-CVC-506-CV

      (3) Open 21 RCDT DRN TO CNTMT FLOOR valve, 2-RCW-4258-SV.

   c. Shut RCS SAMPLE ISOL valve, 2-PS-5464-CV.

   d. Verify RXV VENT and PZR VENT valves are shut:

      - 2-RC-103-SV
      - 2-RC-104-SV
      - 2-RC-105-SV
      - 2-RC-106-SV

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** If needed, refer to ATTACHMENT(12), PROCEDURE TO LOCALLY READ CORE EXIT THERMOCOUPLES to read CETs.	
2. **IF** RCS subcooling drops to 25° F, **THEN** cooldown the RCS **PER** the selected Heat Removal success path to maintain the following conditions: • Subcooling between 25 and 50° F • RCS cooldown rate less than 100° F in any one hour • S/G level between (-)24 and (+)30 inches • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP	2.1 **IF** 25° F subcooling can **NOT** be maintained, **THEN** continue RCS heat removal using two-phase natural circulation **PER** the selected Heat Removal success path **AND** ensure the following: • At least ONE S/G has level between (-)24 inches {0}and (+)30 inches {(+)38} **OR** S/G level is being restored by feedwater flow • CET temperatures are less than 50° F superheated
3. **IF** a controlled cooldown is in progress, **THEN** block SIAS as follows: • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm received, **THEN** block SIAS B. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 4. **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN** restore RCP Bleedoff flowpath to the VCT by performing the following actions: a. Open RCP CBO INBD and OUTBD ISOL valves: • 2-CVC-505-CV • 2-CVC-506-CV b. Shut 21 RCDT DRN TO CNTMT FLOOR valve, 2-RCW-4258-SV. 5. **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN IMPLEMENT ONE** of the following success paths as appropriate: • PIC-1, <u>CVCS</u> • PIC-2, <u>PORVs or PRESSURIZER VENT</u> • PIC-4, <u>SIS</u>	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-3: LOSS OF VITAL AC

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-3.	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: • Pressurizer pressure less than the upper **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • RCS subcooling greater than 25 based on CET temperatures **OR** CET temperatures less than 50° F superheated • Reactor Vessel level indicates the core is covered	1.1 **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure and Inventory Control Success Path.
2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL USING SIS.

1. **IF** pressurizer pressure is less than or equal to 1725 PSIA
   OR containment pressure is greater than or equal to 2.8 PSIG,
   THEN verify SIAS actuation.

2. **IF** pressurizer pressure is greater than 1725 PSIA
   AND containment pressure is less than 2.8 PSIG,
   THEN perform the following actions to block SIAS:

   a. Open HPSI MAIN and AUX HDR valves:

      MAIN
      - 2-SI-616-MOV
      - 2-SI-626-MOV
      - 2-SI-636-MOV
      - 2-SI-646-MOV

      AUX
      - 2-SI-617-MOV
      - 2-SI-627-MOV
      - 2-SI-637-MOV
      - 2-SI-647-MOV

   b. Start 21 and 23 HPSI PPs.

   c. Start **ALL** available CHG PPs.

   d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.

   e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.2 (continued) f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. 3. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 21 HPSI PP • 23 HPSI PP • 21 LPSI PP • 22 LPSI PP • **ALL** available CHG PPs (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

A.3 (continued)

b. Verify safety injection flow:

- HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA
- LPSI flow **PER** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW, when pressure is below 185 PSIA

(continue)

ALTERNATE ACTIONS

b.1 Perform the following actions as necessary:

CAUTION

Operation of two HPSI Pumps on 24 4KV Bus may cause 2B DG loading to exceed 3600 KW.

- **IF** 21 HPSI PP failed,
  THEN perform the following actions:
  (1) **IF** 2B DG is powering 24 4KV Bus,
  THEN verify DG load is less than 2960 KW.
  (2) Start 22 HPSI PP.
- **IF** 23 HPSI PP failed,
  THEN align 22 HPSI PP as follows:
  (1) Start 22 HPSI PP.
  (2) Open HPSI HDR XCONN valve, 2-SI-653-MOV.
  (3) Shut HPSI HDR XCONN valve, 2-SI-655-MOV.
- Ensure electrical power is available to valves and pumps.
- Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 4. **IF** high RCS pressure is preventing adequate SIS flow to support heat removal, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path **NOTE** If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 5. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** maintain subcooling as low as possible **AND** within the following limits: • Between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) a. Lower subcooling by **ANY** of the following methods: (1) De-energize the Pressurizer HTR(s). (2) **IF ALL** RCPs are operating, **THEN** use Main Pressurizer Spray. (3) Lower the RCS cooldown rate. (4) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.a (continued) (5) Initiate AUX SPRAY as follows: (a) Place the CIS OVERRIDE switch, 2-HS-2080A, in OVERRIDE. (b) Open the IA CNTMT ISOL valve, 2-IA-2080-MOV. **CAUTION** **If the difference between the PZR WTR TEMP and CHG OUT TEMP is greater than 400° F, then TRM 15.4.2 must be complied with.** (c) Record the following information: • PZR WTR TEMP (2-TI-101) • CHG OUT TEMP (2-TI-229) (d) Open the AUX SPRAY valve, 2-CVC-517-CV. (e) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 2-CVC-518-CV • 2-CVC-519-CV (f) Shift the PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL. (g) Shut the PZR SPRAY VLVs by adjusting the output of 2-HIC-100 to 0%: • 2-RC-100E-CV • 2-RC-100F-CV (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5.a(5) (continued) (h) Maintain the pressurizer cooldown rate less than 200° F/hour. **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** b. Raise subcooling by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. (1) Energize the Pressurizer HTR(s). (2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped. (3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using the ADV from the unaffected S/G. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 6. **IF** the RCS is water solid, **THEN** maintain subcooling within the following limits: • Between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> a. Lower subcooling by **ANY** of the following methods: (1) Lower RCS temperature. (2) **IF** the overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (3) De-energize the Pressurizer HTR(s). (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.6 (continued)

CAUTION

The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.

b. Raise subcooling by **ANY** of the following methods:

(1) Raise RCS temperature.

(2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled or starting HPSI PPs which have been stopped.

NOTE

Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS.

(3) Energize the Pressurizer HTR(s).

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 7. **IF** the RCS is water solid, **AND** it is desired to draw a bubble in the RCS, **THEN** perform the following actions: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. a. Energize the Pressurizer HTR(s). b. **IF EITHER** of the following conditions exist: • **BOTH** S/G pressures can be maintained less than RCS pressure • At least ONE RCP is running **THEN** draw a bubble in the RCS as follows: (1) **IF** the HPSI throttle criteria are met, **THEN** reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow. (2) Cooldown the RCS, while **NOT** exceeding 100° F in any one hour, using TBVs or ADVs. c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 inches {141} and 180 inches {190}. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7 (continued) d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to maintain RCS level above the top of the hot leg. 8. **IF** a bubble exists in the Pressurizer **AND** HPSI flow has been secured, **THEN** restore and maintain Pressurizer Level between 101 inches {141} and 180 inches {190} by operating charging, and if available, letdown. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)
 	
9. **WHEN ALL** of the following conditions can be maintained:
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed
• Reactor Vessel level above the top of the hot leg
• Reactivity Control Safety Function Acceptance Criteria are met
 	
THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain the following:
• RCS subcooling between 25 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}
 	
10. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
 	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 11. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	

B. IF ONCE-THROUGH-COOLING IS NOT IN PROGRESS, THEN IDENTIFY LOCATION OF LEAK.

RECOVERY ACTIONS	ALTERNATE ACTIONS
1. Attempt leak isolation: a. Verify L/D CNTMT ISOL valves are shut: • 2-CVC-515-CV • 2-CVC-516-CV	
b. Check there is **NO** PORV leakage by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication	b.1 **IF** PORV leakage is indicated **AND** PZR pressure is less than 2300 PSIA, **THEN** perform the following: (1) Shut the appropriate PORV BLOCK valves: • 2-RC-403-MOV • 2-RC-405-MOV (2) Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 2-HS-1402 • 2-HS-1404
c. Shut RCS SAMPLE ISOL valve, 2-PS-5464-CV. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) d. Shut RXV VENT valves: • 2-RC-103-SV • 2-RC-104-SV e. Shut PZR VENT valves: • 2-RC-105-SV • 2-RC-106-SV f. **IF** leakage into Component Cooling is indicated by: • Rise on UNIT 2 CC radiation monitor, 2-RI-3819 • "CC HEAD TK LVL" high alarm **AND** shutting the L/D CNTMT ISOL valves did **NOT** isolate the leak, **THEN** perform the following: (1) Trip **ALL** RCPs. (2) Shut the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV g. **IF** the leak has been isolated **AND** SIAS has **NOT** actuated, **THEN** perform the following actions: (1) Stop the HPSI PPs **PER** step A.9. (2) Shut HPSI MAIN and AUX HDR valves. (3) Verify the Safety Function Status Check Acceptance Criteria for PIC-1, <u>CVCS</u>, are satisfied. (4) **IMPLEMENT** PIC-1, <u>CVCS</u>. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **IF** a LOCA inside containment can **NOT** be determined by: • Rise in containment temperature, pressure, humidity or sump level • UNIT 2 WIDE RANGE NOBLE GAS radiation monitor and UNIT 2 MAIN VENT GASEOUS alarms clear **THEN** perform the following actions: a. Place **BOTH** PENET RM EXH FANs in service. **NOTE** Leakage location may be indicated by sump alarms, room level alarms, or area RMS alarms. b. Attempt to locate and isolate the leak. c. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source.	
3. Observe Containment Sump level rises as RWT level lowers.	3.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. PREPARE FOR RAS ACTUATION	
1. **WHEN** RWT level drops to 4 feet, **THEN** perform the following actions:	
a. **IF** CSAS has **NOT** actuated, **THEN** place **BOTH** CS PPs in PULL TO LOCK.	
b. Place the SI PP RECIRC LOCKOUT switches in ON.	
c. Check HPSI flow is greater than 90 GPM per pump, **OR** check the HPSI PPs have been secured.	c.1 **IF** HPSI flow is less than 90 GPM per pump **AND** the HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** the CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
D. VERIFY RAS ACTUATION.	
1. **WHEN** RWT level drops to 0.75 feet **OR** the "ACTUATION SYS RAS TRIP" alarm is received, **THEN** perform the following actions:	
a. Verify RAS actuation.	
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

D.1 (continued)

b. Check a minimum containment sump level of at least 28 inches is indicated on the CNTMT WIDE RANGE WTR LVL indication, 2-LI-4146 or 2-LI-4147.

c. Verify the CNTMT SUMP DISCH valves open: 03000

- 2-SI-4144-MOV
- 2-SI-4145-MOV

d. Shut the RWT OUT valves:

- 2-SI-4142-MOV
- 2-SI-4143-MOV

e. Verify RAS lineup **PER** ATTACHMENT (6), RAS VERIFICATION CHECKLIST.

(continue)

ALTERNATE ACTIONS

e.1 **IF** a LPSI PP does **NOT** stop, **THEN** place the LPSI PP handswitch in PULL TO LOCK.

- 21 LPSI PP, 2-HS-302X
- 22 LPSI PP, 2-HS-302Y

CAUTION

LPSI flow must be reduced to less than 600 GPM within 4 hours post-RAS to ensure adequate HPSI NPSH. 03000

e.2 **IF** a LPSI PP continues to run with the LPSI PP handswitch in PULL TO LOCK, **THEN** perform the following actions:

(1) Attempt to locally open the LPSI PP breaker:

- NO. 21 LOW PRESS SAFETY INJ. PUMP, 152-2104
- NO. 22 LOW PRESS SAFETY INJ. PUMP, 152-2404

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

D.1.e (continued)

f. Verify Component Cooling in service as follows:

(1) Throttle open BOTH CC HX SW OUT valves:

- 2-HIC-5206
- 2-HIC-5208

(2) Verify BOTH CC HX CC OUT valves are open:

- 2-CC-3824-CV
- 2-CC-3826-CV

(3) Verify TWO CC PPs in operation.

(continue)

ALTERNATE ACTIONS

D.1.e.2 (continued)

(2) **IF** the LPSI PP breaker can **NOT** be opened locally,
THEN throttle LPSI flow to 600 GPM: 03000

(a) Shut THREE LPSI HDR valves:

- 2-SI-615-MOV
- 2-SI-625-MOV
- 2-SI-635-MOV
- 2-SI-645-MOV

(b) Throttle the remaining LPSI HDR valve to 600 GPM.

f.1 **IF NO** CC PPs are operating,
THEN restore Component Cooling **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER.

f.2 **IF** Component Cooling can **NOT** be restored,
THEN align a CS PP for Safety Injection as follows:

(1) Notify the Operational Support Center to check radiation levels are low enough for valve repositioning.

WARNING
Do NOT continue with this step until the Operational Support Center has determined radiation levels are low enough for valve repositioning.

(2) Stop ONE CS PP.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.f (continued)	D.1.f.2 (continued) (3) Shut SDC Hx Out To CS Valve for the SDC Hx associated with the CS Pump. • (21 SDC Hx) 2-SI-319 • (22 SDC Hx) 2-SI-329 (4) Open SDC Hx Inlet Cross Connect Valve for the SDC Hx associated with the CS Pump. • (21 SDC Hx) 2-SI-452 • (22 SDC Hx) 2-SI-453 (5) Open SDC HX LPSI INL valve, 2-SI-658-MOV. (6) Start the CS PP. (7) Stop **ALL** running HPSI PPs.
CAUTION **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** g. **IF** TWO HPSI PPs are running, **THEN** throttle HPSI flow to achieve 250 GPM through each of the four headers.	g.1 **IF** HPSI flow of 250 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.g (continued)	D.1.g (continued)
	g.2 **IF** HPSI flow indication has been lost, **THEN** perform the following: **NOTE** It is desired to secure 21 HPSI PP due to HPSI flow indication and MOV POSITION indicators associated with 21 HPSI PP are powered from 2Y09. (1) Secure ONE HPSI PP. (2) Throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
h. **IF** ONE HPSI PP is running, **THEN** throttle HPSI flow to achieve 150 GPM through each of the four headers.	h.1 **IF** HPSI flow of 150 GPM to each header can **NOT** be achieved, **THEN** throttle HPSI flow equally among the four headers. h.2 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • . **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
(continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued)	
NOTE HPSI MOVs should be throttled at least 30% open throughout a large-break LOCA to prevent MOV erosion and/or plugging.	
i. Check HPSI MOVs with flow are at least 30% open.	i.1 Adjust HPSI MOV(s) as necessary while maintaining header flow at the required flow. i.2 Monitor HPSI flow for indications of MOV erosion (higher flow), and/or plugging (lower or erratic flow).
j. **IF** a loss of ECCS pump suction is indicated during recirculation by **ANY** of the following: • Lower or unstable HPSI or CS flow • Lower or unstable HPSI or CS PP discharge pressure • Lower or unstable HPSI or CS PP motor current • HPSI or CS PP noise **THEN** take actions to prevent HPSI and CS PP damage, **AND** maintain adequate core cooling by performing the following:	
(1) Throttle HPSI flow equally among the four headers to the minimum allowed **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.	(1).1 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered
(continue)	

03000

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1.j (continued)	
(2) **IF** HPSI or CS PP performance is **NOT** acceptable, **THEN** perform the following:	
(a) Stop **BOTH** CS PPs.	
(b) Check acceptable HPSI PP performance.	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).
(c) Notify the Plant Technical Support Center.	
k. Commence ECCS Pump Room cooling as follows:	
(1) Open the ECCS AIR CLR INL/OUT VLVs: • 2-SW-5170-CV • 2-SW-5171-CV • 2-SW-5173-CV	
(2) Start 21 EAST and 22 WEST ECCS PP RM CLG FANs.	
l. Place the ECCS PP RM EXH FILT in service.	

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued) m. Maintain SRW and Component Cooling temperatures by performing the following: (1) Adjust the CC HX SW OUT valves to maintain Component Cooling temperature less than 120° F: • 2-HIC-5206 • 2-HIC-5208 (2) **IF EITHER** SRW HX SW BYPASS valve is in AUTO, **THEN** adjust the setpoint as necessary to maintain SRW temperature less than 105° F: • 2-PIC-5154 • 2-PIC-5157 **NOTE** The current maximum SW header pressure limits are recorded on the Shift Turnover Sheet. (3) Verify SW HDR PRESS less than the maximum SW header pressure limit. n. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. (continue)	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.1 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** o. Ensure HPSI PP flow is at least 90 GPM during recirculation.	o.1 **IF** HPSI flow is less than 90 GPM per pump during recirculation **AND** HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
E. PROTECT ECCS PUMPS FROM OVERHEATING	
1. **IF ANY** ECCS Pumps are operating, **THEN** protect the ECCS Pumps from overheating by commencing ECCS Pump Room cooling as follows: a. Open the ECCS AIR CLR INL/OUT VLVs: • 2-SW-5170-CV • 2-SW-5171-CV • 2-SW-5173-CV b. Start 21 EAST and 22 WEST ECCS PP RM CLG FANs.	

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	
1. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. 2. **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS. 3. Notify the Plant Technical Support Center to review ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT.	
G. COMMENCE CORE FLUSH.	
1. **IF** the elapsed time from SIAS actuation is between 8 and 11 hours, **AND ANY** of the following conditions exist: • RCS subcooling is less than 25° F based on CET temperatures • Pressurizer level is less than 30 inches {90} • Reactor Vessel level below the top of the hot leg **THEN** commence core flush by lining up for Pressurizer Injection as follows: a. Check TWO HPSI PPs are available. (continue)	1.1 **IF** Pressurizer Injection is **NOT** adequate **AND** the following conditions are met: • RCS pressure is less than 270 PSIA {245} • RCS pressure minus containment pressure is less than 75 PSID • HPSI PP(s) are available **THEN** line up for Hot Leg Injection as follows: a. Place the selected LPSI PP RAS OVERRIDE switch in OVERRIDE. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued)	G.1.1 (continued)
b. Open the SI TO CHG HDR valve, 2-CVC-269-MOV.	b. Verify the CNTMT SUMP DISCH valves are open: • 2-SI-4144-MOV • 2-SI-4145-MOV
c. **IF** CIS has actuated, **AND** IA CNTMT ISOL valve, 2-IA-2080-MOV is shut, **THEN** perform the following actions: (1) Place the CIS OVERRIDE switch, 2-HS-2080A, in OVERRIDE. (2) Open IA CNTMT ISOL valve, 2-IA-2080-MOV.	c. Open SDC RECIRC ISOL valve, 2-SI-399-MOV. d. Shut LPSI HDR valves: • 2-SI-615-MOV • 2-SI-625-MOV • 2-SI-635-MOV • 2-SI-645-MOV
d. Shut LOOP CHG valves: • 2-CVC-518-CV • 2-CVC-519-CV	e. Close the power supply breakers to the SDC HDR RETURN ISOL valves: • 2-SI-651-MOV breaker, 52-21466 • 2-SI-652-MOV breaker, 52-20424
e. Shut the PZR SPRAY VLVs by adjusting the output of 2-HIC-100 to 0%: • 2-RC-100E-CV • 2-RC-100F-CV	f. Open SDC HDR RETURN ISOL valves: • 2-SI-651-MOV • 2-SI-652-MOV
f. Verify HPSI AUX HDR ISOL valve, 2-SI-656-MOV, is open.	g. Start the selected LPSI PP.
g. Open AUX SPRAY valve, 2-CVC-517-CV.	h. Maintain a flowrate of at least 150 GPM.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

G.1 (continued)

h. **IF** 23 HPSI PP is available,
THEN perform the following actions:

(1) Verify 22 HPSI PP is running.

(2) Verify HPSI HDR XCONN valve, 2-SI-653-MOV, is shut.

(3) Shut HPSI AUX HDR valves:

- 2-SI-617-MOV
- 2-SI-627-MOV
- 2-SI-637-MOV
- 2-SI-647-MOV

(4) Verify 21 or 22 HPSI PP is running.

(5) **IF** approximately 150 GPM is **NOT** indicated
THEN initiate Hot Leg Injection.

i. **IF** 23 HPSI PP is **NOT** available,
THEN perform the following actions:

(1) Verify 22 HPSI PP is running.

(2) Verify HPSI HDR XCONN valve, 2-SI-653-MOV, is open.

(3) Verify HPSI HDR XCONN valve, 2-SI-655-MOV, is shut.

(4) Shut HPSI AUX HDR valves:

- 2-SI-617-MOV
- 2-SI-627-MOV
- 2-SI-637-MOV
- 2-SI-647-MOV

(continue)

ALTERNATE ACTIONS

G.1.1 (continued)

1.2 **IF** only ONE HPSI PP is available,
AND Hot Leg Injection is **NOT** available,
THEN commence pressurizer injection as follows:

a. Open SI TO CHG HDR valve, 2-CVC-269-MOV.

b. **IF** CIS has actuated,
AND IA CNTMT ISOL valve, 2-IA-2080-MOV is shut,
THEN perform the following actions:

(1) Place the CIS OVERRIDE switch, 2-HS-2080A, in OVERRIDE.

(2) Open IA CNTMT ISOL valve, 2-IA-2080-MOV.

c. Shut LOOP CHG valves:

- 2-CVC-518-MOV
- 2-CVC-519-MOV

d. Shut the PZR SPRAY VLVs by adjusting the output of 2-HIC-100 to 0%:

- 2-RC-100E-CV
- 2-RC-100F-CV

e. Verify HPSI AUX HDR ISOL valve, 2-SI-656-MOV, is open.

f. Open AUX SPRAY valve, 2-CVC-517-CV.

g. Verify ONE HPSI PP is running.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1.i (continued) (5) Verify 21 HPSI PP is running. (6) **IF** approximately 150 GPM is **NOT** indicated **THEN** initiate Hot Leg Injection. (continue)	G.1.i.1 (continued) h. **IF** 23 HPSI PP is running, **THEN** open the HPSI HDR XCONN valve, 2-SI-653-MOV. i. **IF** 23 HPSI PP is running, **THEN** Shut HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV j. Throttle the HPSI flow to maintain cold leg injection flow **NO** more than 100 GPM above the minimum required for heat removal **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued)	G.1 (continued)

ALTERNATE ACTIONS

1.3 **IF** a CS PP is being used for injection, **THEN** line up for Hot Leg Injection as follows:

a. Verify the following conditions exist:

- RCS pressure is less than 270 PSIA {245}
- RCS pressure minus containment pressure is less than 75 PSID

b. Open SDC RECIRC ISOL valve, 2-SI-399-MOV.

c. Verify 22B LPSI HDR valve, 2-SI-635-MOV, is open.

d. Shut the following LPSI HDR valves:

- 2-SI-615-MOV
- 2-SI-625-MOV
- 2-SI-645-MOV

e. Throttle 22B LPSI HDR valve, 2-SI-635-MOV, to maintain a flowrate of 600 GPM, as indicated on 22B LPSI HDR FLOW indicator, 2-FI-332.

f. Close the power supply breakers to the SDC HDR RETURN ISOL valves:

- 2-SI-651-MOV breaker, 52-21466
- 2-SI-652-MOV breaker, 52-20424

g. Open SDC HDR RETURN ISOL valves:

- 2-SI-651-MOV
- 2-SI-652-MOV

h. Maintain Cold Leg Injection flowrate of 600 GPM, as indicated on 22B LPSI HDR FLOW indicator, 2-FI-332.

(continue)

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued) 2. **WHEN** Pressurizer Injection **OR** Hot Leg Injection is in progress, **AND** HPSI PPs are being used for Cold Leg Injection, **THEN** perform the following actions: a. Balance the flow between Pressurizer or Hot Leg Injection and Cold Leg Injection by throttling the HPSI MAIN HDR valves: • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV b. Maintain the minimum flow required to remove decay heat **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW c. Ensure CET temperatures remain constant or lowering.	G.1.3 (continued) i. Ensure CET temperatures remain constant or lowering.
H. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-4:	
1. Check RCS Pressure And Inventory Control is satisfied by the following indications: (continue)	1.1 **IF** RCS Pressure and Inventory Control has **NOT** been satisfied, **THEN** perform the following actions: (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS

H.1 (continued)

- **IF** RAS has **NOT** occurred,
  AND pressurizer pressure is greater than 1270 PSIA,
  THEN at least ONE CHG PP operating

NOTE
LPSI Pumps are **NOT** required post-RAS.

NOTE
Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met.

- HPSI and LPSI PPs are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW

- Reactor Vessel level indicates the core is covered

(continue)

ALTERNATE ACTIONS

H.1.1 (continued)

a. Concurrently perform the recovery actions for the next safety function to be satisfied.

b. Determine the appropriate emergency response actions **PER** the ERPIP.

CAUTION
Cool ECCS water may cause thermal shock to the fuel pins and result in fuel damage. Injection flow should be restored gradually.

CAUTION
Initiating flow to an overheated core will cause rapid steam production and an RCS pressure spike, which may cause creep rupture failure of the RCS, including steam generator tubes. Injection flow should be restored gradually to minimize the RCS pressure spike.

c. **IF ALL** Safety Injection flow has been lost,
   THEN consider consulting the Technical Support Center prior to reinitiating Safety Injection flow.

CAUTION
To prevent loss of Core heat removal while RCS inventory control is lost, it is important to maintain RCS heat removal via the Steam Generators to support single or two-phase natural circulation.

d. Maximize RCS heat removal via the Steam Generators **PER** the selected Core And RCS Heat Removal success path.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1 (continued)

ALTERNATE ACTIONS

H.1.1 (continued)

e. **IF** high RCS pressure is preventing adequate SIS flow, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by operating the PORVs or Pressurizer Vents **PER** PIC-2, PORVs or PRESSURIZER VENT.

f. Verify **ALL** available CACs are operating.

g. **IF** RAS actuated, **THEN** perform the following:

(1) Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning.

(2) Contact the Plant Technical Support Center for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT **PER** ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS.

(3) **WHEN** SIAS has been reset, **THEN** initiate actions to makeup to the RWT **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATIONS.

(continue)

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1 (continued)

RECOVERY ACTIONS

H.1 (continued)

(continue)

ALTERNATE ACTIONS

H.1.1 (continued)

h. **IF ALL** Safety Injection flow has been lost,
AND ALL the following conditions have been established:

- **ALL** ECCS pumps aligned to the Containment Sump are stopped
- Plant Technical Support Center concurrance obtained
- Alignment of the selected pump has been verified
- The selected pump has been vented as required

THEN attempt to re-establish Safety Injection flow to the RCS from the Containment Sump:

(1) Throttle injection valve(s).

(2) Verify the SI PP RECIRC isolation MOVs are shut:

- 2-SI-659-MOV
- 2-SI-660-MOV

(3) Start the selected pump.

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1.h (continued) (4) **IF** a loss of pump suction is *indicated by* **ANY** *of the* following: • Lower or unstable flow • Lower or unstable discharge pressure • Lower or unstable motor current • Pump noise **THEN** stop the pump. (5) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1 (continued) i. **IF** there is inventory in the SITs, **THEN** discharge SIT inventory as needed to replenish RCS inventory: (1) Ensure RCS pressure is less than SIT pressure by performing the following: • Operate the TBVs or ADVs **PER** the selected Core And RCS Heat Removal success path. • Operate the PORVs or Pressurizer Vents **PER** PIC-2, PORVs or PRESSURIZER VENT. (2) Ensure selected SIT outlet isolation valve is open. (3) Verify Reactor Vessel level rises as SIT level lowers. (4) **WHEN** Reactor Vessel level is greater than or equal to the bottom of the hot leg, **THEN** shut the SIT outlet isolation valve. (5) Repeat steps (1) through (4) above as needed to control RCS inventory at the bottom of the hot leg. (6) **WHEN** the SIT is empty, **THEN** isolate the SIT. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1 (continued)

H.1 (continued)

(continue)

H.1.1 (continued)

CAUTION

Injecting additional inventory into the Containment may submerge equipment and/or instrumentation desired to mitigate or monitor the event. Submerged equipment/instrumentation may be rendered inoperable.

j. **IF** RAS actuated,
AND ALL the following conditions have been established:

- Recirculation capability via the Containment Sump has been lost
- Usable inventory is available in the RWT
- RWT boron concentration verified to be acceptable for current plant conditions
- RCS pressure is less than selected pump shutoff head

THEN inject to the RCS as necessary to control Reactor Vessel level greater than or equal to the bottom of the hot leg:

(1) Ensure pump suction from the Containment Sump is isolated.

(2) Align suction for selected pump to RWT:

- HPSI PP
- LPSI PP
- Charging PP
- CS PP

(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.1.j (continued) (3) Align discharge to RCS: • Hot or Cold Leg injection • Normal or Alternate charging path (4) Operate the selected pump as needed. (5) Monitor pump performance. (6) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg.
(continue)	(continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) (continue)	H.1.1 (continued) **CAUTION** **Injecting additional inventory into the Containment may submerge equipment and/or instrumentation desired to mitigate or monitor the event. Submerged equipment/instrumentation may be rendered inoperable.** k. **IF** RAS actuated, **AND ALL** the following conditions have been established: • Recirculation capability via the Containment Sump has been lost • An alternate method to inject directly to the RCS bypassing the RWT has been selected (refer to ERPIP-611, SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS) • Boron concentration of makeup water source verified to be acceptable for current plant conditions • RCS pressure is less than selected pump shutoff head **THEN** inject to the RCS as necessary to control Reactor Vessel level greater than or equal to the bottom of the hot leg: (1) Ensure pump suction from the Containment Sump is isolated. (2) Align suction for selected pump. (3) Align discharge to RCS. (4) Operate the selected pump as needed. (continue)

APPENDIX (3) RCS PRESSURE AND INVENTORY CONTROL

PIC-4: SIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) 2. **IF** RCS Pressure And Inventory Control has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	H.1.1.k (continued) (5) Monitor pump performance. (6) Control flow to maintain Reactor Vessel level greater than or equal to the bottom of the hot leg. l. Evaluate further actions based on the following considerations: (1) The rate of change of pressure and potential for damage to the RCS. (2) The urgency of other jeopardized safety functions. (3) The feasibility of restoring function to a success path by performing **ANY** of the following: • Restoring the vital auxiliaries necessary to operate components or systems in the success paths • Manual operation of valves • Use of alternate components to implement a success path • Depressurization or cooling of the RCS to raise or establish SIS flow

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-1: CVCS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• Charging pump is available
• Charging path is available via normal flow path or SIS flow path
• A charging source is available:
  • VCT
  • BAST
  • RWT
• A method of pressurizer pressure control is available:
  • Pressurizer heaters
  • Main Spray
  • Aux Spray
  • Controlled Steaming
• SIAS has **NOT** actuated **OR** has been reset
	• Pressurizer pressure less than the upper limits of Att. (1)
	• Pressurizer level greater than 30 inches
	• RCS subcooling is between 25°F and 140°F based on CET temperatures
	• Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS INVENTORY CONTROL USING CVCS.		1
	• **IF** charging is unable to maintain pressurizer level greater than 30 inches, **THEN PROCEED** to PIC-4 • Restore letdown flow • **IF** the RCS is water solid, **THEN** draw a bubble		2 2 8
	B. ESTABLISH RCS PRESSURE CONTROL.	C	10
	• Pressurizer HTRs **OR** SPRAYs • Controlled steaming • Block SGIS/SIAS		10 14
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-1.		27
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		27

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-2: PORVs or PRESSURIZER VENT

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• PORV or Pressurizer Vent required to reduce pressure • PORV or Pressurizer Vent available to control pressure • Charging and letdown and/or SIS is available to control pressurizer level • Once-Through-Cooling is **NOT** in progress	• Pressurizer pressure less than 2400 PSIA • Pressurizer pressure less than the upper limits of Att. (1) • RCS subcooling is between 25°F and 140°F based on CET temperatures • Pressurizer level greater than 30 inches {90} • Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS INVENTORY CONTROL.	C	28
	• **IF** RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation.		28
	OR		
	• Align HPSI injection and block SIAS.		28
	• **IF ALL** of the following conditions can be maintained: • At least 25 °F subcooling based on CET temperatures • Pressurizer level greater than 101 inches {141} • At least ONE S/G available for heat removal • Reactor Vessel level above the top of the hot leg • Reactivity Control Safety Function Acceptance Criteria are met **THEN** HPSI flow may be reduced.		30
	• Maintain Pressurizer Level between **101 inches {141} and 180 inches {190}**		31

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

PIC-2: PORVs or PRESSURIZER VENT
(continued)

START	FUNCTION	DONE	PAGE
	B. ESTABLISH RCS PRESSURE CONTROL USING PORVs OR PRESSURIZER VENT.	C	32
	• **IF** pressurizer pressure rises to 2400 PSIA, **THEN** verify **BOTH** PORVs open		32
	• Restore and maintain RCS subcooling using PORVs or PZR VENT valves		33
	• **IF** pressurizer level approaches 305 inches **OR** PORVs are **NOT** required to be open, **THEN** close the PORVs		34
	C. PREPARE FOR RAS ACTUATION	C	36
	• RWT level drops to 4 feet		36
	D. VERIFY CONTAINMENT SUMP LEVEL AND RAS ACTUATION.	C	37
	E. IF RAS ACTUATED, **THEN** REFILL THE RWT.	C	44
	• Notify the Plant Technical Support Center to review ERPIP-611.		44
	F. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-2.		45
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		45

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-3: LOSS OF VITAL AC

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• A loss of **ALL** 4KV Vital Buses has occurred • SIAS has **NOT** actuated **OR** has been reset	• Pressurizer pressure less than the upper limits of Att. (1) • RCS subcooling is greater than 25°F based on CET temperatures **OR** CET temperatures less than 50°F superheated • Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL DURING LOSS OF VITAL AC.	C	46

	• Minimize RCS inventory loss
	• **IF** RCS subcooling drops to 25°F, **THEN** cooldown the RCS to maintain:
	  • RCS subcooling **25 - 50°F**
	  • RCS cooldown rate less than **100°F in any one hour**
	  • S/G level **(-)24 - (+)30 inches**
	  • SUR negative, or SUR zero with WRNI Power **less than 10^{-4}**
	  • T_{COLD} greater than NEOP-23 curve
	• **IF** a controlled cooldown is in progress, **THEN** block SIAS
	• **WHEN** at least ONE 4KV Vital Bus has been re-energized, **THEN IMPLEMENT** PIC-1, PIC-2 **OR** PIC-4
			46
			47
			
			47
			48

	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-3.		49
	• **IF** RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN PROCEED** to the next appropriate RCS Pressure And Inventory Control Success Path.		49

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RCS PRESSURE AND INVENTORY CONTROL PLACEKEEPER
PIC-4: SIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• SIAS has actuated **OR** SIS is able to be used to supply RCS makeup	• **IF** RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA **THEN** at least ONE Charging Pump operating • HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) • Reactor Vessel level indicates the core is covered

START	FUNCTION	DONE	PAGE
	A. ESTABLISH RCS PRESSURE AND INVENTORY CONTROL USING SIS.	C	50
	• IF RCS pressure is less than 1725 PSIA, **OR** containment pressure is greater than 2.8 PSIG **THEN** verify SIAS actuation		50
	OR		
	• Align HPSI injection and block SIAS		50
	• IF high RCS pressure is preventing SIS flow, **THEN** attempt to depressurize the RCS: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path		53
	• **WHEN ALL** of the following conditions can be maintained: • At least 25°F subcooling based on CET temperatures • Pressurizer level greater than 101 inches {141} • At least ONE S/G available for heat removal • Reactor Vessel level above the top of the hot leg • Reactivity Control Safety Function Acceptance Criteria are met **THEN** HPSI flow may be reduced.		61
	• IF pressurizer pressure is greater than 200 PSIA and **EITHER** constant or rising, **THEN** the operating LPSI PPs may be stopped		61

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

PIC-4: SIS
(continued)

START	FUNCTION	DONE	PAGE
	B. IF ONCE-THROUGH-COOLING IS NOT IN PROGRESS, **THEN** IDENTIFY LOCATION OF LEAK.		62
	C. PREPARE FOR RAS ACTUATION.	C	65
	• RWT level drops to 4 feet		65
	D. VERIFY RAS ACTUATION.	C	65
	E. PROTECT ECCS PUMPS FROM OVERHEATING.		73
	F. IF RAS ACTUATED, **THEN** REFILL THE RWT.	C	74
	• Notify the Plant Technical Support Center to review ERPIP-611.		74
	G. COMMENCE CORE FLUSH.	C	74
	• **8 to 11 hours** after SIAS was actuated		74
	H. ACCEPTANCE CRITERIA FOR SUCCESS PATH PIC-4.		79
	• IF RCS Pressure And Inventory Control has **NOT** been satisfied, **THEN** perform the following actions:		
	• Concurrently perform the Recovery actions for the next safety function to be satisfied		80
	• Determine the appropriate emergency response actions **PER** the ERPIP		80
	• **IF ALL** Safety Injection has been lost, **THEN** consider consulting the Technical Support Center prior to reinitiating Safety Injection Flow		80
	• Maximize RCS heat removal via the SGs		78
	• Contact the Plant Technical Support Center for alternate methods **PER** ERPIP-611		81
	• Attempt to re-establish SI flow to the RCS from the Containment Sump		82
	• Discharge SIT inventory		84
	• Inject additional inventory to the RCS from the RWT		85
	• Inject additional inventory to the RCS via an alternate method		87
	• Evaluate further actions		88

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. ESTABLISH CORE AND RCS HEAT REMOVAL.

1. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure and minimize S/G inventory loss.

   a. Shut **BOTH** MSIVs.

   b. Shut the SG BD valves:

   - 2-BD-4010-CV
   - 2-BD-4011-CV
   - 2-BD-4012-CV
   - 2-BD-4013-CV

2. **IF**, at **ANY** time, Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored, **THEN** perform the following actions:

   a. Trip **ALL** RCPs.

   b. Shut the SG BD valves:

   - 2-BD-4010-CV
   - 2-BD-4011-CV
   - 2-BD-4012-CV
   - 2-BD-4013-CV

3. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, ONCE-THROUGH-COOLING.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 4. **IF** at least ONE 4KV Vital Bus is energized, **THEN** commence RCS boration as follows:	
a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 2-CVC-518-CV • 2-CVC-519-CV	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the HPSI AUX HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 2-SI-656-MOV. (2) Open **ONE** of the HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV (3) Open SI TO CHG HDR valve, 2-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 2-CVC-183, located in the 27 ft West Penetration Room. (5) Shut L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the HPSI AUX HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 2-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 2-CVC-188.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued)	
b. Commence RCS boration from the BAST using the CVCS as follows:	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows:
(1) Ensure BAST levels remain greater than 10 inches.	(1) Ensure RWT level is greater than 2 feet.
(2) Shut VCT M/U valve, 2-CVC-512-CV.	(2) Open RWT CHG PP SUCT valve, 2-CVC-504-MOV.
(3) Open BA DIRECT M/U valve, 2-CVC-514-MOV.	(3) Shut VCT OUT valve, 2-CVC-501-MOV.
(4) Open BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV	(4) Start **ALL** available CHG PPs.
(5) Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL.	(5) Ensure CHG HDR PRESS is greater than RCS pressure.
(6) Start **ALL** available BA PPs.	
(7) Shut VCT OUT valve, 2-CVC-501-MOV.	
(8) Start **ALL** available CHG PPs.	
(9) Ensure CHG HDR PRESS is greater than RCS pressure.	
c. Record the time RCS boration was commenced: __________	
d. Record BAST levels: • 21 BAST: __________ • 22 BAST: __________	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.4 (continued) e. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches. (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating (continue)	

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APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown rate greater than the Technical Specification Limits.**	
5. **IF** condenser vacuum is greater than 20 InHg, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions using the TURB BYP valves as follows: a. Ensure the ADVs are shut. b. Operate the TURB BYP valves from the control room. c. **IF** the TURB BYP valves can **NOT** be operated from the Control Room, **THEN** station an operator to manually position the TURB BYP valves **PER** OI-8C, MAIN STEAM AND MSR VENTS AND DRAINS. d. Maintain RCS cooldown less than 100° F in any one hour. e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP (continue)	5.1 Cooldown the RCS to establish Shutdown Cooling entry conditions using the ADVs as follows: a. Prior to determining if a tube rupture exists and isolating the affected S/G, record the ADV open and close times, for dose calculations. b. Shift the ADV controller to MANUAL. c. Operate the ADVs from the control room. d. **IF** the ADVs will **NOT** operate from the Control Room, **THEN** perform **ONE** of the following: (1) Operate the ADVs from 2C43 as follows: (a) Verify the ADV controllers on 2C43 are set at 0% output: • (21 ADV) 2-HC-4056A • (22 ADV) 2-HC-4056B (b) Align the ADV Hand Transfer Valves to 2C43 (POSITION 2): 21 S/G • 2-HV-3939A • 2-HV-3939B 22 S/G • 2-HV-3938A • 2-HV-3938B (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) (continue)	A.5.1.d(1) (continued) (c) Operate the ADVs from 2C43. **NOTE** The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut. (2) Locally operate the ADVs from the 45ft level of the Aux Building. e. Maintain RCS cooldown less than 100° F in any one hour. f. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP **CAUTION** **The following step may blow out the Condenser Rupture Disks and may cause equipment damage.** 5.2 **IF** the ADVs are **NOT** available, **AND** condenser vacuum has been lost, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions by opening the TURB BYP valves: a. Open **ALL** doors to the outside on the 45 ft level of the Turbine Building. (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A.5 (continued)	A.5.2 (continued)

ALTERNATE ACTIONS — A.5.2 (continued)

b. Notify personnel to evacuate the 45 ft level of the Turbine Building.

c. **IF BOTH** MSIVs are shut, **THEN** perform the following

   (1) Close the power supply breakers to the MSIV Bypass valves:

   - 2-MOV-4045 breaker, 52-21428
   - 2-MOV-4052 breaker, 52-20428

   (2) Open the MSIV BYP valves:

   - 2-MS-4045-MOV
   - 2-MS-4052-MOV

d. Shut the SGFPT EXH valves.

e. Station an operator to manually operate the TURB BYP valve(s) **PER** OI-8C, <u>MAIN STEAM AND MSR VENTS AND DRAINS</u>, as directed by the Control Room.

f. Maintain RCS cooldown less than 100° F in any one hour.

g. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-23, figure titled, <u>MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP</u>

(continue) | (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	A.5 (continued)

A.5 (continued) (Alternate Actions)

CAUTION
The following step may blow out the Condenser Rupture Disks and may cause equipment damage.

5.3 **IF** RCS cooldown has **NOT** been established,
THEN cooldown the RCS to establish Shutdown Cooling entry conditions by aligning the steam drains to the condenser as follows:

a. Open the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in OPEN.

b. Open the MAIN STM LINE DRN VLVS by placing handswitch 2-HS-6600 in OPEN.

c. **IF BOTH** MSIVs are shut,
THEN perform the following

(1) Close the power supply breakers to the MSIV Bypass valves:

- 2-MOV-4045 breaker, 52-21428
- 2-MOV-4052 breaker, 52-20428

(2) Open the MSIV BYP valves:

- 2-MS-4045-MOV
- 2-MS-4052-MOV

d. Maintain RCS cooldown less than 100° F in any one hour.

(continue)

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

A.5 (continued)

6. **IF** a controlled cooldown is in progress, **THEN** block SGIS and SIAS:

   - **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A.
   - **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B.
   - **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.
   - **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.

(continue)

ALTERNATE ACTIONS

A.5.3 (continued)

e. **IF ALL** 4KV Vital Buses are de-energized
AND boration has **NOT** been commenced,
THEN maintain the following conditions:

   - SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
   - T_{COLD} greater than NEOP-23, figure titled, <u>MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP</u>

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** Verification of RCS temperature response to a plant change during natural circulation takes approximately 5 to 15 minutes following the action due to increased loop cycle times.	
7. **IF ALL** RCPs are secured, **THEN** verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 25° F based on CET temperatures • T_{HOT} minus T_{COLD} less than 50° F • T_{COLD} constant or lowering • T_{HOT} constant or lowering • CET temperatures trend consistent with T_{HOT} • Steaming rate affects RCS temperatures	7.1 **IF** subcooled Natural Circulation can **NOT** be verified, **THEN PROCEED** to HR-2, S/G HEAT SINK WITH SIS OPERATION.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. DETERMINE IF A SGTR EXISTS.	

1. **IF** a SGTR has occurred, as indicated by **ANY** of the following:
• S/G samples
• RMS trends:
  • UNIT 2 CNDSR OFF-GAS (2-RI-1752)
  • UNIT 2 S/G B/D (2-RI-4014)
  • UNIT 2 MAIN VENT GASEOUS (2-RI-5415)
  • MAIN STM EFFL RAD MON (2-RIC-5421 **OR** 2-RIC-5422)
• S/G level change when **NOT** feeding
• Post-Trip S/G level trends
• Mismatch in feed flow prior to the trip
• Steam flow vs. Feed flow mismatch prior to the trip
THEN identify the most affected S/G.	

2. **IF** indications of a SGTR are **NOT** observed, **THEN PROCEED** to Block Step C.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** Maintaining RCS subcooling takes precedence over equalizing RCS pressure and affected S/G pressure. 3. Depressurize the RCS **PER** the selected Pressure and Inventory Control success path to maintain the following: • Subcooling between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure 4. Dispatch an operator to standby in the Unit 2 45 ft Switchgear Room to shut the affected S/G ADV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
5. **WHEN** T_{HOT} is less than 515° F, **THEN** isolate the most affected S/G.	
a. **IF** 21 S/G is the most affected S/G, **THEN** isolate 21 S/G by performing the following actions:	
(1) Shut 21 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.
(a) **IF** 21 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 21 ADV controller, 2-HC-4056A, at 2C43 is set at 0% output.	
(c) Align 21 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3939A • 2-HV-3939B	
(2) Shut 21 MSIV.	
(3) Verify 21 MSIV BYP valve, 2-MS-4045-MOV, is shut.	
(4) Verify 21 SG FW ISOL valve 2-FW-4516-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.a (continued) (5) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (6) Shut 21 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV (7) Shut 21 SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued)	
b. **IF** 22 S/G is the most affected S/G, **THEN** isolate 22 S/G by performing the following actions:	
(1) Shut 22 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.
(a) **IF** 22 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 22 ADV controller, 2-HC-4056B, at 2C43 is set at 0% output.	
(c) Align 22 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3938A • 2-HV-3938B	
(2) Shut 22 MSIV.	
(3) Verfiy 22 MSIV BYP valve, 2-MS-4052-MOV, is shut.	
(4) Verify 22 SG FW ISOL valve 2-FW-4517-MOV, is shut.	
(5) Shut 22 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4071-CV and 2-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.b (continued) (6) Shut 22 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (7) Shut 22 SG BD valves: • 2-BD-4012-CV • 2-BD-4013-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
6. Ensure the affected S/G Safety Valves remain shut.	
a. Close the power supply breakers to the MSIV Bypass valves: • 2-MOV-4045 breaker, 52-21428 • 2-MOV-4052 breaker, 52-20428	
b. Maintain the affected S/G pressure less than 920 PSIA by performing the following:	
CAUTION **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.**	
(1) **IF** the affected S/G pressure approaches 920 PSIA **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV	
(2) **IF** the MSIV BYP valve can **NOT** maintain S/G pressure less than 920 PSIA, **THEN** steam the affected S/G to atmosphere from 2C43 as follows:	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 2C43 as necessary.	(b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

B. (continued)

7. Verify the most affected S/G is isolated by checking the following:

   - S/G sample activity higher in the affected S/G
   - RMS trends:
     - UNIT 2 CNDSR OFF-GAS (2-RI-1752)
     - UNIT 2 S/G B/D (2-RI-4014)
     - UNIT 2 MAIN VENT GASEOUS (2-RI-5415)
   - Unaffected S/G level change consistent with feed flow
   - S/G pressures
   - RCS loop T_{COLD} trends

8. Verify the motor driven train SG AFW BLOCK valves are open with the handswitches in OPEN on the S/G which is unaffected by **EITHER** a SGTR **OR** an ESDE:

   21 S/G
   - 2-AFW-4522-CV
   - 2-AFW-4523-CV

   22 S/G
   - 2-AFW-4532-CV
   - 2-AFW-4533-CV

(continue)

ALTERNATE ACTIONS

7.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions:

CAUTION
Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.

a. Restore feeding and steaming capability to the least affected S/G.

b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step B.5.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. Contact the Operational Support Center to perform periodic samples for the following: • RCS boron concentration at least once per hour • RCS activity • S/Gs boron concentration and activity • Turbine Building Sumps activity • Condensate and CSTs activity • Air samples and radiation surveys throughout the plant to determine the spread of contamination 10. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 11. **IF ALL** RCPs are secured, **THEN** disable RCPs in the affected loop to prevent inadvertant start. a. **IF** 21 S/G is the affected S/G, **THEN** disable 21A and 21B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 21A RCP 252-21P01 • 21A RCP 252-21P02 • 21B RCP 252-23P01 • 21B RCP 252-23P02 b. **IF** 22 S/G is the affected S/G, **THEN** disable 22A and 22B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 22A RCP 252-22P01 • 22A RCP 252-22P02 • 22B RCP 252-24P01 • 22B RCP 252-24P02 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

NOTE
If available, narrow range S/G level indication should be used to control the affected S/G level.

NOTE
Affected S/G level control steps are listed in order of preference and should be performed in the order listed.

12. Maintain the affected S/G level between 0 and (+)50 inches by performing **ANY** of the following:

    a. Maintain the affected S/G level by controlling RCS pressure with backflow to the RCS as follows:

        (1) **IF** the affected S/G level is high, **THEN** reduce RCS pressure below the affected S/G pressure by **ANY** of the following methods:

            (a) De-energize the Pressurizer HTR(s).

            (b) Use MAIN or AUX SPRAY.

            (c) **IF** the HPSI throttle criteria are met,
            THEN throttle or secure flow to reduce RCS pressure.

        (2) Control RCS pressure to maintain the affected S/G level approximately constant.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
B.12 (continued) b. Maintain the affected S/G level by blowdown to the MWS as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), <u>RESET AFAS START SIGNALS AT THE ACTUATION CABINETS</u>. (2) Place UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095, in OPER alarm at 1C22G: (a) Verify 2-HS-4095B/S1 - OPER BYPASS in OFF. (b) Highlight Stop Pump **AND** press SELECT. (c) Verify the CH 1 green OPER LED extinguishes. (d) Bypass annunciator alarms. (3) Verify open B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (4) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (5) Verify shut B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (6) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.b (continued) (7) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV (8) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104 (9) Pump the MWRT **PER** the TRANSFERRING THE MWRT TO THE RCWMT section of OI-17D. (10) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) c. Maintain the affected S/G level by blowdown to the Condenser as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (7) Bypass UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095: (a) Place 2-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 2-HS-4095B/S1 - OPER BYPASS in BYPASS. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.c (continued) (8) Verify shut B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (9) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (10) Verify open B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (11) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104 (12) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV (13) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) d. Maintain the affected S/G level by steaming to the condenser as follows: (1) Ensure the condenser vacuum is greater than 20 InHg. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (7) Operate the MAIN STM UPSTREAM DRN ISOL VLVS using 2-HS-6622 as necessary. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.d (continued) **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.** (8) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV	
e. Maintain the affected S/G level by steaming to atmosphere as follows:	
(1) Steam the affected S/G to atmosphere from 2C43 as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 2C43 as necessary.	(1).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.12 (continued)

f. **IF** the following conditions can be maintained:

- RCS pressure remains below 900 PSIA
- MSIV, ADV and MSIV BYP valves remain shut

THEN the affected S/G may be allowed to fill to the MSIV.

NOTE
If available, narrow range S/G level indication should be used to control the affected S/G level.

NOTE
Affected S/G pressure control steps are listed in order of preference and should be performed in the order listed.

13. Cool and depressurize the affected S/G as necessary by performing **ANY** of the following:

a. **IF ANY** RCP is operating, **THEN** cool and depressurize the affected S/G by feeding and backflow to the RCS as follows:

(1) Verify Letdown is operating.

(2) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.

(3) Ensure RCS Boron concentration at least 116 percent shutdown margin requirement **PER** the NEOPs.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) **CAUTION** **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.** (4) Verify the affected S/G AFW BLOCK valves are shut with the handswitches in SHUT: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV **CAUTION** **Maintain RCS pressure greater than the minimum pump operating limits PER ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS.** (5) Lower the affected S/G level to 0 inches by reducing RCS pressure below the affected S/G pressure by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) Use MAIN or AUX SPRAY. (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) (6) **WHEN** the affected S/G level is 0 inches, **THEN** control RCS pressure to maintain the affected S/G level approximately constant. (7) Repeat steps (1) through (6) as necessary. b. Cool and depressurize the affected S/G by steaming to the condenser as follows: (1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches. (2) Ensure the condenser vacuum is greater than 20 InHg. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (6) IF AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.b (continued) (8) Operate the MAIN STM UPSTREAM DRN ISOL VLVS using 2-HS-6622 as necessary. **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches.** (9) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches, **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
B.13 (continued) c. Cool and depressurize the affected S/G by feeding and blowdown to the MWS as follows: (1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), <u>RESET AFAS START SIGNALS AT THE ACTUATION CABINETS</u>. (3) Place UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095, in OPER alarm at 1C22G: (a) Verify 2-HS-4095B/S1 - OPER BYPASS in OFF. (b) Highlight Stop Pump **AND** press SELECT. (c) Verify the CH 1 green OPER LED extinguishes. (d) Bypass annunciator alarms. (4) Verify open B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (5) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (6) Verify shut B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.13.c (continued)

(7) Shut S/G Combined B/D Header Throttle Valves:

- 2-BD-102
- 2-BD-104

(8) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE:

- (21 S/G) 2-BD-4011-CV
- (22 S/G) 2-BD-4013-CV

(9) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F:

- (21 S/G) 2-BD-102
- (22 S/G) 2-BD-104

(10) Pump the MWRT **PER** the TRANSFERRING THE MWRT TO THE RCWMT section of OI-17D.

(11) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT.

(12) Lower the affected S/G level to 0 inches by S/G blowdown to the MWS.

(13) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued) (14) Repeat steps (11) and (12) as necessary. d. Cool and depressurize the affected S/G by feeding and blowdown to the Condenser as follows: (1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued) (8) Bypass UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095: (a) Place 2-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 2-HS-4095B/S1 - OPER BYPASS in BYPASS. (9) Verify shut B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (10) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (11) Verify open B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (12) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104 (13) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV (14) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued)	
(15) Lower the affected S/G level to 0 inches by S/G blowdown to the Condenser.	
(16) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(17) Repeat steps (14) and (15) as necessary.	
e. Cool and depressurize the affected S/G by steaming to atmosphere as follows:	
(1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches.	
(2) Steam the affected S/G to atmosphere from 2C43 as follows:	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 2C43 as necessary.	(b) Direct throttling open of the affected ADV Manual Isolation Valve to lower the affected S/G pressure: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

B. (continued)

CAUTION
If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.

14. **IF** feedwater flow to the affected S/G is required,
AND 23 AFW PP is available,
THEN establish Auxiliary Feedwater flow as follows:

a. Open the affected S/G motor driven train SG AFW BLOCK valves:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

b. **IF** 23 AFW PP is **NOT** being used to feed the unaffected S/G,
THEN perform the following:

(1) Shut the motor driven train SG AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

(2) Start 23 AFW PP.

(continue)

ALTERNATE ACTIONS

14.1 **IF** 23 AFW PP is **NOT** available,
THEN establish Auxiliary Feedwater flow using 21 or 22 AFW PP as follows:

a. Open the affected S/G steam driven train SG AFW BLOCK valves:

21 S/G
- 2-AFW-4520-CV
- 2-AFW-4521-CV

22 S/G
- 2-AFW-4530-CV
- 2-AFW-4531-CV

b. **IF** 21 or 22 AFW PP is **NOT** being used to feed the unaffected S/G,
THEN shut the steam driven train SG AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

21 S/G
- 2-AFW-4520-CV
- 2-AFW-4521-CV

22 S/G
- 2-AFW-4530-CV
- 2-AFW-4531-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

B.14 (continued)

CAUTION
The 23 AFW PP flow limit is 575 GPM.

c. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the SG FLOW CONTR valve:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

ALTERNATE ACTIONS

B.14.1 (continued)

CAUTION
An unmonitored radiation release could occur if the SG AFW MAIN STM SUPP & BYP valves from the affected S/G are open.

c. Verify the SG AFW MAIN STM SUPP & BYP valves from the unaffected S/G are open:

- (21 SG)2-MS-4070-CV, 2-MS-4070A-CV
- (22 SG)2-MS-4071-CV, 2-MS-4071A-CV

d. Adjust and maintain 21 or 22 AFW PP discharge pressure at least 100 PSI greater than the affected S/G pressure:

- (21 AFW PP SPD CONTR) 2-HC-3987A
- (22 AFW PP SPD CONTR) 2-HC-3989A

e. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the SG FLOW CONTR valve:

- (21 S/G) 2-AFW-4511-CV
- (22 S/G) 2-AFW-4512-CV

f. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. DETERMINE IF AN ESDE EXISTS.	
1. **IF** an ESDE has occurred, by considering **ALL** of the following: • High steam flow from S/G • Lowering S/G pressure • Lowering S/G level • Lowering RCS T_{COLD} • Lowering PZR pressure • Lowering PZR level **THEN** identify the most affected S/G.	
2. **IF** indications of an ESDE are **NOT** observed, **THEN PROCEED** to Block Step D.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
3. Isolate the most affected S/G.	
a. **IF** 21 S/G is the most affected S/G, **THEN** isolate 21 S/G by performing the following actions:	
(1) Shut 21 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.
(a) **IF** 21 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 21 ADV controller, 2-HC-4056A, at 2C43 is set at 0% output.	
(c) Align 21 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3939A • 2-HV-3939B	
(2) Verify 21 MSIV is shut.	
(3) Verify 21 SG FW ISOL valve 2-FW-4516-MOV, is shut.	
(4) Verify 21 MSIV BYP valve, 2-MS-4045-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.a (continued) (5) Shut 21 SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV (6) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (7) Shut 21 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued)	
b. **IF** 22 S/G is the most affected S/G, **THEN** isolate 22 S/G by performing the following actions:	
(1) Shut 22 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.
(a) **IF** 22 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 22 ADV controller, 2-HC-4056B, at 2C43 is set at 0% output.	
(c) Align 22 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3938A • 2-HV-3938B	
(2) Verify 22 MSIV is shut.	
(3) Verify 22 SG FW ISOL valve 2-FW-4517-MOV, is shut.	
(4) Verify 22 MSIV BYP valve, 2-MS-4052-MOV, is shut.	
(5) Shut 22 SG BD valves: • 2-BD-4012-CV • 2-BD-4013-CV	
(6) Shut 22 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4071-CV and 2-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.b (continued) (7) Shut 22 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking.	
4. Verify the most affected S/G was isolated by checking the following: • S/G pressure lower for the affected S/G • RCS loop T_{COLD} lower in the affected loop • S/G level lowering for the affected S/G and stabilized for the unaffected S/G (continue)	4.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions: **CAUTION** **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** a. Restore feeding and steaming capability to the least affected S/G. b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step C.3.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

NOTE
The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure.

5. **IF** the difference between unaffected S/G temperature and CET temperature exceeds 25° F during the blowdown, **THEN** cool the unaffected S/G to within 25° F of CET temperature using the unaffected S/G ADV.

NOTE
The remainder of this procedure may be performed while waiting for the S/G to blowdown.

CAUTION
A heatup of the RCS following an excessive cooldown rate can result in a rise in RCS pressure and the potential for pressurized thermal shock.

6. **WHEN** the RCS cooldown due to blowdown of the affected S/G has stopped, **THEN** operate the unaffected S/G ADV to stabilize RCS temperatures as follows:

   a. Establish the unaffected S/G temperature within 25° F of the lowest CET temperature during blowdown.

   b. **WHEN** unaffected S/G temperature is within 25° F of the lowest CET temperature during blowdown, **THEN** maintain the following:

      - Unaffected S/G pressure approximately constant

      - T_{COLD} approximately constant

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. DETERMINE IF A LOAF EXISTS.	
1. Determine if a LOAF has occurred, by considering **ANY** of the following: • Lowering S/G level, S/G low level alarm, Reactor Trip on Low S/G level • AFAS actuation on low S/G level • "SGFPT TRIP" alarms	
2. **IF** indications of a LOAF are **NOT** observed, **THEN PROCEED** to Block Step E.	
3. **IF** Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored, **THEN** verify the following actions have been performed: a. Trip **ALL** RCPs. b. Shut the SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
4. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued)	
5. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
6. **IF** AFW is available, **THEN** attempt to establish AFW flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.	
a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected SG AFW BLOCK valves in OPEN: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater flow. Each available method can be attempted until auxiliary feed flow is successfully established.

b. Establish AFW flow with 23 AFW PP as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(2) Start 23 AFW PP by placing its handswitch in START.

(3) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

(continue)

ALTERNATE ACTIONS

b.1 Start 23 AFW PP locally as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

(2) Verify 23 AFW PP handswitch is in AUTO.

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 23 breaker, 152-2415, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued) (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (continue)	D.6.b.1(3) (continued) **CAUTION** **Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.** (4) **IF** the breaker fails to close, **THEN**, with the approval of the SM/CRS, perform the following actions: (a) Remove the breaker control power fuses. (b) **IF** necessary, **THEN** manually charge the breaker closing spring. (c) Press the CLOSE button at AFW PP No. 23 breaker, 152-2415. (d) Ensure normal pump running current less than 70 AMPS. (5) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued)	D.6.b.1 (continued) (6) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour
c. Establish AFW flow with 21 or 22 AFW PP as follows: (1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (2) Verify open 21 and 22 AFW PP Main Steam Supply Valves: • 2-MS-109 • 2-MS-107 (3) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve: • 2-MS-3986 • 2-MS-3988	c.1 Start 21 or 22 AFW PP locally as follows: (1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (2) Turn the turbine governor control knob counterclockwise to the minimum position. (3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves: <u>21 AFW PP</u> • 2-AFW-3987 I/P A ISOL, 2-IA-512 • 2-AFW-3987 I/P B ISOL, 2-IA-511 <u>22 AFW PP</u> • 2-AFW-3989 I/P A ISOL, 2-IA-509 • 2-AFW-3989 I/P B ISOL, 2-IA-510
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6.c (continued)

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(4) Open the SG AFW MAIN STM SUPP & BYP valves from a S/G **NOT** affected by a SGTR:

- (21 S/G)2-MS-4070-CV, 2-MS-4070A-CV
- (22 S/G)2-MS-4071-CV, 2-MS-4071A-CV

WARNING
The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.

(5) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN align Liquid N_2 System to supply SG FLOW CONTR valves by opening the following valves located in SRW Room:

- N_2 SUPPLY TO U-2 AFW AMP AIR SYS B/U ISOLATION VALVE, 0-N2-107
- AFW AMPLIFIER AIR SYSTEM N_2 BACKUP SUPPLY VALVE, 2-IA-390

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(4) Open the air filter drains on controllers to allow local control.

(5) Verify open 21 and 22 AFW PP Main Steam Supply Valves:

- 2-MS-109
- 2-MS-107

(6) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve:

- 2-MS-3986
- 2-MS-3988

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(7) Open the AFW Steam Supply Bypass Valves from a S/G **NOT** affected by a SGTR:

- 2-MS-102
- 2-MS-105

(8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS

D.6.c (continued)

(6) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN assign an operator to control AFW discharge pressure locally as follows:

(a) Establish communications between the operator and the control room.

(b) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

21 AFW PP
- 2-AFW-3987 I/P A ISOL, 2-IA-512
- 2-AFW-3987 I/P B ISOL, 2-IA-511

22 AFW PP
- 2-AFW-3989 I/P A ISOL, 2-IA-509
- 2-AFW-3989 I/P B ISOL, 2-IA-510

(c) Adjust 21 or 22 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure.

(7) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (21 AFW PP SPEED CONTR) 2-HC-3987A
- (22 AFW PP SPEED CONTR) 2-HC-3989A

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(9) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G:

- (21 S/G) 2-AFW-4511-CV
- (22 S/G) 2-AFW-4512-CV

(10) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between (-)24 and (+)30 inches
- RCS cooldown rate less than 100° F in any one hour

(11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.c (continued) (8) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (9) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (10) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D.6 (continued)

d. Establish AFW flow with 13 AFW PP as follows:

(1) Shut the Unit 1 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT:

11 S/G
- 1-AFW-4522-CV
- 1-AFW-4523-CV

12 S/G
- 1-AFW-4532-CV
- 1-AFW-4533-CV

(2) Open the U-1 TO U-2 XCONN valve, 1-AFW-4550-CV.

(3) Establish AFW flow with 13 AFW PP as follows:

(a) Shut the Unit 2 SG FLOW . CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

CAUTION
The 13 AFW PP flow limit is 575 GPM.

(b) Start 13 AFW PP by placing its handswitch in START.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.d(3) (continued) (c) Adjust the Unit 2 SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 7. **IF** Booster Pump Injection is available, **THEN** attempt to establish flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. **IF** an ESDE has **NOT** occurred, **THEN** block SGIS as follows: • **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. b. **IF** SGIS has actuated **AND** indications of an ESDE are **NOT** observed, **THEN** reset SGIS as follows: (1) Place the CBPs in PULL TO LOCK. (2) Match handswitch positions **PER** ATTACHMENT (7), <u>SGIS VERIFICATION CHECKLIST</u>. (3) Block SGIS. (4) Reset the SGIS signal. (5) Open the MSIV(s). (6) Open the SG FW ISOL valve(s): • 2-FW-4516-MOV • 2-FW-4517-MOV (7) Start a CBP. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued)	
CAUTION **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.**	
c. Commence a rapid RCS cooldown to T_{COLD} less than 465° F using the TURB BYP valves **OR** ADVs, while maintaining the following: • Cooldown less than 100° F in any one hour • Subcooling between 25 and 140° F based on CET temperatures • Pressurizer level between 50 and 180 inches	c.1 **IF** subcooling exceeds 140° F, **THEN** depressurize the RCS **PER** the selected Pressure and Inventory Control success path.
d. Shut the MAIN SG FW REG valves.	
e. Shift the SG FW REG BYPASS controllers to Manual.	
f. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0.	
g. Depress the SG FRV BYP RESET buttons.	
h. Manually adjust the SG FW REG BYPASS valve controllers to 0%.	
i. Open the SG FW ISOL valves: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV	
j. Open the PRECOAT SYS BYP valve, 2-CD-5818-CV.	
k. Open the COND DEMIN BYP valve, 2-CD-4439-MOV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued) l. Verify at least ONE COND PP is running. m. Verify ONE CBP is running. n. Place BOTH HDT PP Handswitches in PULL TO LOCK. **NOTE** Feedwater flow to S/Gs should start when RCS cooldown has resulted in the S/G pressures dropping to less than the Condensate Booster Pump shut-off head of approximately 500 PSIA. **CAUTION** **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.** o. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW. p. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 8. **IF** Main Feedwater is available, **THEN** attempt to establish Main Feed flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE. a. Shut the MAIN SG FW REG valves. b. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. c. Depress the SG FRV BYP RESET buttons. d. Manually adjust the SG FW REG BYPASS valve controllers to 0%. e. Open the SG FW ISOL valves: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued)	
f. **IF** at least ONE SGFP is **NOT** operating, **THEN**, with the approval of the SM/CRS, attempt to start a SGFP.	
(1) Verify shut the HP and LP Stop Valves.	
(2) Check the DEMAND MIN indicator is illuminated at the OCS.	(2).1 **IF** the DEMAND MIN indicator is **NOT** illuminated, **THEN** depress the down arrow until the DEMAND MIN indicator illuminates.
(3) Reset the SGFP Vacuum Trip **AND** Turbine Trip.	
(4) Open the HP and LP Stop Valves.	
(5) Depress the DIRECT GOVNR VLV pushbutton at the OCS.	
(6) Raise the speed of the SGFP, until the discharge pressure is sufficient to feed the SGs, by depressing the "up" SPEED arrow at the OCS.	
<u>**CAUTION**</u> **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.**	
g. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), <u>MAIN FEEDWATER GOOSENECK PURGE FLOW</u>.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued) h. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between (-)24 and (+)30 inches • RCS cooldown rate less than 100° F in any one hour	
E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	
1. Ensure the TBVs **OR** ADVs are controlling T_{COLD} less than 535° F.	
2. Ensure adequate RCS heat removal with at least ONE S/G by observing **BOTH** of the following conditions exist: • At least ONE S/G level is greater than (-)350 inches • T_{COLD} is stable or lowering	2.1 **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 4. **IF** AFW is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. 5. **IF** Booster Pump Injection is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. b. Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. c. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 6. **IF** Main Feedwater is feeding the least affected S/G(s), **THEN** perform the following: a. Establish a shutdown feed system lineup as follows: • ONE operating SGFP • ONE operating CBP • TWO operating COND PPs • BOTH HDT PPs secured b. Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. c. **WHEN** manual control of feed flow is desired **OR** S/G level is between (-)24 and (+)30 inches, **THEN** perform the following actions: (1) Shift the SG FW REG BYPASS controllers to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the S/G FRV BYP RESET buttons. (4) Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. d. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

E. (continued)

7. **IF** the Main Feedwater System is **NOT** to be used to feed a S/G,
   THEN secure the Main Feed system.

   a. Trip the SGFPs.

   b. Place the CBPs in PULL TO LOCK.

   c. Place TWO COND PPs in PULL TO LOCK.

   d. Place the HDT PPs in PULL TO LOCK.

   e. Shut SG FW ISOL valve:

      - 2-FW-4516-MOV
      - 2-FW-4517-MOV

   f. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 2-LIC-4405 to MANUAL with 50% output.

   g. **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer:

      (1) Verify the SG BD valves are shut:

         - 2-BD-4010-CV
         - 2-BD-4011-CV
         - 2-BD-4012-CV
         - 2-BD-4013-CV

NOTE
2-CD-333 is located 27 foot southeast of 23 Condenser. 2-CD-334 is located 12 foot west of 21 CBP.

      (2) Shut the 21 B/D RECV HX valves:

         - 2-CD-333
         - 2-CD-334

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

F. SECURE RCS BORATION.

1. **WHEN** RCS boration has been completed,
   THEN shift the charging pump suction to a lower boric acid concentration source as follows:

   a. **IF** boration was from the BASTs,
      THEN secure boration as follows:

      (1) Open VCT OUT valve, 2-CVC-501-MOV.

      (2) Stop BA PP(s).

      (3) Shut BA DIRECT M/U valve, 2-CVC-514-MOV.

      (4) Shut BAST GRAVITY FD valves:

      - 2-CVC-508-MOV
      - 2-CVC-509-MOV

   b. **IF** boration was from a RWT,
      THEN secure boration as follows:

      (1) Open VCT OUT valve, 2-CVC-501-MOV.

      (2) Shut RWT CHG PP SUCT valve, 2-CVC-504-MOV.

   c. Return makeup to the VCT **PER** OI-2B, BORATION, DILUTION AND MAKEUP.

   d. Ensure boric acid concentration in makeup water is adequate to maintain required shutdown margin.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. EVALUATE RESTORING FORCED CIRCULATION.

1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following:
   - Verify electrical power is available to the RCPs
     - RCP BUS
     - MCC-215 (ALL RCPs)
     - MCC-205 (21A/21B RCP)
   - Adequacy of RCS and Core Heat Removal using natural circulation
   - Existing RCS pressure and temperatures
   - RCP Controlled Bleed-off temperatures
   - The capability to supply Main **OR** Auxiliary Feedwater to at least ONE S/G
   - The possibility of dilute pockets of water in the RCS due to flow stagnation in the affected loop

2. **IF** at least ONE RCP is operating in each loop
   OR RCP operation is **NOT** desired,
   THEN PROCEED to step H.

3. **IF** T_{COLD} is less than 306° F,
   THEN PROCEED to step H.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. 5. **IF** Component Cooling has been isolated to Containment, **THEN** restore cooling flow **PER** CE-2, CONTAINMENT ISOLATION, **OR** CE-3, CONTAINMENT SPRAY. **CAUTION** **If a RCP Controlled Bleed-off temperature exceeds 250° F, the affected seal must be rebuilt before the RCP can be operated. Do NOT restart ANY RCP whose Controlled Bleed-off temperature has exceeded 250° F.** 6. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 7. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 8. Restore Pressurizer level to between 155 and 180 inches. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)
 	
9. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Electrical power is available to the RCPs
 	
• 22/12 SERV BUS VOLTS is less than 14.8 KV
 	
• 4KV Vital Bus voltage is greater than 4100 volts
 	
• RCP Controlled Bleed-off temperatures are less than 200° F
 	
• RCS subcooling is greater than 25° F based on CET temperatures
 	
• At least ONE S/G available for heat removal
  • S/G level greater than (-)170 inches
  • capable of being supplied with feedwater
  • capable of being steamed
 	
• Pressurizer level is greater than 155 inches and **NOT** lowering
 	
• T_{COLD} is less than 525° F
 	
• RCS temperature and pressure are greater than the minimum operating limits **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS,</u> for the pumps to be started
 	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)

CAUTION
Starting an RCP may cause the following:

- **A pressurizer level transient**
- **A high pressure transient if an RCP is started in a loop in which NO S/G is available for heat removal**
- **Initiation of SIAS if RCS pressure is greater than the SIAS pressurizer pressure setpoint**
- **A reactivity excursion due to dilute pockets of water, if an RCP is restarted in the affected loop, OR boration is NOT complete prior to restarting an RCP in the unaffected loop**

10. **WHEN** RCP restart is desired
AND the RCP restart criteria are met,
THEN start ONE RCP in a loop with an operating S/G as follows:

    a. **IF** a SGTR has been diagnosed,
    AND the RCS pressure has dropped below the affected S/G pressure,
    OR the level in the affected S/G has lowered after isolation,
    THEN verify RCS boration is complete.

    b. Verify the RCP CBO INBD and OUTBD ISOL valves are open:

    - 2-CVC-505-CV
    - 2-CVC-506-CV

    c. Verify the "CCW FLOW LO" alarm is clear.

    d. Start the associated OIL LIFT PP.

    e. Verify the "OIL LIFT PP PRESS LO" alarm is cleared.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.10 (continued) f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. h. Verify the synchroscope on panel 1C19 is **NOT** rotating. i. Start the RCP. j. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 12. Monitor RCP seal parameters following pump restart. 13. Allow backflow to equalize temperatures in the opposite loop. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 14. Start a second RCP in the opposite loop: a. **IF** the Reactor Coolant Pump Breaker CLOSE CIR fuses have been removed, **THEN** replace the CLOSE CIR fuses on the selected Reactor Coolant Pump Breaker. • 21A RCP 252-21P01 • 21A RCP 252-21P02 • 21B RCP 252-23P01 • 21B RCP 252-23P02 • 22A RCP 252-22P01 • 22A RCP 252-22P02 • 22B RCP 252-24P01 • 22B RCP 252-24P02 b. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>. c. Start RCP **PER** step G.10 above. d. Monitor RCP seal parameters following pump restart.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

H. CONTROL CORE AND RCS VOIDING.

NOTE
Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization,
   THEN reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 2-CVC-515-CV
      - 2-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	
CAUTION **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.**	
c. Cycle RCS subcooling between 25 and 140° F as follows:	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RXV VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.
(1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods:	
NOTE Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS.	
• Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1.c (continued) (2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (3) Repeat steps H.1.c.(1) through H.1.c.(2) as necessary. **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** d. **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	
I. PERFORM LOW TEMPERATURE ACTIONS.	
1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required: • SGFP • CBP 2. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than **TWO** RCPs are in operation. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) **NOTE** If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication. 3. **WHEN** T_{COLD} is less than 325° F, **THEN** establish LTOP control by performing the following: a. Place **ALL** HPSI PPs in PULL TO LOCK. b. Shut **ALL** HPSI HDR valves and place their handswitches in PULL-TO-OVERRIDE: MAIN • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV AUX • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV **CAUTION** **Only ONE HPSI Pump shall be operable prior to cooldown to less than 301° F T_{COLD}.** c. Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	3.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate MAIN SPRAY, AUX SPRAY or PZR VENT valves to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) **CAUTION** **PORVs must be in MPT ENABLE before T_{COLD} is less than 301° F.** 4. **WHEN** T_{COLD} is less than 306° F, **THEN** establish MPT protection as follows: a. Verify the PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV b. Verify PZR LO RANGE PRESS, 2-PI-103 is less than VLTOP PORV SETPOINT, 2-ZI-103. c. Verify PZR LO RANGE PRESS, 2-PI-103-1 is less than VLTOP PORV SETPOINT, 2-ZI-103-1. **CAUTION** **PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 406 PSIA.** d. Place the MPT PROT handswitches in VARIABLE MPT ENABLE: • 2-HS-1406 • 2-HS-1408 e. Verify the PORV OVERRIDE handswitches in the AUTO position: • 2-HS-1402 • 2-HS-1404 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 5. **WHEN** RCS temperature is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. b. Close SIT OUT breakers: • (2-SI-614-MOV) 52-21442 • (2-SI-624-MOV) 52-21443 • (2-SI-634-MOV) 52-20442 • (2-SI-644-MOV) 52-20443 c. Shut SIT OUT valves: • 2-SI-614-MOV • 2-SI-624-MOV • 2-SI-634-MOV • 2-SI-644-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
1.5 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the SG AFW BLOCK valves by placing the handswitches in SHUT: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (2) Place 23 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW MAIN STM SUPP & BYP valves: • (21 SG)2-MS-4070-CV, 2-MS-4070A-CV • (22 SG)2-MS-4071-CV, 2-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-1: S/G HEAT SINK WITH NO SIS OPERATION

J. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-1.

RECOVERY ACTIONS	ALTERNATE ACTIONS
1. Check Core and RCS Heat Removal is satisfied by the following indications: • At least ONE S/G has level between (-)24 and (+)30 inches **OR** S/G level is being restored by feedwater flow • **IF** RCPs are operating, **THEN** T_{HOT} minus T_{COLD} is less than 10° F • **IF** RCPs are **NOT** operating, **THEN** T_{HOT} minus T_{COLD} is less than 50° F • RCS subcooling greater than 25° F based on CET temperatures • Reactor Vessel level above the top of the hot leg	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.
2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CORE AND RCS HEAT REMOVAL WITH SIS OPERATION.	
1. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure and minimize S/G inventory loss. a. Shut **BOTH** MSIVs. b. Shut the SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
2. **IF**, at **ANY** time, Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored, **THEN** perform the following actions: a. Trip **ALL** RCPs. b. Shut the SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
3. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

4. **IF** pressurizer pressure is less than or equal to 1725 PSIA
   OR containment pressure is greater than or equal to 2.8 PSIG,
   THEN verify SIAS actuation.

5. **IF** pressurizer pressure is greater than 1725 PSIA
   AND containment pressure is less than 2.8 PSIG,
   THEN perform the following actions to block SIAS:

   a. Open HPSI MAIN and AUX HDR valves:

      MAIN
      - 2-SI-616-MOV
      - 2-SI-626-MOV
      - 2-SI-636-MOV
      - 2-SI-646-MOV

      AUX
      - 2-SI-617-MOV
      - 2-SI-627-MOV
      - 2-SI-637-MOV
      - 2-SI-647-MOV

   b. Start 21 and 23 HPSI PPs.

   c. Start **ALL** available CHG PPs.

   d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received,
      THEN block SIAS A.

   e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received,
      THEN block SIAS B.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>. 6. **IF** SIAS has actuated, **THEN** perform the following actions: a. Verify the following pumps are running: • 21 HPSI PP • 23 HPSI PP • 21 LPSI PP • 22 LPSI PP • **ALL** available CHG PPs (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

A.6 (continued)

b. Verify safety injection flow:

- HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, when pressure is below 1270 PSIA
- LPSI flow **PER** ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW, when pressure is below 185 PSIA

(continue)

ALTERNATE ACTIONS

b.1 Perform the following actions as necessary:

CAUTION
Operation of two HPSI Pumps on 24 4KV Bus may cause 2B DG loading to exceed 3600 KW.

- **IF** 21 HPSI PP failed, **THEN** perform the following actions:
  (1) **IF** 2B DG is powering 24 4KV Bus, **THEN** verify DG load is less than 2960 KW.
  (2) Start 22 HPSI PP.
- **IF** 23 HPSI PP failed, **THEN** align 22 HPSI PP as follows:
  (1) Start 22 HPSI PP.
  (2) Open HPSI HDR XCONN valve, 2-SI-653-MOV.
  (3) Shut HPSI HDR XCONN valve, 2-SI-655-MOV.
- Ensure electrical power is available to valves and pumps.
- Verify safety injection system lineup **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
7. **IF** high RCS pressure is preventing adequate SIS flow to support heat removal, **THEN** attempt to depressurize the RCS to obtain adequate SIS flow by concurrently performing actions **PER** the following: • RCS Pressure And Inventory Control success paths as necessary • The selected Core And RCS Heat Removal success path	
8. **IF** at least ONE 4KV Vital Bus is energized, **THEN** commence RCS boration as follows:	
a. Verify the normal charging flowpath is available for RCS makeup with at least **ONE** LOOP CHG valve open: • 2-CVC-518-CV • 2-CVC-519-CV	a.1 **IF** the normal charging path is **NOT** available, **THEN** establish charging flowpath to the RCS via the HPSI AUX HDR as follows: (1) Shut HPSI AUX HDR ISOL valve, 2-SI-656-MOV. (2) Open **ONE** of the HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV (3) Open SI TO CHG HDR valve, 2-CVC-269-MOV. (4) Shut REGEN HX CHG INLET valve, 2-CVC-183, located in the 27 ft West Penetration Room.
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.a (continued)	A.8.a.1 (continued) (5) Shut L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV a.2 **IF** a charging flowpath can **NOT** be established via the HPSI AUX HDR, **THEN** perform the following: (1) Verify REGEN HX CHG INLET valve, 2-CVC-183, is open. (2) Charge through the Loop Charging valves Bypass Valve, 2-CVC-188.
b. Verify RCS boration from the BAST using the CVCS is in progress as follows: (1) BAST levels remain greater than 10 inches. (2) VCT M/U valve,, 2-CVC-512-CV, is shut. (3) BA DIRECT M/U valve, 2-CVC-514-MOV, is open. (4) BAST GRAVITY FD valves, are open: • 2-CVC-508-MOV • 2-CVC-509-MOV (5) Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. (6) **ALL** available BA PPs, are running. (7) VCT OUT valve, 2-CVC-501-MOV, is shut. (continue)	b.1 **IF** BAST is **NOT** available, **THEN** align charging pumps to take a suction from the RWT as follows: (1) Ensure RWT level is greater than 2 feet. (2) Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. (3) Shut VCT OUT valve, 2-CVC-501-MOV. (4) Start **ALL** available CHG PPs. (5) Ensure CHG HDR PRESS is greater than RCS pressure.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.b (continued) (8) **ALL** available CHG PPs are running. (9) Ensure CHG HDR PRESS is greater than RCS pressure. c. Record the time RCS boration was commenced: ________ d. Record BAST levels: • 21 BAST: ________ • 22 BAST: ________ **CAUTION** **To prevent boric acid precipitation, do NOT continue boration for greater than the following:** • **134 inches from the BAST** • **60 minutes if THREE CHG PPs are operating** • **90 minutes if TWO CHG PPs are operating** • **180 minutes if ONE CHG PP is operating** e. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches. (continue)	

02802

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.e (continued) (3) Boration has been in progress as follows: • For 53 minutes if THREE CHG PPs are operating • For 80 minutes if TWO CHG PPs are operating • For 160 minutes if ONE CHG PP is operating	02802
CAUTION **RCS temperature must be closely monitored to avoid a cooldown rate greater than the Technical Specification Limits.**	
9. IF condenser vacuum is greater than 20 InHg, **THEN** cooldown the RCS to establish Shutdown Cooling entry conditions using the TURB BYP valves as follows: a. Ensure the ADVs are shut. b. Operate the TURB BYP valves from the control room.	9.1 Cooldown the RCS to establish Shutdown Cooling entry conditions using the ADVs as follows: a. Prior to determining if a tube rupture exists and isolating the affected S/G, record the ADV open and close times, for dose calculations. b. Shift the ADV controller to MANUAL.
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

A.9 (continued)

c. **IF** the TURB BYP valves can **NOT** be operated from the Control Room, **THEN** station an operator to manually position the TURB BYP valves **PER** OI-8C, MAIN STEAM AND MSR VENTS AND DRAINS.

d. Maintain RCS cooldown less than 100° F in any one hour.

e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP

(continue)

ALTERNATE ACTIONS

A.9.1 (continued)

c. Operate the ADVs from the control room.

d. **IF** the ADVs will **NOT** operate from the Control Room, **THEN** perform **ONE** of the following:

(1) Operate the ADVs from 2C43 as follows:

(a) Verify the ADV controllers on 2C43 are set at 0% output:

- (21 ADV) 2-HC-4056A
- (22 ADV) 2-HC-4056B

(b) Align the ADV Hand Transfer Valves to 2C43 (POSITION 2):

21 S/G
- 2-HV-3939A
- 2-HV-3939B

22 S/G
- 2-HV-3938A
- 2-HV-3938B

(c) Operate the ADVs from 2C43.

NOTE
The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut.

(2) Locally operate the ADVs from the 45ft level of the Aux Building.

e. Maintain RCS cooldown less than 100° F in any one hour.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS | **ALTERNATE ACTIONS**

A.9 (continued)

(continue)

A.9.1 (continued)

f. **IF ALL** 4KV Vital Buses are de-energized
AND boration has **NOT** been commenced,
THEN maintain the following conditions:

- SUR negative, or SUR zero with WRNI Power less than 10^{-4}%
- T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP

CAUTION

The following step may blow out the Condenser Rupture Disks and may cause equipment damage.

9.2 **IF** the ADVs are **NOT** available,
AND condenser vacuum has been lost,
THEN cooldown the RCS to establish Shutdown Cooling entry conditions by opening the TURB BYP valves:

a. Open **ALL** doors to the outside on the 45 ft level of the Turbine Building.

b. Notify personnel to evacuate the 45 ft level of the Turbine Building.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued) (continue)	A.9.2 (continued) c. **IF BOTH** MSIVs are shut, **THEN** perform the following (1) Close the power supply breakers to the MSIV Bypass valves: • 2-MOV-4045 breaker, 52-21428 • 2-MOV-4052 breaker, 52-20428 (2) Open the MSIV BYP valves: • 2-MS-4045-MOV • 2-MS-4052-MOV d. Shut the SGFPT EXH valves. e. Station an operator to manually operate the TURB BYP valve(s) **PER** OI-8C, MAIN STEAM AND MSR VENTS AND DRAINS, as directed by the Control Room. f. Maintain RCS cooldown less than 100° F in any one hour. g. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%$\Delta\rho$ SHUTDOWN vs. BURNUP (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued)	A.9 (continued)

RECOVERY ACTIONS

A.9 (continued)

(continue)

ALTERNATE ACTIONS

A.9 (continued)

CAUTION
The following step may blow out the Condenser Rupture Disks and may cause equipment damage.

9.3 **IF** RCS cooldown has **NOT** been established,
THEN cooldown the RCS to establish Shutdown Cooling entry conditions by aligning the steam drains to the condenser as follows:

a. Open the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in OPEN.

b. Open the MAIN STM LINE DRN VLVS by placing handswitch 2-HS-6600 in OPEN.

c. **IF BOTH** MSIVs are shut,
THEN perform the following

(1) Close the power supply breakers to the MSIV Bypass valves:

- 2-MOV-4045 breaker, 52-21428
- 2-MOV-4052 breaker, 52-20428

(2) Open the MSIV BYP valves:

- 2-MS-4045-MOV
- 2-MS-4052-MOV

d. Maintain RCS cooldown less than 100° F in any one hour.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.9 (continued)	A.9.3 (continued) e. **IF ALL** 4KV Vital Buses are de-energized **AND** boration has **NOT** been commenced, **THEN** maintain the following conditions: • SUR negative, or SUR zero with WRNI Power less than 10^{-4}% • T_{COLD} greater than NEOP-23, figure titled, MINIMUM ALLOWED RCS TEMPERATURE TO ENSURE 1%Δρ SHUTDOWN vs. BURNUP
NOTE Verification of RCS temperature response to a plant change during natural circulation takes approximately 5 to 15 minutes following the action due to increased loop cycle times.	

10. **IF ALL** RCPs are secured, **THEN** verify Natural Circulation in at least ONE loop by the following:
• RCS subcooling is at least 25° F based on CET temperatures
• T_{HOT} minus T_{COLD} less than 50° F
• T_{COLD} constant or lowering
• T_{HOT} constant or lowering
• CET temperatures trend consistent with T_{HOT}
• Steaming rate affects RCS temperatures
 	
(continue)
	10.1 **IF** subcooled natural circulation can **NOT** be verified, **THEN** verify adequate RCS cooling flow by the following:
	• **ALL** available CHG PPs are operating
	• SIS flow is appropriate **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW
	• At least ONE S/G available for heat removal
	  • S/G level greater than (-)170 inches
	  • capable of being supplied with feedwater
	  • capable of being steamed
	• CET temperatures are less than 50° F superheated

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 11. **IF** a controlled cooldown is in progress, **THEN** block SGIS and SIAS: a. **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. b. **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. c. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. d. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. DETERMINE IF A SGTR EXISTS.	

1. **IF** a SGTR has occurred, as indicated by **ANY** of the following:
• S/G samples
• RMS trends:
  • UNIT 2 CNDSR OFF-GAS (2-RI-1752)
  • UNIT 2 S/G B/D (2-RI-4014)
  • UNIT 2 MAIN VENT GASEOUS (2-RI-5415)
  • MAIN STM EFFL RAD MON (2-RIC-5421 **OR** 2-RIC-5422)
• S/G level change when **NOT** feeding
• Post-Trip S/G level trends
• Mismatch in feed flow prior to the trip
• Steam flow vs. Feed flow mismatch prior to the trip
THEN identify the most affected S/G.	

2. **IF** indications of a SGTR are **NOT** observed, **THEN PROCEED** to Block Step C.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** Maintaining RCS subcooling takes precedence over equalizing RCS pressure and affected S/G pressure. 3. Depressurize the RCS **PER** the selected Pressure and Inventory Control success path to maintain the following: • Subcooling between 25 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS pressure less than 850 PSIA • RCS pressure approximately equal to affected S/G pressure 4. Dispatch an operator to standby in the Unit 2 45 ft Switchgear Room to shut the affected S/G ADV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
5. **WHEN** T_{HOT} is less than 515° F, **THEN** isolate the most affected S/G.	
a. **IF** 21 S/G is the most affected S/G, **THEN** isolate 21 S/G by performing the following actions:	
(1) Shut 21 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.
(a) **IF** 21 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 21 ADV controller, 2-HC-4056A, at 2C43 is set at 0% output.	
(c) Align 21 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3939A • 2-HV-3939B	
(2) Shut 21 MSIV.	
(3) Verify 21 MSIV BYP valve, 2-MS-4045-MOV, is shut.	
(4) Verify 21 SG FW ISOL valve 2-FW-4516-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.a (continued) (5) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (6) Shut 21 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV (7) Shut 21 SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued)	
b. **IF** 22 S/G is the most affected S/G, **THEN** isolate 22 S/G by performing the following actions:	
(1) Shut 22 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.
(a) **IF** 22 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 22 ADV controller, 2-HC-4056B, at 2C43 is set at 0% output.	
(c) Align 22 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3938A • 2-HV-3938B	
(2) Shut 22 MSIV.	
(3) Verfiy 22 MSIV BYP valve, 2-MS-4052-MOV, is shut.	
(4) Verify 22 SG FW ISOL valve 2-FW-4517-MOV, is shut.	
(5) Shut 22 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4071-CV and 2-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5.b (continued) (6) Shut 22 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (7) Shut 22 SG BD valves: • 2-BD-4012-CV • 2-BD-4013-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 6. Ensure the affected S/G Safety Valves remain shut. a. Close the power supply breakers to the MSIV Bypass valves: • 2-MOV-4045 breaker, 52-21428 • 2-MOV-4052 breaker, 52-20428 b. Maintain the affected S/G pressure less than 920 PSIA by performing the following: **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches {(+)50}.** (1) **IF** the affected S/G pressure approaches 920 PSIA **AND** S/G level is less than (+)55 inches {(+)50}, **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV	
(2) **IF** the MSIV BYP valve can **NOT** maintain S/G pressure less than 920 PSIA, **THEN** steam the affected S/G to atmosphere from 2C43 as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 2C43 as necessary. (continue)	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows: (a) Record the ADV open and close times, for dose calculations. (b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

7. Verify the most affected S/G is isolated by checking the following:
• S/G sample activity higher in the affected S/G
• RMS trends:
  • UNIT 2 CNDSR OFF-GAS (2-RI-1752)
  • UNIT 2 S/G B/D (2-RI-4014)
  • UNIT 2 MAIN VENT GASEOUS (2-RI-5415)
• Unaffected S/G level change consistent with feed flow
• S/G pressures
• RCS loop T_{COLD} trends
	7.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions:
	
	CAUTION
	Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.
	
	a. Restore feeding and steaming capability to the least affected S/G.
	b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step B.5.

8. Verify the motor driven train SG AFW BLOCK valves are open with the handswitches in OPEN on the S/G which is unaffected by **EITHER** a SGTR **OR** an ESDE: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 9. Contact the Operational Support Center to perform periodic samples for the following: • RCS boron concentration at least once per hour • RCS activity • S/Gs boron concentration and activity • Turbine Building Sumps activity • Condensate and CSTs activity • Air samples and radiation surveys throughout the plant to determine the spread of contamination 10. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 11. **IF ALL** RCPs are secured, **THEN** disable RCPs in the affected loop to prevent inadvertant start. a. **IF** 21 S/G is the affected S/G, **THEN** disable 21A and 21B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 21A RCP 252-21P01 • 21A RCP 252-21P02 • 21B RCP 252-23P01 • 21B RCP 252-23P02 b. **IF** 22 S/G is the affected S/G, **THEN** disable 22A and 22B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 22A RCP 252-22P01 • 22A RCP 252-22P02 • 22B RCP 252-24P01 • 22B RCP 252-24P02 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** If available, narrow range S/G level indication should be used to control the affected S/G level. **NOTE** Affected S/G level control steps are listed in order of preference and should be performed in the order listed. 12. Maintain the affected S/G level between 0 and (+)50 inches by performing **ANY** of the following: a. Maintain the affected S/G level by controlling RCS pressure with backflow to the RCS as follows: (1) **IF** the affected S/G level is high, **THEN** reduce RCS pressure below the affected S/G pressure by **ANY** of the following methods: (a) De-energize the Pressurizer HTR(s). (b) Use MAIN or AUX SPRAY. (c) **IF** the HPSI throttle criteria are met, **THEN** throttle or secure flow to reduce RCS pressure. (2) Control RCS pressure to maintain the affected S/G level approximately constant. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) b. Maintain the affected S/G level by blowdown to the MWS as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (2) Place UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095, in OPER alarm at 1C22G: (a) Verify 2-HS-4095B/S1 - OPER BYPASS in OFF. (b) Highlight *Stop Pump* **AND** press SELECT. (c) Verify the CH 1 green OPER LED extinguishes. (d) Bypass annunciator alarms. (3) Verify open B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (4) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (5) Verify shut B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (6) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.b (continued) (7) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV (8) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104 (9) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D. (10) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) c. Maintain the affected S/G level by blowdown to the Condenser as follows: (1) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (7) Bypass UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095: (a) Place 2-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 2-HS-4095B/S1 - OPER BYPASS in BYPASS. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.12.c (continued)

(8) Verify shut B/D Recovery DISCH TO MWS, 2-BD-4097-CV.

(9) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV.

(10) Verify open B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV.

(11) Shut S/G Combined B/D Header Throttle Valves:

- 2-BD-102
- 2-BD-104

(12) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE:

- (21 S/G) 2-BD-4011-CV
- (22 S/G) 2-BD-4013-CV

(13) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F:

- (21 S/G) 2-BD-102
- (22 S/G) 2-BD-104

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) d. Maintain the affected S/G level by steaming to the condenser as follows: (1) Ensure the condenser vacuum is greater than 20 InHg. (2) Ensure at least ONE Condensate Demin is in service. (3) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (4) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (5) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (6) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (7) Operate the MAIN STM UPSTREAM DRN ISOL VLVS using 2-HS-6622 as necessary. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12.d (continued)	
CAUTION **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches {(+)50}.**	
(8) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches {(+)50}, **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV	
e. Maintain the affected S/G level by steaming to atmosphere as follows:	
(1) Steam the affected S/G to atmosphere from 2C43 as follows:	(1).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 2C43 as necessary.	(b) Direct throttling of the affected ADV Manual Isolation Valve as necessary: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.12 (continued) f. **IF** the following conditions can be maintained: • RCS pressure remains below 850 PSIA • MSIV, ADV and MSIV BYP valves remain shut **THEN** the affected S/G may be allowed to fill to the MSIV. **NOTE** If available, narrow range S/G level indication should be used to control the affected S/G level. **NOTE** Affected S/G pressure control steps are listed in order of preference and should be performed in the order listed. 13. Cool and depressurize the affected S/G as necessary by performing **ANY** of the following: a. **IF ANY** RCP is operating, **THEN** cool and depressurize the affected S/G by feeding and backflow to the RCS as follows: (1) Verify Letdown is operating. (2) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (3) Ensure RCS Boron concentration at least 116 percent of the shutdown margin requirement **PER** the NEOPs. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

B.13.a (continued)

CAUTION
If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.

(4) Verify the affected S/G AFW BLOCK valves are shut with the handswitches in SHUT:

21 S/G
- 2-AFW-4520-CV
- 2-AFW-4521-CV
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4530-CV
- 2-AFW-4531-CV
- 2-AFW-4532-CV
- 2-AFW-4533-CV

CAUTION
Maintain RCS pressure greater than the minimum pump operating limits PER ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS.

(5) Lower the affected S/G level to 0 inches by reducing RCS pressure below the affected S/G pressure by **ANY** of the following methods:

(a) De-energize the Pressurizer HTR(s).

(b) Use MAIN or AUX SPRAY.

(c) **IF** the HPSI throttle criteria are met,
THEN throttle or secure flow to reduce RCS pressure.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.a (continued) (6) **WHEN** the affected S/G level is 0 inches, **THEN** control RCS pressure to maintain the affected S/G level approximately constant. (7) Repeat steps (1) through (6) as necessary. b. Cool and depressurize the affected S/G by steaming to the condenser as follows: (1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches. (2) Ensure the condenser vacuum is greater than 20 InHg. (3) Ensure at least ONE Condensate Demin is in service. (4) Open PRECOAT SYS BYP valve, 2-CD-5818-CV. (5) Shut COND DEMIN BYP valve, 2-CD-4439-MOV. (6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin. (7) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.b (continued) (8) Operate the MAIN STM UPSTREAM DRN ISOL VLVS using 2-HS-6622 as necessary. **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a S/G whose level exceeds (+)55 inches ((+)50).** (9) **IF** additional steam flow is desired **AND** S/G level is less than (+)55 inches ((+)50), **THEN** operate the MSIV BYP valve on the affected S/G: • (21 S/G) 2-MS-4045-MOV • (22 S/G) 2-MS-4052-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13 (continued) c. Cool and depressurize the affected S/G by feeding and blowdown to the MWS as follows: (1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (3) Place UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095, in OPER alarm at 1C22G: (a) Verify 2-HS-4095B/S1 - OPER BYPASS in OFF. (b) Highlight Stop Pump **AND** press SELECT. (c) Verify the CH 1 green OPER LED extinguishes. (d) Bypass annunciator alarms. (4) Verify open B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (5) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (6) Verify shut B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued)	
(7) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104	
(8) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV	
(9) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104	
(10) Pump the MWRT **PER** the <u>TRANSFERRING THE MWRT TO THE RCWMT</u> section of OI-17D.	
(11) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the S/G blowdown rate while pumping to the RCWMT.	
(12) Lower the affected S/G level to 0 inches by S/G blowdown to the MWS.	
(13) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.c (continued)	
(14) Repeat steps (11) and (12) as necessary.	
d. Cool and depressurize the affected S/G by feeding and blowdown to the Condenser as follows:	
(1) **IF** S/G level is less than (+)50 inches, **THEN** feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), <u>RESET AFAS START SIGNALS AT THE ACTUATION CABINETS</u>.	
(3) Ensure at least ONE Condensate Demin is in service.	
(4) Open PRECOAT SYS BYP valve, 2-CD-5818-CV.	
(5) Shut COND DEMIN BYP valve, 2-CD-4439-MOV.	
(6) **IF** AFW is operating **AND** the SGFP Miniflow Valves are shut, **THEN** throttle open the FW DUMP TO CNDSR HTWL valves, 2-FW-134 and 2-FW-135, to obtain maximum condensate flow through the Condensate Demin.	
(7) Shut CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued) (8) Bypass UNIT 2 S/G B/D RECOVERY radiation monitor, 2-RIC-4095: (a) Place 2-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 2-HS-4095B/S1 - OPER BYPASS in BYPASS. (9) Verify shut B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (10) Verify shut B/D Recovery DISCH TO CIRC WTR, 2-BD-4015-CV. (11) Verify open B/D Recovery DISCH TO CNDSR, 2-BD-4096-CV. (12) Shut S/G Combined B/D Header Throttle Valves: • 2-BD-102 • 2-BD-104 (13) Open the affected SG BOT BD valve by placing its handswitch in RAD TRIP OVERRIDE: • (21 S/G) 2-BD-4011-CV • (22 S/G) 2-BD-4013-CV (14) Throttle open the S/G Combined B/D Header Throttle Valve on the affected S/G to obtain a blowdown flow of approximately 100 GPM while maintaining 21 B/D Heat Exchanger outlet temperature less than 200° F: • (21 S/G) 2-BD-102 • (22 S/G) 2-BD-104 (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.13.d (continued)	
(15) Lower the affected S/G level to 0 inches by S/G blowdown to the Condenser.	
(16) Feed the affected S/G to raise level to (+)50 inches using AFW **PER** step B.14.	
(17) Repeat steps (14) and (15) as necessary.	
e. Cool and depressurize the affected S/G by steaming to atmosphere as follows:	
(1) Control RCS pressure to establish and maintain the affected S/G level between 0 and (+)50 inches.	
(2) Steam the affected S/G to atmosphere from 2C43 as follows:	(2).1 **IF** the affected S/G ADV was manually isolated, **THEN** steam the affected S/G to atmosphere as follows:
(a) Record the ADV open and close times, for dose calculations.	(a) Record the ADV open and close times, for dose calculations.
(b) Direct the adjustment of the ADV from 2C43 as necessary.	(b) Direct throttling open of the affected ADV Manual Isolation Valve to lower the affected S/G pressure: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

B. (continued)

CAUTION
If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.

14. **IF** feedwater flow to the affected S/G is required,
AND 23 AFW PP is available,
THEN establish Auxiliary Feedwater flow as follows:

a. Open the affected S/G motor driven train SG AFW BLOCK valves:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

b. **IF** 23 AFW PP is **NOT** being used to feed the unaffected S/G,
THEN perform the following:

(1) Shut the motor driven train SG AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

(2) Start 23 AFW PP.

(continue)

ALTERNATE ACTIONS

14.1 **IF** 23 AFW PP is **NOT** available,
THEN establish Auxiliary Feedwater flow using 21 or 22 AFW PP as follows:

a. Open the affected S/G steam driven train SG AFW BLOCK valves:

21 S/G
- 2-AFW-4520-CV
- 2-AFW-4521-CV

22 S/G
- 2-AFW-4530-CV
- 2-AFW-4531-CV

b. **IF** 21 or 22 AFW PP is **NOT** being used to feed the unaffected S/G,
THEN shut the steam driven train SG AFW BLOCK valves for the unaffected S/G by placing the handswitches in SHUT:

21 S/G
- 2-AFW-4520-CV
- 2-AFW-4521-CV

22 S/G
- 2-AFW-4530-CV
- 2-AFW-4531-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.14 (continued) **CAUTION** **The 23 AFW PP flow limit is 575 GPM.** c. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the SG FLOW CONTR valve: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV	B.14.1 (continued) **CAUTION** **An unmonitored radiation release could occur if the SG AFW MAIN STM SUPP & BYP valves from the affected S/G are open.** c. Verify the SG AFW MAIN STM SUPP & BYP valves from the unaffected S/G are open: • (21 SG)2-MS-4070-CV, 2-MS-4070A-CV • (22 SG)2-MS-4071-CV, 2-MS-4071A-CV d. Adjust and maintain 21 or 22 AFW PP discharge pressure at least 100 PSI greater than the affected S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A • (22 AFW PP SPD CONTR) 2-HC-3989A e. Restore the affected S/G level, maintain RCS cooldown less than 100° F in any one hour, by adjusting the SG FLOW CONTR valve: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV f. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. DETERMINE IF AN ESDE EXISTS.	
1. **IF** an ESDE has occurred, by considering **ALL** of the following: • High steam flow from S/G • Lowering S/G pressure • Lowering S/G level • Lowering RCS T_{COLD} • Lowering PZR pressure • Lowering PZR level **THEN** identify the most affected S/G.	
2. **IF** indications of an ESDE are **NOT** observed, **THEN PROCEED** to Block Step D.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If there is a conflict between isolating a S/G due to indications of SGTR or ESDE, and maintaining adequate heat removal, then maintain RCS heat removal via the least affected S/G. At least one S/G should always be available for heat removal if possible.**	
3. Isolate the most affected S/G.	
a. **IF** 21 S/G is the most affected S/G, **THEN** isolate 21 S/G by performing the following actions:	
(1) Shut 21 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.
(a) **IF** 21 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 21 ADV controller, 2-HC-4056A, at 2C43 is set at 0% output.	
(c) Align 21 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3939A • 2-HV-3939B	
(2) Verify 21 MSIV is shut.	
(3) Verify 21 SG FW ISOL valve 2-FW-4516-MOV, is shut.	
(4) Verify 21 MSIV BYP valve, 2-MS-4045-MOV, is shut.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.a (continued) (5) Shut 21 SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV (6) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (7) Shut 21 SG AFW BLOCK valves by placing the handswitches in SHUT: • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued)	
b. **IF** 22 S/G is the most affected S/G, **THEN** isolate 22 S/G by performing the following actions:	
(1) Shut 22 ADV using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.
(a) **IF** 22 ADV was locally operated, **THEN** remove the manual override.	
(b) Verify 22 ADV controller, 2-HC-4056B, at 2C43 is set at 0% output.	
(c) Align 22 S/G Hand Transfer Valves to 2C43 (POSITION 2): • 2-HV-3938A • 2-HV-3938B	
(2) Verify 22 MSIV is shut.	
(3) Verify 22 SG FW ISOL valve 2-FW-4517-MOV, is shut.	
(4) Verify 22 MSIV BYP valve, 2-MS-4052-MOV, is shut.	
(5) Shut 22 SG BD valves: • 2-BD-4012-CV • 2-BD-4013-CV	
(6) Shut 22 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4071-CV and 2-MS-4071A-CV.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3.b (continued) (7) Shut 22 SG AFW BLOCK valvesby placing the handswitches in SHUT: • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (8) Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (9) Observe locally, the S/G Safety Valves are **NOT** leaking.	
4. Verify the most affected S/G was isolated by checking the following: • S/G pressure lower for the affected S/G • RCS loop T_{COLD} lower in the affected loop • S/G level lowering for the affected S/G and stabilized for the unaffected S/G (continue)	4.1 **IF** the wrong S/G was isolated, **THEN** perform the following actions: **CAUTION** **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** a. Restore feeding and steaming capability to the least affected S/G. b. **WHEN** RCS heat removal has been re-established to the least affected S/G, **THEN** isolate the most affected S/G **PER** step C.3.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **NOTE** The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure. 5. **IF** the difference between unaffected S/G temperature and CET temperature exceeds 25° F during the blowdown, **THEN** cool the unaffected S/G to within 25° F of CET temperature using the unaffected S/G ADV. **NOTE** The remainder of this procedure may be performed while waiting for the S/G to blowdown. **CAUTION** **A heatup of the RCS following an excessive cooldown rate can result in a rise in RCS pressure and the potential for pressurized thermal shock.** 6. **WHEN** the RCS cooldown due to blowdown of the affected S/G has stopped, **THEN** operate the unaffected S/G ADV to stabilize RCS temperatures as follows: a. Establish the unaffected S/G temperature within 25° F of the lowest CET temperature during blowdown. b. **WHEN** unaffected S/G temperature is within 25° F of the lowest CET temperature during blowdown, **THEN** maintain the following: • Unaffected S/G pressure approximately constant • T_{COLD} approximately constant	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D. DETERMINE IF A LOAF EXISTS.

1. Determine if a LOAF has occurred, by considering **ANY** of the following:
   - Lowering S/G level, S/G low level alarm, Reactor Trip on Low S/G level
   - AFAS actuation on low S/G level
   - "SGFPT TRIP" alarms

2. **IF** indications of a LOAF are **NOT** observed,
   THEN PROCEED to Block Step E.

3. **IF** Main and Auxiliary Feedwater are lost to **BOTH** S/Gs and can **NOT** be readily restored,
   THEN verify the following actions have been performed:

   a. Trip **ALL** RCPs.

   b. Shut the SG BD valves:
      - 2-BD-4010-CV
      - 2-BD-4011-CV
      - 2-BD-4012-CV
      - 2-BD-4013-CV

4. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches
   OR T_{COLD} rises uncontrollably 5° F or greater,
   THEN IMPLEMENT HR-4,
   <u>ONCE-THROUGH-COOLING</u>.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
D. (continued)	
5. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>.	
6. **IF** AFW is available, **THEN** attempt to establish AFW flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.	
a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected SG AFW BLOCK valves in OPEN: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater flow. Each available method can be attempted until auxiliary feed flow is successfully established.

b. Establish AFW flow with 23 AFW PP as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(2) Start 23 AFW PP by placing its handswitch in START.

(3) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

(continue)

ALTERNATE ACTIONS

b.1 Start 23 AFW PP locally as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

(2) Verify 23 AFW PP handswitch is in AUTO.

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 23 breaker, 152-2415, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued) (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (continue)	D.6.b.1(3) (continued) **CAUTION** **Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.** (4) **IF** the breaker fails to close, **THEN**, with the approval of the SM/CRS, perform the following actions: (a) Remove the breaker control power fuses. (b) **IF** necessary, **THEN** manually charge the breaker closing spring. (c) Press the CLOSE button at AFW PP No. 23 breaker, 152-2415. (d) Ensure normal pump running current less than 70 AMPS. (5) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV (continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.b (continued)	D.6.b.1 (continued) (6) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour
c. Establish AFW flow with 21 or 22 AFW PP as follows: (1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (2) Verify open 21 and 22 AFW PP Main Steam Supply Valves: • 2-MS-109 • 2-MS-107 (3) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve: • 2-MS-3986 • 2-MS-3988	c.1 Start 21 or 22 AFW PP locally as follows: (1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (2) Turn the turbine governor control knob counterclockwise to the minimum position. (3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves: <u>21 AFW PP</u> • 2-AFW-3987 I/P A ISOL, 2-IA-512 • 2-AFW-3987 I/P B ISOL, 2-IA-511 <u>22 AFW PP</u> • 2-AFW-3989 I/P A ISOL, 2-IA-509 • 2-AFW-3989 I/P B ISOL, 2-IA-510
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.c (continued)	D.6.c.1 (continued)

RECOVERY ACTIONS

D.6.c (continued)

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(4) Open the SG AFW MAIN STM SUPP & BYP valves from a S/G **NOT** affected by a SGTR:

- (21 S/G)2-MS-4070-CV, 2-MS-4070A-CV
- (22 S/G)2-MS-4071-CV, 2-MS-4071A-CV

WARNING
The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.

(5) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN align Liquid N_2 System to supply SG FLOW CONTR valves by opening the following valves located in SRW Room:

- N_2 SUPPLY TO U-2 AFW AMP AIR SYS B/U ISOLATION VALVE, 0-N2-107
- AFW AMPLIFIER AIR SYSTEM N_2 BACKUP SUPPLY VALVE, 2-IA-390

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(4) Open the air filter drains on controllers to allow local control.

(5) Verify open 21 and 22 AFW PP Main Steam Supply Valves:

- 2-MS-109
- 2-MS-107

(6) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve:

- 2-MS-3986
- 2-MS-3988

CAUTION
An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.

(7) Open the AFW Steam Supply Bypass Valves from a S/G **NOT** affected by a SGTR:

- 2-MS-102
- 2-MS-105

(8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS

D.6.c (continued)

(6) **IF** a loss of **ALL** Vital 4KV busses has occurred,
THEN assign an operator to control AFW discharge pressure locally as follows:

(a) Establish communications between the operator and the control room.

(b) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves:

21 AFW PP
- 2-AFW-3987 I/P A ISOL, 2-IA-512
- 2-AFW-3987 I/P B ISOL, 2-IA-511

22 AFW PP
- 2-AFW-3989 I/P A ISOL, 2-IA-509
- 2-AFW-3989 I/P B ISOL, 2-IA-510

(c) Adjust 21 or 22 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure.

(7) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (21 AFW PP SPEED CONTR) 2-HC-3987A
- (22 AFW PP SPEED CONTR) 2-HC-3989A

(continue)

ALTERNATE ACTIONS

D.6.c.1 (continued)

(9) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G:

- (21 S/G) 2-AFW-4511-CV
- (22 S/G) 2-AFW-4512-CV

(10) **WHEN** S/G level response is observed
OR continuous feed has been maintained for at least 5 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending to between 0 and (+)38 inches
- RCS cooldown rate less than 100° F in any one hour

(11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.c (continued) (8) Adjust the SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (9) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (10) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6 (continued) d. Establish AFW flow with 13 AFW PP as follows: (1) Shut the Unit 1 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV (2) Open the U-1 TO U-2 XCONN valve, 1-AFW-4550-CV. (3) Establish AFW flow with 13 AFW PP as follows: (a) Shut the Unit 2 SG FLOW CONTR valves: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV **CAUTION** **The 13 AFW PP flow limit is 575 GPM.** (b) Start 13 AFW PP by placing its handswitch in START. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.6.d(3) (continued) (c) Adjust the Unit 2 SG FLOW CONTR valves to approximately 150 GPM per S/G: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV (4) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

D. (continued)

7. **IF** Booster Pump Injection is available, **THEN** attempt to establish flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.

   a. **IF** an ESDE has **NOT** occurred, **THEN** block SGIS as follows:

      - **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A.
      - **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B.

   b. **IF** SGIS has actuated **AND** indications of an ESDE are **NOT** observed, **THEN** reset SGIS as follows:

      (1) Place the CBPs in PULL TO LOCK.

      (2) Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST.

      (3) Block SGIS.

      (4) Reset the SGIS signal.

      (5) Open the MSIV(s).

      (6) Open the SG FW ISOL valve(s):

      - 2-FW-4516-MOV
      - 2-FW-4517-MOV

      (7) Start a CBP.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued)	
CAUTION **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.**	
c. Commence a rapid RCS cooldown to T_{COLD} less than 465° F using the TURB BYP valves **OR** ADVs, while maintaining the following: • Cooldown less than 100° F in any one hour • Subcooling less than 140° F based on CET temperatures	c.1 **IF** subcooling exceeds 140° F, **THEN** depressurize the RCS **PER** the selected Pressure and Inventory Control success path.
d. Shut the MAIN SG FW REG valves.	
e. Shift the SG FW REG BYPASS controllers to Manual.	
f. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0.	
g. Depress the SG FRV BYP RESET buttons.	
h. Manually adjust the SG FW REG BYPASS valve controllers to 0%.	
i. Open the SG FW ISOL valves: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV	
j. Open the PRECOAT SYS BYP valve, 2-CD-5818-CV.	
k. Open the COND DEMIN BYP valve, 2-CD-4439-MOV.	
l. Verify at least ONE COND PP is running.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.7 (continued) m. Verify ONE CBP is running. n. Place BOTH HDT PP Handswitches in PULL TO LOCK. **NOTE** Feedwater flow to S/Gs should start when RCS cooldown has resulted in the S/G pressures dropping to less than the Condensate Booster Pump shut-off head of approximately 500 PSIA. **CAUTION** **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.** o. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW. p. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued)	

CAUTION
Severe waterhammer may occur if the Main Feed Ring is allowed to drain and is subsequently refilled.

8. **IF** Main Feedwater is available, **THEN** attempt to establish Main Feed flow to the S/G(s) which is unaffected by **EITHER** a SGTR **OR** an ESDE.

   a. Shut the MAIN SG FW REG valves.

   b. Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0.

   c. Depress the SG FRV BYP RESET buttons.

   d. Manually adjust the SG FW REG BYPASS valve controllers to 0%.

   e. Open the SG FW ISOL valves:

      - (21 S/G) 2-FW-4516-MOV
      - (22 S/G) 2-FW-4517-MOV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued)	
f. **IF** at least ONE SGFP is **NOT** operating, **THEN**, with the approval of the SM/CRS, attempt to start a SGFP.	
(1) Verify shut the HP and LP Stop Valves.	
(2) Check the DEMAND MIN indicator is illuminated at the OCS.	(2).1 **IF** the DEMAND MIN indicator is **NOT** illuminated, **THEN** depress the down arrow until the DEMAND MIN indicator illuminates.
(3) Reset the SGFP Vacuum Trip **AND** Turbine Trip.	
(4) Open the HP and LP Stop Valves.	
(5) Depress the DIRECT GOVNR VLV pushbutton at the OCS.	
(6) Raise the speed of the SGFP, until the discharge pressure is sufficient to feed the SGs, by depressing the "up" SPEED arrow at the OCS.	
CAUTION **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.**	
g. Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.8 (continued) h. **WHEN** continuous feed has been maintained for at least 10 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending to between 0 and (+)38 inches • RCS cooldown rate less than 100° F in any one hour	
E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	
1. Ensure the TBVs **OR** ADVs are controlling T_{COLD} less than 535° F.	
2. Ensure adequate RCS heat removal with at least ONE S/G by observing **BOTH** of the following conditions exist: • At least ONE S/G level is greater than (-)350 inches • T_{COLD} is stable or lowering	2.1 **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN IMPLEMENT** HR-4, <u>ONCE-THROUGH-COOLING</u>.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>.	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 4. **IF** AFW is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. 5. **IF** Booster Pump Injection is feeding the least affected S/G(s), **THEN** perform the following: a. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. b. Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. c. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 6. **IF** Main Feedwater is feeding the least affected S/G(s), **THEN** perform the following: a. Establish a shutdown feed system lineup as follows: • ONE operating SGFP • ONE operating CBP • TWO operating COND PPs • BOTH HDT PPs secured b. Ensure feed flow is restoring S/G level to between 0 and (+)38 inches and RCS cooldown does **NOT** exceed 100° F in any one hour. c. **WHEN** manual control of feed flow is desired **OR** S/G level is between 0 and (+)38 inches; **THEN** perform the following actions: (1) Shift the SG FW REG BYPASS controllers to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the S/G FRV BYP RESET buttons. (4) Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches. d. **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 7. **IF** the Main Feedwater System is **NOT** to be used to feed a S/G, **THEN** secure the Main Feed system. a. Trip the SGFPs. b. Place the CBPs in PULL TO LOCK. c. Place TWO COND PPs in PULL TO LOCK. d. Place the HDT PPs in PULL TO LOCK. e. Shut SG FW ISOL valve: • 2-FW-4516-MOV • 2-FW-4517-MOV f. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 2-LIC-4405 to MANUAL with 50% output. g. **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer: (1) Verify the SG BD valves are shut: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV **NOTE** 2-CD-333 is located 27 foot southeast of 23 Condenser. 2-CD-334 is located 12 foot west of 21 CBP. (2) Shut the 21 B/D RECV HX valves: • 2-CD-333 • 2-CD-334	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. SECURE RCS BORATION.	
1. **WHEN** RCS boration has been completed, **THEN** shift the charging pump suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut VCT OUT valve, 2-CVC-501-MOV. c. Place the BA PPs in PULL TO LOCK. d. Ensure the BAST levels are steady.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. EVALUATE RESTORING FORCED CIRCULATION.

1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following:
   - Verify electrical power is available to the RCPs
     - RCP BUS
     - MCC-215 (ALL RCPs)
     - MCC-205 (21A/21B RCP)
   - Adequacy of RCS and Core Heat Removal using natural circulation
   - Existing RCS pressure and temperatures
   - RCP Controlled Bleed-off temperatures
   - The capability to supply Main **OR** Auxiliary Feedwater to at least ONE S/G
   - The possibility of dilute pockets of water in the RCS due to flow stagnation in the affected loop

2. **IF** at least ONE RCP is operating in each loop
   OR RCP operation is **NOT** desired,
   THEN PROCEED to step H.

3. **IF** T_{COLD} is less than 306° F,
   THEN PROCEED to step H.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued)	
4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors.	
5. **IF** Component Cooling has been isolated to Containment, **THEN** restore cooling flow **PER** CE-2, CONTAINMENT ISOLATION, **OR** CE-3, CONTAINMENT SPRAY.	
CAUTION **If a RCP Controlled Bleed-off temperature exceeds 250° F, the affected seal must be rebuilt before the RCP can be operated. Do NOT restart ANY RCP whose Controlled Bleed-off temperature has exceeded 250° F.**	
6. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F.	
7. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering.	
8. Restore Pressurizer level to between 155 and 180 inches.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. (continued)

9. Verify the RCP restart criteria are met by **ALL** of the following:
   - Electrical power is available to the RCPs
   - 22/12 SERV BUS VOLTS is less than 14.8 KV
   - 4KV Vital Bus voltage is greater than 4100 volts
   - RCP Controlled Bleed-off temperatures are less than 200° F
   - RCS subcooling is greater than 25° F based on CET temperatures
   - At least ONE S/G available for heat removal
     - S/G level greater than (-)170 inches
     - capable of being supplied with feedwater
     - capable of being steamed
   - Pressurizer level is greater than 155 inches and **NOT** lowering
   - T_{COLD} is less than 525° F
   - RCS temperature and pressure are greater than the minimum operating limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, for the pumps to be started

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) CAUTION **Starting an RCP may cause the following:** • **A pressurizer level transient** • **A high pressure transient if an RCP is started in a loop in which NO S/G is available for heat removal** • **Initiation of SIAS if RCS pressure is greater than the SIAS pressurizer pressure setpoint** • **A reactivity excursion due to dilute pockets of water, if an RCP is restarted in the affected loop, OR boration is NOT complete prior to restarting an RCP in the unaffected loop** 10. **WHEN** RCP restart is desired **AND** the RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. **IF** a SGTR has been diagnosed, **AND** the RCS pressure has dropped below the affected S/G pressure, **OR** the level in the affected S/G has lowered after isolation, **THEN** verify RCS boration is complete. b. Verify the RCP CBO INBD and OUTBD ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV c. Verify the "CCW FLOW LO" alarm is clear. d. Start the associated OIL LIFT PP. e. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.10 (continued) f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. h. Verify the synchroscope on panel 1C19 is **NOT** rotating. i. Start the RCP. j. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 12. Monitor RCP seal parameters following pump restart. 13. Allow backflow to equalize temperatures in the opposite loop. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 14. Start a second RCP in the opposite loop: a. **IF** the Reactor Coolant Pump Breaker CLOSE CIR fuses have been removed, **THEN** replace the CLOSE CIR fuses on the selected Reactor Coolant Pump Breaker. • 21A RCP 252-21P01 • 21A RCP 252-21P02 • 21B RCP 252-23P01 • 21B RCP 252-23P02 • 22A RCP 252-22P01 • 22A RCP 252-22P02 • 22B RCP 252-24P01 • 22B RCP 252-24P02 b. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>. c. Start RCP **PER** step G.10 above. d. Monitor RCP seal parameters following pump restart.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

H. CONTROL CORE AND RCS VOIDING.

NOTE
Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization,
   THEN reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 2-CVC-515-CV
      - 2-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 25 and 140° F as follows: (1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. • Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped. (continue)	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RXV VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1.c (continued) (2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (3) Repeat steps H.1.c.(1) through H.1.c.(2) as necessary. **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** d. **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	
I. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	
1. Observe Containment Sump level rises as RWT level lowers.	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.
2. Ensure steps associated with RAS are performed **PER** the selected RCS Pressure and Inventory Control success path.	
3. Ensure Core Flush is initiated **PER** PIC-4, SIS as required.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. PERFORM LOW TEMPERATURE ACTIONS.	
1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required: • SGFP • CBP	
2. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than **TWO** RCPs are in operation.	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS

J. (continued)

CAUTION
PORVs must be in MPT ENABLE before T_{COLD} is less than 301° F.

3. **WHEN** T_{COLD} is less than 306° F, **THEN** establish MPT protection as follows:

    a. Verify the PORV BLOCK valves are OPEN:

    - 2-RC-403-MOV
    - 2-RC-405-MOV

    b. Verify PZR LO RANGE PRESS, 2-PI-103 is less than VLTOP PORV SETPOINT, 2-ZI-103.

    c. Verify PZR LO RANGE PRESS, 2-PI-103-1 is less than VLTOP PORV SETPOINT, 2-ZI-103-1.

CAUTION
PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 406 PSIA.

    d. Place the MPT PROT handswitches in VARIABLE MPT ENABLE:

    - 2-HS-1406
    - 2-HS-1408

    e. Verify the PORV OVERRIDE handswitches in the AUTO position:

    - 2-HS-1402
    - 2-HS-1404

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. **WHEN** RCS temperature is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. b. Close SIT OUT breakers: • (2-SI-614-MOV) 52-21442 • (2-SI-624-MOV) 52-21443 • (2-SI-634-MOV) 52-20442 • (2-SI-644-MOV) 52-20443 c. Shut SIT OUT valves: • 2-SI-614-MOV • 2-SI-624-MOV • 2-SI-634-MOV • 2-SI-644-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.4 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the SG AFW BLOCK valves by placing the handswitches in SHUT: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (2) Place 23 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW MAIN STM SUPP & BYP valves: • (21 SG)2-MS-4070-CV, 2-MS-4070A-CV • (22 SG)2-MS-4071-CV, 2-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-2: S/G HEAT SINK WITH SIS OPERATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-2.	
1. Check Core and RCS Heat Removal is satisfied by the following indications: • At least ONE S/G has level between 0 and (+)38 inches **OR** S/G level is being restored by feedwater flow • CET temperatures are less than 50° F superheated • IF RAS has **NOT** occurred, **AND** pressurizer pressure is greater than 1270 PSIA, **THEN** at least ONE CHG PP operating **NOTE** LPSI Pumps are **NOT** required post-RAS. **NOTE** Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met. • HPSI and LPSI Pumps are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.
2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. PERFORM LOW TEMPERATURE ACTIONS.	
1. **IF** Main Feedwater is in operation **AND** high Feedwater pressure is causing level control problems, **THEN** secure pumps as required: • SGFP • CBP	
2. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than **TWO** RCPs are in operation.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication.	
3. **IF** the HPSI system is **NOT** in operation, **AND** T_{COLD} is less than 325° F, **THEN** establish LTOP control by performing the following: a. Place **ALL** HPSI PPs in PULL TO LOCK. b. Shut **ALL** HPSI HDR valves and place their handswitches in PULL-TO-OVERRIDE: MAIN • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV AUX • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV	3.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate MAIN SPRAY, AUX SPRAY or PZR VENT valves to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS
CAUTION **Only ONE HPSI Pump shall be operable prior to cooldown to less than 301° F T_{COLD}.** c. Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

CAUTION
PORVs must be in MPT ENABLE before T_{COLD} is less than 301° F.

4. **WHEN** T_{COLD} is less than 306° F, **THEN** establish MPT protection as follows:

   a. Verify the PORV BLOCK valves are OPEN:

      - 2-RC-403-MOV
      - 2-RC-405-MOV

   b. Verify PZR LO RANGE PRESS, 2-PI-103 is less than VLTOP PORV SETPOINT, 2-ZI-103.

   c. Verify PZR LO RANGE PRESS, 2-PI-103-1 is less than VLTOP PORV SETPOINT, 2-ZI-103-1.

CAUTION
PORVs will open if they are placed in SINGLE MPT ENABLE and PZR Pressure is greater than 406 PSIA.

   d. Place the MPT PROT handswitches in VARIABLE MPT ENABLE:

      - 2-HS-1406
      - 2-HS-1408

   e. Verify the PORV OVERRIDE handswitches in the AUTO position:

      - 2-HS-1402
      - 2-HS-1404

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 5. **WHEN** RCS temperature is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. b. Close SIT OUT breakers: • (2-SI-614-MOV) 52-21442 • (2-SI-624-MOV) 52-21443 • (2-SI-634-MOV) 52-20442 • (2-SI-644-MOV) 52-20443 c. Shut SIT OUT valves: • 2-SI-614-MOV • 2-SI-624-MOV • 2-SI-634-MOV • 2-SI-644-MOV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued) d. **IF** Auxiliary Feedwater is **NOT** being used to feed the S/Gs, **THEN** perform the following actions: (1) Shut the SG AFW BLOCK valves by placing the handswitches in SHUT: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (2) Place 23 AFW PP in PULL TO LOCK. (3) Verify shut SG AFW MAIN STM SUPP & BYP valves: • (21 SG)2-MS-4070-CV, 2-MS-4070A-CV • (22 SG)2-MS-4071-CV, 2-MS-4071A-CV	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. CONTROL CORE AND RCS VOIDING.

NOTE

Core and RCS voiding may be indicated by the following:

- Letdown flow greater than charging flow
- Rapid unexplained rise in pressurizer level during an RCS pressure reduction
- Loss of subcooled margin as determined using CET temperatures
- "RXV WTR LVL LO" alarm

1. **IF** voiding causes difficulty in depressurization, **THEN** reduce or eliminate the voided area by performing the following actions:

   a. Shut the L/D CNTMT ISOL valves:

      - 2-CVC-515-CV
      - 2-CVC-516-CV

   b. Stop depressurizing the RCS.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 25 and 140° F as follows: (1) Raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. • Energize the Pressurizer HTR(s) • Secure Pressurizer SPRAY • Raise RCS cooldown rate while maintaining cooldown less than 100° F in any one hour • **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI HDR valves which have been throttled, **OR** starting HPSI PPs which have been stopped. (continue)	c.1 **IF** cycling RCS subcooling is ineffective, **THEN** operate RXV VENT valves **PER** the VENTING THE REACTOR COOLANT SYSTEM AFTER AN ACCIDENT section of OI-1G.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1.c (continued) (2) Lower RCS subcooling to as near 25° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown • **IF** HPSI throttle criteria are met, **THEN** throttle the HPSI HDR valves, **OR** stop the HPSI PPs one at a time (3) Repeat steps B.1.c.(1) through B.1.c.(2) as necessary. **NOTE** Voids may form in the S/G Tubes if saturation pressure of a S/G is greater than saturation pressure of RCS. **CAUTION** **If voids exist in the S/G Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** d. **IF** voiding is suspected in the S/G tubes, **THEN** cool the S/G so RCS cooldown rate remains less than 100° F in any one hour by raising **ANY** of the following: • Steaming rate • Feed rate • S/G Blowdown rate (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	
C. ESTABLISH CORE AND RCS HEAT REMOVAL BY SHUTDOWN COOLING.	
1. Verify RCS pressure and temperature is within the limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. 2. **WHEN** the following conditions exist: • CET temperatures are less than 300° F • Pressurizer pressure is less than 270 PSIA • Pressurizer level is greater than 101 inches • RCS subcooling is greater than 25° F based on CET temperatures **THEN** perform the following actions: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.2 (continued) c. Operate HPSI, and Charging and Letdown to maintain the following: • Pressurizer level between 101 and 180 inches • RCS pressure within the specified limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS 3. **IF** the following conditions exist: • CET temperatures are less than 300° F • Conditions for establishing shutdown cooling can **NOT** be met • Recirculation via the Containment Sump is in progress • CNTMT WIDE RANGE WTR LVL indicator 2-LI-4146, or 2-LI-4147 indicates at least 28 inches • Component Cooling system is available as a heat sink • **BOTH** CS PPs are secured **THEN** commence alternate shutdown cooling as follows: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Verify RCS pressure minus containment pressure is less than 160 PSID. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) c. **IF** the plant computer is **NOT** operating, **THEN** record the following information: • RCS T_{COLD} • PZR PRESS • SDC HX OUTLET TEMP (2-TI-303X and 2-TI-303Y) • Average CNTMT ambient temperature (2-TI-5309 and 2-TI-5311) • 27' Penetration Room temperature (2-TI-5276 and 2-TI-5280) • Steady State SDC flow rate (2-FIC-306) (following initiation) d. Shut 21 CS PP DISCH valve, 2-SI-314. e. Shut 22 CS PP DISCH valve, 2-SI-324. f. Shut 21 SDC HX OUT TO CS valve, 2-SI-319. g. Shut 22 SDC HX OUT TO CS valve, 2-SI-329. h. Open 21 SDC HX INLET XCONN valve, 2-SI-452. i. Open 21 SDC HX OUTLET TO LPSI HDR valve, 2-SI-456. j. Open 22 SDC HX INLET XCONN valve, 2-SI-453. k. Open 22 SDC HX OUTLET TO LPSI HDR valve, 2-SI-457. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) l. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SW OUT valves: • 2-HIC-5206 • 2-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 2-CC-3824-CV • 2-CC-3826-CV (3) Verify TWO CC PPs in operation. m. Open 21 SDC HX CC OUT valve, 2-CC-3828-CV. n. Open 22 SDC HX CC OUT valve, 2-CC-3830-CV. o. Open SDC HX LPSI INL valve, 2-SI-658-MOV. p. Place the keyswitch for SDC FLOW CONTR, 2-SI-306-CV in AUTO. q. Shift 2-FIC-306 to MANUAL with a 95% output signal. r. **IF** Hot Leg Injection is being used for core flush, **THEN** verify 22B LPSI HDR valve, 2-SI-635-MOV, is shut. s. **IF** Pressurizer Injection is being used for core flush, **THEN** open 22B LPSI HDR valve, 2-SI-635-MOV. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 *(continued)* t. Open LPSI HDR valves: • 2-SI-615-MOV • 2-SI-625-MOV • 2-SI-645-MOV u. Verfiy the CNTMT SUMP DISCH valves are open: • 2-SI-4144-MOV • 2-SI-4145-MOV v. Shut SI PP RECIRC valves: • 2-SI-659-MOV • 2-SI-660-MOV **CAUTION** **The possibility of cavitation rises when taking suction from the Containment sump.** w. **IF** the LPSI PPs are **NOT** operating, **THEN** clear RAS from ONE operable LPSI PP and start as follows: (1) Place the selected LPSI PP RAS OVERRIDE switch in OVERRIDE. (2) Start the selected LPSI PP. x. Adjust the signal on 2-FIC-306 to raise flow to 3000 GPM, while maintaining cooldown rate less than 100° F in any one hour. y. Place the keyswitch for the S/D COOLING TEMP CONTR, 2-SI-657-CV, in AUTO. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) **CAUTION** **The heatup rate limit for the Shutdown Cooling Heat Exchangers is 14° F/m.** z. Adjust 2-SI-657-CV to obtain less than 14° F/m heatup rate at SDC HX OUT TEMP, 2-TI-303X and 2-TI-303Y. aa. **IF** a second LPSI PP is desired, **THEN** perform the following actions: (1) Place the second LPSI PP RAS OVERRIDE switch in OVERRIDE. (2) Start the second LPSI PP and adjust 2-FIC-306 to 6000 GPM. ab. Adjust SDC TEMP CONTR valve, 2-SI-657-CV, to obtain the desired cooldown rate. 4. **WHEN** the following conditions exist: • CET temperatures are less than 300° F **AND** less than 50° F superheated • Pressurizer pressure is less than 270 PSIA • Reactor Vessel level is above the middle of the hot leg **THEN** perform the following actions: a. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning. b. Initiate Shutdown Cooling **PER** OI-3B, <u>SHUTDOWN COOLING</u>. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS

C. (continued)

5. **IF** core flush is in progress
   AND CET temperatures are less than 200° F,
   THEN secure core flush as follows:

   a. **IF** Pressurizer Injection is being used,
      THEN perform the following actions:

      (1) **IF** HPSI PPs are **NOT** required for RCS pressure or level control,
          THEN secure HPSI PPs.

CAUTION
Minimum HPSI Pump flow is 90 GPM to prevent pump damage.

      (2) Shut SI TO CHG HDR valve, 2-CVC-269-MOV.

      (3) Open LOOP CHG valves:

      - 2-CVC-518-CV
      - 2-CVC-519-CV

      (4) Shut AUX SPRAY valve, 2-CVC-517-CV.

   b. **IF** Hot Leg Injection is being used,
      THEN perform the following actions:

      (1) Shut SDC RECIRC ISOL valve, 2-SI-399-MOV.

      (2) Open 22B LPSI HDR valve, 2-SI-635-MOV.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-3: SHUTDOWN COOLING SYSTEM

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-3.	
1. Verify Core And RCS Heat Removal is satisfied by the following indications: • CET temperatures are less than 300° F, and less than 50° F superheated **NOTE** The limits of ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if the HPSI throttle criteria are met. • HPSI PPs are injecting water into RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW • Pressurizer pressure is less than 270 PSIA {245} • Reactor Vessel level indicates the core is covered	1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.
2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CORE AND RCS HEAT REMOVAL BY ONCE-THROUGH-COOLING.	
1. Ensure **ALL** RCPs are tripped.	
2. Minimize S/G inventory losses by ensuring the SG BD valves are shut: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
3. **IF EITHER** S/G level is greater than (-)350 inches, **THEN** attempt to maintain RCS temperature constant using the TURB BYP valves **OR** the ADV(s).	
4. IF SGIS has **NOT** actuated, **THEN** perform the following: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B.	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

A. (continued)

NOTE
Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of A.5 may be performed, and in any order.

NOTE
Perform steps A.5 and A.6 concurrently.

CAUTION
If S/Gs have become ineffective in removing heat, Once-Through-Cooling must be initiated prior to CET temperatures reaching 560° F to ensure adequate RCS and Core Heat Removal.

5. **IF**, at **ANY** time, **ANY** of the following conditions exists:

   - BOTH S/G levels are less than (-)350 inches
   - T_{COLD} rises uncontrollably 5° F or greater
   - Once-Through-Cooling has been determined to be required for heat removal

   THEN initiate Once-Through-Cooling as follows:

   a. Place **ALL** Pressurizer HTR handswitches in OFF.

   b. Shut the L/D CNTMT ISOL valves:

      - 2-CVC-515-CV
      - 2-CVC-516-CV

   c. Start **ALL** available CHG PPs.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
d. Open **BOTH** PORVs as follows:	
(1) **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.	
(2) **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	
(3) Verify **BOTH** PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV	
(4) Place the PORV OVERRIDE handswitches in MANUAL OPEN: • 2-HS-1402 • 2-HS-1404	
(5) Verify **BOTH** PORVs are open.	
e. Start **ALL** THREE HPSI PPs.	e.1 **IF** 23 HPSI PP will **NOT** start, **AND** 24 4KV Bus is de-energized, **THEN** perform the following: (1) Align the 23 HPSI PP disconnect to 21 4KV Bus **PER** OI-27C. (2) Start 23 HPSI PP.
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
f. Open the HPSI MAIN and AUX HDR valves: MAIN • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV AUX • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV	f.1 **IF** the HPSI MAIN **OR** AUX HDR valves will **NOT** open, **THEN** open the HPSI HDR XCONN valve, 2-SI-653-MOV.
g. Open **ALL** CAC EMERGENCY OUT valves.	
h. Start **ALL** available CACs in HIGH.	
i. **WHEN** RCS pressure is less than 1270 PSIA, **THEN** verify initiation of Once-Through-Cooling by observing the following: • HPSI flow **PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u> • CET temperatures constant or lowering	i.1 **IF** HPSI flow is **NOT PER** ATTACHMENT(10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>, **THEN** perform the following actions as necessary: (1) Ensure electrical power is available to valves and pumps. (2) Verify safety injection system lineup **PER** ATTACHMENT (2), <u>SIAS VERIFICATION CHECKLIST</u>.
j. **IF** SIAS has **NOT** actuated, **THEN** prevent high pressurizer level from securing the backup CHG PPs by performing the following actions: (1) Locally initiate SIAS A6 and B6. (2) **IF** boration is **NOT** in progress, **THEN** place the BA PP handswitches in PULL TO LOCK. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.5 (continued)	
k. Verify minimum equipment to ensure successful Once-Through-Cooling is available **PER** ATTACHMENT(17), ONCE-THROUGH-COOLING MATRIX.	k.1 **IF** minimum equipment to ensure successful Once-Through-Cooling is **NOT** available, **THEN** verify **BOTH** S/Gs are isolated **PER** step A.6, **AND PROCEED** to Step G.1.1.
6. Prevent S/G dryout.	

a. **WHEN EACH** S/G level lowers to (-)380 inches, **THEN** isolate the S/G by performing the following actions:
• Shut the MSIV(s):
  • (21 S/G) 21 MSIV
  • (22 S/G) 22 MSIV
• Shut the SG AFW MAIN STM SUPP & BYP valves:
  • (21 S/G)2-MS-4070-CV, 2-MS-4070A-CV
  • (22 S/G)2-MS-4071-CV, 2-MS-4071A-CV
• Verify the SG BD valves are shut:
  • 2-BD-4010-CV
  • 2-BD-4011-CV
  • 2-BD-4012-CV
  • 2-BD-4013-CV
• Verify the MSIV BYP valves are shut:
  • 2-MS-4045-MOV
  • 2-MS-4052-MOV
• Shut the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE	

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.6.a (continued) • **WHEN** at least **ONE** S/G is less than (-)380 inches, **AND BOTH** S/G levels are less than (-)350 inches, **THEN** ensure the ADVs are shut	
B. ESTABLISH FEEDWATER SOURCE.	
1. Determine the desirability of restoring feed capability to a S/G by considering: • Plant Status • Integrity of the S/Gs • Condensate inventory • Time remaining until Shutdown Cooling entry conditions are established • Adequacy of the cooldown while on Once-Through-Cooling (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

2. **IF** Once-Through-Cooling is in progress **AND** feedwater will **NOT** be restored to **ANY** S/Gs, **THEN** perform the following actions to isolate **BOTH** S/Gs:

   a. Shut SG FW ISOL valves:

   - (21 S/G) 2-FW-4516-MOV
   - (22 S/G) 2-FW-4517-MOV

   b. Shut SG AFW BLOCK valves by placing the handswitches in SHUT:

   21 S/G
   - 2-AFW-4520-CV
   - 2-AFW-4521-CV
   - 2-AFW-4522-CV
   - 2-AFW-4523-CV

   22 S/G
   - 2-AFW-4530-CV
   - 2-AFW-4531-CV
   - 2-AFW-4532-CV
   - 2-AFW-4533-CV

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.2 (continued)	
c. Shut the ADVs using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows:	c.1 **IF** the ADV will **NOT** shut from 2C43, **THEN** shut the affected ADV Manual Isolation Valve: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104
(1) Verify the ADV controller on 2C43 is set at 0% output: • (21 ADV) 2-HC-4056A • (22 ADV) 2-HC-4056B	
(2) Align the Hand Transfer Valves to 2C43 (POSITION 2): 21 S/G • 2-HV-3939A • 2-HV-3939B 22 S/G • 2-HV-3938A • 2-HV-3938B	
d. **PROCEED** to Block Step D.	
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), <u>MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY</u>.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) **NOTE** The following steps are alternative methods to establish a feedwater source. Each available method can be attempted until a feedwater source is successfully established. 4. Attempt to establish AFW. a. Establish AFW flowpath to the S/G(s) by placing the handswitches for the unaffected SG AFW BLOCK valves in OPEN: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (continue)	a.1 **IF** S/G AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on North wall of SRW Room.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS

B.4 (continued)

NOTE
The following substeps are alternative methods to establish auxiliary feedwater flow. Each available method can be attempted until auxiliary feed flow is successfully established.

b. Establish AFW flow with 23 AFW PP as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(2) Start 23 AFW PP by placing its handswitch in START.

(continue)

ALTERNATE ACTIONS

b.1 Start 23 AFW PP locally as follows:

(1) Shut the SG FLOW CONTR valves:

- (21 S/G) 2-AFW-4525-CV
- (22 S/G) 2-AFW-4535-CV

(2) Verify 23 AFW PP handswitch is in normal.

CAUTION
The 23 AFW PP flow limit is 575 GPM.

(3) Close the AFW PP No. 23 breaker, 152-2415, by pressing the CLOSE button.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.b (continued) (continue)	B.4.b.1 (continued) **CAUTION** **Removing control power fuses eliminates bus protection from breaker faults, and overcurrent, undervoltage and ground protection for the breaker.** (4) **IF** the breaker fails to close, **THEN**, with the approval of the SM/CRS, perform the following actions: (a) Remove the breaker control power fuses. (b) **IF** necessary, **THEN** manually charge the breaker closing spring. (c) Press the CLOSE button at AFW PP No. 23 breaker, 152-2415. (d) Ensure normal pump running current less than 70 AMPS.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4 (continued)	
c. Establish AFW flow with 21 or 22 AFW PP as follows:	c.1 Start 21 or 22 AFW PP locally as follows:
(1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV	(1) Shut the SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV
(2) Verify open 21 and 22 AFW PP Main Steam Supply Valves: • 2-MS-109 • 2-MS-107	(2) Turn the turbine governor control knob counterclockwise to the minimum position.
(3) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve: • 2-MS-3986 • 2-MS-3988	(3) Isolate the Instrument Air to the Turbine Governor Controller(s) by shutting the following valves: 21 AFW PP • 2-AFW-3987 I/P A ISOL, 2-IA-512 • 2-AFW-3987 I/P B ISOL, 2-IA-511 22 AFW PP • 2-AFW-3989 I/P A ISOL, 2-IA-509 • 2-AFW-3989 I/P B ISOL, 2-IA-510
CAUTION **An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.**	
(4) Open the SG AFW MAIN STM SUPP & BYP valves from a S/G **NOT** affected by a SGTR: • (21 S/G)2-MS-4070-CV, 2-MS-4070A-CV • (22 S/G)2-MS-4071-CV, 2-MS-4071A-CV	(4) Open the air filter drains on controllers to allow local control. (5) Verify open 21 and 22 AFW PP Main Steam Supply Valves: • 2-MS-109 • 2-MS-107
(continue)	(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4.c (continued) (5) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (21 AFW PP SPEED CONTR) 2-HC-3987A • (22 AFW PP SPEED CONTR) 2-HC-3989A (6) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	B.4.c.1 (continued) (6) Verify open 21 **OR** 22 AFW PP TURB THROTTLE/STOP valve: • 2-MS-3986 • 2-MS-3988 **CAUTION** **An unmonitored radiation release could occur if the AFW Steam Supply Bypass Valve from a S/G affected by a SGTR is opened.** (7) Open the AFW Steam Supply Bypass Valves from a S/G **NOT** affected by a SGTR: • 2-MS-102 • 2-MS-105 (8) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure using the local turbine governor control knob. (9) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.4 (continued) d. Establish AFW flow with 13 AFW PP as follows: (1) Shut the Unit 1 Motor Train S/G AFW BLOCK valves by placing the handswitches in SHUT: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV (2) Open the U-1 TO U-2 XCONN valve, 1-AFW-4550-CV. (3) Establish AFW flow with 13 AFW PP as follows: (a) Shut the Unit 2 SG FLOW CONTR valves: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV **CAUTION** **The 13 AFW PP flow limit is 575 GPM.** (b) Start 13 AFW PP by placing its handswitch in START. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued)	

5. **IF** T_{COLD} is less than 465° F, **THEN** attempt to establish Booster Pump Injection.

   a. **IF** SGIS has actuated **AND** indications of an ESDE are **NOT** observed, **THEN** reset SGIS as follows:

      (1) Place the CBPs in PULL TO LOCK.

      (2) Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST.

      (3) Block SGIS.

      (4) Reset the SGIS signal.

      (5) Open the MSIV(s).

   b. Shut the MAIN SG FW REG valves.

   c. Shift the BYPASS SG FW REG controllers to Manual.

   d. Depress the SG FRV BYP RESET buttons.

   e. Manually adjust the BYPASS SG FW REG valve controllers to 0%.

   f. Verify **BOTH** SG FW ISOL valves are shut:

      - (21 S/G) 2-FW-4516-MOV
      - (22 S/G) 2-FW-4517-MOV

   g. Open the PRECOAT SYS BYP valve, 2-CD-5818-CV.

   h. Open the COND DEMIN BYP valve, 2-CD-4439-MOV.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) i. Verify at least ONE COND PP is running. j. Verify ONE CBP is running. k. Place BOTH HDT PP Handswitches in PULL TO LOCK. 6. **IF** a feedwater source can **NOT** be established, **THEN PROCEED** to Block Step D.	
C. ESTABLISH S/G HEAT SINK.	
1. **IF** feedwater capability is restored **AND** Once-Through-Cooling is in progress, **THEN** evaluate feeding a S/G by considering the following: • Plant Status • Auxiliary systems availability • Condensate inventory • Time remaining until Shutdown Cooling entry conditions are established • Adequacy of the cooldown while on Once-Through-Cooling 2. **IF NEITHER** S/G is to be fed, **THEN PROCEED** to Block Step D. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) **NOTE** The decision to feed a S/G should be made by the Plant Technical Support Center or the Shift Manager. **CAUTION** **If ANY S/G has indicated level, then only the S/G with the highest level should be fed. If BOTH S/Gs are dry, then only ONE S/G should be fed to initiate RCS heat removal.** 3. **IF** the Plant Technical Support Center or Shift Manager recommends feeding a S/G, **THEN** isolate the S/G which is **NOT** to be fed as follows: a. Shut the SG FW ISOL valve for the S/G to be isolated: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV b. Shut the SG AFW BLOCK valves for the S/G to be isolated by placing the handswitches in SHUT: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV • 2-AFW-4532-CV • 2-AFW-4533-CV (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.3 (continued) c. Shut the ADV for the S/G to be isolated using the Hand Transfer Valves on the West wall of the Unit 2 45 ft Switchgear Room as follows: (1) Verify the ADV controller on 1C43 is set at 0% output: • (21 ADV) 2-HC-4056A • (22 ADV) 2-HC-4056B (2) Align the Hand Transfer Valves to 2C43 (POSITION 2): 21 S/G • 2-HV-3939A • 2-HV-3939B 22 S/G • 2-HV-3938A • 2-HV-3938B (continue)	c.1 **IF** the ADV will **NOT** shut from 2C43, **THEN** shut the affected ADV Manual Isolation Valve: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued)	
CAUTION **If voids exist in the S/G tubes, a rapid RCS pressure reduction will occur when the voids collapse.**	
4. Establish feed to the selected S/G.	
a. Verify the ADV is shut.	
b. **IF** AFW has been restored, **THEN** perform the following actions:	
(1) **IF** AFW has been restored using 23 **OR** 13 AFW PP, **THEN** adjust SG FLOW CONTR valve to approximately 150 GPM to the appropriate S/G: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV	(1).1 **IF** the SG FLOW CONTR valve(s) will **NOT** open, **THEN** locally throttle open the appropriate bypass valve(s), located in the SRW Room: • (21 S/G) 2-AFW-195 • (22 S/G) 2-AFW-196
(2) **IF** AFW has been restored using 21 or 22 AFW PP, **THEN** adjust SG FLOW CONTR valve to approximately 150 GPM to the appropriate S/G: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV	(2).1 **IF** the SG FLOW CONTR valve(s) will **NOT** open, **THEN** locally throttle open the appropriate bypass valve(s), located in the 27 ft East Penetration Room: • (21 S/G) 2-AFW-163 • (22 S/G) 2-AFW-165

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.4.b (continued) (3) **WHEN** S/G level response is observed **OR** continuous feed has been maintained for at least 5 minutes, **THEN** feed rate may be slowly raised while maintaining the following: • Gradual rise in S/G level • S/G level trending towards 0 inches • RCS cooldown rate less than 100° F in any one hour **CAUTION** **Rapid or uncontrolled restoration of Main Feedwater may cause a severe waterhammer.** c. **IF** Booster Pump Injection has been restored, **THEN** perform the following for the S/G to be fed: (1) Open the appropriate SG FW ISOL valve: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV (2) Throttle open the SG FW REG BYPASS valve to establish a flow of 100 to 160 GPM **PER** ATTACHMENT(18), MAIN FEEDWATER GOOSENECK PURGE FLOW. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

C.4.c (continued)

(3) **WHEN** continuous feed has been maintained for at least 10 minutes,
THEN feed rate may be slowly raised while maintaining the following:

- Gradual rise in S/G level
- S/G level trending towards 0 inches
- RCS cooldown rate less than 100° F in any one hour

CAUTION
The RCS may be solid. Any action involving RCS cooldown or heatup should be closely monitored to prevent rapid pressure excursions.

5. Establish a secondary heat sink as follows:

   a. Adjust the ADV to establish RCS temperature control.

   b. Restore and maintain the level of the S/G being fed to between (-)170 and (+)30 inches.

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. (continued) 6. **WHEN** a secondary heat sink has been established, **THEN** reduce Once-Through-Cooling flow as follows: a. **IF** THREE HPSI PPs are operating, **AND** HPSI throttle criteria are met **THEN** stop ONE HPSI PP. b. Stop **ALL** but ONE CHG PP. **CAUTION** **HPSI flow must be closely monitored to prevent a rapid pressure excursion when the PORV Block Valve is shut.** c. Shut the BLOCK valve for ONE PORV. d. Adjust the HPSI flow to maintain RCS subcooling between 25 and 140° F using CET temperatures. e. Adjust the ADV to establish RCS temperature control. 7. **IF** a S/G heat sink can **NOT** be established, **THEN** continue RCS cooldown using Once-Through-Cooling until shutdown cooling entry conditions are reached.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	

1. **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained:
• At least 25° F subcooling based on CET temperatures
• Pressurizer level greater than 101 inches {141}
• At least ONE S/G available for heat removal
    • S/G level greater than (-)170 inches
    • capable of being supplied with feedwater
    • capable of being steamed
• Reactor Vessel level above the top of the hot leg
• Reactivity Control Safety Function Acceptance Criteria are met
THEN HPSI flow may be reduced by throttling the HPSI HDR valves, or stopping the HPSI PPs one at a time, as desired, to maintain RCS subcooling between 25 and 140° F based on CET temperatures.	

2. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.	
(continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 3. **IF** HPSI or LPSI throttle criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps **AND** restore full flow.	
E. IF A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	
1. **WHEN** S/G level is greater than (-)170 inches, **THEN** secure Once-Through-Cooling as follows: a. Ensure Once-Through-Cooling flow has been reduced **PER** step C.6. b. Verify the HPSI throttle criteria are met. c. Secure the HPSI PPs. d. Shut the HPSI HDR valves. e. Place the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404 f. Adjust charging and letdown to maintain RCS subcooling between 25 and 140° F using CET temperatures. 2. Adjust the ADV to establish natural circulation, and maintain CET temperatures constant or lowering. (continue)	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 3. Verify **BOTH** PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV 4. Restore and maintain the level of the S/G being fed between (-)24 inches {0} and (+)30 inches {(+)38}.	
F. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	
1. Observe Containment Sump level rises as RWT level lowers.	1.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** perform the follows actions: a. Maintain RWT level greater than 2 feet by replenishment from **ANY** available source. **NOTE** Leakage location may be indicated by sump alarms or room level alarms. b. Determine the cause for the leakage and attempt to isolate it.
2. Ensure steps associated with RAS are performed **PER** the selected RCS Pressure and Inventory Control success path.	

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS

G. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-4.

RECOVERY ACTIONS

1. Check Core and RCS Heat Removal is satisfied by the following indications:

   - CET temperatures less than 50° F superheated

   - **IF** RAS has **NOT** occurred,
     AND HPSI throttle criteria are **NOT** met,
     THEN ALL available Charging Pumps operating

NOTE
LPSI Pumps are **NOT** required post-RAS.

NOTE
Limits in ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW are **NOT** required to be met if SIS throttle criteria are met.

   - HPSI and LPSI Pumps are injecting water into the RCS **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW and ATTACHMENT(11), LOW PRESSURE SAFETY INJECTION FLOW

   - Pressurizer Pressure less than 1270 PSIA
     OR is lowering

(continue)

ALTERNATE ACTIONS

1.1 **IF** Core and RCS Heat Removal has **NOT** been satisfied,
THEN perform the following actions:

a. Concurrently perform the recovery actions for the next safety function to be satisfied.

b. Determine the appropriate emergency response actions **PER** the ERPIP.

c. **IF** SIS flow is adequate,
THEN perform **ANY** of the following as necessary to transfer additional heat through the S/Gs:

(1) Restore vital auxiliaries necessary to feed at least ONE S/G.

(2) **IF** remote valve operation fails,
THEN operate failed valves locally.

(3) Feed the S/Gs from **ANY** of the following water supplies:

- Condensate
- DI Water
- Well Water System
- Fire System
- Bay Water

(4) Steam the S/G through **ANY** of the following paths:

- TURB BYP valves
- ADVs
- SGFPs or AFW PPs
- MSIV Bypass valves

(continue)

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued) (continue)	G.1.1.c(4) (continued) • Upstream drains d. **IF** SIS flow is **NOT** adequate, **THEN IMPLEMENT** a Core and RCS Heat Removal success path by performing **ANY** of the following as necessary: (1) Restore vital auxiliaries necessary to regain needed components or subsystems. (2) **IF** remote valve operation fails, **THEN** operate failed valves locally. (3) Fill the RCS from an alternate source. (4) Depressurize or cool the RCS to raise or establish SIS flow. (5) Steam and feed S/Gs from alternate sources. e. **IF BOTH** of the following conditions exist: • AC power is **NOT** available • RCS subcooling can **NOT** be maintained **THEN** perform **BOTH** of the following to maintain two-phase natural circulation: (1) S/G steaming and feeding are properly controlled. (2) Maintain CET temperatures less than 50° F superheated

APPENDIX (4) CORE AND RCS HEAT REMOVAL

HR-4: ONCE-THROUGH-COOLING

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** Core and RCS Heat Removal has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-1: S/G HEAT SINK WITH NO SIS OPERATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• At least ONE S/G level greater than (-)350 inches
• Feedwater is available:
  • Main Feedwater
  • AFW
  • Booster Pump Injection
• SIAS has NOT actuated
OR has been reset
• SIS operation NOT required
	• At least ONE S/G has level between (-)24 inches and (+)30 inches
	OR
	S/G level is being restored by feedwater flow
	• IF RCPs are operating,
	THEN T_{HOT} minus T_{COLD} is less than 10°F
	• IF RCPs are NOT operating,
	THEN T_{HOT} minus T_{COLD} is less than 50°F
	• RCS subcooling greater than 25°F based on CET temperatures
	• Reactor Vessel level above the top of the hot leg

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CORE AND RCS HEAT REMOVAL.	C	1
	• IF 500KV offsite power lost, THEN shut the MSIVs AND isolate S/G B/D • IF Main and AFW are lost to BOTH S/Gs, THEN trip ALL RCPs, AND isolate S/G B/D • IF, at ANY time, BOTH S/G levels are less than (-)350 inches, OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4 • Commence Boration • Commence RCS Cooldown at less than 100°F in any one hour • IF a controlled cooldown is in progress, THEN block SGIS/SIAS		1 1 1 2 5 9

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-1: S/G HEAT SINK WITH NO SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	B DETERMINE IF A SGTR EXISTS.	C	11

	• Identify the most affected S/G:
	  • S/G samples
	  • RMS trends
	  • S/G level change when NOT feeding
	  • Post-Trip S/G level trends
	  • Mismatch in feed flow prior to the trip
	  • Steam flow vs. Feed flow mismatch prior to the trip
	• Depressurize the RCS:
	  • Subcooling 25 - 140°F
	  • RCP NPSH limits
	  • RCS pressure less than 900 PSIA
	  • RCS pressure approximately equal to affected S/G pressure
	• WHEN T_{HOT} is less than 515°F,
	THEN isolate the most affected S/G
	• Ensure boron concentration remains above 116% of the required shutdown margin
	• Maintain affected S/G level between 0 and (+)50 inches
			11
			
			12
			
			13
			
			19
			
			21

	C. DETERMINE IF AN ESDE EXISTS.	C	39

	• Identify the most affected S/G.
	  • High steam flow from S/G
	  • Lowering S/G pressure
	  • Lowering S/G level
	  • Lowering RCS T_{COLD}
	  • Lowering PZR pressure
	  • Lowering PZR level
	• Isolate the affected S/G
	• Cool the unaffected S/G to within 25°F of CETs during the blowdown
			39
			
			40
			43

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-1: S/G HEAT SINK WITH NO SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	D. DETERMINE IF A LOAF EXISTS	C	45
	• Trip ALL RCPs, AND isolate S/G B/D • IF, at ANY time, BOTH S/G levels are less than (-)350 inches OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4 • Attempt to establish AFW flow • Attempt to establish Booster Pump Injection • Attempt to establish Main Feed flow		45 45 46 55 58
	E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	C	60
	• Ensure the TBVs OR ADVs are controlling T_{COLD} less than 535°F • Ensure feed flow is restoring S/G level to between (-)24 and (+)30 inches		60 61
	F. SECURE RCS BORATION.	C	64
	G EVALUATE RESTORING FORCED CIRCULATION.	C	65
	H CONTROL CORE AND RCS VOIDING	C	71
	I. PERFORM LOW TEMPERATURE ACTIONS.	C	74
	• WHEN T_{COLD} is less than 325°F, THEN establish LTOP control • WHEN T_{COLD} is less than 306°F, THEN establish MPT protection		75 76
	J. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-1		79
	• IF Core and RCS Heat Removal has NOT been satisfied, THEN PROCEED to the next appropriate Core and RCS Heat Removal Success Path.		79

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-2: S/G HEAT SINK WITH SIS OPERATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA

• At least ONE S/G level greater than (-)350 inches
• Feedwater is available.
  • Main Feedwater
  • AFW
  • Booster Pump Injection
• SIAS has actuated or SIS operation required
	• At least ONE S/G has level between 0 inches and (+)38 inches
	OR
	S/G level is being restored by feedwater flow
	• CET temperatures less than 50°F superheated
	• IF RAS has NOT occurred.
	AND pressurizer pressure is greater than 1270 PSIA
	THEN at least ONE Charging Pump operating
	• HPSI and LPSI Pumps are injecting water into the RCS PER Atts. (10) and (11)

START	FUNCTION	DONE	PAGE
	A ESTABLISH CORE AND RCS HEAT REMOVAL WITH SIS OPERATION.	C	80
	• IF 500KV offsite power lost. THEN shut the MSIVs AND isolate S/G B/D • IF Main and AFW are lost to BOTH S/Gs, THEN trip ALL RCPs, AND isolate S/G B/D • IF, at ANY time, BOTH S/G levels are less than (-)350 inches, OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4 • IF RCS pressure is less than 1725 PSIA. OR containment pressure is greater than 2.8 PSIG THEN verify SIAS actuation. OR • Align HPSI injection and block SIAS. • Commence Boration • Commence RCS Cooldown at less than 100°F in any one hour • IF a controlled cooldown is in progress, THEN block SGIS/SIAS		80 80 80 81 81 84 87 93

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-2: S/G HEAT SINK WITH SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	B. DETERMINE IF A SGTR EXISTS.	C	94

	• Identify the most affected S/G:
	  • S/G samples
	  • RMS trends
	  • S/G level change when NOT feeding
	  • Post-Trip S/G level trends
	  • Mismatch in feed flow prior to the trip
	  • Steam flow vs. Feed flow mismatch prior to the trip
	• Depressurize the RCS:
	  • Subcooling 25 - 140°F
	  • RCP NPSH limits
	  • RCS pressure less than 850 PSIA
	  • RCS pressure approximately equal to affected S/G pressure
	• WHEN T_{HOT} is less than 515°F,
	THEN isolate the most affected S/G
	• Ensure boron concentration remains above 116% of the required shutdown margin
	• Maintain affected S/G level between 0 and (+)50 inches
			94
			
			95
			
			98
			
			102
			
			104

	C. DETERMINE IF AN ESDE EXISTS.	C	122

	• Identify the most affected S/G:
	  • High steam flow from S/G
	  • Lowering S/G pressure
	  • Lowering S/G level
	  • Lowering RCS T_{COLD}
	  • Lowering PZR pressure
	  • Lowering PZR level
	• Isolate the affected S/G
	• Cool the unaffected S/G to within 25°F of CETs during the blowdown
			122
			
			123
			127

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-2: S/G HEAT SINK WITH SIS OPERATION
(continued)

START	FUNCTION	DONE	PAGE
	D. DETERMINE IF A LOAF EXISTS	C	128
	• Trip ALL RCPs, AND isolate S/G B/D • IF, at ANY time, BOTH S/G levels are less than (-)350 inches OR T_{COLD} rises uncontrollably 5°F or greater, THEN IMPLEMENT HR-4 • Attempt to establish AFW flow • Attempt to establish Booster Pump Injection • Attempt to establish Main Feed flow		128 128 129 138 141
	E. VERIFY CORE AND RCS HEAT REMOVAL HAS BEEN ESTABLISHED.	C	143
	• Ensure the TBVs OR ADVs are controlling T_{COLD} less than 535°F • Ensure feed flow is restoring S/G level to between 0 and (+)38 inches		143 144
	F. SECURE RCS BORATION	C	147
	G. EVALUATE RESTORING FORCED CIRCULATION.	C	148
	H. CONTROL CORE AND RCS VOIDING	C	154
	I. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	C	157
	J. PERFORM LOW TEMPERATURE ACTIONS		158
	• WHEN T_{COLD} is less than 306°F, THEN establish MPT protection		159
	K ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-2		162
	• IF Core and RCS Heat Removal has NOT been satisfied, THEN PROCEED to the next appropriate Core and RCS Heat Removal Success Path.		162

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-3: SHUTDOWN COOLING SYSTEM

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• CET Temperatures less than 300°F • Radiation levels are low enough to allow valve repositioning	• CET Temperatures less than 300°F and less than 50°F superheated • HPSI Pumps are injecting water into the RCS **PER** Att. (10) • Pressurizer pressure less than 270{245} • Reactor Vessel level indicates the core is covered

START	FUNCTION	DONE	PAGE
	A. PERFORM LOW TEMPERATURE ACTIONS.	C	163
	• **WHEN** TCOLD is less than 325°F, **THEN** establish LTOP control • **WHEN** TCOLD is less than 306°F, **THEN** establish MPT protection.		164 165
	B. CONTROL CORE AND RCS VOIDING.	C	168
	C. ESTABLISH CORE AND RCS HEAT REMOVAL BY SHUTDOWN COOLING.	C	171
	D. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-3.		178
	• **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Core and RCS Heat Removal Success Path.		178

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CORE AND RCS HEAT REMOVAL PLACEKEEPER
HR-4: ONCE-THROUGH-COOLING

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• HPSI pumps are available • BOTH PORVs are available • Flow path is available • RWT is available as a makeup source	• CET temperatures less than 50°F superheated • IF RAS has **NOT** occurred, **AND** HPSI throttle criteria are **NOT** met **THEN ALL** available Charging Pumps operating • HPSI and LPSI Pumps are injecting water into the RCS **PER** Atts. (10) and (11) • Pressurizer pressure less than 1270 PSIA **OR** is lowering

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CORE AND RCS HEAT REMOVAL BY ONCE-THROUGH-COOLING.	C	179

	• Ensure **ALL** RCPs are tripped
	• Isolate S/G B/D
	• Attempt to maintain RCS temperature constant
	• **IF** SGIS has **NOT** actuated, **THEN** block SGIS
	NOTE: Prior to meeting Initiation criteria, with the exception of opening the PORVs, the substeps of A.5 may be performed, and in any order.
	Perform S/G dryout step concurrently with initiation of Once-Through-Cooling.
	• **IF**, at **ANY** time, **ANY** of the following conditions exist:
	  • **BOTH** S/G levels are less than (-)350 inches
	  • T_{COLD} rises uncontrollably 5°F or greater,
	  • Once-Through-Cooling has been determined to be required for heat removal
	THEN initiate Once-Through-Cooling
	  • Verify **BOTH** PORVs are open
	  • Block SIAS
	• **WHEN EACH** S/G level is less than (-)380 inches, **THEN** prevent S/G dryout
			179
			179
			179
			179
			
			180
			
			183

	B. ESTABLISH FEEDWATER SOURCE.	C	184
	• **IF** feedwater will **NOT** be restored, **THEN** isolate **BOTH** S/Gs • Attempt to establish AFW • Attempt to establish Booster Pump Injection		185 187 193

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

HR-4: ONCE-THROUGH-COOLING
(continued)

START	FUNCTION	DONE	PAGE
	C. ESTABLISH S/G HEAT SINK.	C	194

	• Isolate the S/G which is **NOT** to be fed
	• Establish Feed flow
	  • Verify ADV is shut
	• Establish a secondary heat sink
	  • Adjust ADV
	  • Restore and maintain S/G level between **(-)170 and (+)30 inches**
	• Reduce Once-Through-Cooling flow
			195
			197
			
			199
			
			200

	D. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	201

	• **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained.
	  • At least 25°F subcooling based on CET temperatures
	  • Pressurizer level greater than 101 inches {141}
	  • At least ONE S/G available for heat removal
	  • Reactor Vessel level above the top of the hot leg
	  • Reactivity Control Safety Function Acceptance Criteria are met
	THEN HPSI flow may be reduced.
	• **IF** pressurizer pressure is greater than 200 PSIA and **EITHER** constant or rising, **THEN** the operating LPSI PPs may be stopped
			201
			
			201

	E. **IF** A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.		202
	F. ENSURE INVENTORY CONTROL SUPPORTS HEAT REMOVAL.	C	203
	G. ACCEPTANCE CRITERIA FOR SUCCESS PATH HR-4.		204

	• **IF** Core and RCS Heat Removal has **NOT** been satisfied, **THEN** perform the following actions:
	  • Concurrently perform the Recovery actions for the next safety function to be satisfied
	  • Determine the appropriate emergency response actions **PER** the ERPIP
	  • Evaluate further actions
			204

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT WITH CONTAINMENT FANS.	
1. Verify **ALL** available CACs are operating.	
2. **IF** containment pressure exceeds 0.7 PSIG, **OR** containment temperature exceeds 120° F, **THEN** open the CAC EMERGENCY OUT valves for the operating CACs. • 2-SRW-1582-CV • 2-SRW-1585-CV • 2-SRW-1590-CV • 2-SRW-1593-CV	
3. Check containment radiation monitor alarms are clear with **NO** unexplained rise.	3.1 Verify **ALL** available IODINE FILT FANs are running, **AND PROCEED** to CE-2, CONTAINMENT ISOLATION.
4. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15.	
(continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 5. **IF** SIAS has actuated, **THEN** perform the following actions: **NOTE** Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklist. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** a. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** ATTACHMENT (2), SIAS VERIFICATION CHECKLIST. b. Block the pressurizer pressure signals. **NOTE** Diesel Generator non-essential trips are enabled when SIAS is reset. c. Reset the SIAS signals. d. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST to the desired condition. e. Evaluate the Charging Pump suction supply. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	

6. **IF** SIAS has actuated
   AND has been reset,
   THEN restore auxiliaries.

   a. Restore Service Water to the Turbine Building as follows:

      (1) Verify 11 PA COMPR is operating.

      (2) Verify the Plant Air To Plant Air Header Valve, 2-PA-2059-CV, is shut.

      (3) Verify the PA TO IA HDR XCONN valve, 2-PA-2061-CV, is open.

      (4) Open SRW HDR TURB BLDG ISOL valves:

      - 2-SRW-1600-CV
      - 2-SRW-1637-CV
      - 2-SRW-1638-CV
      - 2-SRW-1639-CV

   b. Restore an IA COMPR to service as follows:

      (1) **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears:

      - (21 IA COMPR) 2-HS-2063
      - (22 IA COMPR) 2-HS-2065

      (2) Start at least ONE IA COMPR.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.6 (continued)

c. Restore Instrument Air to the Containment as follows:

(1) Open IA CNTMT ISOL valve, 2-IA-2080-MOV.

NOTE
2-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #80 from the Control Room Key Locker.

(2) Open Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN.

7. IF Component Cooling has been secured to containment,
THEN restore flow.

NOTE
RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.

a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:

- 21A RCP: _____° F / _____° F
- 21B RCP: _____° F / _____° F
- 22A RCP: _____° F / _____° F
- 22B RCP: _____° F / _____° F

b. Verify CIS has **NOT** actuated or is reset.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV (3) Slowly open 2-CC-284 to restore component cooling flow.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-1: NO CIS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-1.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 2.8 PSIG • Containment temperature less than 220° F • Containment radiation alarms are clear with **NO** unexplained rise	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.
2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT ISOLATION.	
1. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS	
2. **IF** CIS has actuated, **THEN** trip **ALL** RCPs.	
3. Verify **ALL** available CACs are operating.	
4. Open the CAC EMERGENCY OUT valves for the operating CACs: • 2-SRW-1582-CV • 2-SRW-1585-CV • 2-SRW-1590-CV • 2-SRW-1593-CV	
5. Verify SRW Pump Room Ventilation is in service **PER** the <u>SRW Pump Room Ventilation</u> section of OI-15.	

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) **NOTE** Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** 6. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** the following checklists as appropriate: • ATTACHMENT (2), SIAS VERIFICATION CHECKLIST • ATTACHMENT (4), CIS VERIFICATION CHECKLIST 7. Verify **ALL** available IODINE FILT FANs are running. 8. Ensure Chemistry has been directed to place the Hydrogen Monitors in service. 9. Establish containment ventilation to prevent local hydrogen accumulation as follows: a. Verify **ALL** available CACs are operating. b. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued)	
10. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS.	
11. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners.	
12. **IF** the Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, HYDROGEN PURGE SYSTEM OPERATION, until the Plant Technical Support Center recommends its termination.	
B. RESTORE THE CONTAINMENT ENVIRONMENT.	
1. **WHEN** containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions:	
a. Block the pressurizer pressure signals.	
NOTE Diesel Generator non-essential trips are enabled when SIAS is reset.	
b. Reset the SIAS signals.	
c. Reset the CIS signals.	
(continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.1 (continued) **CAUTION** **At least ONE Containment Spray Pump shall remain in operation until Containment temperature can be maintained less than 120° F by the Containment Air Coolers.** d. Secure ONE CS PP. e. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition. f. Evaluate the Charging Pump suction supply. g. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP. 2. Restore Service Water to the Turbine Building as follows: a. Verify 11 PA COMPR is operating. b. Verify the Plant Air To Plant Air Header Valve, 2-PA-2059-CV, is shut. c. Verify the PA TO IA HDR XCONN valve, 2-PA-2061-CV, is open. d. Open SRW HDR TURB BLDG ISOL valves: • 2-SRW-1600-CV • 2-SRW-1637-CV • 2-SRW-1638-CV • 2-SRW-1639-CV (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 3. Restore an IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears: • (21 IA COMPR) 2-HS-2063 • (22 IA COMPR) 2-HS-2065 b. Start at least ONE IA COMPR. 4. Restore Instrument Air to the Containment as follows: a. Open IA CNTMT ISOL valve, 2-IA-2080-MOV. **NOTE** 2-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #80 from the Control Room Key Locker. b. Open Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 5. Restore Component Cooling flow to containment. **NOTE** RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9. a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP: • 21A RCP: _____° F / _____° F • 21B RCP: _____° F / _____° F • 22A RCP: _____° F / _____° F • 22B RCP: _____° F / _____° F b. Verify CIS is reset. **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.5 (continued) d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV (3) Slowly open 2-CC-284 to restore component cooling flow.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-2: CONTAINMENT ISOLATION

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-2.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 4.25 PSIG • **ALL** available CACs are operating with maximum SRW flow • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Support recommendation	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.
2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT SPRAY.	
1. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS	
2. **IF** CIS has actuated, **THEN** trip **ALL** RCPs.	
3. Verify **ALL** available CACs are operating.	
4. Open the CAC EMERGENCY OUT valves for the operating CACs: • 2-SRW-1582-CV • 2-SRW-1585-CV • 2-SRW-1590-CV • 2-SRW-1593-CV	
5. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15.	
6. **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS has actuated and spray flow is approximately 1350 GPM per pump by flow indicators: • (21 CS HDR FLOW) 2-FI-4148 • (22 CS HDR FLOW) 2-FI-4149 (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS

A. (continued)

CAUTION
The following step provides actions to prevent water hammer damage from CAC voiding.

CAUTION
SRW Pumps start when power is restored to the associated 4KV Bus.

7. **IF** CSAS has actuated,
   AND EITHER SRW Header is **NOT** in operation,
   THEN perform the following actions:

   a. **IF** 21 SRW Header is idle,
      THEN restart 21 SRW Header as follows:

      (1) Check that Containment Pressure has remained less than 25 PSIG with 21 SRW Header idle.

      (2) Attempt to start the desired SRW PP on 21 SRW Header.

(continue)

ALTERNATE ACTIONS

a.1 **IF** Containment Pressure exceeded 25 PSIG,
THEN perform the following actions:

CAUTION
2A DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2A DG.

WARNING
High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.

(1) Restart 21 SRW Header:

(a) Shut 21 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-135, located 27 ft East Pen Room.

(b) Shut 22 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-142, located 5 ft West Pen Room.

(c) Attempt to start the desired SRW PP on 21 SRW Header.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7.a (continued) (continue)	A.7.a.1(1) (continued) (d) Consult with the Plant Technical Support Center for guidance on system restoration. (2) **IF** 21 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 21 SRW Header in PULL TO LOCK. (b) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (c) Locally trip the 2A DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7 (continued) b. **IF** 22 SRW Header is idle, **THEN** restart 22 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 22 SRW Header idle. (2) Attempt to start the desired SRW PP on 22 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **2B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 22 SRW Header: (a) Shut 23 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-149, located 27 ft East Pen Room. (b) Shut 24 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-156, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 22 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.7.b (continued)	A.7.b.1 (continued) (2) **IF** 22 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 22 SRW Header in PULL TO LOCK. (b) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK. (c) Locally trip the 2B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.
NOTE Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists. **CAUTION** **To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.** 8. Verify ESFAS equipment is aligned correctly **AND** handswitches are matched **PER** the following checklists as *appropriate*: • ATTACHMENT (2), SIAS VERIFICATION CHECKLIST • ATTACHMENT (3), CSAS VERIFICATION CHECKLIST • ATTACHMENT (4), CIS VERIFICATION CHECKLIST (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 9. Verify **ALL** available IODINE FILT FANs are running. 10. Ensure Chemistry has been directed to place the Hydrogen Monitors in service. 11. Establish containment ventilation to prevent local hydrogen accumulation as follows: a. Verify **ALL** available CACs are operating. b. Verify ONE CAV CLG and ONE CEDM CLG fan running if available. 12. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, <u>HYDROGEN RECOMBINERS</u>. 13. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 14. **IF** the Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, <u>HYDROGEN PURGE SYSTEM OPERATION</u>, until the Plant Technical Support Center recommends its termination.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. RESTORE THE CONTAINMENT ENVIRONMENT.	
1. **WHEN** containment pressure drops to less than 4.0 PSIG, **THEN** perform the following actions: a. Verify the CS HDR handswitches, 2-HS-4150 and 2-HS-4151 in OPEN. b. Reset the CSAS signals. c. Verify **ALL** available CACs are operating to reduce containment temperature. d. Restore the equipment listed in ATTACHMENT (3), CSAS VERIFICATION CHECKLIST to the desired condition. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **WHEN** containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions: a. Block the pressurizer pressure signals. **NOTE** Diesel Generator non-essential trips are enabled when SIAS is reset. b. Reset the SIAS signals. c. Reset the CIS signals. **CAUTION** **At least ONE Containment Spray Pump shall remain in operation until Containment temperature can be maintained less than 120° F by the Containment Air Coolers.** d. Secure ONE CS PP. e. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition. f. Evaluate the Charging Pump suction supply. g. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 3. Restore Service Water to the Turbine Building as follows: a. Verify 11 PA COMPR is operating. b. Verify the Plant Air To Plant Air Header Valve, 2-PA-2059-CV, is shut. c. Verify the PA TO IA HDR XCONN valve, 2-PA-2061-CV, is open. d. Open SRW HDR TURB BLDG ISOL valves: • 2-SRW-1600-CV • 2-SRW-1637-CV • 2-SRW-1638-CV • 2-SRW-1639-CV 4. Restore an IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPRs, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until the temperature alarm clears: • (21 IA COMPR) 2-HS-2063 • (22 IA COMPR) 2-HS-2065 b. Start at least ONE IA COMPR. (continue)	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. (continued)

5. Restore Instrument Air to the Containment as follows:

   a. Open IA CNTMT ISOL valve, 2-IA-2080-MOV.

NOTE
2-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by Key #80 from the Control Room Key Locker.

   b. Open Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN.

6. Restore Component Cooling flow to containment.

NOTE
RCP CBO and LOWER SEAL temperatures may be obtained from computer trend block 9.

   a. Record the highest attained RCP CBO and LOWER SEAL temperatures for each RCP:

      - 21A RCP: _____°F / _____°F
      - 21B RCP: _____°F / _____°F
      - 22A RCP: _____°F / _____°F
      - 22B RCP: _____°F / _____°F

   b. Verify CIS is reset.

(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
B.6 (continued) **CAUTION** **Uncontrolled restoration of cooling to hot RCP seals may cause a water hammer and could result in thermal shock of the RCP seal coolers.** c. **IF ALL** RCP LOWER SEAL temperatures are less than 280° F, **THEN** restore Component Cooling flow to Containment by opening the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV d. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: (1) Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. (2) Open CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV (3) Slowly open 2-CC-284 to restore component cooling flow.	

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-3.	
1. Check Containment Environment is satisfied by the following indications: • Containment pressure less than 50 PSIG • **ALL** available CACs are operating with maximum SRW flow • Containment spray flow is greater than 1350 GPM per pump, if operating • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR ALL** available hydrogen recombiners are energized with Hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Support recommendation	1.1 **IF** Containment Environment has **NOT** been satisfied, **THEN** perform the following actions: a. Concurrently perform the recovery actions for the next safety function to be satisfied. b. Determine the appropriate emergency response actions **PER** the ERPIP. c. **IF** Containment Cooling has been lost, **THEN** consider consulting the Technical Support Center about deinerting the Containment prior to reinitiating Containment Cooling. d. Evaluate further actions based on the following considerations: (1) The urgency of other jeopardized safety functions. (2) Rate of change of containment temperature and pressure, and potential for damage to the containment. (3) Rate of change of containment hydrogen concentration, and potential for hydrogen burn.
(continue)	(continue)

APPENDIX (5) CONTAINMENT ENVIRONMENT

CE-3: CONTAINMENT SPRAY

RECOVERY ACTIONS	ALTERNATE ACTIONS
C.1 (continued) 2. **IF** Containment Environment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	C.1.1.d (continued) (4) The feasibility of restoring a success path by performing **ANY** of the following: • Restoring the vital auxiliaries necessary to operate components or systems in the success paths • Manual operation of valves • Use of alternate components to implement a success path

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-1: NO CIS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure less than 2.8 PSIG • CIS has **NOT** actuated **OR** has been reset • Containment radiation alarms are clear with **NO** unexplained rise	• Containment pressure less than 2.8 PSIG • Containment temperature less than 220°F • Containment radiation alarms are clear with **NO** unexplained rise

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT WITH CONTAINMENT FANS.	C	1

	• Verify **ALL** available CACs are operating
	• **IF** SIAS has actuated, **THEN** perform the following actions:
	  • SIAS VERIFICATION CHECKLIST
	  • Reset SIAS
			1
			2

	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-1.		6
	• **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.		6

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-2: CONTAINMENT ISOLATION

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure less than 4.25 PSIG • CSAS has **NOT** actuated **OR** *has been reset*	• Containment pressure less than 4.25 PSIG • **ALL** available CACs are operating with *maximum* SRW flow • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR** **ALL** available hydrogen recombiners are energized with hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Suppport recommendation

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT ISOLATION.	C	7
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify SIAS and CIS.		7
	• **IF** CIS has actuated, **THEN** trip **ALL** RCPs		7
	• Verify **ALL** available CACs are operating		7
	• SIAS VERIFICATION CHECKLIST		8
	• CIS VERIFICATION CHECKLIST		8
	• Prevent local hydrogen accumulation		8
	B. RESTORE THE CONTAINMENT ENVIRONMENT.	C	9
	• **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP		9
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-2.		14
	• **IF** Containment Environment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Containment Environment Success Path.		14

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CONTAINMENT ENVIRONMENT PLACEKEEPER
CE-3: CONTAINMENT SPRAY

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Containment pressure greater than 4.25 PSIG	• Containment pressure less than 50 PSIG • **ALL** available CACs are operating with maximum SRW flow • Containment spray flow is greater than1350 GPM per pump, if operating • **ALL** containment penetrations required to be shut have an isolation valve shut • Hydrogen concentration less than 0.5% **OR** **ALL** available hydrogen recombiners are energized with hydrogen concentration less than 4.0% **OR** Hydrogen purge operation per Tech Suppport recommendation

START	FUNCTION	DONE	PAGE
	A. ESTABLISH CONTAINMENT ENVIRONMENT BY CONTAINMENT SPRAY.	C	15
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify SIAS and CIS.		15
	• **IF** CIS has actuated, **THEN** trip **ALL** RCPs		15
	• Verify **ALL** available CACs are operating		15
	• **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS		15
	• **IF** a SRW Header is **NOT** in operation **THEN** attempt to restart: • 21 SRW Header – CNTMT pressure less than 25 PSIG. • 22 SRW Header – CNTMT pressure less than 10 PSIG.		16
	• SIAS VERIFICATION CHECKLIST		19
	• CSAS VERIFICATION CHECKLIST		19
	• CIS VERIFICATION CHECKLIST		19
	• Prevent local hydrogen accumulation		20

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

CE-3: CONTAINMENT SPRAY
(continued)

START	FUNCTION	DONE	PAGE
	B. RESTORE THE CONTAINMENT ENVIRONMENT.	C	21
	• **WHEN** pressure is less than 4.0 PSIG, **THEN** reset CSAS **AND** verify **ALL** available CACs are operating		21
	• **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP		22
	C. ACCEPTANCE CRITERIA FOR SUCCESS PATH CE-3.		26
	• **IF** Containment Environment has **NOT** been satisfied, **THEN** perform the following actions: • Concurrently perform the Recovery actions for the next safety function to be satisfied • Determine the appropriate emergency response actions **PER** the ERPIP • **IF** containment cooling has been lost, **THEN** consider consulting the Technical Support Center about deinerting the Containment prior to reinitiating Containment Cooling • Evaluate further actions		26

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-1:NORMAL LEVELS

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A. VERIFY NORMAL RADIATION LEVELS EXTERNAL TO CONTAINMENT.	
1. Check the following RMS alarms are clear with **NO** unexplained rise: • "U-2 WIDE RANGE NOBLE GAS MON" (2-RIC-5415) • "UNIT 2 CNDSR OFF-GAS" (2-RI-1752) • "UNIT 2 S/G B/D" (2-RI-4014) • "UNIT 2 MAIN VENT GASEOUS" (2-RI-5415)	1.1 **IF** a valid "UNIT 2 CNDSR OFF-GAS" or "UNIT 2 S/G B/D" alarm is received, **THEN** secure S/G Blowdown. 1.2 **IMPLEMENT** RLEC-2, <u>CONTAINMENT ISOLATED</u>.
2. **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify the following containment isolation valves are shut: • CNTMT NORMAL SUMP DRN, 2-EAD-5462-MOV • CNTMT NORMAL SUMP DRN, 2-EAD-5463-MOV • H_2 PURGE INBD ISOL, 2-HP-6900-MOV • H_2 PURGE OUTBD ISOL, 2-HP-6901-MOV	2.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 2.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 2-HP-6901-MOV.
3. **IF** containment pressure exceeds 2.8 PSIG, **THEN IMPLEMENT** RLEC-2, <u>CONTAINMENT ISOLATED</u>.	
4. **IF** 500KV Offsite Power was lost, **AND** power has been restored, **THEN** restore the associated Radiation Monitors to service.	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-1:NORMAL LEVELS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-1.	
1. Check Radiation Levels External to Containment is satisfied by the following indications: • "U-2 WIDE RANGE NOBLE GAS MON" (2-RIC-5415) alarm clear with NO unexplained rise • "UNIT 2 CNDSR OFF-GAS" (2-RI-1752) alarm clear with NO unexplained rise • "UNIT 2 S/G B/D" (2-RI-4014) alarm clear with NO unexplained rise • "UNIT 2 MAIN VENT GASEOUS" (2-RI-5415) alarm clear with NO unexplained rise	1.1 IF Radiation Levels External to Containment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Radiation Levels External to Containment Success Path.
2. IF Radiation Levels External to Containment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. ESTABLISH RADIATION LEVELS EXTERNAL TO CONTAINMENT BY CONTAINMENT ISOLATION.	
1. Check the following RMS alarms are clear with **NO** unexplained rise: • "U-2 WIDE RANGE NOBLE GAS MON" (2-RIC-5415) • "UNIT 2 CNDSR OFF-GAS" (2-RI-1752) • "UNIT 2 S/G B/D" (2-RI-4014) • "UNIT 2 MAIN VENT GASEOUS" (2-RI-5415) (continue)	1.1 **IF** a valid "UNIT 2 CNDSR OFF-GAS" or "UNIT 2 S/G B/D" alarm is received, **THEN** secure S/G Blowdown.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 2. **IF** leakage into Component Cooling is indicated by: • Rise on UNIT 2 CC radiation monitor, 2-RI-3819 • "CC HEAD TK LVL" high alarm **THEN** perform the following: a. Verify L/D CNTMT ISOL valves are shut: • 2-CVC-515-CV • 2-CVC-516-CV b. **IF** shutting the L/D CNTMT ISOL valves did **NOT** isolate the leak, **THEN** perform the following: (1) Trip **ALL** RCPs. (2) Shut the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV 3. **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 4. **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS has actuated. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

<u>RECOVERY ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A. (continued)	
5. **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify the following containment isolation valves are shut: • CNTMT NORMAL SUMP DRN, 2-EAD-5462-MOV • CNTMT NORMAL SUMP DRN, 2-EAD-5463-MOV • H_2 PURGE INBD ISOL, 2-HP-6900-MOV • H_2 PURGE OUTBD ISOL, 2-HP-6901-MOV	5.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 5.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 2-HP-6901-MOV.

6. **IF** a SGTR has occurred as indicated by **ANY** of the following:
• S/G samples
• RMS trends:
  • UNIT 2 CNDSR OFF-GAS (2-RI-1752)
  • UNIT 2 S/G B/D (2-RI-4014)
  • UNIT 2 MAIN VENT GASEOUS (2-RI-5415)
  • MAIN STM EFFL RAD MON (2-RIC-5421 **OR** 2-RIC-5422)
• S/G level change when **NOT** feeding
• Post-Trip S/G level trends
• Mismatch in feed flow prior to the trip
• Steam flow vs. Feed flow mismatch prior to the trip
 	
THEN identify the most affected S/G.
 	
(continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 7. **IF** a tube rupture is identified in a S/G, **THEN** commence working the appropriate Heat Removal success path until the affected **OR** most affected S/G is isolated. **CAUTION** **The following step provides actions to prevent water hammer damage from CAC voiding.** **CAUTION** **SRW Pumps start when power is restored to the associated 4KV Bus.** 8. **IF** CSAS has actuated, **AND EITHER** SRW Header is **NOT** in operation, **THEN** perform the following actions:	
a. **IF** 21 SRW Header is idle, **THEN** restart 21 SRW Header as follows: (1) Check that Containment Pressure has remained less than 25 PSIG with 21 SRW Header idle. (2) Attempt to start the desired SRW PP on 21 SRW Header. (continue)	a.1 **IF** Containment Pressure exceeded 25 PSIG, **THEN** perform the following actions: **CAUTION** **2A DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2A DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 21 SRW Header: (a) Shut 21 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-135, located 27 ft East Pen Room. (continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8.a (continued) (continue)	A.8.a.1(1) (continued) (b) Shut 22 CAC MAN SUPP 21 SRW SUBSYS, 2-SRW-142, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 21 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (2) **IF** 21 SRW Header can **NOT** be restarted, **THEN** perform the following actions: (a) Place the SRW PP(s) aligned to 21 SRW Header in PULL TO LOCK. (b) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK. (c) Locally trip the 2A DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device. (d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.8 (continued) b. **IF** 22 SRW Header is idle, **THEN** restart 22 SRW Header as follows: (1) Check that Containment Pressure has remained less than 10 PSIG with 22 SRW Header idle. (2) Attempt to start the desired SRW PP on 22 SRW Header. (continue)	b.1 **IF** Containment Pressure exceeded 10 PSIG, **THEN** perform the following actions: **CAUTION** **2B DG SRW flow is less than SRW PP minimum flow requirements. This step permits restoration of SRW to supply 2B DG.** **WARNING** **High radiation levels may exist in the Auxiliary Building. RAS may significantly raise existing radiation levels.** (1) Restart 22 SRW Header: (a) Shut 23 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-149, located 27 ft East Pen Room. (b) Shut 24 CAC MAN SUPP 22 SRW SUBSYS, 2-SRW-156, located 5 ft West Pen Room. (c) Attempt to start the desired SRW PP on 22 SRW Header. (d) Consult with the Plant Technical Support Center for guidance on system restoration. (continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS

A.8.b (continued)

NOTE
Performance of procedure steps and present plant conditions may create acceptable exceptions to the checklists.

CAUTION
To prevent uncontrolled system restoration, handswitches should be matched to the checklist positions unless specified otherwise.

9. Verify ESFAS equipment is aligned correctly
   AND handswitches are matched **PER** the following checklists as appropriate:
   - ATTACHMENT (2), SIAS VERIFICATION CHECKLIST
   - ATTACHMENT (3), CSAS VERIFICATION CHECKLIST
   - ATTACHMENT (4), CIS VERIFICATION CHECKLIST

(continue)

ALTERNATE ACTIONS

A.8.b.1 (continued)

(2) **IF** 22 SRW Header can **NOT** be restarted,
THEN perform the following actions:

(a) Place the SRW PP(s) aligned to 22 SRW Header in PULL TO LOCK.

(b) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK.

(c) Locally trip the 2B DG fuel racks by pushing the EMERGENCY STOP PUSH TO STOP ENGINE trip device.

(d) Consult with the Plant Technical Support Center for guidance on system restoration.

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. (continued) 10. **IF ANY** automatic Containment Isolation valve fails to shut, **OR ANY** manual Containment Isolation valve is open, **THEN** shut the affected valve(s) **OR** the next valve out from the appropriate penetration. 11. **IF** a tube rupture is identified in a S/G, **THEN** control secondary system contamination. a. Minimize the spread of contamination by performing the following: (1) Ensure the Unit 2 Turbine Building Sump Pumps are in STOP. (2) Isolate Condensate Dump to 21 CST by verifying the following valves are shut: • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 2-CD-232 • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 BYPASS VALVE, 2-CD-234 (3) Reduce moisture carryover into the CAR Discharge Header by fully opening the CONDENSER AIR REMOVAL PUMP SERVICE WATER OUTLET VALVEs: • (21 CAR) 2-SRW-211 • (22 CAR) 2-SRW-215 • (23 CAR) 2-SRW-219 • (24 CAR) 2-SRW-223 (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.a (continued) (4) Ensure Condensate to Circ Water Dump is isolated by verifying the following valves shut: • CONDENSER DUMP TO CIRCULATING WATER ISOLATION VALVE, 2-CD-239 • CONDENSATE DUMP TO CIRCULATING WATER BYPASS VALVE, 2-CD-240 (5) Ensure condenser expansion joints are **NOT** overflowing by verifying the CONDENSER EXPANSION JOINT FILL VALVEs are shut: • (21 Condenser) 2-CD-306 • (22 Condenser) 2-CD-307 • (23 Condenser) 2-CD-308 (6) Verify shut SERVICE WATER HEAD TANK MAKEUP VALVE, 2-CD-144. (7) Verify shut COMPONENT COOLING HEAD TANK MAKEUP VALVE, 2-CD-145. (8) Notify Plant Chemistry to secure the Hotwell sample pumps and isolate the Condensate Demin and Turbine Plant sample sinks. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS

A.11 (continued)

b. Control the volume of contaminated condensate inventory by performing the following:

CAUTION
Operating CAR PPs with condenser hotwell level greater than 12 feet may draw excessive water into the CAR PPs.

CAUTION
Operating a SGFP with condenser hotwell level greater than 12 feet may actuate the high exhaust casing level trip.

(1) **IF** condenser hotwell level exceeds 12 feet, **THEN** perform the following:

(a) Ensure Auxiliary Feedwater flow is established to the unaffected S/G.

(b) **IF** a SGFP is in operation, **THEN** secure the SGFP.

(c) Secure the CAR PPs.

(2) **IF** condenser hotwell level exceeds 14 feet, **THEN** shut the COND SHELL STOPs:

- 2-CAR-101
- 2-CAR-102
- 2-CAR-103
- 2-CAR-104
- 2-CAR-105
- 2-CAR-106

(continue)

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.b (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater will enable greater cooldown capability without raising contaminated condensate inventory. **CAUTION** **An unmonitored radiation release could occur if the ADVs are in use and Condensate/Main Feedwater is used to feed the unaffected S/G.** (3) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure. (4) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** isolate Condensate Makeup from 21 CST by performing the following: (a) Shut the Hotwell Makeup CV by shifting 2-LIC-4405 to MANUAL with 100% output. (b) Verify CONDENSER HOTWELL MAKEUP CV-4406 BYPASS VALVE, 2-CD-238, is shut. (continue)	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
A.11.b (continued) (5) Ensure the Auxiliary Boiler Condensate returns are aligned to Unit 1 by verifying the following: (a) 0-AHB-210, DEAERATOR OVERFLOW TO 11 CONDENSER ISOLATION VALVE, is open. (b) 0-AHB-211, DEARATOR OVERFLOW TO 21 CONDENSER ISOLATION VALVE, is shut. (6) Ensure the RC Waste Evaporators are aligned to Unit 1 or the Auxiliary Boilers **PER** OI-17E, <u>REACTOR COOLANT WASTE EVAPORATOR OPERATION</u>. (7) Ensure Plant Heating is aligned to Unit 1 Reheat Steam or the Auxiliary Boilers **PER** OI-40, <u>PLANT HEATING SYSTEM</u>. 12. **IF** 500KV Offsite Power was lost, **AND** power has been restored, **THEN** restore the associated Radiation Monitors to service.	

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS

B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-2.

1. Check Radiation Levels External to Containment is satisfied by **EITHER** of the following indications:
   - **ALL** of the following alarms are clear with **NO** unexplained rise:
     - "U-2 WIDE RANGE NOBLE GAS MON" (2-RIC-5415)
     - "UNIT 2 CNDSR OFF-GAS" (2-RI-1752)
     - "UNIT 2 S/G B/D" (2-RI-4014)
     - "UNIT 2 MAIN VENT GASEOUS" (2-RI-5415)

   OR

   - **ALL** containment penetrations required to be shut have an isolation valve shut.

     IF a tube rupture is identified in a S/G:
     - **ALL** release paths from the affected S/G to the environment are isolated
     - Affected S/G pressure less than 920 PSIA

(continue)

1.1 **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN** perform the following actions:

   a. Concurrently perform the recovery actions for the next safety function to be satisfied.

   b. Determine the appropriate emergency response actions **PER** the ERPIP.

   c. Evaluate further actions based on the following considerations:

      (1) The urgency of other jeopardized safety functions.

      (2) The risk to plant personnel and the public of leaving certain containment penetrations unisolated

      (3) The feasibility of isolating the containment penetration(s) by alternate methods

      (4) The feasibility of restoring a success path by performing **ANY** of the following:
      - Restoring the vital auxiliaries necessary to operate components or systems in the success paths
      - Manual operation of valves
      - Use of alternate components to implement a success path

APPENDIX (6) RADIATION LEVELS EXTERNAL TO CONTAINMENT

RLEC-2:CONTAINMENT ISOLATED

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. (continued) 2. **IF** Radiation Levels External to Containment has been established, **THEN PROCEED** to the next Safety Function to be satisfied.	

RADIATION LEVELS EXTERNAL TO CONTAINMENT PLACEKEEPER
RLEC-1: NORMAL LEVELS

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Normal Radiation levels exist outside of containment • Containment pressure less than 2.8 PSIG • A loss of **ALL** Vital 4KV Buses may have occurred	• Noble Gas Monitor (2-RIC-5415) alarm clear with **NO** unexplained rise • Condenser Off-Gas RMS (2-RI-1752) alarm clear with **NO** unexplained rise • S/G B/D RMS (2-RI-4014) alarm clear with **NO** unexplained rise • Main Vent Gaseous RMS (2-RI-5415) alarm clear with **NO** unexplained rise

START	FUNCTION	DONE	PAGE
	A. VERIFY NORMAL RADIATION LEVELS EXTERNAL TO CONTAINMENT.	C	1
	• **IF** radiation detected outside containment, **THEN IMPLEMENT** RLEC-2 • **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** verify Containment Normal Sump and H_2 Purge Isolation valves are shut • **IF** containment pressure exceeds 2.8 PSIG, **THEN IMPLEMENT** RLEC-2		1 1 1
	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-1.		2
	• **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN PROCEED** to the next appropriate Radiation Levels External to Containment Success Path.		2

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

RADIATION LEVELS EXTERNAL TO CONTAINMENT PLACEKEEPER

RLEC-2: CONTAINMENT ISOLATED

RESOURCE CONDITIONS	ACCEPTANCE CRITERIA
• Radiation detected outside containment • Containment pressure greater than 2.8 PSIG	• **ALL** of the following alarms are clear with **NO** unexplained rise: • Noble Gas Monitor (2-RIC-5415) • Condenser Off-Gas RMS (2-RI-1752) • S/G B/D RMS (2-RI-4014) • Main Vent Gaseous RMS (2-RI-5415) **OR** • **ALL** containment penetrations required to be shut have an isolation valve shut **IF** a tube rupture is identified in a S/G, • **ALL** release paths from the affected S/G *to the environment are isolated* • Affected S/G pressure less than 920 PSIA

START	FUNCTION	DONE	PAGE
	A. VERIFY RADIATION LEVELS EXTERNAL TO CONTAINMENT BY CONTAINMENT ISOLATION.	C	3

	• **IF** pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS.
	• **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS
	• **IF** a loss of **ALL** Vital 4KV buses has occurred, **THEN** *verify Containment Normal Sump and* H_2 Purge Isolation valves are shut
	• **IF** a tube rupture is identified, **THEN** perform the following:
	  • Commence working the appropriate Heat Removal success path until the affected **OR** most affected S/G is isolated
	• **IF** a SRW Header is **NOT** in operation **THEN** attempt to restart:
	  • 21 SRW Header – CNTMT pressure less than 25 PSIG.
	  • 22 SRW Header – CNTMT pressure less than 10 PSIG.
	• SIAS VERIFICATION CHECKLIST
	• CSAS VERIFICATION CHECKLIST
	• CIS VERIFICATION CHECKLIST
	• **IF** a tube rupture is identified, **THEN** control secondary system contamination
			4
			4
			5
			6
			6
			9
			9
			9
			10

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

(continue)

RLEC-2: CONTAINMENT ISOLATED

(continued)

START	FUNCTION	DONE	PAGE
	B. ACCEPTANCE CRITERIA FOR SUCCESS PATH RLEC-2.		15

	• **IF** Radiation Levels External to Containment has **NOT** been satisfied, **THEN** perform the following actions:
	  • Concurrently perform the Recovery actions for the next safety function to be satisfied
	  • Determine the appropriate emergency response actions **PER** the ERPIP
	  • Evaluate further actions
			15

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP ATTACHMENTS

REVISION 18

Safety Related

Approval Authority: Kent Mills / 8-30-2004
signature/date

Effective Date: 9-2-2004

LIST OF EFFECTIVE PAGES

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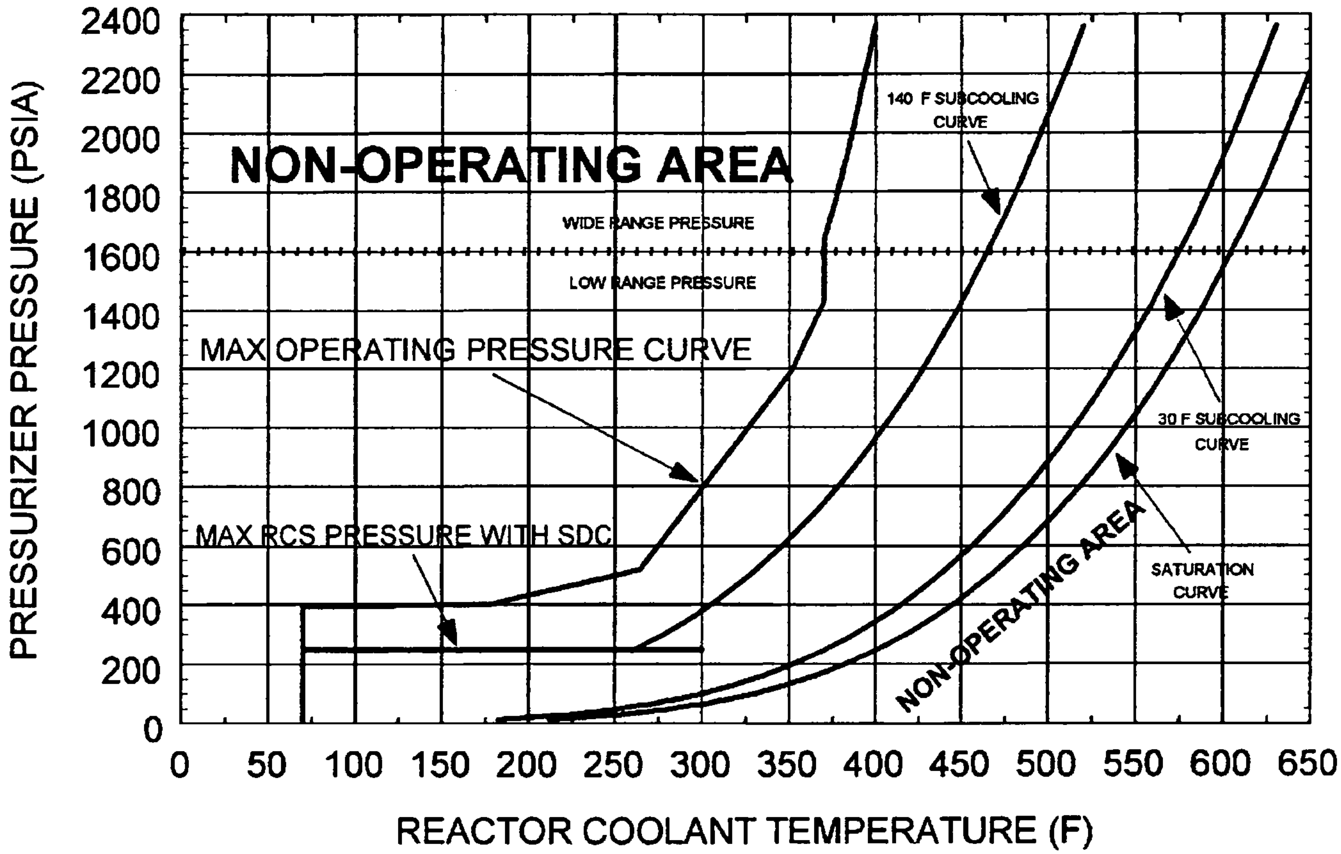
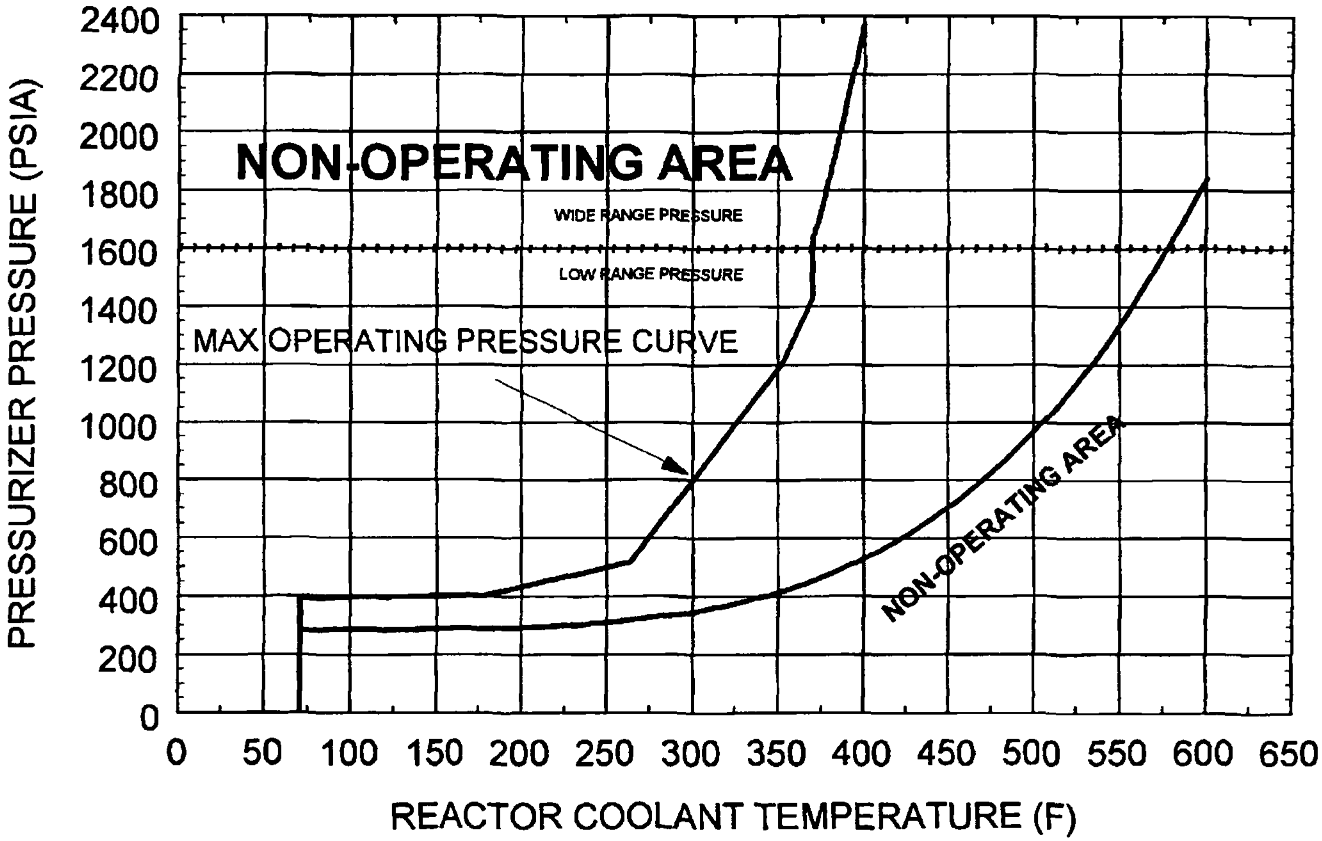
PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
1800	Att. 2 pg. 4

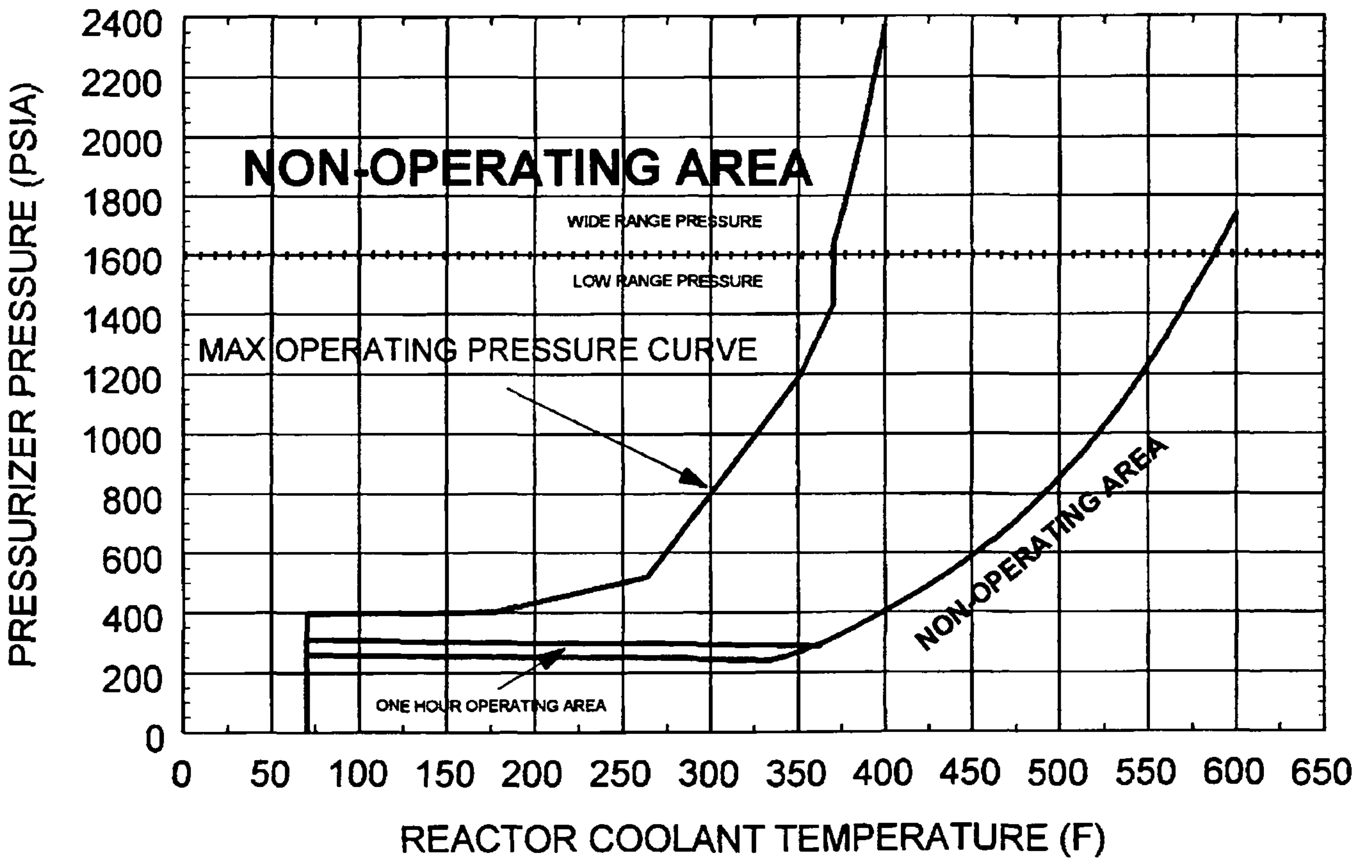
RCS PRESSURE TEMPERATURE LIMITS



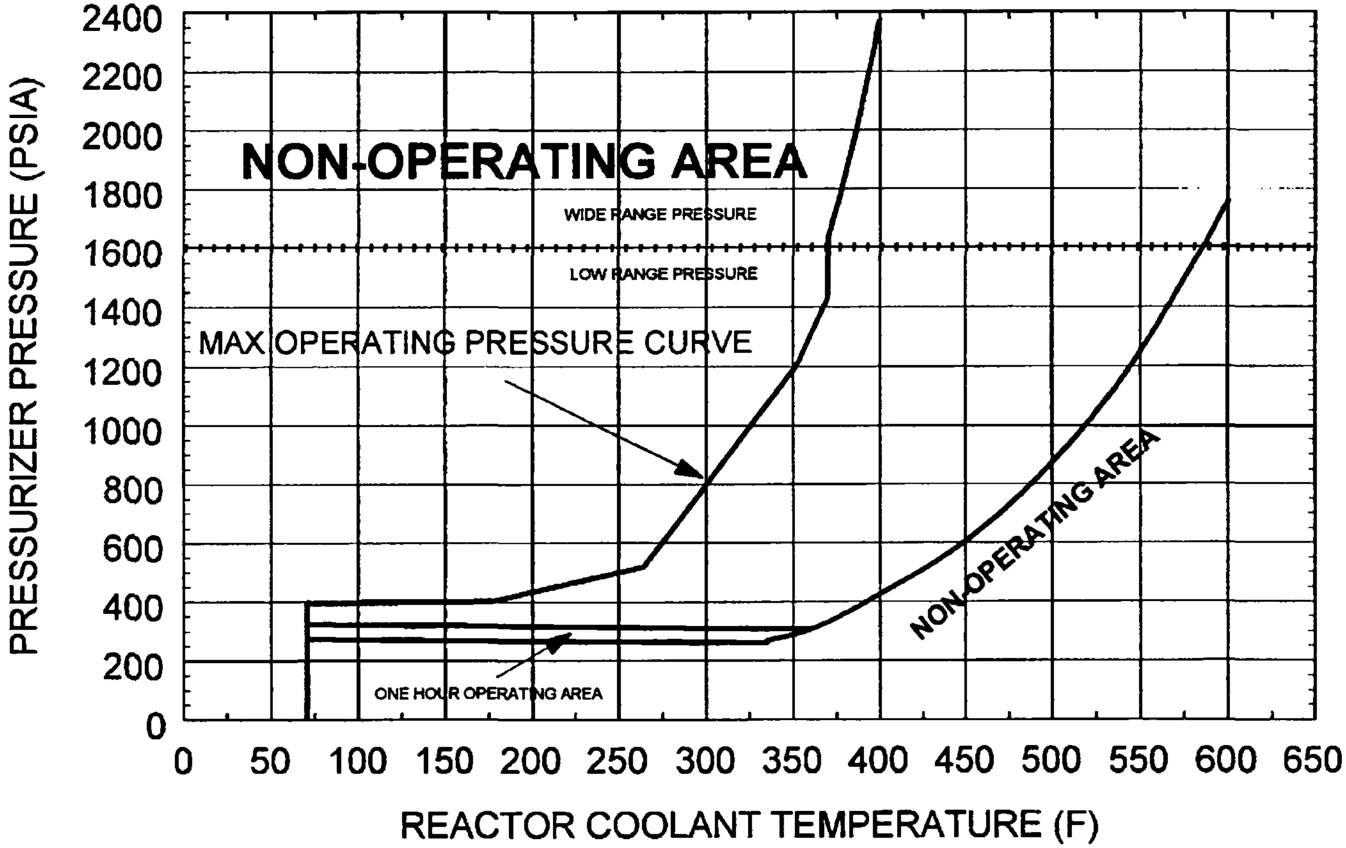
RCS PRESSURE TEMPERATURE LIMITS
11A or 11B and 12A or 12B RCP



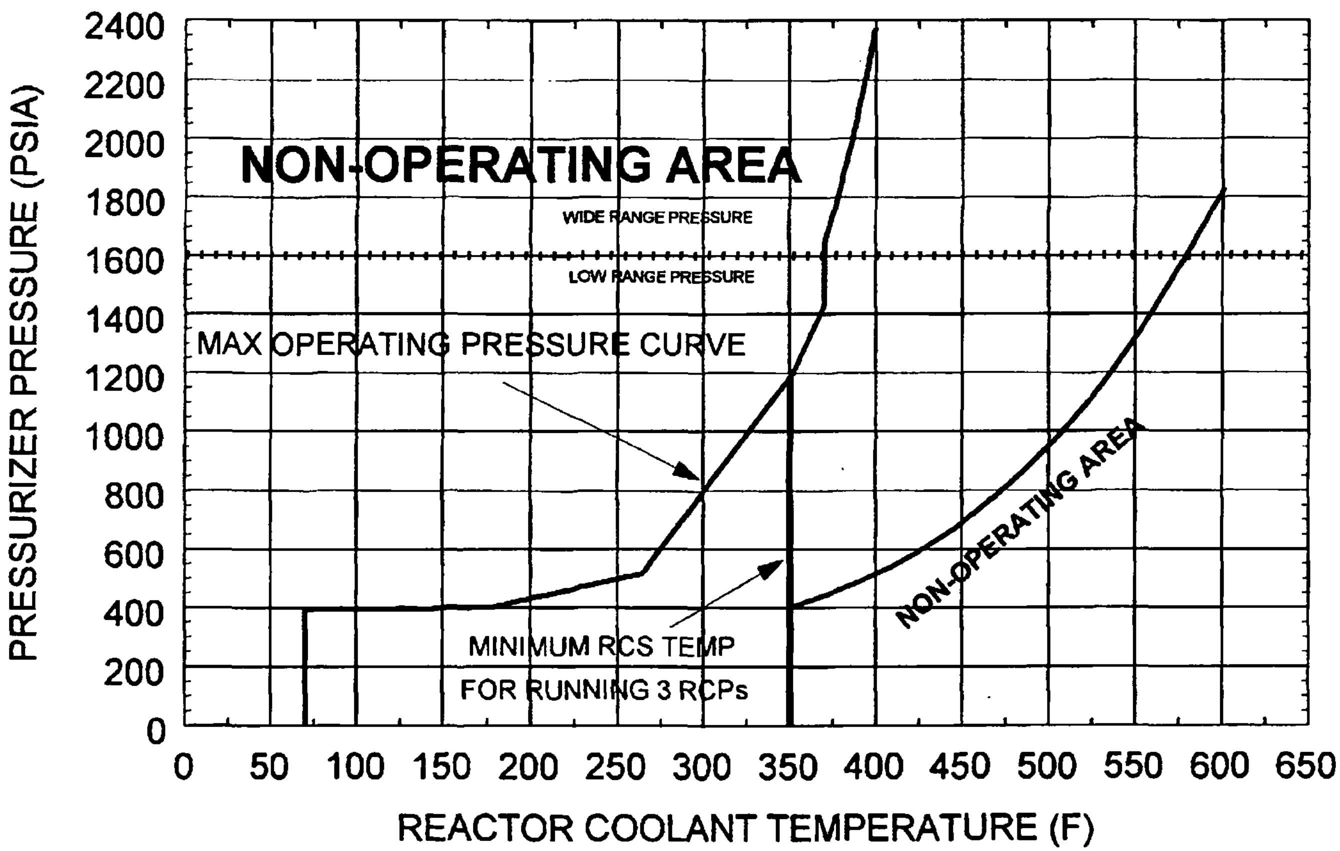
RCS PRESSURE TEMPERATURE LIMITS
11A and 11B RCP



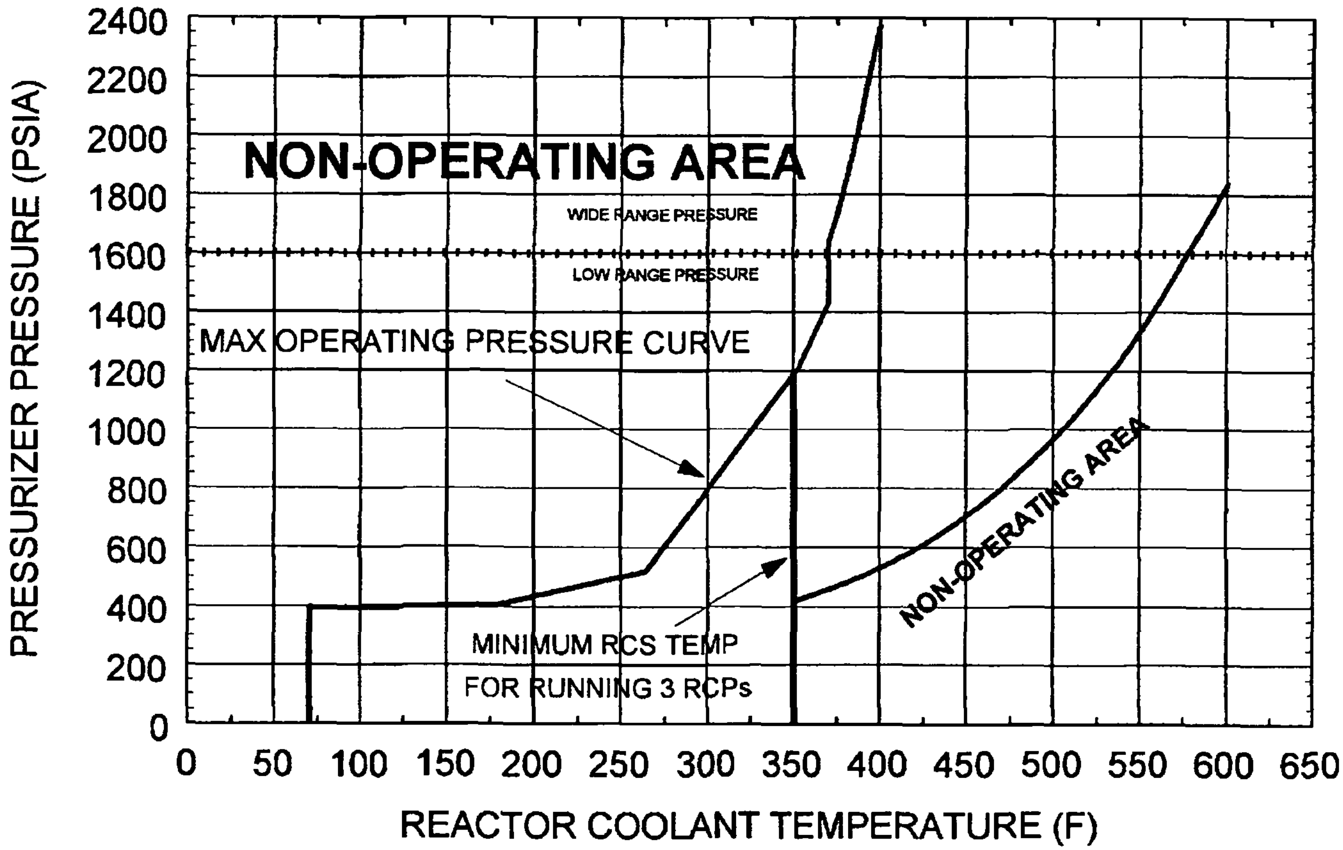
RCS PRESSURE TEMPERATURE LIMITS
12A and 12B RCP



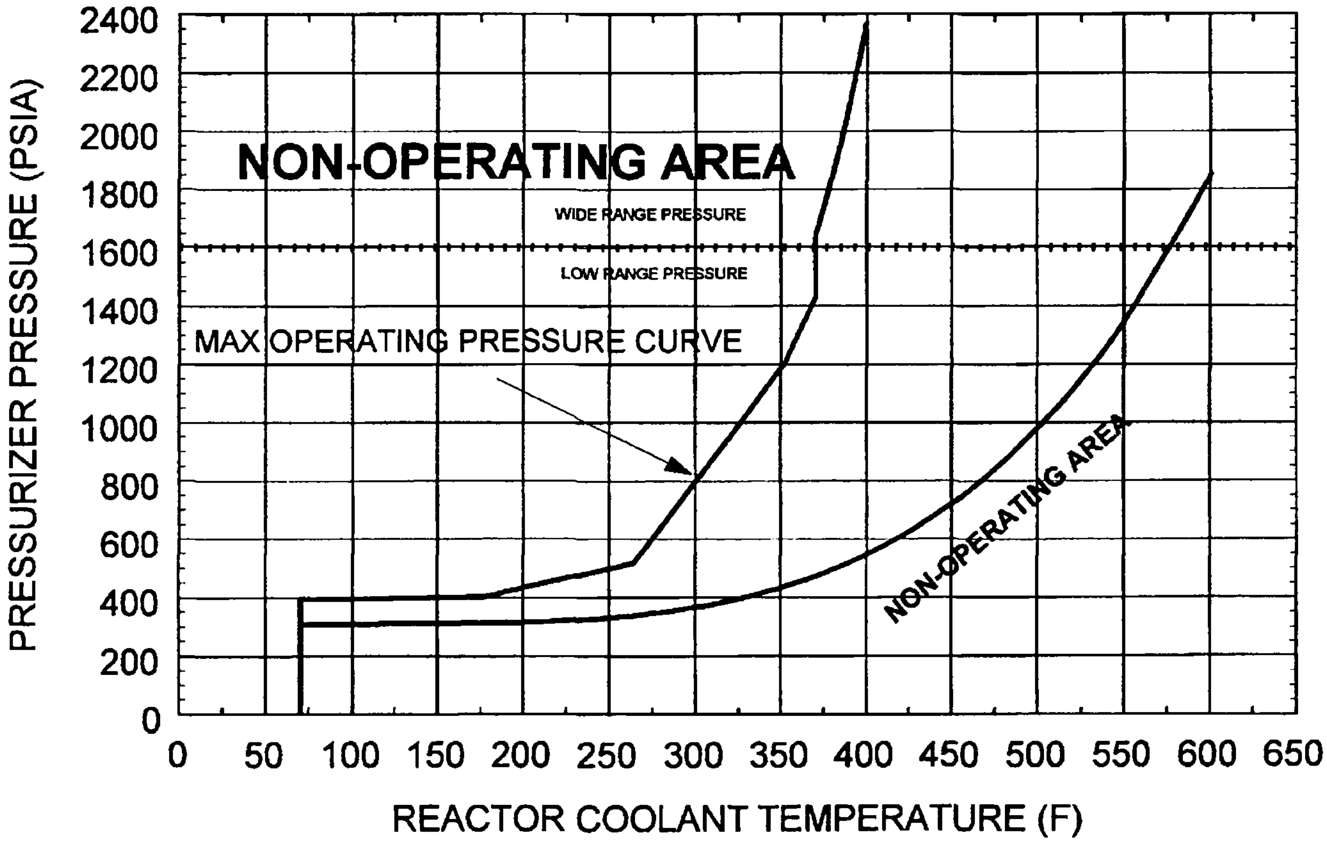
RCS PRESSURE TEMPERATURE LIMITS
11A and 11B with 12A or 12B RCP



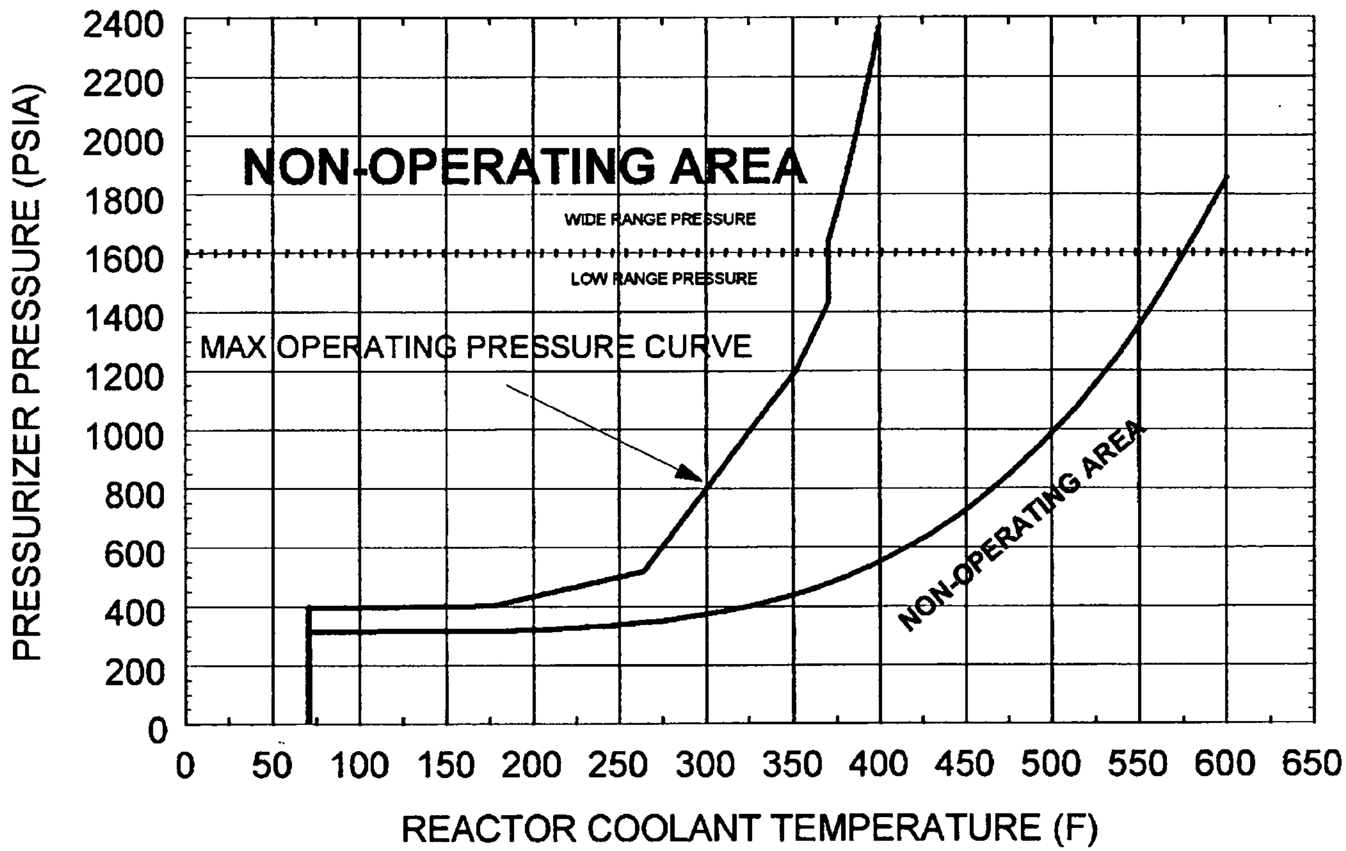
RCS PRESSURE TEMPERATURE LIMITS
12A and 12B with 11A or 11B RCP



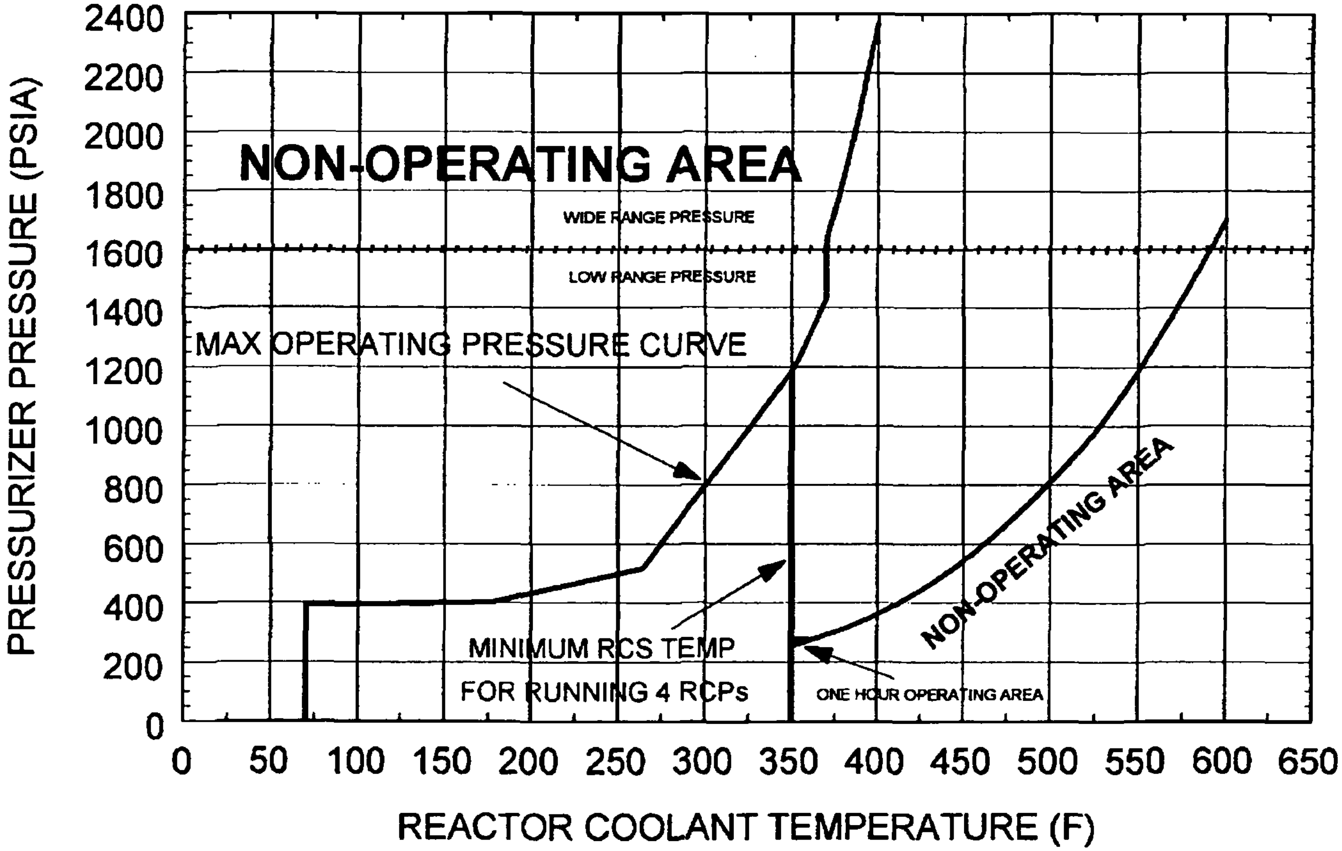
RCS PRESSURE TEMPERATURE LIMITS
11A or 11B RCP



RCS PRESSURE TEMPERATURE LIMITS
12A or 12B RCP



RCS PRESSURE TEMPERATURE LIMITS
4 RCP OPERATION



ATTACHMENT (2)
Page 1 of 5

SIAS VERIFICATION CHECKLIST

<u>1C08, 1C09, 1C10</u>

a. 11 and 13 HPSI PPs .... Running

b. 11 and 12 LPSI PPs .... Running

c. 11 and 12 CS PPs .... Running

d. MAIN HPSI HDR valves:

- 1-SI-616-MOV .... Open
- 1-SI-626-MOV .... Open
- 1-SI-636-MOV .... Open
- 1-SI-646-MOV .... Open

e. AUX HPSI HDR valves:

- 1-SI-617-MOV .... Open
- 1-SI-627-MOV .... Open
- 1-SI-637-MOV .... Open
- 1-SI-647-MOV .... Open

f. LPSI HDR valves:

- 1-SI-615-MOV .... Open
- 1-SI-625-MOV .... Open
- 1-SI-635-MOV .... Open
- 1-SI-645-MOV .... Open

g. SIT CKV LKG DRN valves:

- 1-SI-618-CV .... Shut*
- 1-SI-628-CV .... Shut*
- 1-SI-638-CV .... Shut*
- 1-SI-648-CV .... Shut*

h. SIT OUT valves:

- 1-SI-614-MOV .... Open
- 1-SI-624-MOV .... Open
- 1-SI-634-MOV .... Open
- 1-SI-644-MOV .... Open

I. SIT RECIRC TO RCDT valve, 1-SI-661-CV .... Shut*

* Handswitches required in the Post Accident Position to enable resetting SIAS.

(continue)

ATTACHMENT (2)
Page 2 of 5

SIAS VERIFICATION CHECKLIST

(Continued)

j. 11, 12, 13 and 14 CNTMT AIR CLRs .... Running in Low(1)

k. CNTMT CLR EMER OUT valves:

- 1-SRW-1582-CV .... Open
- 1-SRW-1585-CV .... Open
- 1-SRW-1590-CV .... Open
- 1-SRW-1593-CV .... Open

l. 11, 12 and 13 IODINE FILT FANs .... Running

m. RCDT PP CNTMT ISOL valve, 1-RCW-4260-CV .... Shut*

n. WGS CNTMT ISOL valves:

- 1-WGS-2180-CV .... Shut*
- 1-WGS-2181-CV .... Shut*

o. CNTMT RMS ISOL valves:

- 1-CRM-5291-CV .... Shut*
- 1-CRM-5292-CV .... Shut*

p. CNTMT NORMAL SUMP DRN valves:

- 1-EAD-5462-MOV .... Shut*
- 1-EAD-5463-MOV .... Shut*

q. RCS SAMPLE ISOL valve, 1-PS-5464-CV .... Shut*

r. H_2 PURGE ISOL valves:

- 1-HP-6900-MOV .... Shut*
- 1-HP-6901-MOV .... Shut*

* Handswitches required in the Post Accident Position to enable resetting SIAS.

(1) Do **NOT** place these Handswitches in their Post Accident Position.

ATTACHMENT (2)

SIAS VERIFICATION CHECKLIST

1C07

a. L/D CNTMT ISOL valves:

- 1-CVC-515-CV .... Shut*
- 1-CVC-516-CV .... Shut*

b. 11, 12 and 13 CHG PPs .... Running

c. VCT OUT valve, 1-CVC-501-MOV .... Shut

d. VCT M/U valve, 1-CVC-512-CV........................... Shut

e. BA DIRECT M/U valve, 1-CVC-514-MOV .... Open

f. 11 and 12 BA PPs .... Running

g. BAST GRAVITY FD valves:

- 1-CVC-5O8-MOV .... Open
- 1-CVC-509-MOV .... Open

h. BAST RECIRC valves:

- 1-CVC-510-CV .... Shut
- 1-CVC-511-CV .... Shut

i. RCP BLEED-OFF ISOL valves:

- 1-CVC-505-CV .... Shut*
- 1-CVC-506-CV .... Shut*

1C06

a. 11 and 13 BACKUP HTRs .... Off

* Handswitches required in the Post Accident Position to enable resetting SIAS.

ATTACHMENT (2)
Page 4 of 5

SIAS VERIFICATION CHECKLIST

1C13

a. 11 and 12 CC PPs .... Running

b. 11 and 12 SALTWATER PPs .... Running

c. 11 and 12 SRW PPs .... Running

d. CCHX CC OUT valves

- 1-CC-3824-CV.................................. Open **(2)** 18/00
- 1-CC-3826-CV .... Open **(2)**

e. SDC HX CC OUT valves:

- 1-CC-3828-CV.................................. Open
- 1-CC-3830-CV .... Open

f. SRW HDR TURB BLDG ISOL valves:

- 1-SRW-1600-CV .... Shut
- 1-SRW-1637-CV .... Shut
- 1-SRW-1638-CV .... Shut
- 1-SRW-1639-CV .... Shut

g. 11 and 12 SALTWATER AIR COMPRs .... Running

h. LQD WASTE EVAP UNIT 1 CC ISOL valves:

- 1-CC-3840-CV .... Shut
- 1-CC-3842-CV .... Shut

i. CAC SRW INL valves:

- 1-SRW-1581-CV .... Throttled **(1)** (Open if RAS actuated)
- 1-SRW-1584-CV .... Throttled **(1)** (Open if RAS actuated)
- 1-SRW-1589-CV .... Throttled **(1)** (Open if RAS actuated)
- 1-SRW-1592-CV .... Throttled **(1)** (Open if RAS actuated)

(1) Do **NOT** place these Handswitches in their Post Accident Position.
(2) Valves do **NOT** receive a SIAS signal.

ATTACHMENT (2)

SIAS VERIFICATION CHECKLIST

<u>1C18A, 1C18B</u>

a. 1A DG .... Running

b. 1B DG .... Running

c. 0C DG 11 4KV BUS FDR, 152-1106 .... Open

d. 0C DG 14 4KV BUS FDR, 152-1406 .... Open

<u>1C34</u>

a. 11 POST LOCI FILT FAN & DMPR .... Running

b. 12 POST LOCI FILT FAN & DMPR .... Running

c. 11 CONTR RM FRESH AIR, 0-HVAC-5350 .... Close

d. 12 CONTR RM FRESH AIR, 0-HVAC-5351 .... Close

<u>1C90</u> (45 ft S/G B/D Sample Panel)

a. Pressurizer Vapor Sample Valve, 1-PS-5465-CV .... Shut

b. Pressurizer Liquid Sample Valve, 1-PS-5466-CV .... Shut

c. RCS Hot Leg Sample Valve, 1-PS-5467-CV .... Shut

<u>1C101</u> (45 ft Solid Waste)

a. Quench Tank O_2 Sample Valve, 1-PS-6531-SV .... Shut

ATTACHMENT (3)

CSAS VERIFICATION CHECKLIST

1C03

a. 11 and 12 MSIVs:

- 1-MS-4043-CV .... Shut*
- 1-MS-4048-CV .... Shut*

b. 11 and 12 SG FW ISOL valves:

- 1-FW-4516-MOV .... Shut*
- 1-FW-4517-MOV .... Shut*

c. 11 and 12 S/G B/D valves:

- 1-BD-4010-CV .... Shut
- 1-BD-4011-CV .... Shut
- 1-BD-4012-CV .... Shut
- 1-BD-4013-CV .... Shut

d. 11 and 12 SGFPT TRIP RESET .... Tripped

e. 11 and 12 HTR DRN PPs .... Off

f. 11, 12 and 13 COND BSTR PPs .... Off

1C08, 1C09

a. CS HDR valves:

- 1-SI-4150-CV .... Open
- 1-SI-4151-CV .... Open

1C13

a. SRW SUPP TO 12 BD HX, 1-SRW-1640-CV .... Shut

b. 11 SFP HX SRW INL/OUT valves:

- 1-SRW-1597-CV .... Shut
- 1-SRW-1596-CV .... Shut

* Handswitches required in the Post Accident Position to enable resetting CSAS.

ATTACHMENT (4)
Page 1 of 2

CIS VERIFICATION CHECKLIST

1C09, 1C10

a. 11 and 12 PENETRATION RM VENT FANs .... Running

b. 11 and 12 FILT ISOL DMPRs .... Open

c. CC CNTMT SUPPLY and RETURN VLVs:

- 1-CC-3832-CV .... Shut*
- 1-CC-3833-CV .... Shut*

d. IA CNTMT ISOL, 1-IA-2080-MOV .... Shut*

e. 1-IA-2080-MOV CIS OVERRIDE, 1-HS-2080A .... Normal*

Administratively Controlled Valves

a. **IF ANY** of the following administratively controlled valves are open, **THEN** return them to the shut position:

NOTE
1-PA-1040 is located inside containment. If 1-PA-1040 is open, 1-PA-1044 must be shut to establish containment isolation.

(1) Plant Air Containment Isolation Valves:

- 1-PA-1040 .... Shut
- 1-PA-1044 .... Shut

(2) Nitrogen Supply To SITs:

- 1-SI-612-CV .... Shut
- 1-SI-622-CV .... Shut
- 1-SI-632-CV .... Shut
- 1-SI-642-CV .... Shut

(3) DI WTR CNTMT ISOL valve, 1-DW-5460-CV .... Shut

(4) U-1 FIRE PROT CNTMT ISOL valve, 1-FP-6200-MOV...... Shut

* Handswitches required in the Post Accident Position to enable resetting CIS.

(continue)

ATTACHMENT (4)
Page 2 of 2

CIS VERIFICATION CHECKLIST

(Continued)

NOTE
The PASS Return to RCDT and Hydrogen Sample Valves may be open for accident sampling. Contact Chemistry for operation of the PASS Return to RCDT and Hydrogen Sample Valves.

(5) PASS Return to RCDT, 1-PS-6529-SV .... Shut

(6) Hydrogen Sample Valves:

- 1-PS-6507A-SV .... Shut
- 1-PS-6507B-SV .... Shut
- 1-PS-6507C-SV .... Shut
- 1-PS-6507D-SV .... Shut
- 1-PS-6507E-SV .... Shut
- 1-PS-6507F-SV .... Shut
- 1-PS-6507G-SV .... Shut

- 1-PS-6540A-SV .... Shut
- 1-PS-6540B-SV .... Shut
- 1-PS-6540C-SV .... Shut
- 1-PS-6540D-SV .... Shut
- 1-PS-6540E-SV .... Shut
- 1-PS-6540F-SV .... Shut
- 1-PS-6540G-SV .... Shut

ATTACHMENT (5)
Page 1 of 1

CRS VERIFICATION CHECKLIST

1C10

a. CNTMT PURGE SUPP valve, 1-CPA-1410-CV .... Shut*

b. CNTMT PURGE EXH valve, 1-CPA-1412-CV .... Shut*

c. H_2 PURGE ISOL valves:

- 1-HP-6900-MOV .... Shut*
- 1-HP-6901-MOV .... Shut*

1C34

a. 11 CNTMT PURGE EXH FAN .... Off

b. 11 CNTMT PURGE SUPP FAN .... Off

* Handswitches required in the Post Accident Position to enable resetting CRS.

ATTACHMENT (6)
Page 1 of 1

RAS VERIFICATION CHECKLIST

1C08, 1C09, 1C10

a. 11 and 12 LPSI PPs .... Off

b. MINI FLOW RETURN TO RWT ISOL MOVs:

- 1-SI-659-MOV .... Shut
- 1-SI-660-MOV .... Shut

c. CNTMT SUMP DISCH valves:

- 1-SI-4144-MOV .... Open
- 1-SI-4145-MOV .... Open

1C13

a. CAC SRW INL valves:

- 1-SRW-1581-CV .... Open
- 1-SRW-1584-CV .... Open
- 1-SRW-1589-CV .... Open
- 1-SRW-1592-CV .... Open

ATTACHMENT (7)
Page 1 of 1

SGIS VERIFICATION CHECKLIST

1C03

a. 11 and 12 MSIVs:

- 1-MS-4043-CV .... Shut*
- 1-MS-4048-CV .... Shut*

b. 11 and 12 SG FW ISOL valves:

- 1-FW-4516-MOV .... Shut*
- 1-FW-4517-MOV .... Shut*

c. 11 and 12 SGFPT TRIP RESET .... Tripped

d. 11 and 12 HTR DRN PPs .... Off

e. 11, 12 and 13 COND BSTR PPs .... Off

* Handswitches required in the Post Accident Position to enable resetting SGIS.

ATTACHMENT (8)
Page 1 of 5

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

NOTE

Technical Specifications require a minimum of 150,000 gallons of makeup water to be available to Unit 2 while it is in modes 1, 2 or 3.

1. Verify 12 CST is available to supply feedwater by the following:

   - 12 CST level greater than 5 feet
   - 12 CST SUPPLY TO UNIT 1 AFW PUMPS ISOLATION VALVE, 1-AFW-161, open

NOTE

Condenser Makeup valve, 1-CD-4406-CV fails open on loss of power, shut on loss of air.

2. **IF** 1Y09 is **NOT** energized,
   AND hotwell makeup is **NOT** required,
   THEN shut DISCH FROM COND M/U, 1-CD-236.

CAUTION

Before transferring AFW Pump suction to an alternate supply, the possibility of suction line or CST rupture should be considered.

3. **IF** 12 CST is **NOT** available to supply feedwater
   AND 11 CST is available,
   THEN line up 11 CST as an alternate suction supply as follows:

   a. Locally open 11 CST MAN ISOL valves:

      - 1-AFW-131
      - 1-AFW-167

   b. Locally shut 12 CST SUPPLY TO UNIT 1 AFW PUMPS ISOLATION VALVE, 1-AFW-161.

   c. Confirm normal CST LVL response.

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

4. **IF** 12 CST LVL is less than 5 feet
AND 11 CST is **NOT** available to supply feedwater,
THEN lineup an alternate supply to the auxiliary feedwater pump suction as follows:

NOTE

The following substeps are different methods, listed in preferred order, which may be used to line up an alternate supply to auxiliary feedwater pump suction. Each available method should be attempted until a source of water has been established.

CAUTION

Before transferring AFW Pump suction to an alternate supply, the possibility of suction line or CST rupture should be considered.

a. Lineup 21 CST as an alternate suction supply as follows:

NOTE

The following step will cause 12 and 21 CST levels to equalize.

(1) Locally open 21 CST MAN ISOL valves:

- 2-AFW-131
- 2-AFW-167

(2) Verify open 12 CST SUPPLY TO AFW PUMPS ISOLATION valves:

- 1-AFW-161
- 2-AFW-161

(3) Confirm normal CST LVL response.

b. Align the Fire System to 13 AFW PP suction as follows:

(1) Place 13 AFW PP in PULL TO LOCK.

(2) Shut 13 AFW PP Suction Valve, 1-AFW-182.

(3) Connect fire hoses between pump suction and a fire main.

(4) Open the 13 AFW PP SUCTION FIRE HOSE CONNECTION ISOLATION VALVE, 1-AFW-180.

(5) Open the fire hose discharge valve.

(6) Restore 13 AFW PP as required.

(continued)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

4. (continued)

c. Align the Fire System to 23 AFW PP suction for cross connected operation:

(1) Place 23 AFW PP in PULL TO LOCK.

(2) Shut 23 AFW PP Suction Valve, 2-AFW-182.

(3) Connect fire hoses between pump suction and a fire main.

(4) Open the FIRE HOSE CONNECTION AUX FEED SUCT LINE ISOLATION VALVE, 2-AFW-180.

(5) Open the fire hose discharge valve.

(6) Restore 23 AFW PP as required.

5. Makeup to the on-service CST.

NOTE

The following substeps are different methods, listed in preferred order, which may be used to establish makeup to the on-service CST. Each available method should be attempted until a source of water has been established.

a. **IF** the Demineralized Water Transfer Pumps are available,
THEN perform the following:

(1) Throttle open the CST Fill Valve for the tank to be filled, while maintaining the Demineralized Water Transfer Pump discharge pressure greater than 30 PSIG.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(2) **IF** desired for faster CST fill rate,
THEN start the second Demineralized Water Transfer Pump.

(3) **WHEN** the desired tank level is reached,
THEN shut the appropriate CST Fill Valve.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(continued)

ATTACHMENT (8)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

5. (continued)

b. **IF** a COND PP is available,
THEN transfer hotwell inventory to 11 CST as follows:

(1) Shift the CNDSR HOTWELL M/U & DUMP CONTROLLER, 1-LIC-4405, to MANUAL.

(2) Adjust Controller to open Hotwell To CST Dump CV, 1-CD-4405-CV.

(3) **IF** a COND PP is **NOT** running,
THEN shut ONE Condensate Pump Discharge Valve:

- (11 Pump) 1-CD-106
- (12 Pump) 1-CD-113
- (13 Pump) 1-CD-120

(4) Verify the appropriate COND PP is running.

(5) Slowly throttle open the pump discharge valve to maintain pump discharge pressure between 175 and 240 PSIG.

(6) Stop the pump when cavitation occurs.

(7) Shut the Hotwell To CST Dump CV by adjusting 1-LIC-4405, to 50% output.

c. **IF** the DI Water Storage Tank level is greater than 10 feet
AND the on-service CST level is less than 5 feet,
THEN gravity fill the on-service CST by performing the following:

(1) Throttle open the CST Fill Valve for the tank to be filled.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(2) **WHEN** the desired tank level is reached,
THEN shut the appropriate CST Fill Valve.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(continued)

ATTACHMENT (8)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

5. (continued)

d. Emergency fill 11 CST from the Fire System as follows:

(1) Connect a fire hose between fire house hose manifold and 11 CST EMERGENCY CROSS CONNECT ISOLATION VALVE, 1-CD-312.

(2) Shut the FIRE PUMPS DISCHARGE TEST DRAIN VALVE, 0-FP-277.

(3) Open the FIRE PUMPS DISCHARGE HEADER TEST ISOLATION VALVE, 0-FP-246.

(4) Open 11 CST EMERGENCY CROSS CONNECT ISOLATION VALVE, 1-CD-312.

(5) Open the fire hose discharge valve.

(6) Ensure 11 CST LVL rises.

e. Emergency fill 21 CST from the Fire System as follows:

(1) Connect a fire hose between fire house hose manifold and 21 CST EMERGENCY HOSE CONNECTION VALVE, 2-CD-312.

(2) Shut the FIRE PUMPS DISCHARGE TEST DRAIN VALVE, 0-FP-277.

(3) Open the FIRE PUMPS DISCHARGE HEADER TEST ISOLATION VALVE, 0-FP-246.

(4) Open 21 CST EMERGENCY HOSE CONNECTION VALVE, 2-CD-312.

(5) Open the fire hose discharge valve.

(6) Ensure 21 CST LVL rises.

ATTACHMENT (9)

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

1. Determine the amount of makeup water required to perform an ADV cooldown and a TBV cooldown, based on the time after shutdown:

   a. ADV cooldown and time after shutdown 1.a _____gals

   b. TBV cooldown and time after shutdown 1.b _____gals

2. Determine the amount of makeup water available in the CSTs:

   a. Record the level in 11 CST. 2.a _____ft

   b. Record the level in 12 CST. 2.b _____ft

   c. Record the level in 21 CST. 2.c _____ft

   d. Determine the status of Unit 2 (check one):

      (1) ___ Mode 1, 2 or 3 and does **NOT** require AFW operation.

      (2) ___ Mode 1, 2 or 3 and does require AFW operation.

      (3) ___ Mode 4, 5, 6 or defueled.

NOTE
Calculated negative values should be entered as zero.

   e. Determine the amount of makeup water available to Unit 1 using one of the following formulas, based on the status checked in step 2.d above:

      (1) **IF** step d.(1) is checked,
      THEN correct CST levels for usable volume:

         (a) step 2.a _____ft - 2.75 ft = (a) _____ft

         (b) step 2.b _____ft - 16 ft = (b) _____ft

         (c) step(a) _____ft + step(b) _____ft = e.(1) _____ft

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

(2) **IF** step d.(2) is checked,
THEN correct CST levels for usable volume:

(a) step 2.a _____ft - 2.75 ft = (a) _____ft

(b) $\dfrac{\text{step 2.b \_\_\_\_\_ft - 2.5 ft}}{2}$ = (b) _____ft

(c) step(a) _____ft + step(b) _____ft = e.(2) _____ft

(3) **IF** step d.(3) is checked,
THEN correct CST levels for usable volume:

(a) step 2.a _____ft - 2.75 ft = (a) _____ft

(b) step 2.b _____ft - 2.5 ft = (b) _____ft

(c) step 2.c _____ft - 2.75 ft = (c) _____ft

(d) step(a) _____ft + step(b) _____ft + step(c) _____ft = e.(3) _____ft

f. Convert the amount of CST level into gallons.

(ft available) _____ft x 9636.78 gal/ft = 2.f _____gals

NOTE
The nominal capacity of a Well Water pump is 300 GPM.
The nominal capacity of a Demineralized Water Transfer pump is 300 GPM.
The Fire System can fill the CST via fire hoses at greater than 500 GPM.

CAUTION
The status of both units should be considered when evaluating a makeup source.

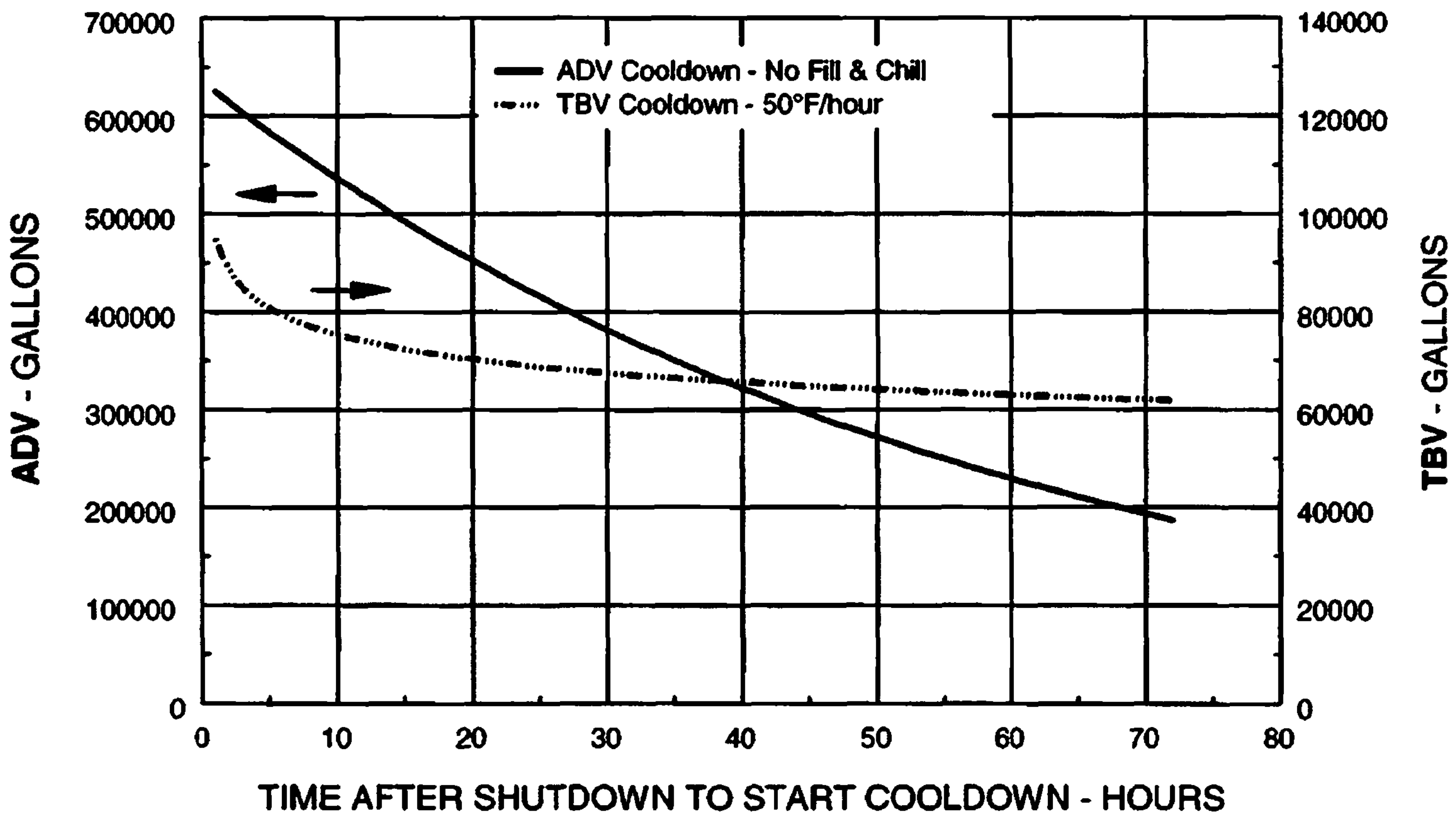
3. **IF** adequate inventory exists to perform cooldown,
THEN determine if an adequate makeup source exists to maintain hot standby.

4. **IF** adequate inventory does **NOT** exist to perform cooldown,
THEN evaluate the following:

- Maintaining hot standby conditions
- Time to restore an adequate makeup source
- Restoration of other plant systems (TBVs, main feedwater system, etc.)
- Performing partial cooldown while restoring plant systems

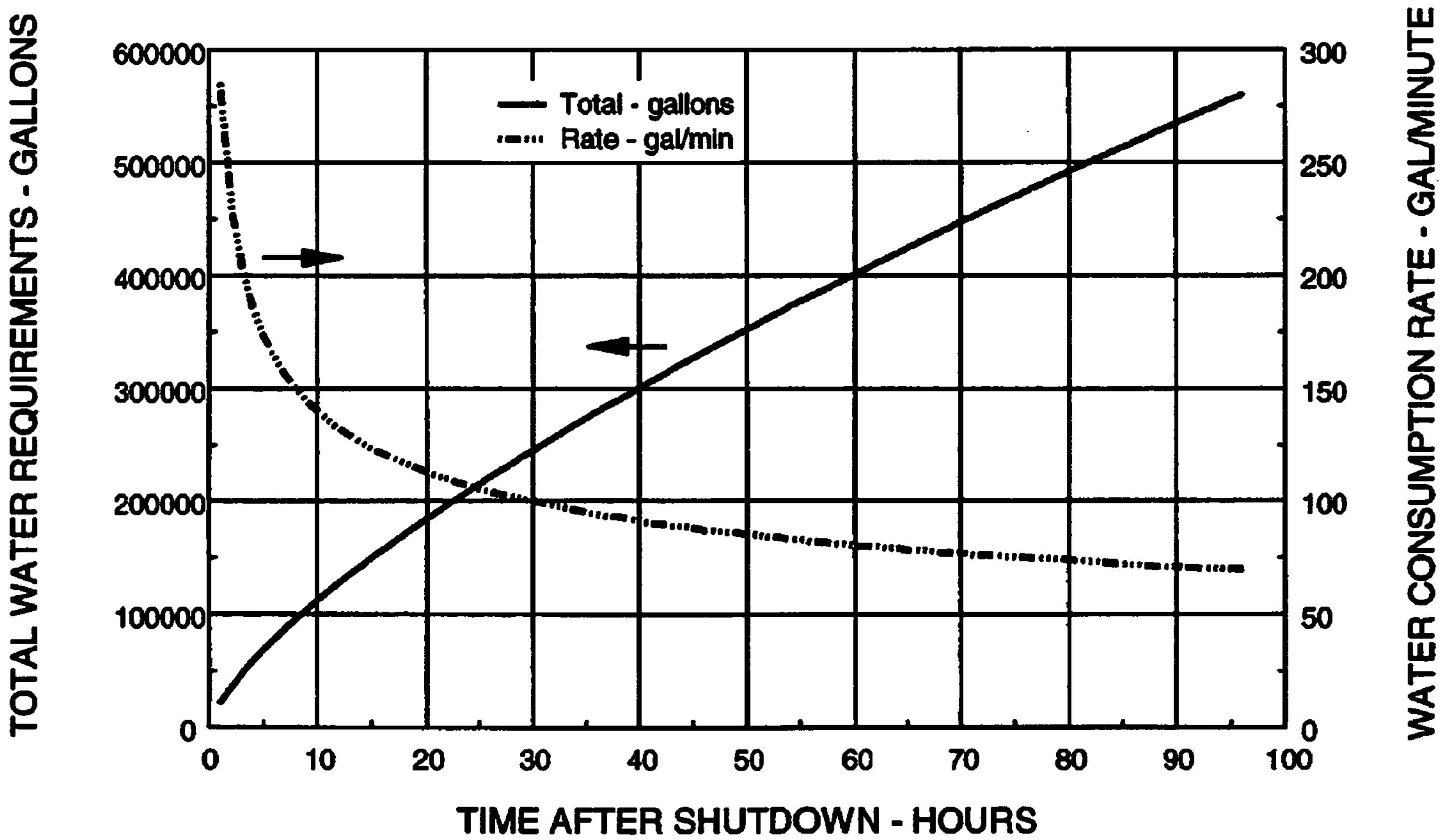
MAKEUP WATER REQUIRED FOR RCS COOLDOWN

INVENTORY REQUIRED TO COOL DOWN TO 300°F



MAKEUP WATER REQUIRED FOR RCS COOLDOWN

MAKEUP WATER REQUIRED TO MAINTAIN HOT STANDBY



ATTACHMENT (9)

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

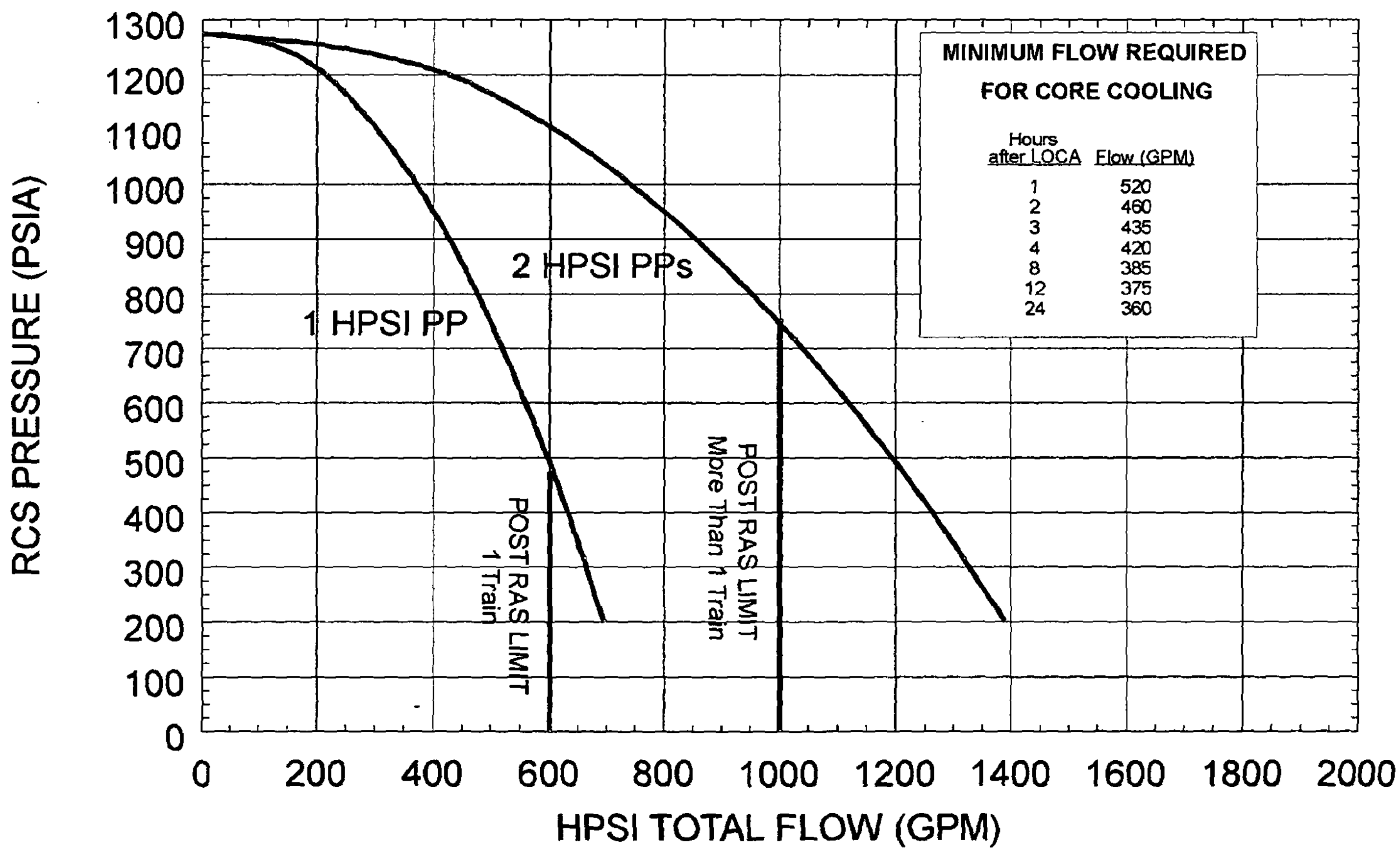
INVENTORY REQUIRED TO COOL DOWN TO 300 F

TIME AFTER SHUTDOWN - HOURS	ADV COOLDOWN - GALLONS	TBV COOLDOWN - GALLONS
1	625,067	94,828
2	614,531	88,490
4	593,988	82,575
6	574,132	79,301
8	554,939	77,056
10	536,389	75,359
12	518,458	74,000
24	422,783	69,054
36	344,764	66,316
48	281,142	64,439
72	186,953	61,883

MAKEUP WATER REQUIRED TO MAINTAIN HOT STANDBY

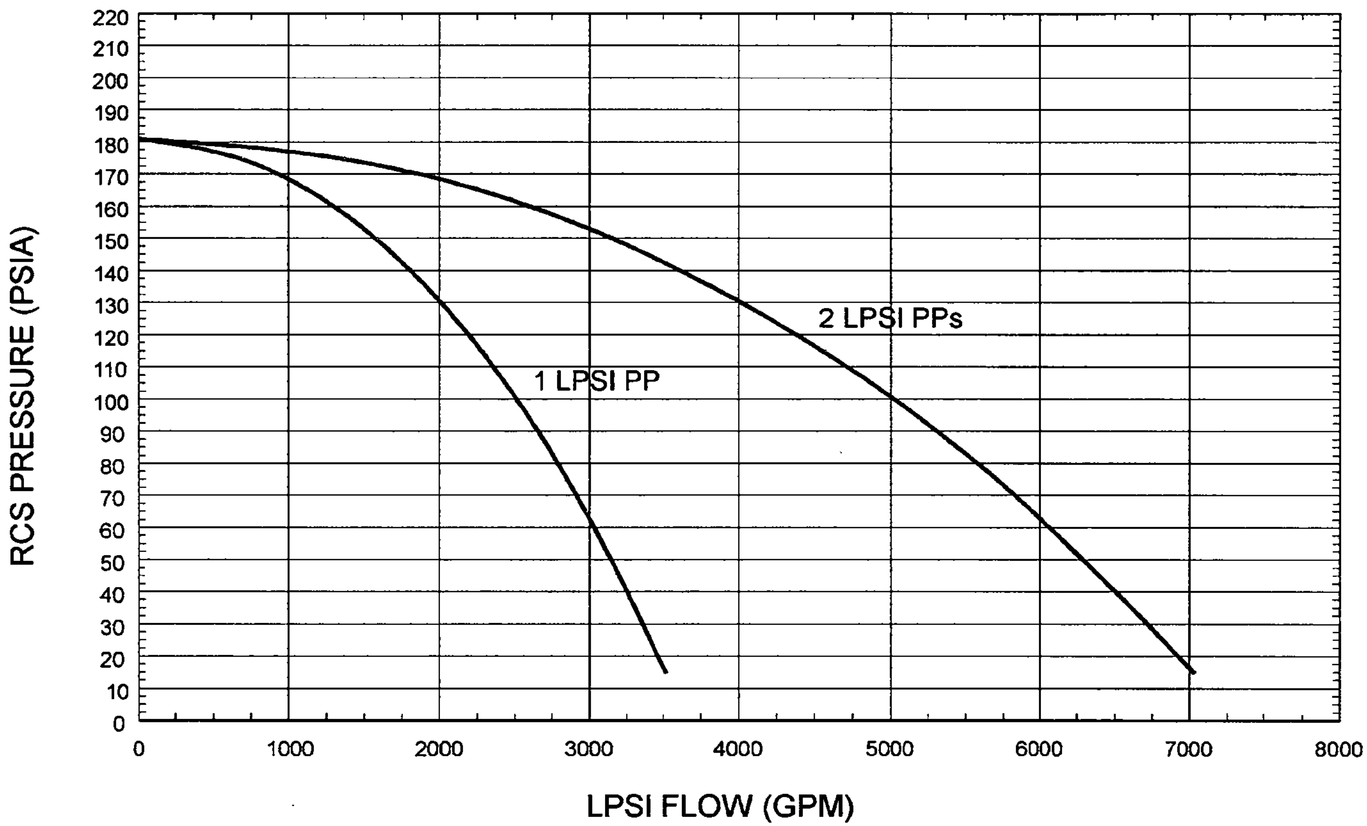
TIME AFTER SHUTDOWN - HOURS	TOTAL WATER REQUIREMENT - GALLONS	WATER CONSUMPTION RATE - GAL/MINUTE
1	21,964	285
2	35,919	230
4	58,740	186
6	78,323	164
8	96,060	150
10	112,541	140
12	128,085	132
24	209,464	107
36	279,295	94
48	342,547	86
72	456,746	76
96	560,185	70

RCS PRESSURE vs. HPSI TOTAL FLOW



HIGH PRESSURE SAFETY INJECTION FLOW

RCS PRESSURE vs. LPSI FLOW



LOW PRESSURE SAFETY INJECTION FLOW

ATTACHMENT(11)
Page 1 of 1

ATTACHMENT(12)

PROCEDURE TO LOCALLY READ CORE EXIT THERMOCOUPLES

1. Obtain an ALTEK thermocouple meter from the Operations Safety Related Storage Locker or the IM Shop, and a set of CET cables from the Operations Safety Related Storage Locker.
2. Obtain a small flat-head screwdriver from the Shift Manager's Office.
3. Obtain the U-1 PAM cabinet door key.
4. Align the ALTEK thermocouple meter as follows:
   a. Select READ.
   b. Depress RESET button until "k" appears in the lower right corner of the display.

NOTE
When using the CET cables, the RED wire is always the (-) negative post.

5. Connect the CET cables to the terminal posts on the ALTEK thermocouple meter.
6. Select an operable CET to be measured.
7. Open the back panel door on 1C182A or 1C182B as appropriate.
8. Connect the cables at terminal block A03/B03.

NOTE
The CET numbers are indicated on the cable labels.

   a. Locate the red and yellow thermocouple wires for the selected CET.
   b. Loosen the terminal block screws
      AND remove the red and yellow thermocouple wires from the terminal block.
   c. Connect the red wire to the red connector.
   d. Connect the yellow wire to the yellow connector.
9. Read CET temperature in ° F from the meter.

ATTACHMENT(13)
Page 1 of 1

ADMINISTRATIVE POST-TRIP ACTIONS

NOTE
The following actions may be accomplished whenever feasible, and may be done in any order.

_____ 1. Prior to exiting the EOP, review OP-6, PRE-STARTUP CHECKOFF for Tech. Spec. compliance in the applicable mode.

_____ 2. Refer to the ERPIP to determine appropriate emergency response actions.

_____ 3. Perform notifications **PER** RM-1-101 REGULATORY REPORTING.

_____ 4. Notify SO-TSO of trip.

_____ 5. Request RCS Boron and Iodine Sample.

_____ 6. Perform shutdown margin calculation **PER** the NEOPs.

_____ 7. Complete any Transient Log entries **PER** EN-1-115, RECORDING OF PLANT TRANSIENTS/OPERATIONAL CYCLES.

_____ 8. Collect the post-trip data automatically printed from the Plant Computer.

_____ 9. Perform the post-trip review **PER** NO-1-111, POST-TRIP REVIEW.

_____ 10. Monitor turbine bearing temperatures.

_____ 11. Continue the Main Turbine Shutdown **PER** OI-43A, MAIN TURBINE AND GENERATOR/EXCITER OPERATION.

_____ 12. Reestablish normal plant configuration control as required:

- Locked Valves **PER** NO-1-205, LOCKED VALVES
- Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES

_____ 13. Initiate the Forced Outage Worklist.

ATTACHMENT(14)

RCS COOLDOWN DATA SHEET

RCS COOLDOWN NO. _______________

DATE/TIME COOLDOWN COMMENCED _______________

- The cooldown of the Reactor Vessel should be conducted at a linear rate not to exceed 100° F in any one hour period.
- At an RCS temperature of 256° F the cooldown limit changes from 100° F to 40° F in any one hour period.
- The RCS temperature should be recorded every 15 minutes.

TIME	PRESS(PSIA) (1)	TEMP(°F) (2)	C/D RATE(°F/HR)

(1) RCS Pressure:
- Greater than 1600 PSIA: PAM CH A or CH B
- Less than 1600 PSIA: PI-103 or PI-103-1

(2) RCS Temperature:
- Forced Circulation: TI-112C or 122C
- Natural Circulation:
  - RCS Temp Greater than 365° F: average of at least 2 CETs
  - RCS Temp Less than 365° F: lowest valid displayed CET
- SDC Flow: TR-351

ATTACHMENT(15)
Page 1 of 1

PRESSURIZER COOLDOWN DATA SHEET

PRESSURIZER COOLDOWN NO. _______________

DATE/TIME COOLDOWN COMMENCED _______________

- The cooldown of the Pressurizer should be conducted at a linear rate not to exceed 200° F in any one hour period.
- The Pressurizer temperature should be recorded every 15 minutes.

TIME	PZR PRESS (PSIA)(1)	PZR TEMP(°F)(2)	PZR SPRAY TEMP(°F)(3)	PZR C/D RATE(°F/HR)	PZR SPRAY DIFF TEMP(°F) *

(1) RCS Pressure:
- Greater than 1600 PSIA: PAM CH A or CH B
- Less than 1600 PSIA: PI-103 or PI-103-1

(2) PZR Temperature: TI-101

(3) Spray Temperature:
- PZR: TIA-103 or 104
- Aux: TI-229

* Maximum Spray Differential Temperature is 400° F (TRM 15.4.2)

500KV OFFSITE POWER RESTORATION

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
The following steps are intended to restore from a loss of offsite power. Restoration of power for other causes should be performed PER the appropriate procedure.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

1. Energize the 500KV Red Bus **OR** the 500KV Black Bus by performing the following actions:

   a. Verify that switching orders have been received by the Control Room Supervisor **OR** Shift Manager, from the SO-TSO, to operate the required equipment.

   b. Evaluate alarms associated with the 500KV swithyard.

   c. Verify the associated Unit Generator High Side Line Disconnect is open before closing Turbine Generator Output breakers.

   d. **IF** the 500KV Black Bus is de-energized,
   THEN verify the following breakers are open:

   - UNIT 2 RCP BUS FDR, 252-1202
   - UNIT 1 RCP BUS FDR, 252-1201
   - 11 SERV BUS 13KV FDR, 252-1104

   e. **IF** the 500KV Red Bus is de-energized,
   THEN verify the following breakers are open:

   - UNIT 1 RCP BUS FDR, 252-2202
   - UNIT 2 RCP BUS FDR, 252-2201
   - 21 SERV BUS 13KV FDR, 252-2104

   f. Verify the Unit-2 Generator Coast Down Lockout is reset.

   g. Place the SYNCHROSCOPE SEL Switch in NORMAL (1) **OR** EMERGENCY (2) position.

(continued)

500KV OFFSITE POWER RESTORATION

1. (continued)

NOTE
A Synchronizer is **NOT** required for operation of breakers 552-41 **OR** 552-43.

h. Place the applicable SYNCHRONIZER SEL Switch in MANUAL position.

- (552-21) 11 GEN SYNCHRONIZER SEL Switch
- (552-22) 11 GEN SYNCHRONIZER SEL Switch
- (552-23) 11 GEN SYNCHRONIZER SEL Switch
- (552-61) 21 GEN SYNCHRONIZER SEL Switch
- (552-62) 21 GEN SYNCHRONIZER SEL Switch
- (552-63) 21 GEN SYNCHRONIZER SEL Switch

i. Insert the sync stick in the sync jack at the breaker to be closed.

j. **IF** paralleling TWO power sources,
THEN ensure the power sources are synchronized by observing the following:

- Sync lights out
- Synchroscope at 12 o'clock
- Running and incoming voltages are matched

k. **IF** closing in on a de-energized bus,
THEN ensure the bus is **NOT** energized.

l. Close the breaker by placing the Breaker Control Handswitch in the CLOSE position
AND release.

m. Check the breaker has closed by observing applicable breaker indicating lights and meters, if applicable.

n. Repeat steps 1.a through 1.m as desired to close additional breakers.

o. Remove the sync stick
AND return to Home Base.

p. Verify **BOTH** SYNCHRONIZER SEL Switches in the OFF position.

q. Place the SYNCHROSCOPE SEL Switch in the OFF position.

r. **WHEN** operation has been completed in accordance with the switching orders,
THEN inform the SO-TSO.

s. Reset the 13KV BUS 12 **OR** 22 286 LOCKOUT/RESET DEVICE as applicable.

(continued)

1. (continued)

t. Reset the applicable bus 247/B device target flags on **BOTH** undervoltage relays:

13KV BUS 12

- B-12-P
- B-12-B

13KV BUS 22

- B-22-P
- B-22-B

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

2. Energize the desired 13KV Service Bus by performing the following actions:

a. **IF** it is desired to energize 11 13KV Service Bus,
THEN perform the following actions:

(1) Verify 12 13KV Service Bus is energized.

(2) Verify the following breakers are open:

- 11 SERV BUS 13KV FDR, 252-1104
- 11 SERV BUS TIE, 252-1105
- U-4000-12 13KV FDR, 252-1103
- U-4000-11 13KV FDR, 252-1102
- U-4000-13 13KV FDR, 252-1101
- Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106

(3) Energize 11 13KV Service Bus by closing 11 SERV BUS 13KV FDR, 252-1104.

(4) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE.

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-11-P
- B-11-B

(continued)

500KV OFFSITE POWER RESTORATION

2.a. (continued)

(6) **IF** MCC 116T is de-energized,
THEN place the following LTC Drive Power Selector Switches in ALT:

- 1H1101REG
- 1H1102REG
- 1H1103REG

b. **IF** it is desired to energize 21 13KV Service Bus,
THEN perform the following actions:

(1) Verify 22 13KV Service Bus is energized.

(2) Verify the following breakers are open:

- 21 SERV BUS 13KV FDR, 252-2104
- 21 SERV BUS TIE, 252-2105
- U-4000-21 13KV FDR, 252-2102
- U-4000-22 13KV FDR, 252-2103
- U-4000-23 13KV FDR, 252-2101
- Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

(3) Energize 21 13KV Service Bus by closing 21 SERV BUS 13KV FDR, 252-2104.

(4) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE.

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-21-P
- B-21-B

(6) **IF** MCC 216T is de-energized,
THEN place the following LTC Drive Power Selector Switches in ALT:

- 2H2101REG
- 2H2102REG
- 2H2103REG

500KV OFFSITE POWER RESTORATION

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

3. Energize the desired U4000 SERV XFMRs.

   a. **IF** it is desired to energize U4000-11 SERV XFMR, **THEN** perform the following actions:

      (1) Verify the following breakers are open:

      - 14 4KV BUS ALT FDR, 152-1401
      - 11 4KV BUS NORMAL FDR, 152-1115
      - 12 4KV BUS NORMAL FDR, 152-1201
      - 13 4KV BUS NORMAL FDR, 152-1311

      (2) Close the U4000-11 13KV FDR, 252-1102.

   b. **IF** it is desired to energize U4000-21 SERV XFMR, **THEN** perform the following actions:

      (1) Verify the following breakers are open:

      - 14 4KV BUS NORMAL FDR, 152-1414
      - 11 4KV BUS ALT FDR, 152-1101
      - 12 4KV BUS ALT FDR, 152-1209
      - 13 4KV BUS ALT FDR, 152-1301

      (2) Close the U4000-21 13KV FDR, 252-2102.

   c. **IF** it is desired to energize U4000-13 SERV XFMR, **THEN** perform the following actions:

      (1) Verify the following breakers are open:

      - 15 4KV BUS FDR, 152-1501
      - 26 4KV BUS FDR, 152-2604

      (2) Close the U4000-13 13KV FDR, 252-1101.

(continued)

500KV OFFSITE POWER RESTORATION

3. (continued)

d. **IF** it is desired to energize U4000-23 SERV XFMR,
THEN perform the following actions:

(1) Verify the following breakers are open:

- 25 4KV BUS FDR, 152-2501
- 16 4KV BUS FDR, 152-1604

(2) Close the U4000-23 13KV FDR, 252-2101.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

4. **IF** 11 **OR** 14 4KV Vital Bus is de-energized,
THEN restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows:

a. **IF NO** CC PPs are operating,
THEN shut CC CNTMT SUPPLY valve, 1-CC-3832-CV.

b. **IF** it is desired to energize 11 4KV Vital Bus from U4000-11 SERV XFMR,
THEN energize 11 4KV Vital Bus as follows:

(1) Verify the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK.

(3) Place 13 AFW PP in PULL TO LOCK.

(4) Verify 11 4KV BUS ALT FDR, 152-1101, is open.

(5) Insert the sync stick into the sync jack at the 11 4KV BUS NORMAL FDR, 152-1115.

(6) Close the 11 4KV BUS NORMAL FDR, 152-1115.

(7) Remove the sync stick
AND return to Home Base.

(8) **WHEN** 11 4KV Bus sequencing is complete,
THEN place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

(continued)

500KV OFFSITE POWER RESTORATION

4. (continued)

c. **IF** it is desired to energize 14 4KV Vital Bus from U4000-11 SERV XFMR, **THEN** energize 14 4KV Vital Bus as follows:

(1) Verify the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK.

(3) Verify the 14 4KV BUS NORMAL FDR, 152-1414, is open.

(4) Insert the sync stick into the sync jack at the 14 4KV BUS ALT FDR, 152-1401.

(5) Close the 14 4KV BUS ALT FDR, 152-1401.

(6) Remove the sync stick
AND return to Home Base.

(7) **WHEN** 14 4KV Bus sequencing is complete,
THEN place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

d. **IF** it is desired to energize 11 4KV Vital Bus from U4000-21 SERV XFMR, **THEN** energize 11 4KV Vital Bus as follows:

(1) Verify the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 1A DG OUT BKR, 152-1703, in PULL TO LOCK.

(3) Place 13 AFW PP in PULL TO LOCK.

(4) Verify 11 4KV BUS NORMAL FDR, 152-1115, is open.

(5) Insert the sync stick into the sync jack at the 11 4KV BUS ALT FDR, 152-1101.

(6) Close the 11 4KV BUS ALT FDR, 152-1101.

(7) Remove the sync stick
AND return to Home Base.

(8) **WHEN** 11 4KV Bus sequencing is complete,
THEN place the 11 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

(continued)

500KV OFFSITE POWER RESTORATION

4. (continued)

e. **IF** it is desired to energize 14 4KV Vital Bus from U4000-21 SERV XFMR,
THEN energize 14 4KV Vital Bus as follows:

(1) Verify the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 1B DG OUT BKR, 152-1403, in PULL TO LOCK.

(3) Verify 14 4KV BUS ALT FDR, 152-1401, is open.

(4) Insert the sync stick into the sync jack at the 14 4KV BUS NORMAL FDR, 152-1414.

(5) Close the 14 4KV BUS NORMAL FDR, 152-1414.

(6) Remove the sync stick
AND return to Home Base.

(7) **WHEN** 14 4KV Bus sequencing is complete,
THEN place the 14 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

5. **IF** 11 **OR** 14 4KV Vital Bus is powered by a DG,
AND SIAS has **NOT** actuated **OR** has been reset,
THEN restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows:

a. **IF** it is desired to energize 11 4KV Vital Bus from U4000-11 SERV XFMR,
AND 1A DG is powering 11 4KV Vital Bus,
THEN transfer 11 4KV Vital Bus from 1A DG to U4000-11 SERV XFMR as follows:

(1) Place 1A DG in the TRANSFER MODE by performing the following:

(a) Depress 1A DG EMERGENCY START, 1-HS-1707, pushbutton.

(b) Insert the sync stick into the sync jack at the 1A DG OUT BKR, 152-1703.

(c) Depress 1A DG SLOW START, 1-HS-1708, pushbutton.

(d) Momentarily place 1A DG SPEED CONTR, 1-CS-1705, to RAISE OR LOWER.

(continued)

500KV OFFSITE POWER RESTORATION

5.a.1. (continued)

(e) Maintain 1A DG at approximately 60 Hz using 1A DG SPEED CONTR, 1-CS-1705.

(f) Remove the sync stick from 1A DG OUT BKR, 152-1703.

(g) Insert the sync stick into the sync jack at the 11 4KV BUS NORMAL FDR, 152-1115.

(h) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(i) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 1A DG AUTO VOLT CONTR, 1-CS-1704.

NOTE
The Synchroscope works in the opposite direction from normal when 1A DG is the RUNNING power source.

(j) Adjust 1A DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 1A DG SPEED CONTR, 1-CS-1705.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 11 4KV Bus.

(k) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 11 4KV BUS NORMAL FDR, 152-1115.

(l) Check 1A DG load is approximately 2000 KW.

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 1A DG **PER** OI-21A, 1A Diesel Generator, if desired.

(continued)

500KV OFFSITE POWER RESTORATION

5. (continued)

b. **IF** it is desired to energize 11 4KV Vital Bus from U4000-11 SERV XFMR,
AND 0C DG is powering 11 4KV Vital Bus,
THEN transfer 11 4KV Vital Bus from 0C DG to U4000-11 SERV XFMR as follows:

NOTE
Load on 11 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.b.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 11 4KV BUS NORMAL FDR, 152-1115.

(i) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

NOTE
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 11 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 11 4KV BUS NORMAL FDR, 152-1115.

(continued)

5.b.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

c. **IF** it is desired to energize 14 4KV Vital Bus from U4000-11 SERV XFMR,
AND 1B DG is powering 14 4KV Vital Bus,
THEN transfer 14 4KV Vital Bus from 1B DG to U4000-11 SERV XFMR as follows:

(1) Momentarily place 1B DG UNIT PARALLEL, 1-CS-1404, to PARA.

(2) Adjust 1B DG frequency to approximately 60 Hz using 1B DG SPEED, 1-CS-1403.

(3) Insert the sync stick into the sync jack at the 14 4KV BUS ALT FDR, 152-1401.

(4) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 1B DG AUTO VOLT CONTR, 1-CS-1402.

NOTE
The Synchroscope works in the opposite direction from normal when 1B DG is the RUNNING power source.

(6) Adjust 1B DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 1B DG SPEED CONTR, 1-CS-1403.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 14 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 14 4KV BUS ALT FDR, 152-1401.

(8) Remove the sync stick
AND return to Home Base.

(9) Shutdown 1B DG **PER** OI-21B, 1B Diesel Generator, if desired.

(continued)

500KV OFFSITE POWER RESTORATION

5. (continued)

d. **IF** it is desired to energize 14 4KV Vital Bus from U4000-11 SERV XFMR,
AND 0C DG is powering 14 4KV Vital Bus,
THEN transfer 14 4KV Vital Bus from 0C DG to U4000-11 SERV XFMR as follows:

NOTE
Load on 14 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.d.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 14 4KV BUS ALT FDR, 152-1401.

(i) Check the associated Synchroscope and Sync Lights are operating.

<u>NOTE</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

<u>NOTE</u>
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

<u>CAUTION</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 14 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 14 4KV BUS ALT FDR, 152-1401.

(continued)

5.d.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

e. **IF** it is desired to energize 11 4KV Vital Bus from U4000-21 SERV XFMR,
AND 1A DG is powering 11 4KV Vital Bus,
THEN transfer 11 4KV Vital Bus from 1A DG to U4000-21 SERV XFMR as follows:

(1) Place 1A DG in the TRANSFER MODE by performing the following:

(a) Depress 1A DG EMERGENCY START, 1-HS-1707, pushbutton.

(b) Insert the sync stick into the sync jack at the 1A DG OUT BKR, 152-1703.

(c) Depress 1A DG SLOW START, 1-HS-1708, pushbutton.

(d) Momentarily place 1A DG SPEED CONTR, 1-CS-1705, to RAISE OR LOWER.

(e) Maintain 1A DG at approximately 60 Hz using 1A DG SPEED CONTR, 1-CS-1705.

(f) Remove the sync stick from 1A DG OUT BKR, 152-1703.

(g) Insert the sync stick into the sync jack at the 11 4KV BUS ALT FDR, 152-1101.

(h) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(i) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 1A DG AUTO VOLT CONTR, 1-CS-1704.

NOTE
The Synchroscope works in the opposite direction from normal when 1A DG is the RUNNING power source.

(j) Adjust 1A DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 1A DG SPEED CONTR, 1-CS-1705.

(continued)

500KV OFFSITE POWER RESTORATION

5.e.1. (continued)

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 11 4KV Bus.

(k) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 11 4KV BUS ALT FDR, 152-1101.

(l) Check 1A DG load is approximately 2000 KW.

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 1A DG **PER** OI-21A, 1A Diesel Generator, if desired.

f. **IF** it is desired to energize 11 4KV Vital Bus from U4000-21 SERV XFMR,
AND 0C DG is powering 11 4KV Vital Bus,
THEN transfer 11 4KV Vital Bus from 0C DG to U4000-21 SERV XFMR as follows:

NOTE
Load on 11 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(continued)

5.f. (continued)

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION

0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 11 4KV BUS ALT FDR, 152-1101.

(i) Check the associated Synchroscope and Sync Lights are operating.

(continued)

500KV OFFSITE POWER RESTORATION

5.f.2. (continued)

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

NOTE
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 11 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 11 4KV BUS ALT FDR, 152-1101.

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

(continued)

5. (continued)

g. **IF** it is desired to energize 14 4KV Vital Bus from U4000-21 SERV XFMR,
AND 1B DG is powering 14 4KV Vital Bus,
THEN transfer 14 4KV Vital Bus from 1B DG to U4000-21 SERV XFMR as follows:

(1) Momentarily place 1B DG UNIT PARALLEL, 1-CS-1404, to PARA.

(2) Adjust 1B DG frequency to approximately 60 Hz using 1B DG SPEED, 1-CS-1403.

(3) Insert the sync stick into the sync jack at the 14 4KV BUS NORMAL FDR, 152-1414.

(4) Check the associated Synchroscope and Sync Lights are operating.

<u>**NOTE**</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 1B DG AUTO VOLT CONTR, 1-CS-1402.

<u>**NOTE**</u>
The Synchroscope works in the opposite direction from normal when 1B DG is the RUNNING power source.

(6) Adjust 1B DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 1B DG SPEED CONTR, 1-CS-1403.

<u>**CAUTION**</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 14 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 14 4KV BUS NORMAL FDR, 152-1414.

(8) Remove the sync stick
AND return to Home Base.

(9) Shutdown 1B DG **PER** OI-21B, <u>1B Diesel Generator</u>, if desired.

(continued)

500KV OFFSITE POWER RESTORATION

5. (continued)

h. **IF** it is desired to energize 14 4KV Vital Bus from U4000-21 SERV XFMR,
AND 0C DG is powering 14 4KV Vital Bus,
THEN transfer 14 4KV Vital Bus from 0C DG to U4000-21 SERV XFMR as follows:

NOTE
Load on 14 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.h.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 14 4KV BUS NORMAL FDR, 152-1414.

(i) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

NOTE
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 14 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 14 4KV BUS NORMAL FDR, 152-1414.

(continued)

500KV OFFSITE POWER RESTORATION

5.h.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

6. Energize the desired 4KV Non Vital Buses.

a. **IF** it is desired to energize 12 4KV Non Vital Bus,
THEN perform the following:

- Verify the following breakers are open:
  - U440-12B 4KV FDR, 152-1202
  - U440-12A 4KV FDR, 152-1208
- Verify the handswitches for the following loads are in PULL TO LOCK:
  - 11 COND PP
  - 11 COND BSTR PP
  - 12 COND BSTR PP
  - 11 HTR DRN PP

b. **IF** it is desired to energize 13 4KV Non Vital Bus,
THEN perform the following:

- Verify the following breakers are open:
  - U440-13B 4KV FDR, 152-1302
  - U440-13A 4KV FDR, 152-1310
- Verify the handswitches for the following loads are in PULL TO LOCK:
  - 12 COND PP
  - 13 COND PP
  - 13 COND BSTR PP
  - 12 HTR DRN PP

(continued)

500KV OFFSITE POWER RESTORATION

6. (continued)

c. **IF** it is desired to energize 15 4KV Non Vital Bus,
THEN perform the following:

- Verify U440-15 4KV FDR, 152-1505, is open.
- Verify 15-16 4KV TIE, 152-1506, is open.
- Verify the handswitches for the following loads are in PULL TO LOCK:
  - 11 CIRC WTR PP
  - 12 CIRC WTR PP
  - 13 CIRC WTR PP

d. **IF** it is desired to energize 16 4KV Non Vital Bus,
THEN perform the following:

- Verify U440-16 4KV FDR, 152-1605, is open.
- Verify 15-16 4KV TIE, 152-1506, is open.
- Verify the handswitches for the following loads are in PULL TO LOCK:
  - 14 CIRC WTR PP
  - 15 CIRC WTR PP
  - 16 CIRC WTR PP

e. Verify the associated 4KV SERV XFMR FDR BKR is closed.

f. Insert the sync stick into the sync jack at the 4KV BUS FDR or TIE breaker to be closed.

g. Place and hold the 4KV BUS FDR or TIE breaker handswitch in CLOSE until the bus voltage indicates between 4.1 and 4.35 KV

h. Remove the sync stick
AND return to Home Base.

i. Close the associated U440 4KV FDR breaker(s).

j. Repeat steps 6.a through 6.i as desired to energize additional 4KV Non Vital Buses.

500KV OFFSITE POWER RESTORATION

CAUTION
Attempts should NOT be made to re-energize a bus if a fault is suspected.

7. **IF** MCC-101AT **OR** MCC-101BT are de-energized,
THEN energize the desired Turbine MCC.

   a. **IF** 11A 480V BUS is energized from 500KV offsite power,
   THEN restore power to MCC-101AT by closing normal feeder breaker 52-1109.

   b. **IF** 14B 480V BUS is energized from 500KV offsite power,
   THEN restore power to MCC-101BT by closing normal feeder breaker 52-1419.

ATTACHMENT(17)
Page 1 of 1

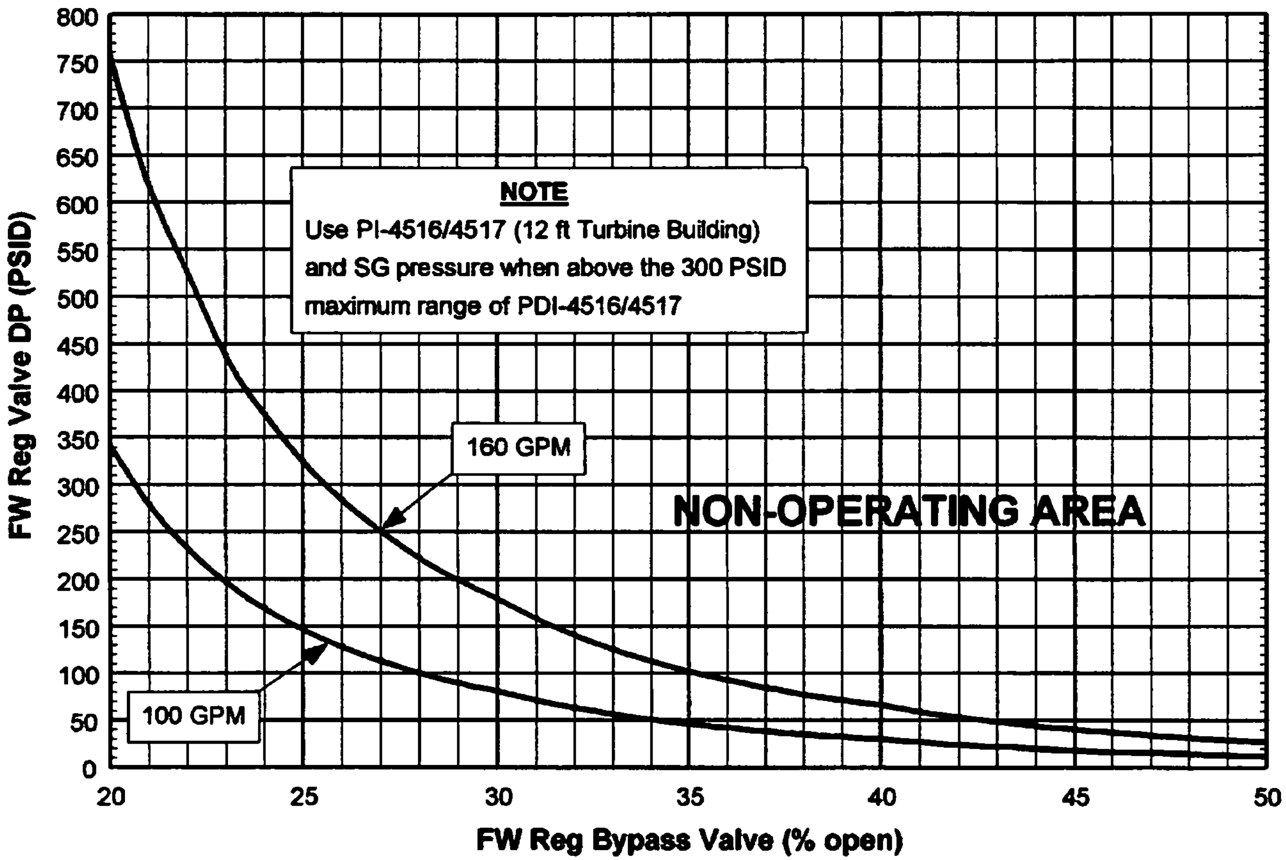
ONCE-THROUGH-COOLING MATRIX

NOTE
OK: indicates adequate equipment to support successful Once-Through-Cooling.

NOTE
Calculated minimum time to core uncovery is displayed for cases where adequate equipment to support successful Once-Through-Cooling is **NOT** available.

equipment	2 PORV			1 PORV		
	3 CHG PP	2 CHG PP	1 CHG PP	3 CHG PP	2 CHG PP	1 CHG PP
3 HPSI PP	OK	OK	OK	5 hours	3 hours	3 hours
2 HPSI PP	OK	OK	OK	5 hours	3 hours	3 hours
1 HPSI PP	OK	3 hours	2 hours	5 hours	3 hours	2 hours

MAIN FEEDWATER GOOSENECK PURGE FLOW



ATTACHMENT(19)
Page 1 of 1

RESET AFAS START SIGNALS AT THE ACTUATION CABINETS

1. Verify **BOTH** SG levels are greater than (-)170 inches.
2. Verify the S/G B/D valve handswitches are in CLOSE:
   - 1-BD-4010-CV
   - 1-BD-4011-CV
   - 1-BD-4012-CV
   - 1-BD-4013-CV
3. Reset the AFAS Sensor Modules:
   a. Unlock and open the Sensor Cabinet front door.
   b. Reset the sensor module bistable(s) by momentarily pushing the RESET pushbutton on the SG LEVEL LOW module(s).
   c. Momentarily place the BISTABLE TRIP TEST/RESET toggle switch on the AIM module in RESET.
   d. Close and lock the Sensor Cabinet front door.
   e. Repeat steps 3.a through 3.d for **ALL** channels.
4. Reset the AFAS Logic Modules:
   a. Unlock and open the Logic Cabinet front door.
   b. Reset the logic module bistable by momentarily pushing the RESET pushbutton on the AFAS START module.
   c. Momentarily place the AFAS START TEST/RESET toggle switch on the AIM module in RESET.
   d. Check the TRIP light is extinguished.
   e. Close and lock the Logic Cabinet front door.
   f. Repeat steps 4.a through 4.e for the other Logic Cabinet.
5. Check the following extinguished:
   - "AFAS A ACTUATED" status panel alarm light on panel 1C04.
   - "AFAS B ACTUATED" status panel alarm light on panel 1C04.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP ATTACHMENTS

REVISION 17

Safety Related

Approval Authority: Kent Mills / 8-30-2004
signature/date

Effective Date: 9-2-2004

LIST OF EFFECTIVE PAGES

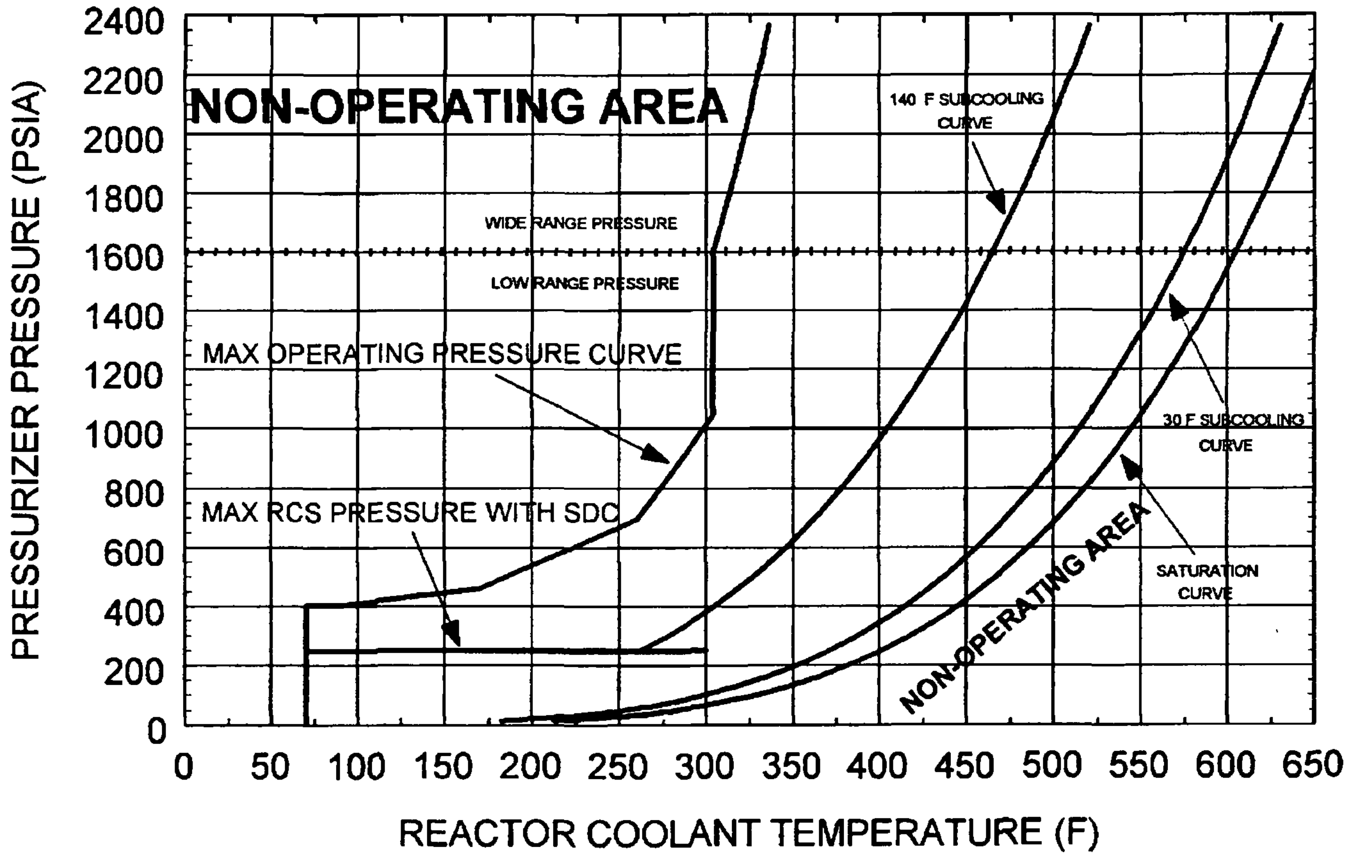
PAGE NUMBERS	REVISION
1-2	17

ATTACHMENT	PAGE NUMBERS	REVISION
1	1 - 9	17
2	1 - 5	17
3	1	17
4	1 - 2	17
5	1	17
6	1	17
7	1	17
8	1 - 5	17
9	1 - 5	17
10	1	17
11	1	17
12	1	17
13	1	17
14	1	17
15	1	17
16	1-23	17
17	1	17
18	1	17
19	1	17

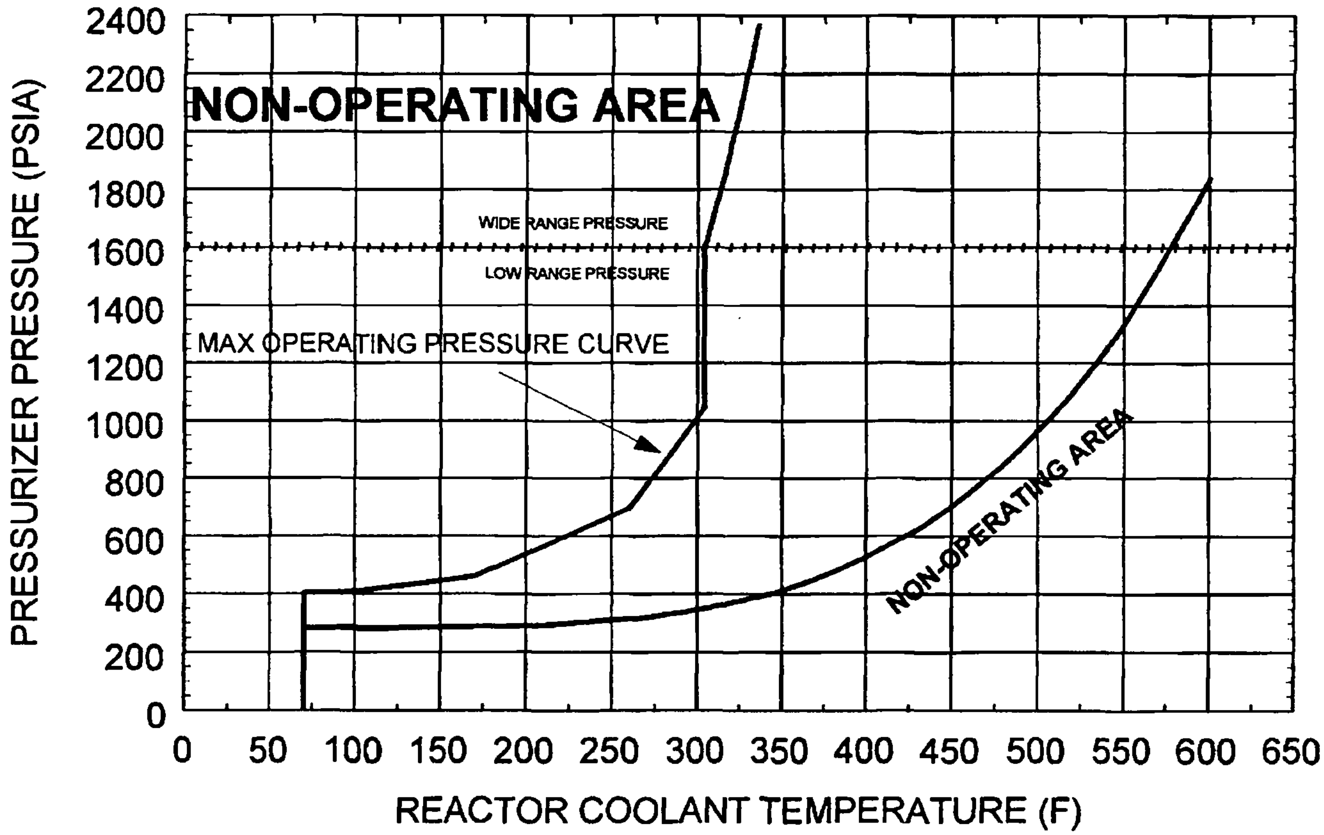
PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
1700	Att. 2,pg. 4

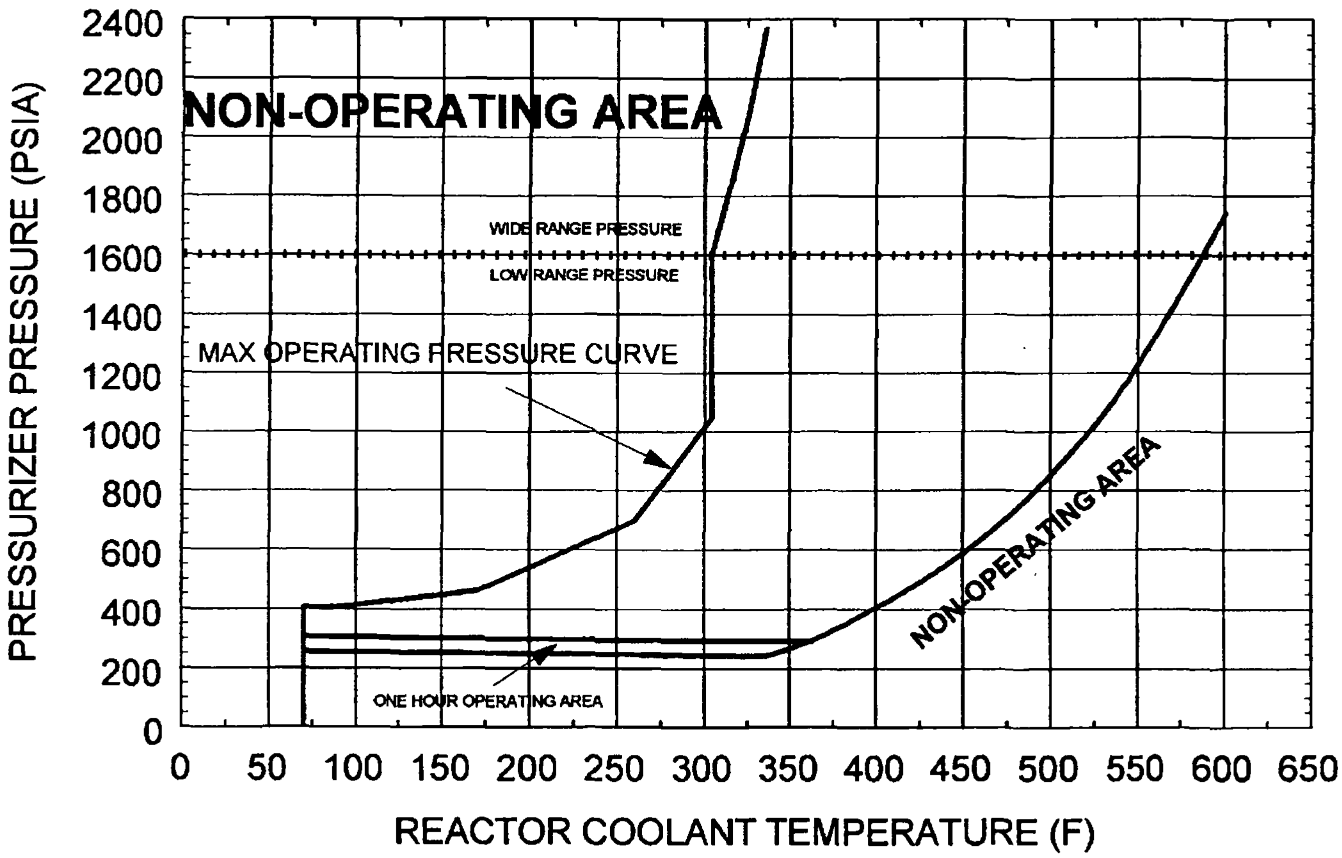
RCS PRESSURE TEMPERATURE LIMITS

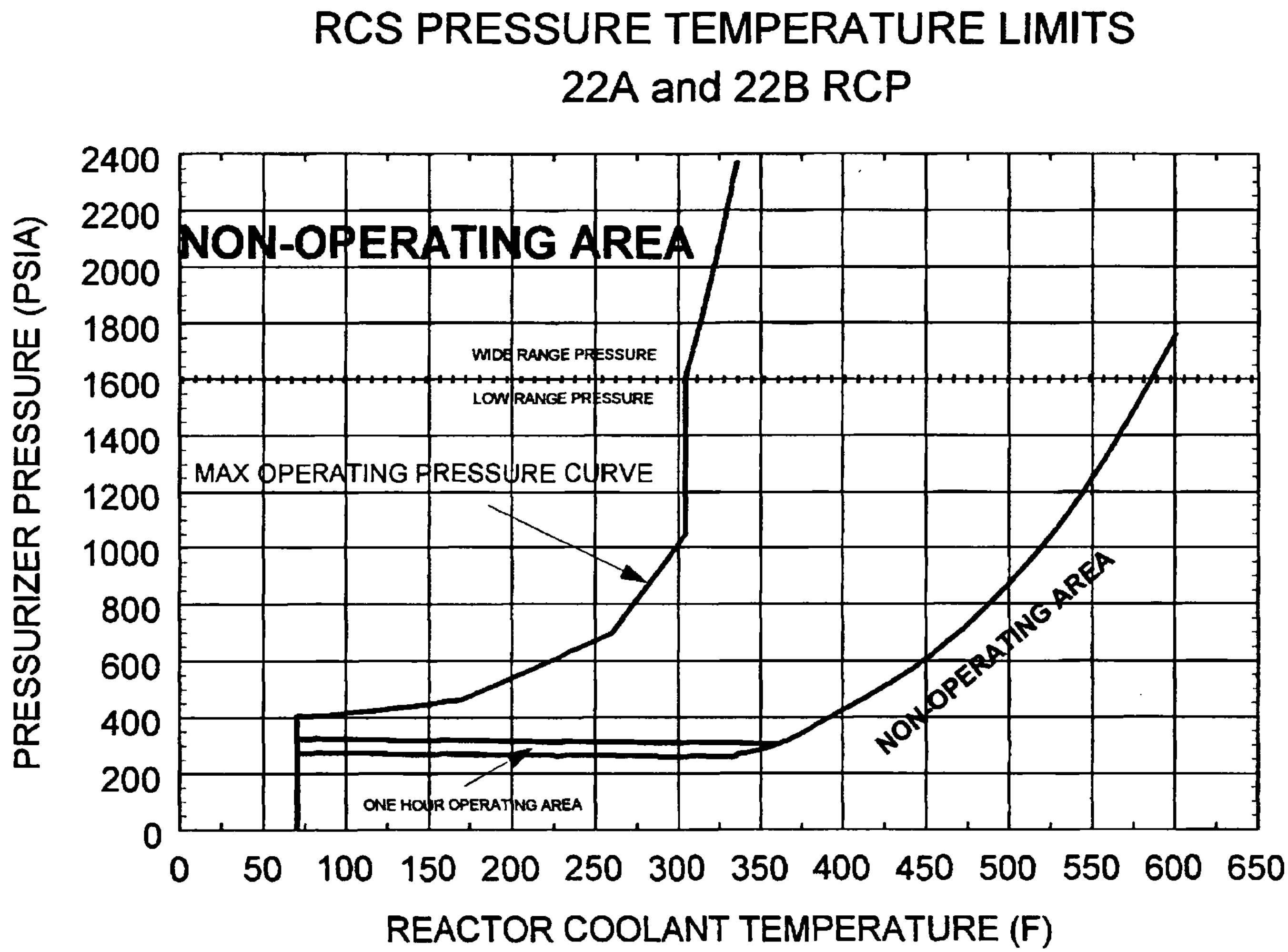


RCS PRESSURE TEMPERATURE LIMITS
21A or 21B and 22A or 22B RCP



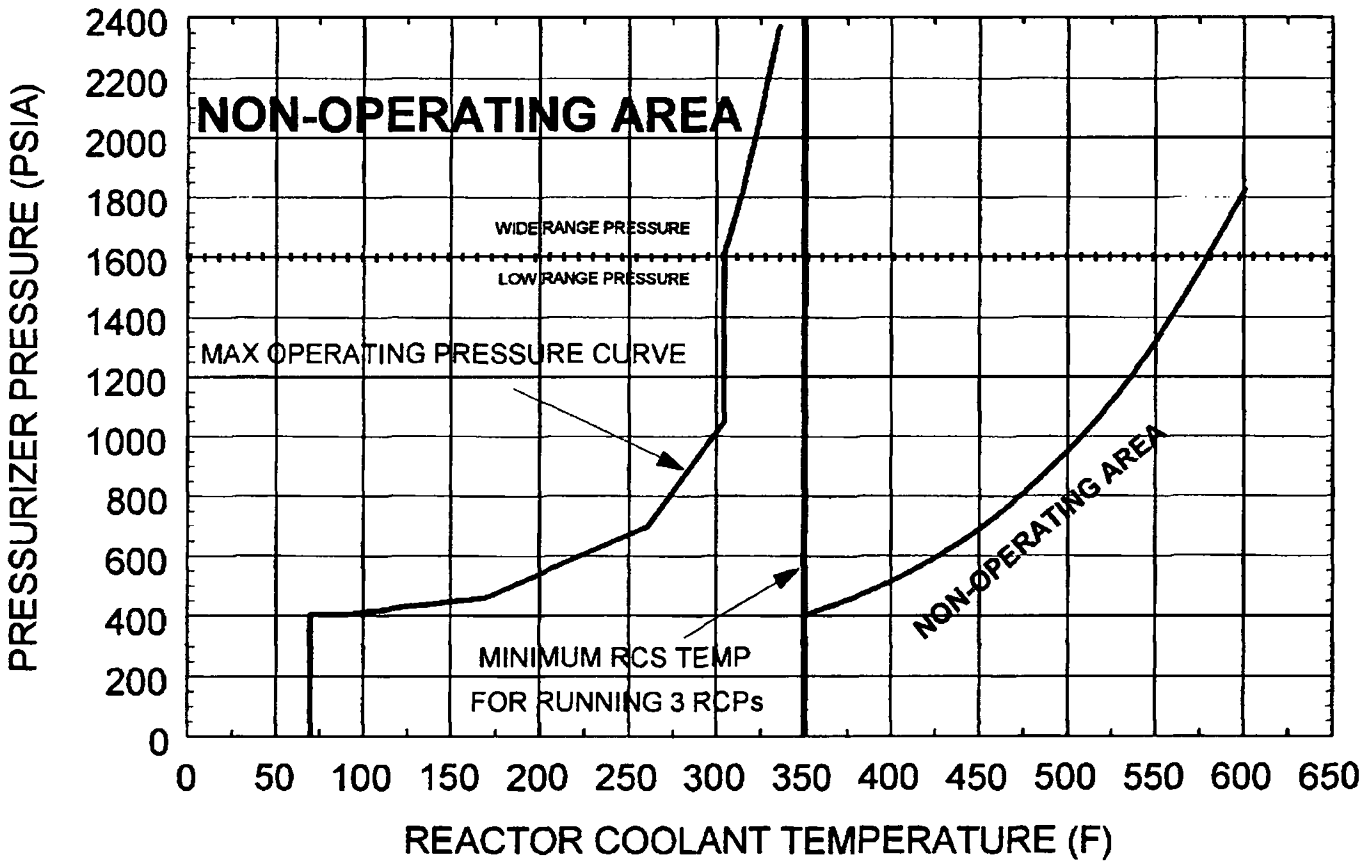
RCS PRESSURE TEMPERATURE LIMITS
21A and 21B RCP



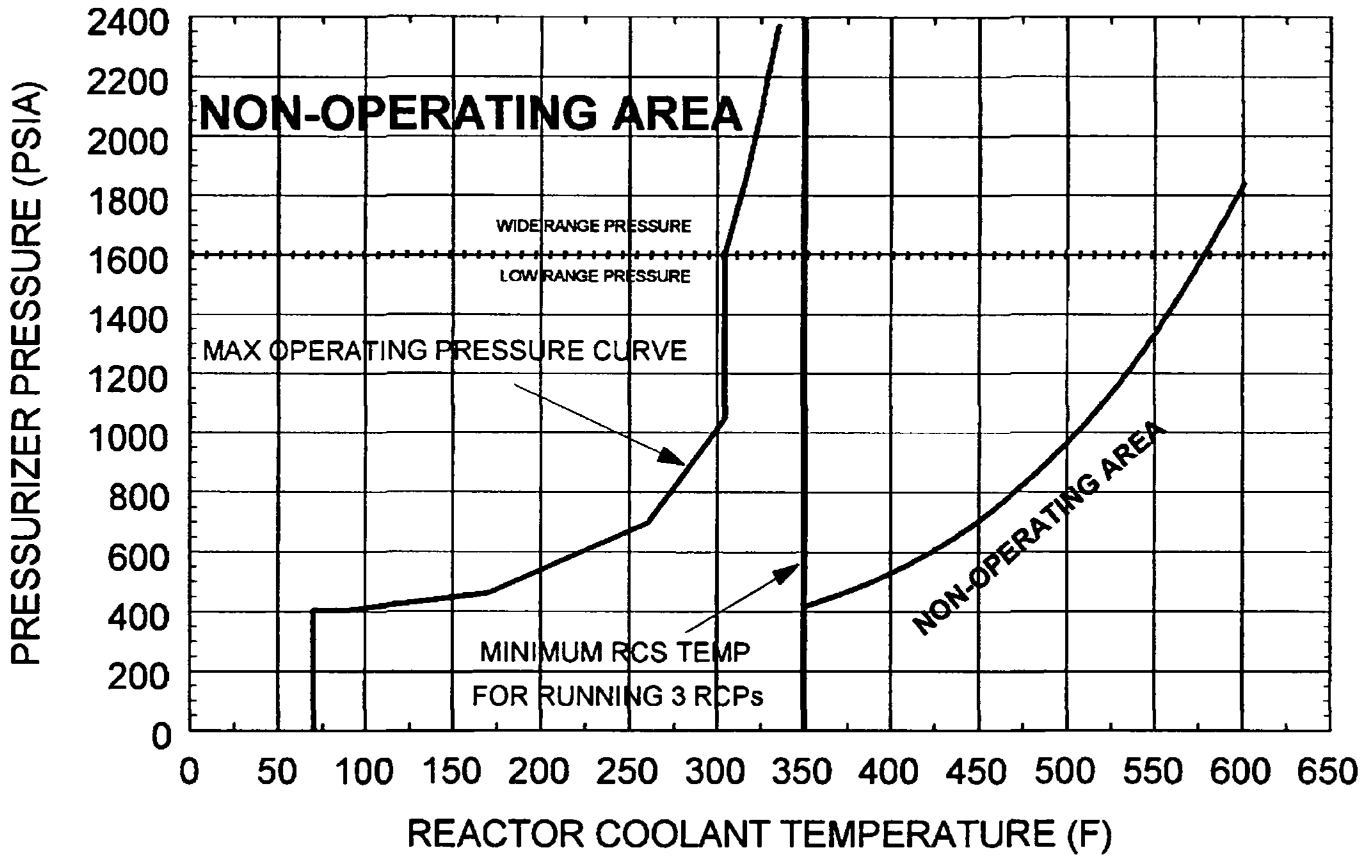


ATTACHMENT (1)
Page 4 of 9
RCS PRESSURE TEMPERATURE LIMITS

RCS PRESSURE TEMPERATURE LIMITS
21A and 21B with 22A or 22B RCP

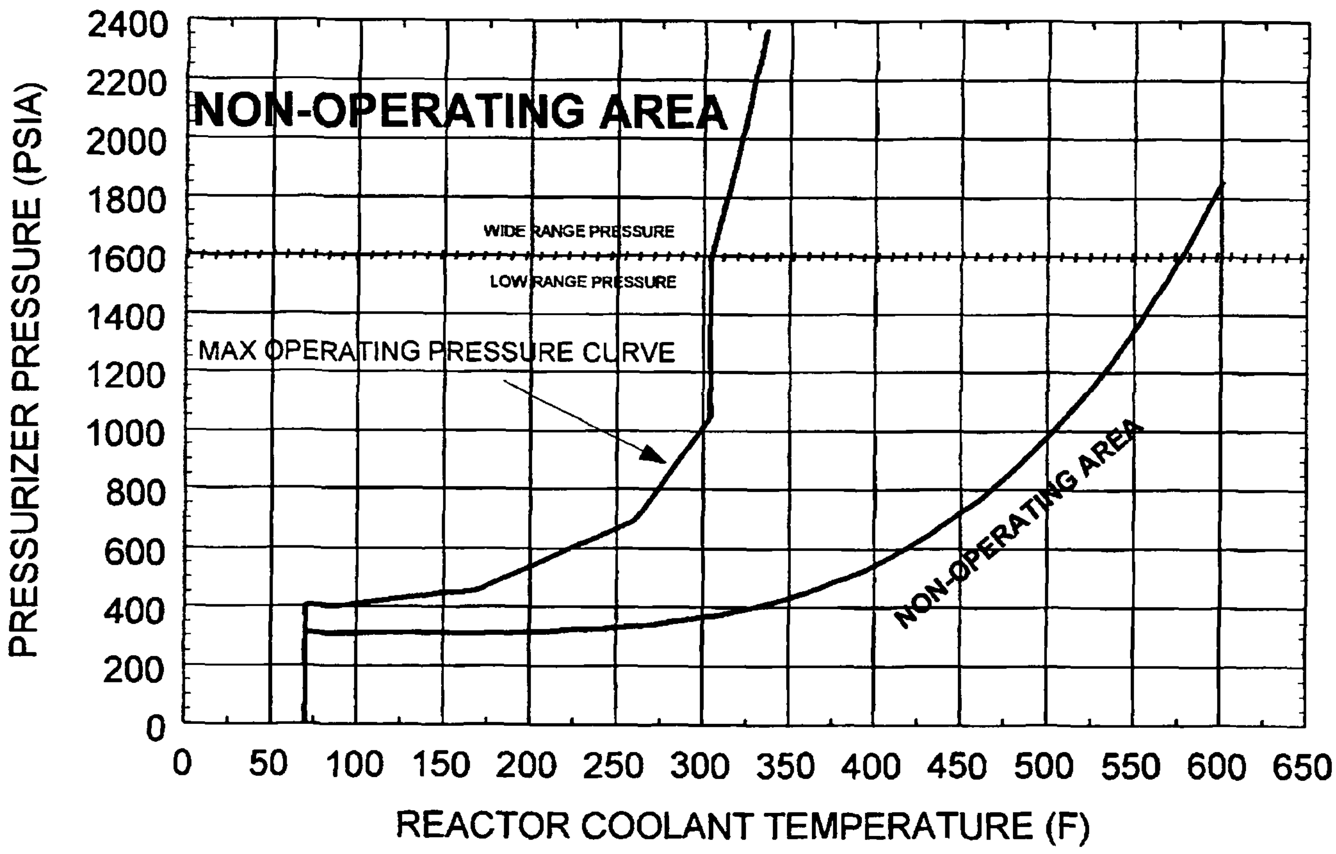


RCS PRESSURE TEMPERATURE LIMITS
22A and 22B with 21A or 21B RCP

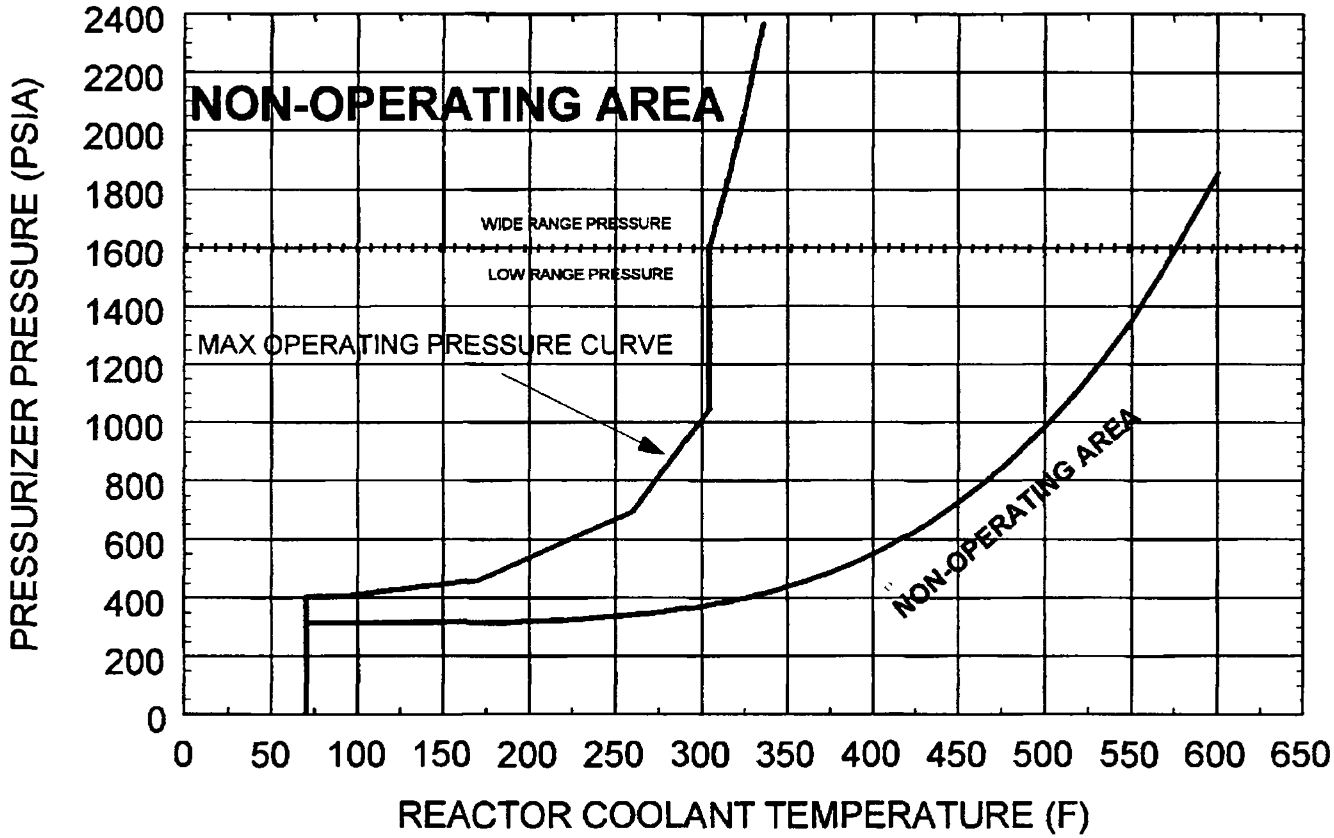


RCS PRESSURE TEMPERATURE LIMITS

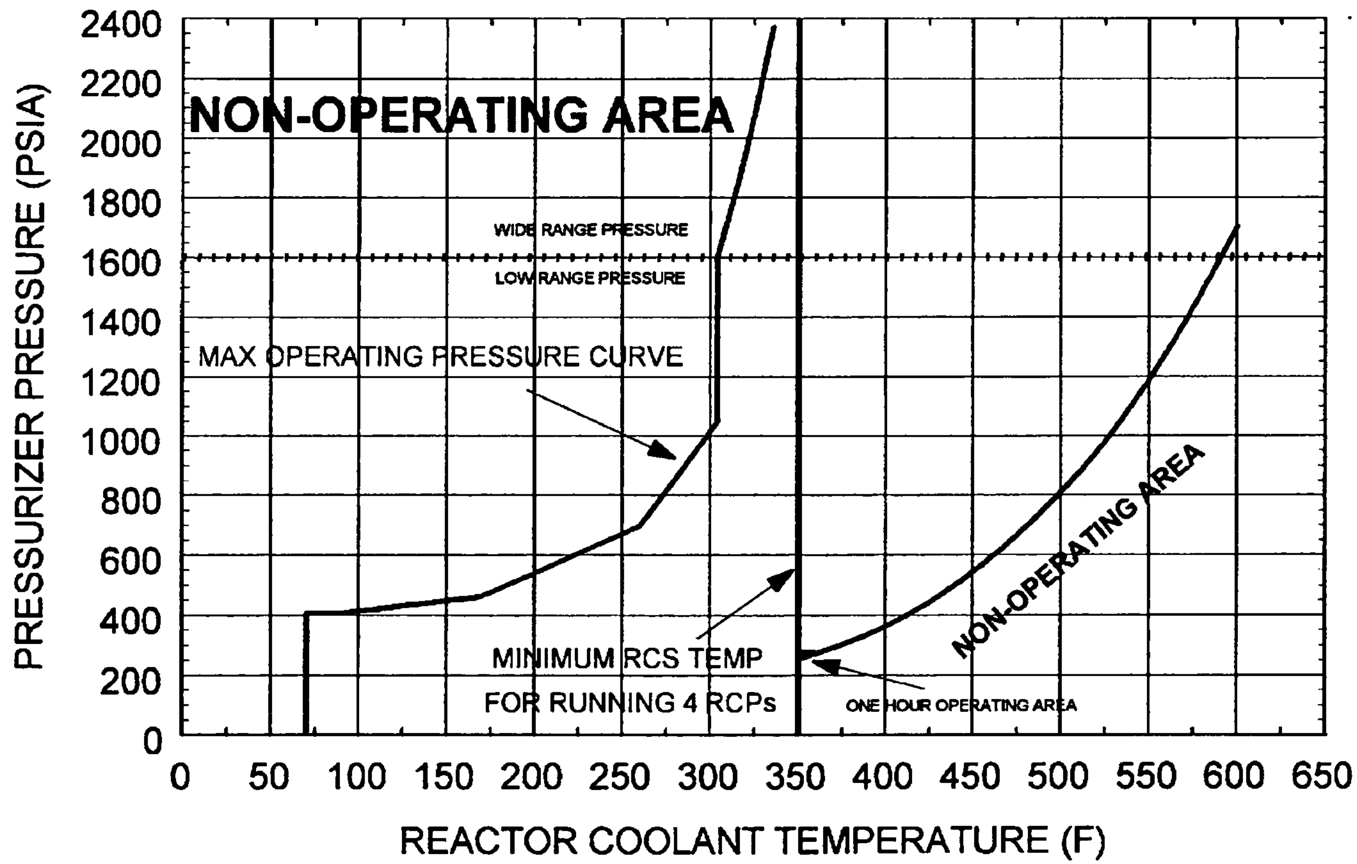
RCS PRESSURE TEMPERATURE LIMITS
21A or 21B RCP



RCS PRESSURE TEMPERATURE LIMITS
22A or 22B RCP



RCS PRESSURE TEMPERATURE LIMITS
4 RCP OPERATION



ATTACHMENT (2)
Page 1 of 5

SIAS VERIFICATION CHECKLIST

2C08, 2C09, 2C10

a. 21 and 23 HPSI PPs .... Running

b. 21 and 22 LPSI PPs .... Running

c. 21 and 22 CS PPs .... Running

d. HPSI MAIN HDR valves:

- 2-SI-616-MOV .... Open
- 2-SI-626-MOV .... Open
- 2-SI-636-MOV .... Open
- 2-SI-646-MOV .... Open

e. HPSI AUX HDR valves:

- 2-SI-617-MOV .... Open
- 2-SI-627-MOV .... Open
- 2-SI-637-MOV .... Open
- 2-SI-647-MOV .... Open

f. LPSI HDR valves:

- 2-SI-615-MOV .... Open
- 2-SI-625-MOV .... Open
- 2-SI-635-MOV .... Open
- 2-SI-645-MOV .... Open

g. SIT CKV LKG DRN valves:

- 2-SI-618-CV .... Shut*
- 2-SI-628-CV .... Shut*
- 2-SI-638-CV .... Shut*
- 2-SI-648-CV .... Shut*

h. SIT OUT valves:

- 2-SI-614-MOV .... Open
- 2-SI-624-MOV .... Open
- 2-SI-634-MOV .... Open
- 2-SI-644-MOV .... Open

I. SIT RECIRC TO RCDT valve, 2-SI-661-CV .... Shut*

* Handswitches required in the Post Accident Position to enable resetting SIAS.

(continue)

SIAS VERIFICATION CHECKLIST

(Continued)

j. 21, 22, 23 and 24 CACs .... Running in Low (1)

k. CAC EMERGENCY OUT valves:

- 2-SRW-1582-CV .... Open
- 2-SRW-1585-CV .... Open
- 2-SRW-1590-CV .... Open
- 2-SRW-1593-CV .... Open

l. 21, 22 and 23 IODINE FILT FANs .... Running

m. RCDT PP CNTMT ISOL valve, 2-RCW-4260-CV .... Shut*

n. WGS CNTMT ISOL valves:

- 2-WGS-2180-CV .... Shut*
- 2-WGS-2181-CV .... Shut*

o. CNTMT RMS ISOL valves:

- 2-CRM-5291-CV .... Shut*
- 2-CRM-5292-CV .... Shut*

p. CNTMT NORMAL SUMP DRN valves:

- 2-EAD-5462-MOV .... Shut*
- 2-EAD-5463-MOV .... Shut*

q. RCS SAMPLE ISOL valve, 2-PS-5464-CV .... Shut*

r. H_2 PURGE ISOL valves:

- 2-HP-6900-MOV .... Shut*
- 2-HP-6901-MOV .... Shut*

* Handswitches required in the Post Accident Position to enable resetting SIAS.

(1) Do **NOT** place these Handswitches in their Post Accident Position.

SIAS VERIFICATION CHECKLIST

2C07

a. L/D CNTMT ISOL valves:

- 2-CVC-515-CV .... Shut*
- 2-CVC-516-CV .... Shut*

b. 21, 22 and 23 CHG PPs .... Running

c. VCT OUT valve, 2-CVC-501-MOV .... Shut

d. VCT M/U valve, 2-CVC-512-CV......................... Shut

e. BA DIRECT M/U valve, 2-CVC-514-MOV .... Open

f. 21 and 22 BA PPs .... Running

g. BAST GRAVITY FD valves:

- 2-CVC-5O8-MOV .... Open
- 2-CVC-509-MOV .... Open

h. BAST RECIRC valves:

- 2-CVC-510-CV .... Shut
- 2-CVC-511-CV .... Shut

NOTE
High water levels in containment may cause 2-CVC-506-CV to lose indication. The handswitch must still be placed in the post-accident position for SIAS reset from the Control Room.

i. RCP CBO ISOL valves:

- 2-CVC-505-CV .... Shut*
- 2-CVC-506-CV .... Shut*

2C06

a. 21 and 23 Pressurizer B/U HTRs .... Off

* Handswitches required in the Post Accident Position to enable resetting SIAS.

SIAS VERIFICATION CHECKLIST

2C13

a. 21 and 22 CC PPs .... Running

b. 21 and 22 SW PPs .... Running

c. 21 and 22 SRW PPs .... Running

d. CC HX CC OUT valves:

- 2-CC-3824-CV .... Open (2)
- 2-CC-3826-CV .... Open (2) 17/00

e. SDC HX CC OUT valves:

- 2-CC-3828-CV .... Open
- 2-CC-3830-CV .... Open

f. SRW HDR TURB BLDG ISOL valves:

- 2-SRW-1600-CV .... Shut
- 2-SRW-1637-CV .... Shut
- 2-SRW-1638-CV .... Shut
- 2-SRW-1639-CV .... Shut

g. 21 and 22 SW AIR COMPRs .... Running

h. LQD WASTE EVP valves:

- 2-CC-3840-CV .... Shut
- 2-CC-3842-CV .... Shut

i. CAC SRW INL valves:

- 2-SRW-1581-CV .... Throttled (1) (Open if RAS actuated)
- 2-SRW-1584-CV .... Throttled (1) (Open if RAS actuated)
- 2-SRW-1589-CV .... Throttled (1) (Open if RAS actuated)
- 2-SRW-1592-CV .... Throttled (1) (Open if RAS actuated)

(1) Do **NOT** place these Handswitches in their Post Accident Position.
(2) Valves do **NOT** receive a SIAS signal.

ATTACHMENT (2)

SIAS VERIFICATION CHECKLIST

1C20A, 1C20B

a. 2A DG .... Running

b. 2B DG .... Running

c. 0C DG 21 4KV BUS FDR, 152-2106 .... Open

d. 0C DG 24 4KV BUS FDR, 152-2406 .... Open

1C34

a. 11 POST LOCI FILT FAN & DMPR .... Running

b. 12 POST LOCI FILT FAN & DMPR .... Running

c. 11 CONTR RM FRESH AIR, 0-HVAC-5350 .... Close

d. 12 CONTR RM FRESH AIR, 0-HVAC-5351 .... Close

2C90 (45 ft S/G B/D Sample Panel)

a. Pressurizer Vapor Sample Valve, 2-PS-5465-CV .... Shut

b. Pressurizer Liquid Sample Valve, 2-PS-5466-CV .... Shut

c. RCS Hot Leg Sample Valve, 2-PS-5467-CV .... Shut

1C102 (45 ft Solid Waste)

a. Quench Tank O_2 Sample Valve, 2-PS-6531-SV .... Shut

(1) Do **NOT** place these Handswitches in their Post Accident Position.

ATTACHMENT (3)
Page 1 of 1

CSAS VERIFICATION CHECKLIST

<u>2C03</u>

a. 21 and 22 MSIVs:

- 2-MS-4043-CV .... Shut*
- 2-MS-4048-CV .... Shut*

b. 21 and 22 SG FW ISOL valves:

- 2-FW-4516-MOV .... Shut*
- 2-FW-4517-MOV .... Shut*

c. 21 and 22 SG BD valves:

- 2-BD-4010-CV .... Shut
- 2-BD-4011-CV .... Shut
- 2-BD-4012-CV .... Shut
- 2-BD-4013-CV .... Shut

d. 21 and 22 SGFPT TRIP RESET .... Tripped

e. 21 and 22 HDT PPs .... Off

f. 21, 22 and 23 CBPs .... Off

<u>2C08, 2C09</u>

a. CS HDR valves:

- 2-SI-4150-CV .... Open
- 2-SI-4151-CV .... Open

<u>2C13</u>

a. SRW SUPP TO 22 BD HX, 2-SRW-1640-CV .... Shut

<u>1C13</u>

a. 12 SFP HX SRW INL/OUT valves:

- 2-SRW-1599-CV .... Shut
- 2-SRW-1598-CV .... Shut

* Handswitches required in the Post Accident Position to enable resetting CSAS.

ATTACHMENT (4)
Page 1 of 2

CIS VERIFICATION CHECKLIST

2C09, 2C10

a. 21 and 22 PENET RM VENT FANs .... Running

b. 21 and 22 FILT ISOL DMPRs .... Open

c. CC CNTMT SUPP and RTN valves:

- 2-CC-3832-CV .... Shut*
- 2-CC-3833-CV .... Shut*

d. IA CNTMT ISOL, 2-IA-2080-MOV .... Shut*

e. 2-IA-2080-MOV CIS OVERRIDE, 2-HS-2080A .... Normal*

Administratively Controlled Valves

a. **IF ANY** of the following administratively controlled valves are open, **THEN** return them to the shut position:

NOTE
2-PA-137 is located inside containment. If 2-PA-137 is open, 2-PA-1044 must be shut to establish containment isolation.

(1) Plant Air Containment Isolation Valves:

- 2-PA-137 .... Shut
- 2-PA-1044 .... Shut

(2) SIT N_2 SUPP:

- 2-SI-612-CV .... Shut
- 2-SI-622-CV .... Shut
- 2-SI-632-CV .... Shut
- 2-SI-642-CV .... Shut

(3) DW CNTMT ISOL valve, 2-DW-5460-CV .... Shut

(4) U-2 FIRE PROT CNTMT ISOL valve, 2-FP-6200-MOV .... Shut

* Handswitches required in the Post Accident Position to enable resetting CIS.

(continue)

ATTACHMENT (4)
Page 2 of 2

CIS VERIFICATION CHECKLIST

(Continued)

NOTE

The PASS Return to RCDT and Hydrogen Sample Valves may be open for accident sampling. Contact Chemistry for operation of the PASS Return to RCDT and Hydrogen Sample Valves.

(5) PASS Return to RCDT, 2-PS-6529-SV .... Shut

(6) Hydrogen Sample Valves:

- 2-PS-6507A-SV .... Shut
- 2-PS-6507B-SV .... Shut
- 2-PS-6507C-SV .... Shut
- 2-PS-6507D-SV .... Shut
- 2-PS-6507E-SV .... Shut
- 2-PS-6507F-SV .... Shut
- 2-PS-6507G-SV .... Shut

- 2-PS-6540A-SV .... Shut
- 2-PS-6540B-SV .... Shut
- 2-PS-6540C-SV .... Shut
- 2-PS-6540D-SV .... Shut
- 2-PS-6540E-SV .... Shut
- 2-PS-6540F-SV .... Shut
- 2-PS-6540G-SV .... Shut

ATTACHMENT (5)
Page 1 of 1

CRS VERIFICATION CHECKLIST

2C10

a. CNTMT PURGE SUPP valve, 2-CPA-1410-CV .... Shut*

b. CNTMT PURGE EXH valve, 2-CPA-1412-CV .... Shut*

c. H_2 PURGE ISOL valves:

- 2-HP-6900-MOV .... Shut*
- 2-HP-6901-MOV .... Shut*

1C34

a. 21 CNTMT PURGE EXH FAN .... Off

b. 21 CNTMT PURGE SUPP FAN .... Off

* Handswitches required in the Post Accident Position to enable resetting CRS.

ATTACHMENT (6)

RAS VERIFICATION CHECKLIST

2C08, 2C09, 2C10

a. 21 and 22 LPSI PPs .... Off

b. SI PP RECIRC isolation MOVs:

- 2-SI-659-MOV .... Shut
- 2-SI-660-MOV .... Shut

c. CNTMT SUMP DISCH valves:

- 2-SI-4144-MOV .... Open
- 2-SI-4145-MOV .... Open

2C13

a. CAC SRW INL valves:

- 2-SRW-1581-CV .... Open
- 2-SRW-1584-CV .... Open
- 2-SRW-1589-CV .... Open
- 2-SRW-1592-CV .... Open

ATTACHMENT (7)
Page 1 of 1

SGIS VERIFICATION CHECKLIST

<u>2C03</u>

a. 21 and 22 MSIVs:

- 2-MS-4043-CV .... Shut*
- 2-MS-4048-CV .... Shut*

b. 21 and 22 SG FW ISOL valves:

- 2-FW-4516-MOV .... Shut*
- 2-FW-4517-MOV .... Shut*

c. 21 and 22 SGFPT TRIP RESET .... Tripped

d. 21 and 22 HDT PPs .... Off

e. 21, 22 and 23 CBPs .... Off

* Handswitches required in the Post Accident Position to enable resetting SGIS.

ATTACHMENT (8)
Page 1 of 5

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

NOTE
Technical Specifications require a minimum of 150,000 gallons of makeup water to be available to Unit 1 while it is in modes 1, 2 or 3.

1. Verify 12 CST is available to supply feedwater by the following:

   - 12 CST level greater than 5 feet
   - 12 CST TO UNIT 2 AUX FEEDWATER PUMPS ISOLATION VALVE, 2-AFW-161, open

NOTE
Condenser Makeup valve, 2-CD-4406-CV fails open on loss of power, shut on loss of air.

2. **IF** 2Y10 is **NOT** energized,
   AND hotwell makeup is **NOT** required,
   THEN shut DISCH FROM COND M/U, 2-CD-236.

CAUTION
Before transferring AFW Pump suction to an alternate supply, the possibility of suction line or CST rupture should be considered.

3. **IF** 12 CST is **NOT** available to supply feedwater
   AND 21 CST is available,
   THEN line up 21 CST as an alternate suction supply as follows:

   a. Locally open 21 CST MANUAL ISOL valves:

      - 2-AFW-131
      - 2-AFW-167

   b. Locally shut 12 CST SUPPLY TO UNIT 2 AUX FEEDWATER PUMPS ISOLATION VALVE, 2-AFW-161.

   c. Confirm normal CST LVL response.

ATTACHMENT (8)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

4. **IF** 12 CST LVL is less than 5 feet
   AND 21 CST is **NOT** available to supply feedwater,
   THEN lineup an alternate supply to the auxiliary feedwater pump suction as follows:

NOTE
The following substeps are different methods, listed in preferred order, which may be used to line up an alternate supply to auxiliary feedwater pump suction. Each available method should be attempted until a source of water has been established.

CAUTION
Before transferring AFW Pump suction to an alternate supply, the possibility of suction line or CST rupture should be considered.

a. Lineup 11 CST as an alternate suction supply as follows:

NOTE
The following step will cause 12 and 11 CST levels to equalize.

(1) Locally open 11 CST MANUAL ISOL valves:

- 1-AFW-131
- 1-AFW-167

(2) Verify open 12 CST SUPPLY TO AFW PUMPS ISOLATION valves:

- 1-AFW-161
- 2-AFW-161

(3) Confirm normal CST LVL response.

b. Align the Fire System to 23 AFW PP suction as follows:

(1) Place 23 AFW PP in PULL TO LOCK.

(2) Shut 23 AFW PP Suction Valve, 2-AFW-182.

(3) Connect fire hoses between pump suction and a fire main.

(4) Open the FIRE HOSE CONNECTION AUX FEED SUCT LINE ISOLATION VALVE, 2-AFW-180.

(5) Open the fire hose discharge valve.

(6) Restore 23 AFW PP as required.

(continued)

ATTACHMENT (8)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

4. (continued)

   c. Align the Fire System to 13 AFW PP suction for cross connected operation:

      (1) Place 13 AFW PP in PULL TO LOCK.

      (2) Shut 13 AFW PP Suction Valve, 1-AFW-182.

      (3) Connect fire hoses between pump suction and a fire main.

      (4) Open the 13 AFW PP SUCTION FIRE HOSE CONNECTION ISOLATION VALVE, 1-AFW-180.

      (5) Open the fire hose discharge valve.

      (6) Restore 13 AFW PP as required.

5. Makeup to the on-service CST.

NOTE

The following substeps are different methods, listed in preferred order, which may be used to establish makeup to the on-service CST. Each available method should be attempted until a source of water has been established.

   a. **IF** the Demineralized Water Transfer Pumps are available,
      THEN perform the following:

      (1) Throttle open the CST Fill Valve for the tank to be filled, while maintaining the Demineralized Water Transfer Pump discharge pressure greater than 30 PSIG.

         - 11 CST Fill Valve, 0-DW-184
         - 12 CST Fill Valve, 0-DW-284
         - 21 CST Fill Valve, 0-DW-186

      (2) **IF** desired for faster CST fill rate,
          THEN start the second Demineralized Water Transfer Pump.

      (3) **WHEN** the desired tank level is reached,
          THEN shut the appropriate CST Fill Valve.

         - 11 CST Fill Valve, 0-DW-184
         - 12 CST Fill Valve, 0-DW-284
         - 21 CST Fill Valve, 0-DW-186

(continued)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

5. (continued)

b. **IF** a COND PP is available,
THEN transfer hotwell inventory to 21 CST as follows:

(1) Shift the CNDSR HOTWELL M/U & DUMP CONTR, 2-LIC-4405, to MANUAL.

(2) Adjust Controller to open Hotwell To CST Dump CV, 2-CD-4405-CV.

(3) **IF** a COND PP is **NOT** running,
THEN shut ONE Condensate Pump Discharge Valve:

- (21 Pump) 2-CD-106
- (22 Pump) 2-CD-113
- (23 Pump) 2-CD-120

(4) Verify the appropriate COND PP is running.

(5) Slowly throttle open the pump discharge valve to maintain pump discharge pressure between 175 and 240 PSIG.

(6) Stop the pump when cavitation occurs.

(7) Shut the Hotwell To CST Dump CV by adjusting 2-LIC-4405, to 50% output.

c. **IF** the DI Water Storage Tank level is greater than 10 feet
AND the on-service CST level is less than 5 feet,
THEN gravity fill the on-service CST by performing the following:

(1) Throttle open the CST Fill Valve for the tank to be filled.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(2) **WHEN** the desired tank level is reached,
THEN shut the appropriate CST Fill Valve.

- 11 CST Fill Valve, 0-DW-184
- 12 CST Fill Valve, 0-DW-284
- 21 CST Fill Valve, 0-DW-186

(continued)

MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY

5. (continued)

d. Emergency fill 21 CST from the Fire System as follows:

(1) Connect a fire hose between fire house hose manifold and 21 CST EMERGENCY HOSE CONNECTION VALVE, 2-CD-312.

(2) Shut the FIRE PUMPS DISCHARGE TEST DRAIN VALVE, 0-FP-277.

(3) Open the FIRE PUMPS DISCHARGE HEADER TEST ISOLATION VALVE, 0-FP-246.

(4) Open 21 CST EMERGENCY HOSE CONNECTION VALVE, 2-CD-312.

(5) Open the fire hose discharge valve.

(6) Ensure 21 CST LVL rises.

e. Emergency fill 11 CST from the Fire System as follows:

(1) Connect a fire hose between fire house hose manifold and 11 CST EMERGENCY CROSS CONNECT ISOLATION VALVE, 1-CD-312.

(2) Shut the FIRE PUMPS DISCHARGE TEST DRAIN VALVE, 0-FP-277.

(3) Open the FIRE PUMPS DISCHARGE HEADER TEST ISOLATION VALVE, 0-FP-246.

(4) Open 11 CST EMERGENCY CROSS CONNECT ISOLATION VALVE, 1-CD-312.

(5) Open the fire hose discharge valve.

(6) Ensure 11 CST LVL rises.

ATTACHMENT (9)
Page 1 of 5

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

1. Determine the amount of makeup water required to perform an ADV cooldown and a TBV cooldown, based on the time after shutdown:

   a. ADV cooldown and time after shutdown — 1.a _____gals

   b. TBV cooldown and time after shutdown — 1.b _____gals

2. Determine the amount of makeup water available in the CSTs:

   a. Record the level in 21 CST. — 2.a _____ft

   b. Record the level in 12 CST. — 2.b _____ft

   c. Record the level in 11 CST. — 2.c _____ft

   d. Determine the status of Unit 1 (check one):

      (1) ___ Mode 1, 2 or 3 and does **NOT** require AFW operation.

      (2) ___ Mode 1, 2 or 3 and does require AFW operation.

      (3) ___ Mode 4, 5, 6 or defueled.

NOTE
Calculated negative values should be entered as zero.

   e. Determine the amount of makeup water available to Unit 2 using one of the following formulas, based on the status checked in step 2.d above:

      (1) **IF** step d.(1) is checked,
      THEN correct CST levels for usable volume:

         (a) step 2.a _____ft - 2.75 ft = — (a) _____ft

         (b) step 2.b _____ft - 16 ft = — (b) _____ft

         (c) step(a) _____ft + step(b) _____ft = — e.(1) _____ft

ATTACHMENT (9)

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

(2) **IF** step d.(2) is checked,
THEN correct CST levels for usable volume:

(a) step 2.a _____ft - 2.75 ft = (a) _____ft

(b) $\frac{\text{step 2.b \_\_\_\_\_ft - 2.5 ft}}{2}$ = (b) _____ft

(c) step(a) _____ft + step(b) _____ft = e.(2) _____ft

(3) **IF** step d.(3) is checked,
THEN correct CST levels for usable volume:

(a) step 2.a _____ft - 2.75 ft = (a) _____ft

(b) step 2.b _____ft - 2.5 ft = (b) _____ft

(c) step 2.c _____ft - 2.75 ft = (c) _____ft

(d) step(a) _____ft + step(b) _____ft + step(c) _____ft = e.(3) _____ft

f. Convert the amount of CST level into gallons.

(ft available) _____ft x 9636.78 gal/ft = 2.f _____gals

NOTE
The nominal capacity of a Well Water pump is 300 GPM.
The nominal capacity of a Demineralized Water Transfer pump is 300 GPM.
The Fire System can fill the CST via fire hoses at greater than 500 GPM.

CAUTION
The status of both units should be considered when evaluating a makeup source.

3. **IF** adequate inventory exists to perform cooldown,
THEN determine if an adequate makeup source exists to maintain hot standby.

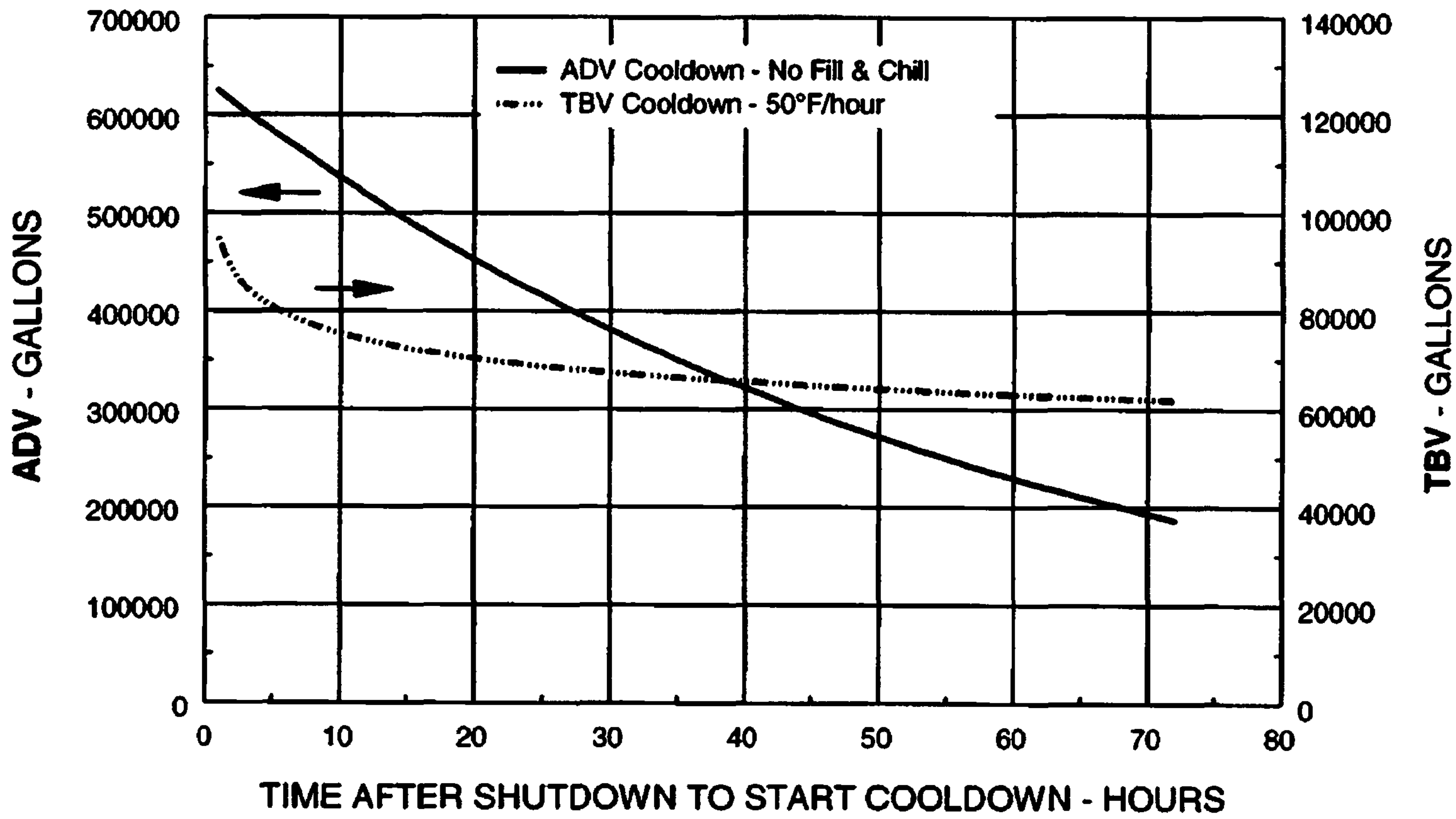
4. **IF** adequate inventory does **NOT** exist to perform cooldown,
THEN evaluate the following:

- Maintaining hot standby conditions
- Time to restore an adequate makeup source
- Restoration of other plant systems (TBVs, main feedwater system, etc.)
- Performing partial cooldown while restoring plant systems

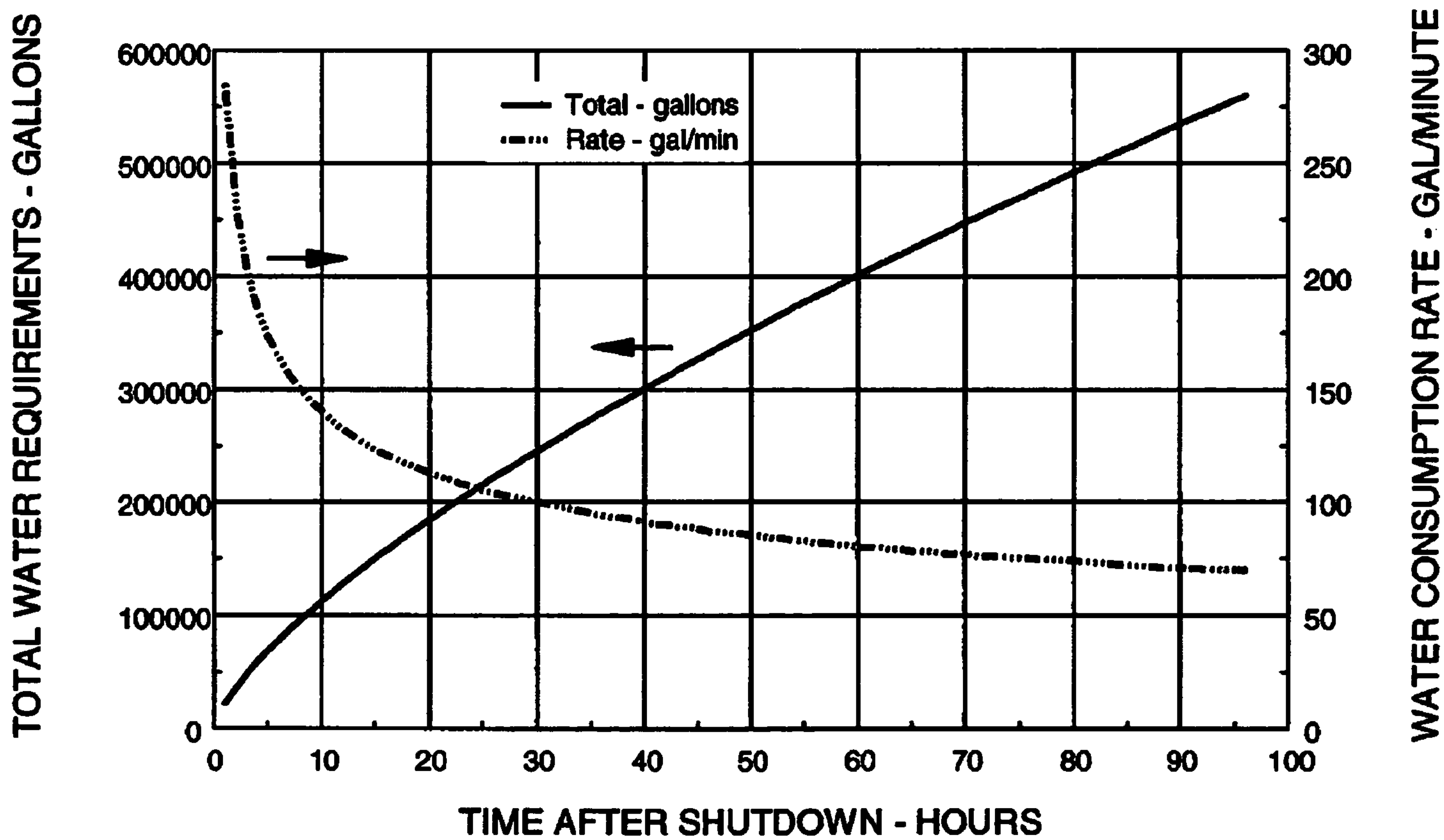
ATTACHMENT (9)
Page 3 of 5

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

INVENTORY REQUIRED TO COOL DOWN TO 300°F



MAKEUP WATER REQUIRED TO MAINTAIN HOT STANDBY



ATTACHMENT (9)

MAKEUP WATER REQUIRED FOR RCS COOLDOWN

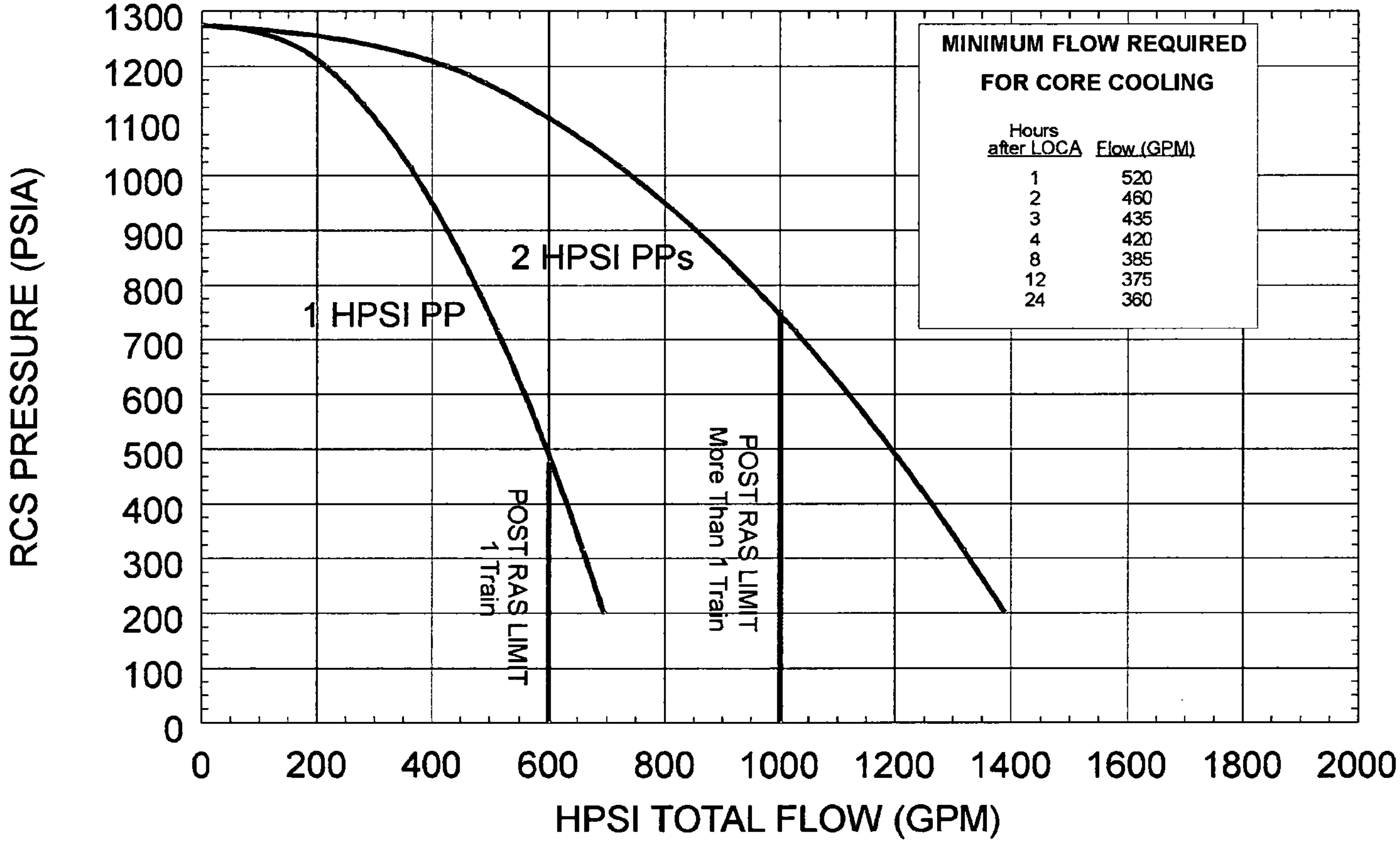
INVENTORY REQUIRED TO COOL DOWN TO 300 F

TIME AFTER SHUTDOWN - HOURS	ADV COOLDOWN - GALLONS	TBV COOLDOWN - GALLONS
1	625,067	94,828
2	614,531	88,490
4	593,988	82,575
6	574,132	79,301
8	554,939	77,056
10	536,389	75,359
12	518,458	74,000
24	422,783	69,054
36	344,764	66,316
48	281,142	64,439
72	186,953	61,883

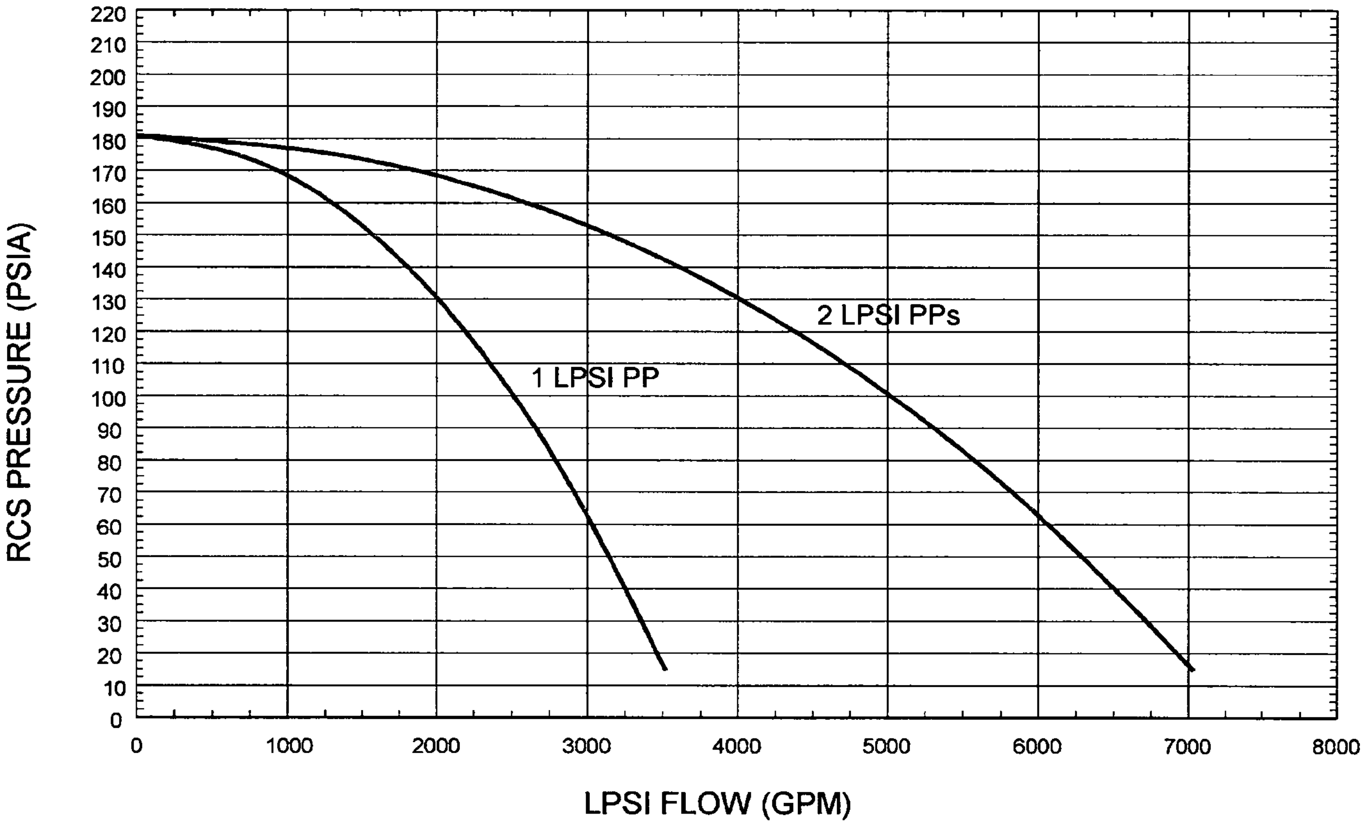
MAKEUP WATER REQUIRED TO MAINTAIN HOT STANDBY

TIME AFTER SHUTDOWN - HOURS	TOTAL WATER REQUIREMENT - GALLONS	WATER CONSUMPTION RATE - GAL/MINUTE
1	21,964	285
2	35,919	230
4	58,740	186
6	78,323	164
8	96,060	150
10	112,541	140
12	128,085	132
24	209,464	107
36	279,295	94
48	342,547	86
72	456,746	76
96	560,185	70

RCS PRESSURE vs. HPSI TOTAL FLOW



RCS PRESSURE vs. LPSI FLOW



ATTACHMENT(11)
Page 1 of 1

LOW PRESSURE SAFETY INJECTION FLOW

ATTACHMENT(12)

PROCEDURE TO LOCALLY READ CORE EXIT THERMOCOUPLES

1. Obtain an ALTEK thermocouple meter from the Operations Safety Related Storage Locker or the IM Shop, and a set of CET cables from the Operations Safety Related Storage Locker.

2. Obtain a small flat-head screwdriver from the Shift Manager's Office.

3. Obtain the U-2 PAM cabinet door key.

4. Align the ALTEK thermocouple meter as follows:

   a. Select READ.

   b. Depress RESET button until "k" apppears in the lower right corner of the display.

   NOTE
   When using the CET cables, the RED wire is always the (-) negative post.

5. Connect the CET cables to the terminal posts on the ALTEK thermocouple meter.

6. Select an operable CET to be measured.

7. Open the back panel door on 2C182A or 2C182B as appropriate.

8. Connect the cables at terminal block A03/B03.

   NOTE
   The CET numbers are indicated on the cable labels.

   a. Locate the red and yellow thermocouple wires for the selected CET.

   b. Loosen the terminal block screws
   AND remove the red and yellow thermocouple wires from the terminal block.

   c. Connect the red wire to the red connector.

   d. Connect the yellow wire to the yellow connector.

9. Read CET temperature in ° F from the meter.

ATTACHMENT(13)
Page 1 of 1

ADMINISTRATIVE POST-TRIP ACTIONS

NOTE

The following actions may be accomplished whenever feasible, and may be done in any order.

_____ 1. Prior to exiting the EOP, review OP-6, PRE-STARTUP CHECKOFF for Tech. Spec. compliance in the applicable mode.

_____ 2. Refer to the ERPIP to determine appropriate emergency response actions.

_____ 3. Perform notifications **PER** RM-1-101 REGULATORY REPORTING.

_____ 4. Notify SO-TSO of trip.

_____ 5. Request RCS Boron and Iodine Sample.

_____ 6. Perform shutdown margin calculation **PER** the NEOPs.

_____ 7. Complete any Transient Log entries **PER** EN-1-115, RECORDING OF PLANT TRANSIENTS/OPERATIONAL CYCLES.

_____ 8. Collect the post-trip data automatically printed from the Plant Computer.

_____ 9. Perform the post-trip review **PER** NO-1-111, POST-TRIP REVIEW.

_____ 10. Monitor turbine bearing temperatures.

_____ 11. Continue the Main Turbine Shutdown **PER** OI-43A, MAIN TURBINE AND GENERATOR/EXCITER OPERATION.

_____ 12. Reestablish normal plant configuration control as required:

- Locked Valves **PER** NO-1-205, LOCKED VALVES
- Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES

_____ 13. Initiate the Forced Outage Worklist.

ATTACHMENT(14)
Page 1 of 1

RCS COOLDOWN DATA SHEET

RCS COOLDOWN NO. _______________

DATE/TIME COOLDOWN COMMENCED _______________

- The cooldown of the Reactor Vessel should be conducted at a linear rate not to exceed 100° F in any one hour period.
- The RCS temperature should be recorded every 15 minutes.

TIME	PRESS(PSIA) (1)	TEMP(°F) (2)	C/D RATE(°F/HR)

(1) RCS Pressure:
- Greater than 1600 PSIA: PAM CH A or CH B
- Less than 1600 PSIA: PI-103 or PI-103-1

(2) RCS Temperature:
- Forced Circulation: TI-112C or 122C
- Natural Circulation:
  - RCS Temp Greater than 301° F: average of at least 2 CETs
  - RCS Temp Less than 301° F: lowest valid displayed CET
- SDC Flow: TR-351

ATTACHMENT(15)
Page 1 of 1

PRESSURIZER COOLDOWN DATA SHEET

PRESSURIZER COOLDOWN NO. _______________

DATE/TIME COOLDOWN COMMENCED _______________

- The cooldown of the Pressurizer should be conducted at a linear rate not to exceed 200° F in any one hour period.
- The Pressurizer temperature should be recorded every 15 minutes.

TIME	PZR PRESS (PSIA)(1)	PZR TEMP(°F)(2)	PZR SPRAY TEMP(°F)(3)	PZR C/D RATE(°F/HR)	PZR SPRAY DIFF TEMP(°F) *

(1) RCS Pressure:
- Greater than 1600 PSIA: PAM CH A or CH B
- Less than 1600 PSIA: PI-103 or PI-103-1

(2) PZR Temperature: TI-101

(3) Spray Temperature:
- PZR: TIA-103 or 104
- Aux: TI-229

* Maximum Spray Differential Temperature is 400° F (TRM 15.4.2)

500KV OFFSITE POWER RESTORATION

NOTE

Steps may be performed as necessary to energize multiple buses.

CAUTION

The following steps are intended to restore from a loss of offsite power. Restoration of power for other causes should be performed PER the appropriate procedure.

CAUTION

Attempts should NOT be made to reenergize a bus if a fault is suspected.

1. Energize the 500KV Red Bus **OR** the 500KV Black Bus by performing the following actions:

   a. Verify that switching orders have been received by the Control Room Supervisor **OR** Shift Manager, from the SO-TSO, to operate the required equipment.

   b. Evaluate alarms associated with the 500KV switchyard.

   c. Verify the associated Unit Generator High Side Line Disconnect is open before closing Turbine Generator Output breakers.

   d. **IF** the 500KV Red Bus is de-energized,
   THEN verify the following breakers are open:

   - UNIT 1 RCP BUS FDR, 252-2202
   - UNIT 2 RCP BUS FDR, 252-2201
   - 21 SERV BUS 13KV FDR, 252-2104

   e. **IF** the 500KV Black Bus is de-energized,
   THEN verify the following breakers are open:

   - UNIT 2 RCP BUS FDR, 252-1202
   - UNIT 1 RCP BUS FDR, 252-1201
   - 11 SERV BUS 13KV FDR, 252-1104

   f. Verify the Unit-2 Generator Coast Down Lockout is reset.

   g. Place the SYNCHROSCOPE SEL Switch in NORMAL (1) **OR** EMERGENCY (2) position.

(continued)

500KV OFFSITE POWER RESTORATION

1. (continued)

NOTE
A Synchronizer is **NOT** required for operation of breakers 552-41 **OR** 552-43.

h. Place the applicable SYNCHRONIZER SEL Switch in MANUAL position.

- (552-21) 11 GEN SYNCHRONIZER SEL Switch
- (552-22) 11 GEN SYNCHRONIZER SEL Switch
- (552-23) 11 GEN SYNCHRONIZER SEL Switch
- (552-61) 21 GEN SYNCHRONIZER SEL Switch
- (552-62) 21 GEN SYNCHRONIZER SEL Switch
- (552-63) 21 GEN SYNCHRONIZER SEL Switch

i. Insert the sync stick in the sync jack at the breaker to be closed.

j. **IF** paralleling TWO power sources,
THEN ensure the power sources are synchronized by observing the following:

- Sync lights out
- Synchroscope at 12 o'clock
- Running and incoming voltages are matched

k. **IF** closing in on a de-energized bus,
THEN ensure the bus is **NOT** energized.

l. Close the breaker by placing the Breaker Control Handswitch in the CLOSE position
AND release.

m. Check the breaker has closed by observing applicable breaker indicating lights and meters, if applicable.

n. Repeat steps 1.a through 1.m as desired to close additional breakers.

o. Remove the sync stick
AND return to Home Base.

p. Verify **BOTH** SYNCHRONIZER SEL Switches in the OFF position.

q. Place the SYNCHROSCOPE SEL Switch in the OFF position.

r. **WHEN** operation has been completed in accordance with the switching orders,
THEN inform the SO-TSO.

s. Reset the 13KV BUS 22 **OR** 12 286 LOCKOUT/RESET DEVICE as applicable.

(continued)

500KV OFFSITE POWER RESTORATION

1. (continued)

t. Reset the applicable bus 247/B device target flags on **BOTH** undervoltage relays:

13KV BUS 22

- B-22-P
- B-22-B

13KV BUS 12

- B-12-P
- B-12-B

NOTE

Steps may be performed as necessary to energize multiple buses.

CAUTION

Attempts should NOT be made to reenergize a bus if a fault is suspected.

2. Energize the desired 13KV Service Bus by performing the following actions:

a. **IF** it is desired to energize 21 13KV Service Bus,
THEN perform the following actions:

(1) Verify 22 13KV Service Bus is energized.

(2) Verify the following breakers are open:

- 21 SERV BUS 13KV FDR, 252-2104
- 21 SERV BUS TIE, 252-2105
- U-4000-21 13KV FDR, 252-2102
- U-4000-22 13KV FDR, 252-2103
- U-4000-23 13KV FDR, 252-2101
- Locally at the U-2 13KV SWGR House, SITE POWER FDR BREAKER (to 0X04), 252-2106

(3) Energize 21 13KV Service Bus by closing 21 SERV BUS 13KV FDR, 252-2104.

(4) Reset the 13KV BUS 21 286 LOCKOUT/RESET DEVICE.

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-21-P
- B-21-B

(continued)

500KV OFFSITE POWER RESTORATION

2.a. (continued)

(6) **IF** MCC 216T is de-energized,
THEN place the following LTC Drive Power Selector Switches in ALT:

- 2H2101REG
- 2H2102REG
- 2H2103REG

b. **IF** it is desired to energize 11 13KV Service Bus,
THEN perform the following actions:

(1) Verify 12 13KV Service Bus is energized.

(2) Verify the following breakers are open:

- 11 SERV BUS 13KV FDR, 252-1104
- 11 SERV BUS TIE, 252-1105
- U-4000-12 13KV FDR, 252-1103
- U-4000-11 13KV FDR, 252-1102
- U-4000-13 13KV FDR, 252-1101
- Locally at the U-1 13KV SWGR House, SITE POWER FDR BREAKER (to 0X03), 252-1106

(3) Energize 11 13KV Service Bus by closing 11 SERV BUS 13KV FDR, 252-1104.

(4) Reset the 13KV BUS 11 286 LOCKOUT/RESET DEVICE.

(5) Reset the 247/B device target flags on **BOTH** undervoltage relays:

- B-11-P
- B-11-B

(6) **IF** MCC 116T is de-energized,
THEN place the following LTC Drive Power Selector Switches in ALT:

- 1H1101REG
- 1H1102REG
- 1H1103REG

500KV OFFSITE POWER RESTORATION

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

3. Energize the desired U4000 SERV XFMRs.

 a. **IF** it is desired to energize U4000-22 SERV XFMR,
 THEN perform the following actions:

 (1) Verify the following breakers are open:

 - 24 4KV BUS NORMAL FDR, 152-2401
 - 21 4KV BUS ALT FDR, 152-2115
 - 22 4KV BUS NORMAL FDR, 152-2201
 - 23 4KV BUS NORMAL FDR, 152-2311

 (2) Close the U4000-22 13KV FDR, 252-2103.

 b. **IF** it is desired to energize U4000-12 SERV XFMR,
 THEN perform the following actions:

 (1) Verify the following breakers are open:

 - 24 4KV BUS ALT FDR, 152-2414
 - 21 4KV BUS NORMAL FDR, 152-2101
 - 22 4KV BUS ALT FDR, 152-2209
 - 23 4KV BUS ALT FDR, 152-2301

 (2) Close the U4000-12 13KV FDR, 252-1103.

 c. **IF** it is desired to energize U4000-23 SERV XFMR,
 THEN perform the following actions:

 (1) Verify the following breakers are open:

 - 25 4KV BUS FDR, 152-2501
 - 16 4KV BUS FDR, 152-1604

 (2) Close the U4000-23 13KV FDR, 252-2101.

(continued)

500KV OFFSITE POWER RESTORATION

3. (continued)

d. **IF** it is desired to energize U4000-13 SERV XFMR,
THEN perform the following actions:

(1) Verify the following breakers are open:

- 15 4KV BUS FDR, 152-1501
- 26 4KV BUS FDR, 152-2604

(2) Close the U4000-13 13KV FDR, 252-1101.

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

4. **IF** 21 **OR** 24 4KV Vital Bus is de-energized,
THEN restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows:

a. **IF NO** CC PPs are operating,
THEN shut CC CNTMT SUPP valve, 2-CC-3832-CV.

b. **IF** it is desired to energize 21 4KV Vital Bus from U4000-22 SERV XFMR,
THEN energize 21 4KV Vital Bus as follows:

(1) Verify the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK.

(3) Verify 21 4KV BUS NORMAL FDR, 152-2101, is open.

(4) Insert the sync stick into the sync jack at the 21 4KV BUS ALT FDR, 152-2115.

(5) Close the 21 4KV BUS ALT FDR, 152-2115.

(6) Remove the sync stick
AND return to Home Base.

(7) **WHEN** 21 4KV Bus sequencing is complete,
THEN place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

(continued)

500KV OFFSITE POWER RESTORATION

4. (continued)

c. **IF** it is desired to energize 24 4KV Vital Bus from U4000-22 SERV XFMR, **THEN** energize 24 4KV Vital Bus as follows:

(1) Verify the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK.

(3) Place 23 AFW PP in PULL TO LOCK.

(4) Verify the 24 4KV BUS ALT FDR, 152-2414, is open.

(5) Insert the sync stick into the sync jack at the 24 4KV BUS NORMAL FDR, 152-2401.

(6) Close the 24 4KV BUS NORMAL FDR, 152-2401.

(7) Remove the sync stick
AND return to Home Base.

(8) **WHEN** 24 4KV Bus sequencing is complete,
THEN place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

d. **IF** it is desired to energize 21 4KV Vital Bus from U4000-12 SERV XFMR, **THEN** energize 21 4KV Vital Bus as follows:

(1) Verify the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 2A DG OUT BKR, 152-2103, in PULL TO LOCK.

(3) Verify 21 4KV BUS ALT FDR, 152-2115, is open.

(4) Insert the sync stick into the sync jack at the 21 4KV BUS NORMAL FDR, 152-2101.

(5) Close the 21 4KV BUS NORMAL FDR, 152-2101.

(6) Remove the sync stick
AND return to Home Base.

(7) **WHEN** 21 4KV Bus sequencing is complete,
THEN place the 21 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

(continued)

500KV OFFSITE POWER RESTORATION

4. (continued)

e. **IF** it is desired to energize 24 4KV Vital Bus from U4000-12 SERV XFMR, **THEN** energize 24 4KV Vital Bus as follows:

(1) Verify the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch is ON.

(2) Place 2B DG OUT BKR, 152-2403, in PULL TO LOCK.

(3) Place 23 AFW PP in PULL TO LOCK.

(4) Verify 24 4KV BUS NORMAL FDR, 152-2401, is open.

(5) Insert the sync stick into the sync jack at the 24 4KV BUS ALT FDR, 152-2414.

(6) Close the 24 4KV BUS ALT FDR, 152-2414.

(7) Remove the sync stick
AND return to Home Base.

(8) **WHEN** 24 4KV Bus sequencing is complete,
THEN place the 24 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in NORM.

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

5. **IF** 21 **OR** 24 4KV Vital Bus is powered by a DG,
AND SIAS has **NOT** actuated **OR** has been reset,
THEN restore power to the Engineered Safety Features Buses from the 13KV Service Buses as follows:

a. **IF** it is desired to energize 21 4KV Vital Bus from U4000-22 SERV XFMR,
AND 2A DG is powering 21 4KV Vital Bus,
THEN transfer 21 4KV Vital Bus from 2A DG to U4000-22 SERV XFMR as follows:

(1) Momentarily place 2A DG UNIT PARALLEL, 2-CS-2104, to PARA.

(2) Adjust 2A DG frequency to approximately 60 Hz using 2A DG SPEED, 2-CS-2103.

(3) Insert the sync stick into the sync jack at the 21 4KV BUS ALT FDR, 152-2115.

(4) Check the associated Synchroscope and Sync Lights are operating.

(continued)

5.a. (continued)

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 2A DG AUTO VOLT CONTR, 2-CS-2102.

NOTE
The Synchroscope works in the opposite direction from normal when 2A DG is the RUNNING power source.

(6) Adjust 2A DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 2A DG SPEED CONTR, 2-CS-2103.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 24 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 21 4KV BUS ALT FDR, 152-2115.

(8) Remove the sync stick
AND return to Home Base.

(9) Shutdown 2A DG **PER** OI-21A, 2A Diesel Generator, if desired.

(continued)

500KV OFFSITE POWER RESTORATION

5. (continued)

b. **IF** it is desired to energize 21 4KV Vital Bus from U4000-22 SERV XFMR,
AND 0C DG is powering 21 4KV Vital Bus,
THEN transfer 21 4KV Vital Bus from 0C DG to U4000-22 SERV XFMR as follows:

NOTE
Load on 21 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.b.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 21 4KV BUS ALT FDR, 152-2115.

(i) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

NOTE
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 21 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 21 4KV BUS ALT FDR, 152-2115.

(continued)

500KV OFFSITE POWER RESTORATION

5.b.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, <u>0C Diesel Generator</u>, if desired.

c. **IF** it is desired to energize 24 4KV Vital Bus from U4000-22 SERV XFMR,
AND 2B DG is powering 24 4KV Vital Bus,
THEN transfer 24 4KV Vital Bus from 2B DG to U4000-22 SERV XFMR as follows:

(1) Momentarily place 2B DG UNIT PARALLEL, 2-CS-2404, to PARA.

(2) Adjust 2B DG frequency to approximately 60 Hz using 2B DG SPEED, 2-CS-2403.

(3) Insert the sync stick into the sync jack at the 24 4KV BUS NORMAL FDR, 152-2401.

(4) Check the associated Synchroscope and Sync Lights are operating.

<u>NOTE</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 2B DG AUTO VOLT CONTR, 2-CS-2402.

<u>NOTE</u>
The Synchroscope works in the opposite direction from normal when 2B DG is the RUNNING power source.

(6) Adjust 2B DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 2B DG SPEED CONTR, 2-CS-2403.

<u>CAUTION</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 24 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 24 4KV BUS NORMAL FDR, 152-2401.

(8) Remove the sync stick
AND return to Home Base.

(continued)

500KV OFFSITE POWER RESTORATION

5.c. (continued)

(9) Shutdown 2B DG **PER** OI-21B, 2B Diesel Generator, if desired.

d. **IF** it is desired to energize 24 4KV Vital Bus from U4000-22 SERV XFMR, **AND** 0C DG is powering 24 4KV Vital Bus, **THEN** transfer 24 4KV Vital Bus from 0C DG to U4000-22 SERV XFMR as follows:

NOTE

Load on 24 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW, **THEN** bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION

0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.d.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 24 4KV BUS NORMAL FDR, 152-2401.

(i) Check the associated Synchroscope and Sync Lights are operating.

<u>NOTE</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

<u>NOTE</u>
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

<u>CAUTION</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 24 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 24 4KV BUS NORMAL FDR, 152-2401.

(continued)

500KV OFFSITE POWER RESTORATION

5.d.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, <u>0C Diesel Generator</u>, if desired.

e. **IF** it is desired to energize 21 4KV Vital Bus from U4000-12 SERV XFMR,
AND 2A DG is powering 21 4KV Vital Bus,
THEN transfer 21 4KV Vital Bus from 2A DG to U4000-12 SERV XFMR as follows:

(1) Momentarily place 2A DG UNIT PARALLEL, 2-CS-2104, to PARA.

(2) Adjust 2A DG frequency to approximately 60 Hz using 2A DG SPEED, 2-CS-2103.

(3) Insert the sync stick into the sync jack at the 21 4KV BUS NORMAL FDR, 152-2101.

(4) Check the associated Synchroscope and Sync Lights are operating.

<u>NOTE</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 2A DG AUTO VOLT CONTR, 2-CS-2102.

<u>NOTE</u>
The Synchroscope works in the opposite direction from normal when 2A DG is the RUNNING power source.

(6) Adjust 2A DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 2A DG SPEED CONTR, 2-CS-2103.

<u>CAUTION</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 21 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 21 4KV BUS NORMAL FDR, 152-2101.

(8) Remove the sync stick
AND return to Home Base.

(continued)

500KV OFFSITE POWER RESTORATION

5.e. (continued)

(9) Shutdown 2A DG **PER** OI-21A, 2A Diesel Generator, if desired.

f. **IF** it is desired to energize 21 4KV Vital Bus from U4000-12 SERV XFMR,
AND 0C DG is powering 21 4KV Vital Bus,
THEN transfer 21 4KV Vital Bus from 0C DG to U4000-12 SERV XFMR as follows:

NOTE
Load on 21 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.f.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 21 4KV BUS NORMAL FDR, 152-2101.

(i) Check the associated Synchroscope and Sync Lights are operating.

<u>NOTE</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

<u>NOTE</u>
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

<u>CAUTION</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 21 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 21 4KV BUS NORMAL FDR, 152-2101.

(continued)

500KV OFFSITE POWER RESTORATION

5.f.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

g. **IF** it is desired to energize 24 4KV Vital Bus from U4000-12 SERV XFMR,
AND 2B DG is powering 24 4KV Vital Bus,
THEN transfer 24 4KV Vital Bus from 2B DG to U4000-12 SERV XFMR as follows:

(1) Momentarily place 2B DG UNIT PARALLEL, 2-CS-2404, to PARA.

(2) Adjust 2B DG frequency to approximately 60 Hz using 2B DG SPEED, 2-CS-2403.

(3) Insert the sync stick into the sync jack at the 24 4KV BUS ALT FDR, 152-2414.

(4) Check the associated Synchroscope and Sync Lights are operating.

NOTE
Offsite power voltage indication will be on the INCOMING voltmeter.

(5) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 2B DG AUTO VOLT CONTR, 2-CS-2402.

NOTE
The Synchroscope works in the opposite direction from normal when 2B DG is the RUNNING power source.

(6) Adjust 2B DG frequency so the synchroscope pointer is rotating slowly in the FAST direction using 2B DG SPEED CONTR, 2-CS-2403.

CAUTION
To avoid improper paralleling, do NOT start OR stop any large loads on the 24 4KV Bus.

(7) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 24 4KV BUS ALT FDR, 152-2414.

(8) Remove the sync stick
AND return to Home Base.

(9) Shutdown 2B DG **PER** OI-21B, 2B Diesel Generator, if desired.

(continued)

500KV OFFSITE POWER RESTORATION

5. (continued)

h. **IF** it is desired to energize 24 4KV Vital Bus from U4000-12 SERV XFMR,
AND 0C DG is powering 24 4KV Vital Bus,
THEN transfer 24 4KV Vital Bus from 0C DG to U4000-12 SERV XFMR as follows:

NOTE
Load on 24 4KV bus may be reduced by using redundant 4KV bus equipment.

(1) **IF** 0C DG load is greater than 1000 KW,
THEN bypass breaker 152-0703 underfrequency trip as follows:

(a) Remove the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, in 0C DG Local Control Panel 0C188 Cabinet 5.

(b) Disconnect the RED knifeswitch in the bottom right of the relay by pressing the top down.

(2) Place 0C DG in the TRANSFER MODE by performing the following:

(a) Depress 0C DG EMERGENCY START, 0-HS-0707, pushbutton.

(b) Insert the sync stick into the sync jack at the 0C DG OUT BKR, 152-0703.

CAUTION
0C DG OUT BKR, 152-0703 trips on underfrequency at 59.5 Hz in the parallel OR transfer modes, unless bypassed.

(c) Depress 0C DG SLOW START, 0-HS-0708, pushbutton.

(d) Momentarily place 0C DG SPEED CONTR, 0-CS-0705, to RAISE OR LOWER.

(e) Maintain 0C DG at approximately 60 Hz using 0C DG SPEED CONTR, 0-CS-0705.

(f) Remove the sync stick from 0C DG OUT BKR, 152-0703.

(continued)

500KV OFFSITE POWER RESTORATION

5.h.2. (continued)

(g) **IF** UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is bypassed,
THEN enable the underfrequency trip by performing the following, in 0C DG Local Control Panel 0C188 Cabinet 5:

1) Verify UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U, is reset.

2) Raise the RED knifeswitch in the bottom right of the relay until the switch is fully engaged.

3) Request an independent person to second check the knifeswitch is closed properly.

4) Install the cover from UNDERVOLTAGE PROTECTION RELAY, 0SSL 0998-81.U.

(h) Insert the sync stick into the sync jack at the 24 4KV BUS ALT FDR, 152-2414.

(i) Check the associated Synchroscope and Sync Lights are operating.

<u>**NOTE**</u>
Offsite power voltage indication will be on the INCOMING voltmeter.

(j) Adjust RUNNING VOLTS equal to INCOMING VOLTS using 0C DG AUTO VOLT CONTR, 0-CS-0704.

<u>**NOTE**</u>
The Synchroscope works in the opposite direction from normal when 0C DG is the RUNNING power source.

(k) Adjust 0C DG frequency so the synchroscope pointer is rotating <u>slowly</u> in the FAST direction using 0C DG SPEED CONTR, 0-CS-0705.

<u>**CAUTION**</u>
To avoid improper paralleling, do NOT start OR stop any large loads on the 24 4KV Bus.

(l) **WHEN** the Synchroscope pointer is approximately 5 degrees prior to the 12 o'clock position,
THEN close the 24 4KV BUS ALT FDR, 152-2414.

(continued)

500KV OFFSITE POWER RESTORATION

5.h.2. (continued)

(m) Remove the sync stick
AND return to Home Base.

(n) Shutdown 0C DG **PER** OI-21C, 0C Diesel Generator, if desired.

NOTE
Steps may be performed as necessary to energize multiple buses.

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

6. Energize the desired 4KV Non Vital Buses.

a. **IF** it is desired to energize 22 4KV Non Vital Bus,
THEN perform the following:

- Verify the following breakers are open:
    - U440-22B 4KV FDR, 152-2202
    - U440-22A 4KV FDR, 152-2208
- Verify the handswitches for the following loads are in PULL TO LOCK:
    - 21 COND PP
    - 21 CBP
    - 22 CBP
    - 21 HDT PP

b. **IF** it is desired to energize 23 4KV Non Vital Bus,
THEN perform the following:

- Verify the following breakers are open:
    - U440-23B 4KV FDR, 152-2302
    - U440-23A 4KV FDR, 152-2310
- Verify the handswitches for the following loads are in PULL TO LOCK:
    - 22 COND PP
    - 23 COND PP
    - 23 CBP
    - 22 HDT PP

(continued)

500KV OFFSITE POWER RESTORATION

6. (continued)

c. **IF** it is desired to energize 25 4KV Non Vital Bus,
THEN perform the following:

- Verify U440-25 4KV FDR, 152-2505, is open.
- Verify 25-26 4KV TIE, 152-2506, is open.
- Verify the handswitches for the following loads are in PULL TO LOCK:
    - 21 CW PP
    - 22 CW PP
    - 23 CW PP

d. **IF** it is desired to energize 26 4KV Non Vital Bus,
THEN perform the following:

- Verify U440-26 4KV FDR, 152-2605, is open.
- Verify 25-26 4KV TIE, 152-2506, is open.
- Verify the handswitches for the following loads are in PULL TO LOCK:
    - 24 CW PP
    - 25 CW PP
    - 26 CW PP

e. Verify the associated 4KV SERV XFMR FDR BKR is closed.

f. Insert the sync stick into the sync jack at the 4KV BUS FDR or TIE breaker to be closed.

g. Place and hold the 4KV BUS FDR or TIE breaker handswitch in CLOSE until the bus voltage indicates between 4.1 and 4.35 KV

h. Remove the sync stick
AND return to Home Base.

i. Close the associated U440 4KV FDR breaker(s).

j. Repeat steps 6.a through 6.i as desired to energize additional 4KV Non Vital Buses.

500KV OFFSITE POWER RESTORATION

CAUTION
Attempts should NOT be made to reenergize a bus if a fault is suspected.

7. **IF** MCC-201AT **OR** MCC-201BT are de-energized,
THEN energize the desired Turbine MCC.

   a. **IF** 21A 480V BUS is energized from 500KV offsite power,
   THEN restore power to MCC-201AT by closing normal feeder breaker 52-2109.

   b. **IF** 24B 480V BUS is energized from 500KV offsite power,
   THEN restore power to MCC-201BT by closing normal feeder breaker 52-2419.

ATTACHMENT(17)

ONCE-THROUGH-COOLING MATRIX

NOTE

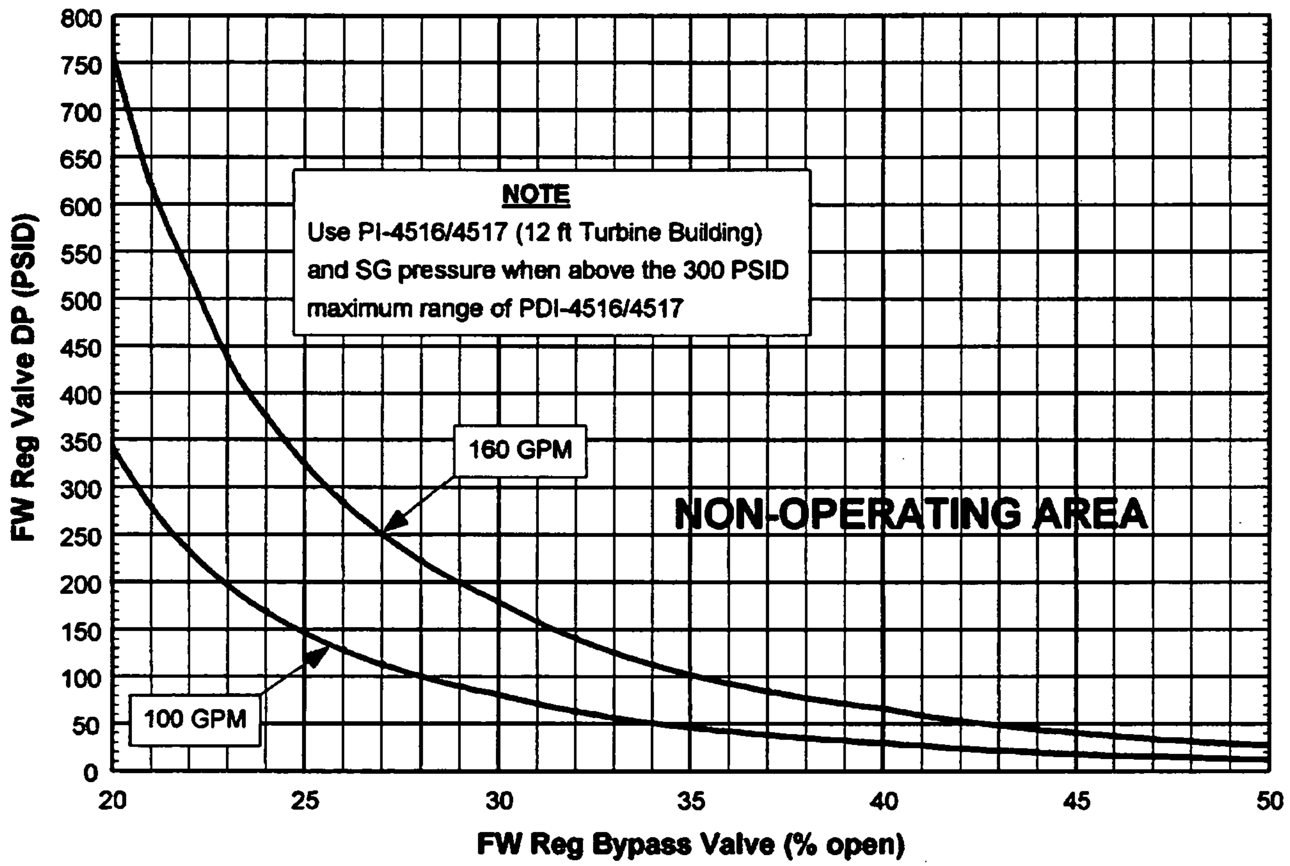
OK: indicates adequate equipment to support successful Once-Through-Cooling.

NOTE

Calculated minimum time to core uncovery is displayed for cases where adequate equipment to support successful Once-Through-Cooling is **NOT** available.

equipment	2 PORV			1 PORV		
	3 CHG PP	2 CHG PP	1 CHG PP	3 CHG PP	2 CHG PP	1 CHG PP
3 HPSI PP	OK	OK	OK	5 hours	3 hours	3 hours
2 HPSI PP	OK	OK	OK	5 hours	3 hours	3 hours
1 HPSI PP	OK	3 hours	2 hours	5 hours	3 hours	2 hours

MAIN FEEDWATER GOOSENECK PURGE FLOW



ATTACHMENT(19)

RESET AFAS START SIGNALS AT THE ACTUATION CABINETS

1. Verify **BOTH** SG levels are greater than (-)170 inches.

2. Verify the SG BD valve handswitches are in CLOSE:

   - 2-BD-4010-CV
   - 2-BD-4011-CV
   - 2-BD-4012-CV
   - 2-BD-4013-CV

3. Reset the AFAS Sensor Modules:

   a. Unlock and open the Sensor Cabinet front door.

   b. Reset the sensor module bistable(s) by momentarily pushing the RESET pushbutton on the SG LEVEL LOW module(s).

   c. Momentarily place the BISTABLE TRIP TEST/RESET toggle switch on the AIM module in RESET.

   d. Close and lock the Sensor Cabinet front door.

   e. Repeat steps 3.a through 3.d for **ALL** channels.

4. Reset the AFAS Logic Modules:

   a. Unlock and open the Logic Cabinet front door.

   b. Reset the logic module bistable by momentarily pushing the RESET pushbutton on the AFAS START module.

   c. Momentarily place the AFAS START TEST/RESET toggle switch on the AIM module in RESET.

   d. Check the TRIP light is extinguished.

   e. Close and lock the Logic Cabinet front door.

   f. Repeat steps 4.a through 4.e for the other Logic Cabinet.

5. Check the following extinguished:

   - "AFAS A ACTUATED" status panel alarm light on panel 2C04.
   - "AFAS B ACTUATED" status panel alarm light on panel 2C04.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE
UNIT 1 & 2

SEISMIC INSTRUMENTATION CHANNEL

STP M-260-0

REVISION 00301

This procedure is **EXEMPT** from 10CFR 50.59 / 10 CFR 72.48 Reviews.

Safety Related

CONTINUOUS USE
Read each step
before performing

Approval Authority : General Supervisor – I and C Maintenance

PERFORMANCE OF SURVEILLANCE TEST:

A. Test Performance

Permission to perform test:____________________/____________
SHIFT MANAGER DATE

B. Test completion, results review and approval (circle appropriate answer)

Accept. criteria in spec?	YES NO N/A	Adjustments Made?	YES NO N/A
As found results in spec?	YES NO N/A	CR submitted?	YES NO N/A
As left results in spec?	YES NO N/A	Malfunctions indicated	YES NO N/A

REMARKS, NATURE OF MALFUNCTION, OR ADJUSTMENT AND RESULTS

Test completed by: ____________________/____________
DATE

Completion acknowledged
and discrepancies noted: ____________________/____________
SHIFT MANAGER DATE

ANALYSIS OF RESULTS:____________________

SUPERVISOR: ____________________DATE________

ANALYSIS / COMMENTS:____________________

FUNCTIONAL SURVEILLANCE
TEST COORDINATOR: ____________________DATE________

EQSE (IF REQUIRED): ____________________DATE________

*PORC MEETING No.: ____________________DATE________

*PLANT GENERAL MANAGER: ____________________DATE________

*Required only if completed tests on SR and designated NSR structures, systems and components identified a malfunction or were out of specification.

Attach a separate sheet, if necessary, to document additional comments. Place additional cover sheet pages immediately after the initial cover sheet.

TABLE OF CONTENTS

LIST OF EFFECTIVE PAGES

Cumulative Changes 1

Page No.	Change No.	Page No.	Change No.	Page No.	Change No.
1	00301	25			
2	00301	26			
3		27			
4		28			
5	00301	29			
6		30			
7	00301	31			
8		32			
9	00301				
10	00301				
11	00301				
12					
13	00301				
14					
15					
16					
17					
18					
19					
20	00301				
21					
22					
23					
24					

1.0 PURPOSE

A. To provide detailed instructions for the Channel Check of the SMA-3, Strong Motion Accelerograph earthquake monitoring system.

2.0 APPLICABILITY/SCOPE

A. This procedure satisfies Technical Requirements Manual (TRM) TVR 15.3.4.1 and TVR 15.3.4.2.

B. Conditional steps which are not performed shall be marked N/A.

C. Check applicable reason for Surveillance Test:

[ ] Scheduled Surveillance

[ ] Plant Conditions requiring test (Explain in Pre-surveillance remarks)

[ ] Post Maintenance Operability Verification

Enter WO/CR number____________________

PRE-SURVEILLANCE REMARKS:

____

____

____

3.0 REFERENCES AND DEFINITIONS

A. Development References: System 65

- Technical Manual 12-778-12, Strong Motion Accelerograph SMA-2 & SMA-3.
- Technical Manual 12-778-13, Operating Instructions for SMP-1 Magnetic Tape Playback System.
- Technical Manual 12-778-14, Operating Instructions for SMA-3 Strong Motion Accelerograph System.
- Technical Manual 12-778-15, Triaxial Force-Balance Accelerometer FBA-3.

B. Performance References:

- None

C. Equipment Locations: All tests are in the Control Room for the associated equipment below:

- Seismic Control Panel 0YRC001, Control Room

Tag No	EIN
0YE001	200-065-IYE001
0YE002	200-065-IYE002
0YE003	200-065-IYE003
0YE004	200-065-IYE004
0YE005	200-065-IYE005
0YR001	200-065-IYR001
0YRC001	200-065-IYRC001

4.0 PREREQUISITES

A. Personnel Requirements:

- A minimum of one qualified person who SHALL meet the requirements of The Fleet Maintenance Training and Qualification Programs.
- When a procedure requires technicians at multiple locations to perform tasks that require qualification, a qualified person SHALL be at that location to oversee any task that the technician is not qualified to perform.

B. Specifications/Surveillances:

- None

C. Special Tools and Equipment Recommended:

- Bulk Tape Eraser
- Five Blank Cassette Tapes
- Fluke 45, Digital Multimeter (DMM) or equivalent
- Stopwatch

D. Spare Parts Required:

- None

E. Documentation and Support:

- Work Order may be required to replace ± 12 vdc batteries.

F. Signature / Initial Block:

NAME (Print)	SIGNATURE	INITIALS

4.0 PREREQUISITES (Continued)

G. Initial Conditions:

1. Plant in any mode.
2. Ensure an adequate supply of chart paper is available on the Magnetic Tape Playback system for recording.
3. Five spare cassette tapes have been obtained and erased using the bulk eraser.
4. Each spare tape has been inspected for the presence of a felt pad under the tape. If the felt pad is missing, obtain a new tape(s).
5. **PAGE CHECK** to ensure all pages are contained within.

The prerequisites listed above have all been satisfied.

_______________ / _______
JOB SUPERVISOR DATE

5.0 PRECAUTIONS

A. Ensure that equipment is returned to its normal lineup after completion of each test (including alarms and annunciators).

B. Extreme care should be taken while working on energized equipment.

C. Do not erase tapes which have earthquakes recorded on them.

D. Do not put on a calibration record nor remove a cassette if the yellow EVENT ALARM is on.

E. Stop the STP, and immediately notify the Shift Manager if unexpected conditions occur. Unexpected conditions include the following:

- Malfunctions
- Out of tolerance As Left items
- Conditions outside those allowed by TRM
- Other discrepancies appropriate for the specific STP

INITIALS

6.0 PERFORMANCE

A. **BRIEF** the OWC and the CRS on work to be performed. ______

6.1 SEISMIC INSTRUMENTATION CHECK

A. FUNCTIONAL TEST

1. **OBTAIN** SEISMIC System Key from CRS (Key #73). ______
2. **VERIFY** the "AC ON" light is lit. ______
3. On control panel 0YRC001. **INSERT AND TURN** the key switch to the "OFF" position. ______
4. **VERIFY** the "AC ON" light is extinguished. ______

> **NOTE:**
>
> In order to minimize the amount of paper used, step 6.1.A.5 should be reviewed prior to performance.

5. **OBTAIN** a calibration record for each of the five accelerometers using the following:
   a. **TURN** the key switch to "TEST" for 30+ seconds.
   b. **TURN** the key switch to "CALIB" for 1-2 seconds.
   c. **TURN** the key switch to "NAT FREQ" for 1-2 seconds.
   d. **TURN** the key switch back to "CALIB" for 1-2 seconds.
   e. **TURN** the key switch back to "TEST" for 1-2 seconds.
   f. **TURN** the key switch back to "OFF" **AND WAIT** 15-20 seconds to allow the internal time delay to reset.

______

INITIALS

6.1.A (CONTINUED)

6. **REMOVE** active tape cassettes from the Tape Transport on the recorder panel. ________

7. **UNPLUG** the AC supply for the Control Panel (upper cord) in back of the panel. ________

8. **TURN** key switch to the "TEST" position. ________

9. **PUSH** Battery Voltage selector up towards positive (+) **AND RECORD** AS FOUND reading in TABLE 1.

TABLE 1			
DESIRED VDC	MINIMUM	AS FOUND	MAXIMUM
+12.5	+11.5		+13.5

10. **PUSH** Battery Voltage selector down towards negative (-) **AND RECORD** AS FOUND reading in TABLE 2.

TABLE 2			
DESIRED VDC	MINIMUM	AS FOUND	MAXIMUM
-12.5	-13.5		-11.5

11. **IF** the voltage is less than +11.5 volts DC for steps 6.1.A.9, **THEN PERFORM** the following:

    a. **REPLACE** the battery in accordance with MN-1-101.

    b. **DOCUMENT** the WO#: ____________________

12. **IF** the voltage is greater than -11.5 volts DC for steps 6.1.A.10, **THEN PERFORM** the following:

    a. **REPLACE** the battery in accordance with MN-1-101.

    b. **DOCUMENT** the WO#: ____________________

6.1.A (CONTINUED)

NOTE:

Battery age is determined by the date stamped on a label on the top of the case.

13. **RECORD** the date of manufacture for the two batteries.

    a. +12 VDC battery Date_________

    b. -12 VDC battery Date_________

14. **IF** either battery is more than 5 years old, **THEN PERFORM** the following:

    a. **REPLACE** the battery in accordance with MN-1-101.

    b. **DOCUMENT** the battery that was replaced

    - +12 VDC Battery replaced [ ] YES [ ] NO
    - -12 VDC Battery replaced [ ] YES [ ] NO

    c. **DOCUMENT** the WO# ____________________

15. **IF** either battery was replaced, **THEN PERFORM** the following for the replacement battery.

    a. **PUSH** Battery Voltage selector up towards positive (+) **AND RECORD** AS LEFT reading in TABLE 3.

TABLE 3			
DESIRED VDC	MINIMUM	AS LEFT	MAXIMUM
+12.5	+11.5		+13.5

    b. **PUSH** Battery Voltage selector down towards negative (-) **AND RECORD** AS LEFT reading in TABLE 4.

TABLE 4			
DESIRED VDC	MINIMUM	AS LEFT	MAXIMUM
-12.5	-13.5		-11.5

INITIALS

6.1.A (CONTINUED)

NOTE:

Turn the key switch with as close to a snap action as possible.

16. Simultaneously **TURN** the key switch to the "OPERATE" position **AND RECORD** the amount of time the tape transport spools continue to rotate with a stopwatch in TABLE 5.

TABLE 5			
DESIRED TIME (SECONDS)	MINIMUM	AS FOUND	MAXIMUM
11.0	7.0		15.0

17. **VERIFY** the Event Indicator has turned "WHITE". ________

18. **TURN** the key switch to the "OFF" position. ________

19. **PLUG** in the AC supply cord for the Control Panel in back of the panel. ________

____
CV

20. On the Magnetic Tape Playback Unit SMP-1, **PERFORM** the following:

    a. **PLACE** the Chart Drive Switch to "OFF". ________

    b. **PLACE** the Power Select switch to "BATTERY RUN" position. ________

21. **UNPLUG** the AC supply for the Magnetic Tape Playback Unit (lower cord) in back of the panel. ________

INITIALS

6.1.A (CONTINUED)

22. **MEASURE AND RECORD** the Voltage on the battery terminals for the SMP-1 in the rear of the panel in TABLE 6.

TABLE 6			
DESIRED VDC	MINIMUM	AS FOUND	MAXIMUM
+12.5	+11.5		+13.5

23. **IF** the voltage in step 6.1.A.22 is less than +11.5 volts DC, **THEN PERFORM** the following:

    a. **REPLACE** the battery in accordance with MN-1-101.

    b. **DOCUMENT** the WO# ____________________

24. **RECORD** the date of manufacture for the battery in the SMP-1.

    - SMP-1 +12 VDC battery Date__________

25. **IF** the battery is more than 5 years old, **THEN PEFORM** the following:

    a. **REPLACE** the battery in accordance with MN-1-101.

    b. **DOCUMENT** the WO# ____________________

26. **PLUG** in the AC supply cord for the Magnetic Tape Playback Unit in the rear of the panel. _______

____
CV

27. On the Magnetic Tape Playback Unit SMP-1, **TURN** the power select switch to "AC RUN" position. _______

NOTE:

A gain factor of 1 is 1g full scale.

28. **ENSURE** the Gain Factor switch is in position "1". _______

INITIALS

6.1.A (CONTINUED)

29. **PLACE** the Stylus Drive "ON/OFF" switch to "ON". _______

30. **PLACE AND HOLD** the Stylus Drive RUN/CAL/ZERO switch to "ZERO". _______

NOTE:

The position control is used to center the Stylus on the center line of the chart paper.

31. **PERFORM** the following:

    a. **CENTER** the Stylus on the center line of the chart paper.

    b. **PLACE** the Chart Drive switch to "25 mm/sec." to obtain a short trace.

    c. **REPEAT** steps 6.1.A.31.a and 6.1.A.31.b **UNTIL** the Stylus is centered on chart paper. _______

    d. **RELEASE** the Stylus Drive RUN/CAL/ZERO switch. _______

32. **IF** a proper trace is NOT present, **THEN ADJUST** Stylus Heat Control for a proper trace. _______

33. **PLACE AND HOLD** the Stylus Drive RUN/CAL/ZERO switch to "CAL". _______

NOTE:

Ensure the pen is not hitting the mechanical stop while adjusting GAIN/CAL pot during the performance of Step 6.1.A.34. The GAIN/CAL potentiometer may have to be lowered in order to determine whether full scale deflection is indicated.

34. **PERFORM** the following:

    a. **IF** full scale deflection is indicated, **THEN RELEASE** the Stylus Drive RUN/CAL/ZERO switch **AND PROCEED** to step 6.1.A.35. _______

    b. **IF** full scale deflection is not indicated, **THEN ADJUST** the GAIN/CAL potentiometer for full scale deflection. _______

    c. **RELEASE** the Stylus Drive RUN/CAL/ZERO switch. _______

INITIALS

6.1.A (CONTINUED)

35. **PLACE** the Chart Drive Switch to the "OFF" position. ________

NOTE:

All three data channels of each tape on the SMP-1 will be verified to contain the presence and acceptability of the following items (Attachment 2 is a typical test record):

- calibration offset (nominal sensitivity)
- natural frequency (system freq. response)
- damping (sensor and system damping)
- background noise (signal continuity)
- output balance and timing marks.

36. **SELECT** a cassette recording of an accelerometer calibration.

37. On the Playback Unit, **PULL** down the tape transport slide **AND INSERT** the cassette to be played in the transport mechanism label side up.

38. **PLACE** the Transport "ON/OFF" switch to "ON".

39. **PULL** down and to the left on the slide handle to rewind the tape.

40. **PLACE** the Transport "ON/OFF" switch to "OFF".

NOTE:

Channel 1 plays back the signal from the longitudinal axis.
Channel 2 plays back the signal from the transverse axis.
Channel 3 plays back the signal from the vertical axis

41. **TURN** Channel Select switch to playback an axis.

NOTE:

Tape Playback will occur upon completion of step 6.1.A.42.

42. **PLACE** the Transport "ON/OFF" switch to "ON".

6.1.A (CONTINUED)

NOTE:

When the playback unit begins playing back a recorded signal, the timing marker on the right hand side of the chart paper will begin making ½ second interval marks on the paper. When the record is over, the timing marks will stop. Attachment 2 is a typical test record.

43. **PERFORM** the following:

    a. **ADJUST** the tape position for the first test record.

    b. **MONITOR** the Stylus for movement that indicates a testing record is present.

    c. **REWIND** the tape to a point just prior to the Stylus movement observed in step 6.1.A.43.b.

    d. **PLACE** the Chart Drive switch to the "25 mm/sec." position **UNTIL** the first test record has been printed.

    e. **PLACE** the Chart Drive switch to the "OFF" position.

    f. **ADJUST** the tape position for the second test record.

    g. **MONITOR** the Stylus for movement that indicates a testing record is present.

    h. **REWIND** the tape to a point just prior to the Stylus movement observed in step 6.1.A.43.g.

    i. **PLACE** the Chart Drive switch to the "25 mm/sec." position **UNTIL** the second test record has been printed.

    j. **PLACE** the Chart Drive switch to the "OFF" position.

    k. **INITIAL** for the channel tested in TABLE 7 below.

TABLE 7

	0YE001	0YE002	0YE003	0YE004	0YE005
Channel 1					
Channel 2					
Channel 3					

INITIALS

6.1.A.43 (CONTINUED)

l. **MARK** the chart paper for each cassette recording to identify the Accelerometer Number, Channel Number, and Test Record Number.

m. **SELECT** the next channel that will be tested for the Accelerometer under test.

n. **REPEAT** steps 6.1.A.43.a through 6.1.A.43.m for the remaining channels of the accelerometer under test.

44. **VERIFY** Transport ON/OFF switch is in the "OFF" position.

45. **REPEAT** steps 6.1.A.36 through 6.1.A.44 for the remaining Accelerometers to be tested. ________

46. **PLACE** the Stylus Drive ON/OFF switch to "OFF." ________

47. **PLACE** Channel Select Switch to "OFF." ________

48. **IF** the tapes are NOT completely rewound on the left reel, **THEN USE** the play back unit to rewind the tape. ________

49. **TURN** the Power Selector switch to the "BATTERY CHARGER" position. ________

50. **ENSURE** each tape is clearly marked designating corresponding tape transport. ________

51. **INSERT** tapes into each designated tape transport. ________

INITIALS

6.1.A (CONTINUED)

NOTE:

The slide handle may have to be momentarily pulled down if the tape stalls during performance of step 6.1.A.52.

52. **TURN** key switch to "TEST" for 15 seconds **AND ENSURE** the following:

    - Indicator is black ________
    - Event Alarm is illuminated yellow ________
    - Control Room annunciator is received ________
    - Leaders are wound on the tape reels. ________

53. **TURN** key switch to "OFF". ________

NOTE:

In order to minimize the amount of paper used, step 6.1.A.54 should be reviewed prior to performance.

54. **OBTAIN** a calibration record for each of the five accelerometers using the following:

    a. **TURN** the key switch to "TEST" for 30+ seconds.

    b. **TURN** the key switch to "CALIB" for 1-2 seconds.

    c. **TURN** the key switch to "NAT FREQ" for 1-2 seconds.

    d. **TURN** the key switch back to "CALIB" for 1-2 seconds.

    e. **TURN** the key switch back to "TEST" for 1-2 seconds.

    f. **TURN** the key switch back to "OFF" **AND WAIT** 15-20 seconds to allow the internal time delay to reset.

    ____

55. **TURN** the key switch to "OPERATE". ________

56. **ENSURE** that the Event Indicator is BLACK. ________

INITIALS

6.1.A (CONTINUED)

57. **VERIFY** Control Room Annunciator is clear. ________

58. **VERIFY** that the "AC ON" light is lit. ________

59. **ENSURE** an adequate supply of chart paper remains to record possible seismic events. ________

60. **REMOVE** the key from the key switch **AND RETURN** to OPERATIONS. ________

61. **VERIFY** the following on the Chart printouts, (Reference Attachment 2):

    a. Calibration amplitude (12.5 $\pm$ 2.5 increments)

    b. The presence and acceptable appearance of each of the following items:

        (1) Natural frequency (system frequency response)

        (2) Damping (sensor and system damping)

        (3) Background noise (signal continuity)

        (4) Output balance and timing marks

____

62. **IF** review of all data reveals any discrepancies, **THEN NOTIFY** the Shift Manager, System Manager, and RMGS. ________

63. **RETAIN** Tapes for review by System Manager. ________

64. **RECORD** Test Equipment used during performance of this Surveillance Test Procedure.

INSTRUMENT	SERIAL NUMBER	MODEL NUMBER	CAL DUE DATE

7.0 POST-PERFORMANCE ACTIVITIES

A. **ATTACH** chart paper recordings from Step 6.1.A.45 to the corresponding Attachment 3 sheets on pages 23 through 32. _______

B. **PAGE CHECK** to ensure all pages are contained within.

_______________/_____
PERFORMED BY DATE

8.0 BASES

- None

9.0 RECORDS

A. Records generated by this procedure SHALL be captured and controlled. Prior to transferring records to Records Management for retention, legibility and completeness of the record SHALL be verified by the transmitting organization.

B. Records generated by this procedure are identified as Lifetime and SHALL be retained for the lifetime of Calvert Cliffs Nuclear Power Plant.

C. This procedure has been written under the guidance of, and is controlled by CNG-PR-1.01-1011, Control Of Station-Specific Procedure Change Process.

D. This procedure has been written under the guidance of, and is controlled by EN-4-104, Surveillance Testing.

E. The contents of this procedure SHALL be retained in accordance with CNG-PR-3.01-1000, Records Management.

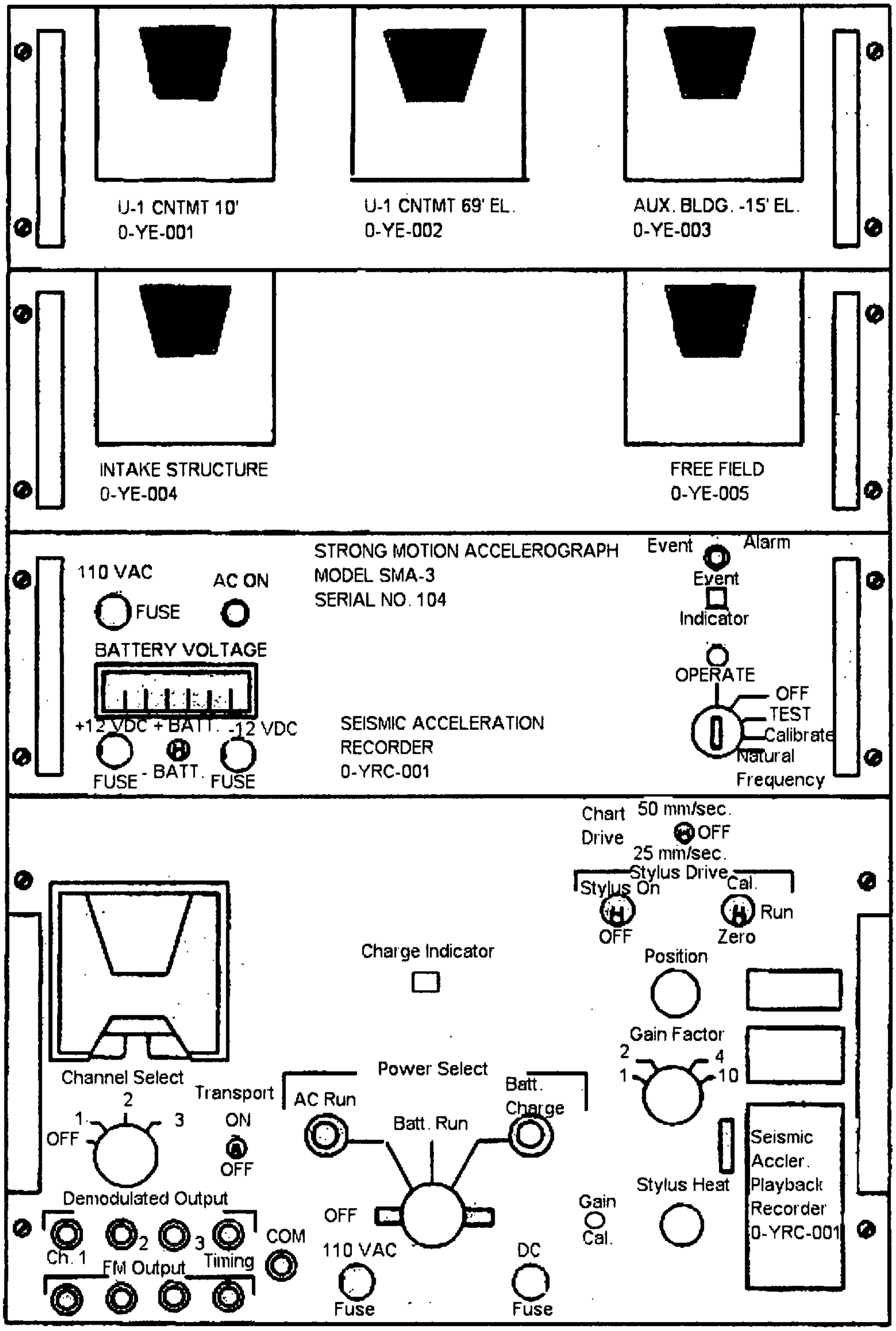
10.0 ATTACHMENTS:

A. ATTACHMENT 1, SEISMIC INSTRUMENT PANEL

B. ATTACHMENT 2, TYPICAL TEST RECORD

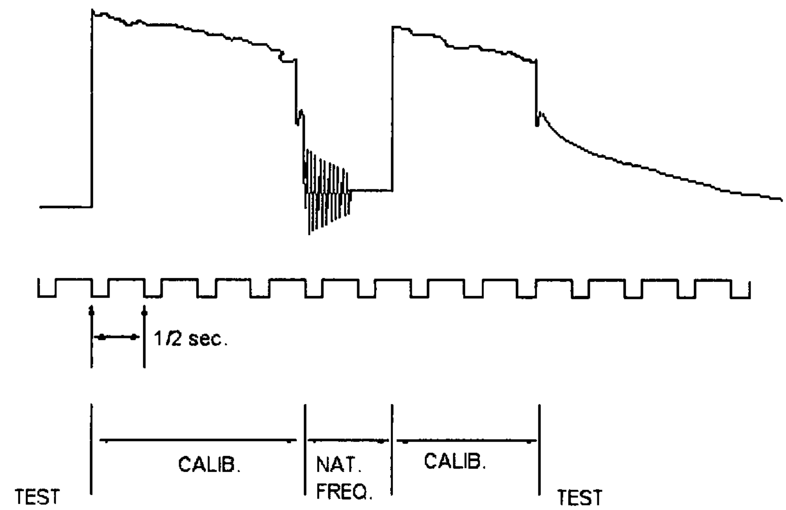
C. ATTACHMENT 3, CALIBRATION RECORDS

ATTACHMENT 1
SEISMIC INSTRUMENTATION PANEL

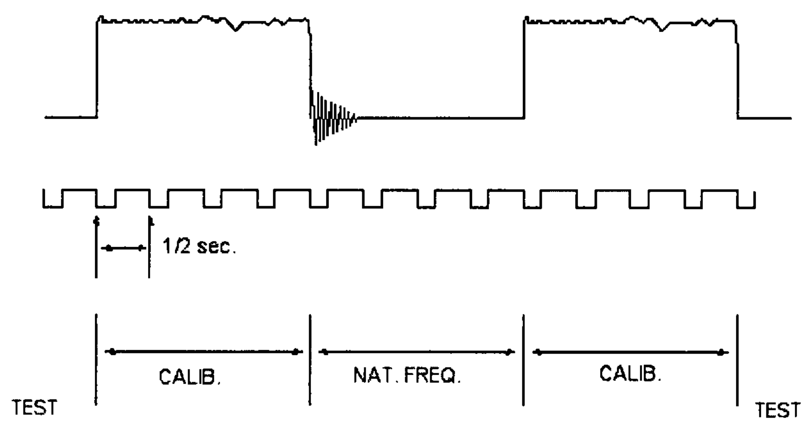


ATTACHMENT 2

TYPICAL TEST RECORD



TYPICAL TEST RECORD - ELECTROMAGNETIC ACCELEROMETER (EMA)



TYPICAL TEST RECORD - FORCED BALANCE ACCELEROMETER (FBA)

ATTACHMENT 3 CALIBRATION RECORD
(Page 1 of 10)

First Calibration Record Channel 0YE001

LOCATION: 10' Level, Containment Building Floor

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 2 of 10)

First Calibration Record Channel 0YE002

LOCATION: 69' Level, Containment Building Floor

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 3 of 10)

First Calibration Record Channel 0YE003

LOCATION: -15' Level, Aux Building

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 4 of 10)

First Calibration Record Channel 0YE004

LOCATION: 3' Level, Intake Structure

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 5 of 10)

First Calibration Record Channel 0YE005

LOCATION: Free Field

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 6 of 10)

Second Calibration Record Channel 0YE001

LOCATION: 10' Level, Containment Building Floor

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 7 of 10)

Second Calibration Record Channel 0YE002

LOCATION: 69' Level, Containment Building Floor

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 8 of 10)

Second Calibration Record Channel 0YE003

LOCATION: -15' Level, Aux Building

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 9 of 10)

Second Calibration Record Channel 0YE004

LOCATION: 3' Level, Intake Structure

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

ATTACHMENT 3 CALIBRATION RECORD (Continued)
(Page 10 of 10)

Second Calibration Record Channel 0YE005

LOCATION: Free Field

LONGITUDINAL AXIS

TRANSVERSE AXIS

VERTICAL AXIS

- END -

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

AOP-11

CONTROL ROOM EVACUATION AND SAFE SHUTDOWN NON-FIRE CONDITIONS

REVISION 2

Safety Related

Approval Authority: 5/14/02
signature/date

Effective Date: 05-15-02

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-41	2
ATTACHMENT NUMBER	**REVISION**
1	2

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
None	None

TABLE OF CONTENTS

I. PURPOSE

The purpose of this procedure is to provide a means of shutting down the Unit from outside the Control Room and maintaining the Unit in a Mode 3 (hot standby) condition until plant control is reestablished from the Control Room.

II. ENTRY CONDITIONS

1. Any non-fire condition which, in the opinion of the Shift Manager, exposes Control Room personnel to a harmful operating environment.

2. Any non-fire condition which, in the opinion of the Shift Manager, impedes plant control from the Control Room.

III. PRECAUTIONS

The following specific precautions apply prior to or throughout this procedure.

A. WARNINGS

1. Other plant areas may be affected by the same conditions causing the Control Room evacuation.

B. CAUTIONS

1. When the Pressurizer heaters are controlled from panel 1C43, the low level cutoff at 101 inches is inoperable.
2. Valid ESFAS and AFAS signals to equipment shall **NOT** be overridden or blocked unless specifically directed in this procedure. A valid signal is a signal that at the time of initiation, correlated to plant parameters (e.g., the monitored parameter actually reached its setpoint value).

C. NOTES

1. This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM

A. **(RO)** TRIP THE REACTOR.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Trip the Reactor by depressing **ONE** set of Manual Reactor Trip Buttons at 1C05 or 1C15.

2. **IF** RCS dilution is in progress,
   THEN secure RC M/U PPs.

3. **GO TO** the Main Turbine Front Standard to perform Section V, Step A.

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM...............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM

B. **(CRO)** TRIP THE MAIN TURBINE, SGFPs AND SECURE BLOWDOWN.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Before leaving the Control Room, perform the following actions:
   a. Trip the Main Turbine by depressing the Turbine TRIP button at 1C02.
   b. Trip 11 and 12 SGFPs at 1C03.
   c. Shut the S/G B/D valves:
      - 1-BD-4010-CV
      - 1-BD-4011-CV
      - 1-BD-4012-CV
      - 1-BD-4013-CV
2. If time permits, make the following a site wide page announcement:

   "The Control Room is being evacuated. Plant operators report to their safe shutdown stations, all persons stay clear of the Control Room."
3. **GO TO** Unit 1 45' Switchgear Room to perform Section V, Step C.

C. **(ALL PERSONNEL)** EVACUATE THE CONTROL ROOM.

1. **WHEN** evacuation is ordered by the SM/CRS,
   THEN ALL personnel are to leave the Control Room.
2. Report to Safe Shutdown Stations.

END of Section IV

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM................5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG.................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

A. (RO) MANUALLY TRIP THE MAIN TURBINE.

1. Manually trip the Unit 1 Main Turbine at the Front Standard.
2. **GO TO** Unit 1 45' Switchgear Room.
3. Notify 1C43 that the Main Turbine is tripped.

B. (RO) SHUTDOWN 11 AND 12 CEDM MG SETS.

1. On the CEDM MG Set Control Panel:
   a. Depress the Local LOAD OFF Pushbutton.
   b. Depress the Remote LOAD OFF Pushbutton.
   c. Depress and hold the Local MOTOR OFF Pushbutton until the MOTOR ON light deenergizes.
   d. Depress and hold the Remote MOTOR OFF Pushbutton until the MOTOR ON light deenergizes.

C. (CRO) UNLOCK SAFE SHUTDOWN KEY LOCKER AND EQUIPMENT LOCKER.

1. Open 11 ADV Handvalve enclosure.
2. Obtain the Safe Shutdown Key Locker door key.
3. Open the Safe Shutdown Key Locker.
4. Obtain the CRO key ring at the Safe Shutdown Key Locker.

NOTE
The key for the Safe Shutdown Equipment Locker is on the 1C43 Panel key ring.

5. Open the Safe Shutdown Equipment Locker.
6. Obtain CRO equipment at the Safe Shutdown Equipment Locker.

V. ACTIONS OUTSIDE THE CONTROL ROOM

D. **(SM)** DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.

NOTE
The SM may designate personnel to notify the offsite agencies.

WARNING
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Determine the appropriate emergency response actions **PER** the ERPIP.
2. Determine reporting requirements of RM-1-101, REGULATORY REPORTING.

E. **(OSO)** OBTAIN RADIOS AND REPORT TO 1C43 AND 2C43.

WARNING
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. **GO TO** the Fire Brigade Locker and retrieve two portable radios.
2. **GO TO** 1C43 and give one radio to the SM.
3. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
4. **GO TO** 2C43 and give the other radio to the CRS.
5. Make the following announcement:

   "The Control Room has been evacuated. The Plant is being controlled from 1C43 and 2C43. All personnel are required to stay clear of the following areas: Control Room, Cable Spreading Room, Shift Managers Office, Security Central Alarm Station, Technical Support Center, Technical Support Computer Room and Control Room Computer Rooms."

6. **GO TO** 1C43 to provide additional assistance where needed.

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM...............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

F. **(TBO)** OBTAIN EQUIPMENT, THEN TRIP 11 AND 12 SGFPs.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
2. **GO TO** the SGFPs 12' Turbine Building.
3. Manually trip the SGFPs.
   - PULL-TO-TRIP 11 SGFP
   - PULL-TO-TRIP 12 SGFP
4. **GO TO** the AFW Pump Room to perform Section V, Step O.

V. ACTIONS OUTSIDE THE CONTROL ROOM

G. **(ABO)** OBTAIN EQUIPMENT, THEN GO TO 45 FOOT AUXILIARY BUILDING.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
2. **GO TO** 45' Auxiliary Building to the telephone by the Unit 1 NSSS Sample Sink.
3. Notify 1C43 upon arrival.

H. **(CRO)** VERIFY REACTOR IS SHUTDOWN.

1. Verify Reactor Power trending to or is less than 10^{-4}% power and lowering.
2. **WHEN** Reactor Power is less than 10^{-4}% power and constant or lowering, **THEN** Reactivity Control is satisfactory.

I. **(CRO)** INITIALIZE ADV CONTROLLERS ON 1C43.

NOTE

Adjustment of the ADV controllers past the controller detent pin will stop valve motion.

1. Place 11 ADV CONTR, 1-HC-4056A, to SHUT.
2. Place 12 ADV CONTR, 1-HC-4056B, to SHUT.
3. Notify the RO to align 11 and 12 ADVs to 1C43 **PER** Section V, Step J.

1C43.....3501/5625/3511	AFW...................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM...............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG.................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

J. **(RO)** ALIGN 11 AND 12 ADVs TO 1C43.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.

2. **WHEN** notified to align 11 and 12 ADVs to 1C43, **THEN GO TO** the ADV Handvalve enclosure.

3. Place the following handvalves to POSITION 2:

   - 11 ADV Aux Shutdown Control Transfer, 1-HV-3938A
   - 11 ADV Quick Open Override Handvalve, 1-HV-3938B
   - 12 ADV Aux Shutdown Control Transfer, 1-HV-3939A
   - 12 ADV Quick Open Override Handvalve, 1-HV-3939B

4. Notify the CRO that the ADVs are aligned to 1C43.

V. ACTIONS OUTSIDE THE CONTROL ROOM

K. **(CRO)** VERIFY COLD LEG TEMPERATURES.

1. Verify the Turbine Bypass Valves are maintaining T_{COLD} between 525 and 535° F.

2. **IF** T_{COLD} is greater than 535° F,
   AND NOT trending to less than 535° F,
   THEN adjust 11 and 12 ADV CONTRs, 1-HC-4056A and 1-HC-4056B, as needed to maintain T_{COLD} between 525 and 535° F.

3. **IF** T_{COLD} is less than 525° F,
   AND NOT trending to greater than 525° F,
   THEN perform the following actions:

NOTE
The ABO is located at the Unit 1 NSSS Sample Sink telephone.

   a. Notify the ABO to shut the MSIVs **PER** Section V, Step L.

   b. **WHEN** notified that the MSIVs are shut,
      THEN adjust 11 and 12 ADV CONTRs, 1-HC-4056A and 1-HC-4056B, as needed to maintain T_{COLD} between 525 and 535° F.

V. ACTIONS OUTSIDE THE CONTROL ROOM

L. **(ABO)** IF NOTIFIED, THEN SHUT BOTH MSIVs.

NOTE

Performance of this step may not be required. Direction to perform this step will be given from 1C43.

CAUTION

Performance of this step will result in a fast closure of the MSIVs.

1. **IF** notified to shut the MSIVs,
   THEN perform the following actions:

   a. Shut Instrument Air Isolation to 11 MSIV Hydraulic Pump, 1-IA-1069.

   b. Perform the following actions to shut 11 MSIV:

      (1) Remove the Dump Solenoid Valve Cap on **ONE** of the following:

      - 11 MSIV Dump SV Channel A, 1-MSH-4042A-SV

      OR

      - 11 MSIV Dump SV Channel B, 1-MSH-4042B-SV

      (2) Place a wrench on the selected Dump Solenoid stem nut.

      (3) Rotate the wrench in the clockwise direction (approximately three turns) to bleed hydraulic fluid back to the reservoir.

   c. Shut Instrument Air Isolation to 12 MSIV Hydraulic Pump, 1-IA-1070.

(continue)

V. ACTIONS OUTSIDE THE CONTROL ROOM

L.1 (continued)

d. Perform the following actions to shut 12 MSIV:

(1) Remove the Dump Solenoid Valve Cap on **ONE** of the following:

- 12 MSIV Dump SV Channel A, 1-MSH-4047A-SV

OR

- 12 MSIV Dump SV Channel B, 1-MSH-4047B-SV

(2) Place a wrench on the selected Dump Solenoid stem nut.

(3) Rotate the wrench in the clockwise direction (approximately three turns) to bleed hydraulic fluid back to the reservoir.

2. Notify 1C43 that the MSIVs are shut.

3. **GO TO** 45' Auxiliary Building to the telephone by the Unit 1 NSSS Sample Sink.

M. **(STA)** COMMENCE SAFETY FUNCTION STATUS CHECKS.

<u>NOTE</u>
Data to complete the Safety Function Status Checks may be obtained at the 72' Computer Room.

<u>WARNING</u>
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Monitor plant status **PER** Section VII., <u>SAFETY FUNCTION STATUS CHECK</u>.

1C43.....3501/5625/3511	AFW....................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM................5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG.................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104..............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

N. **(CRO)** COMPLETE INITIALIZATION OF CONTROLLERS ON 1C43.

NOTE
Adjustment of Controllers past the controller detent pin will stop valve motion.

1. Place 11 AFW PP SPEED CONTR, 1-HC-3987B, to MIN SPD.
2. Place 12 AFW PP SPEED CONTR, 1-HC-3989B, to MIN SPD.
3. Place 11 S/G FLOW CONTR, 1-HC-4511B, to MIN FLOW.
4. Place 12 S/G FLOW CONTR, 1-HC-4512B, to MIN FLOW.
5. Place 11 S/G FLOW CONTR, 1-HC-4525B, to MIN FLOW.
6. Place 12 S/G FLOW CONTR, 1-HC-4535B, to MIN FLOW.
7. Notify the TBO to align AFW Pump Speed Control to 1C43 **PER** Section V, Step O.

O. **(TBO)** ALIGN AFW PUMP SPEED CONTROL TO 1C43.

1. **WHEN** notified to align the AFW Pump Speed Control to 1C43,
   THEN perform the following actions:
   a. Place 11 AFW Pump Speed Control Handvalve, 1-HV-3987, to POSITION 2.
   b. Place 12 AFW Pump Speed Control Handvalve, 1-HV-3989, to POSITION 2.
2. Notify 1C43 that AFW Speed Control is aligned to 1C43.
3. **GO TO** the SRW Pump Room to perform Section V, Step P.

V. ACTIONS OUTSIDE THE CONTROL ROOM

P. (TBO) ALIGN THE AFW FLOW CONTROL TO 1C43.

1. In the SRW Pump Room Upper Level,
   Place in POSITION 2 **ALL** AFW System Valves listed below:

   - **NORTH WALL** (In Hand Transfer Box)
     - 1-IA-4511-HV
     - 1-IA-4512-HV

   - **Stanchion L.O.9** between 1-AFW-4525-CV and 1-AFW-4535-CV (In Hand Transfer Box)
     - 1-IA-4525-HV
     - 1-IA-4535-HV

   - **Southwest Corner** next to U-1 to U-2 AFW X-conn CV, 1-AFW-4550-CV
     - 1-IA-4070-HV
     - 1-IA-4071-HV

2. Notify 1C43 that the AFW flow control is aligned to 1C43.

3. **GO TO** the AFW Pump Room and verify AFW Pump operation **PER** Section V, Step Q.

Q. (TBO) VERIFY AFW PUMP OPERATION.

1. **IF** the in-service AFW Pump has tripped,
   THEN reset the Throttle/Stop Valve, 1-MS-3986 (1-MS-3988):

NOTE
Cycling the governor MANUAL ADJUSTMENT knob after Turbine Operation releases a hydraulic lock on the speed setting piston.

   a. Reset the Turbine Governor Speed Control as follows:

      (1) Turn the governor MANUAL ADJUSTMENT knob fully counterclockwise to MINIMUM position.

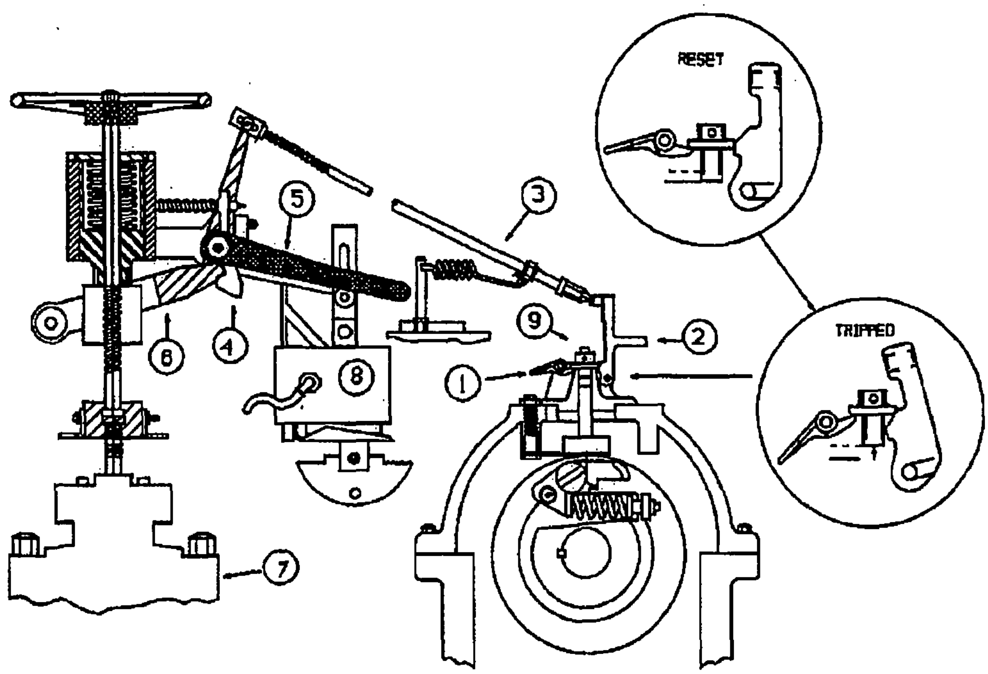
      (2) Turn the governor MANUAL ADJUSTMENT knob fully clockwise to MAXIMUM position.

(continue)

V. ACTIONS OUTSIDE THE CONTROL ROOM

Q.1 (continued)

b. **IF** the Overspeed Device has been tripped,
THEN reset the Overspeed Trip by momentarily pulling the VALVE TRIP LEVER LINKAGE Connecting Rod (3) against spring tension toward the AFW Pump Turbine.



1. TURBINE MANUAL TRIP LEVER
2. HEAD LEVER
3. VALVE TRIP LEVER LINKAGE
4. TRIP HOOK
5. TRIP LEVER (VALVE)
6. VALVE TRIP/LATCH LEVER
7. TURBINE THROTTLE STOP VALVE
8. TURBINE TRIP SOLENOID
9. TAPPET NUT

NOTE
Proper engagement between the Tappet Nut and the Head Lever is critical to prevent inadvertent tripping of the AFW Pump.

c. Ensure the flat side of the TAPPET NUT (9) is seated firmly against the HEAD LEVER (2).

(continue)

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM................5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

Q.1 (continued)

d. Reset the Throttle/Stop Valve:

   (1) Rotate the handwheel clockwise until the Trip/Latch Lever is lifted over the Trip Hook.

   (2) Ensure the Trip/Latch Lever and the Trip Hook are fully engaged.

e. Slowly rotate the handwheel counterclockwise until the Throttle/Stop Valve, 1-MS-3986 (1-MS-3988), is fully open.

2. **IF** the in service AFW Pump fails to operate,
   THEN perform the following actions:

   a. Notify 1C43 that the standby AFW pump will be placed in service.

   b. Slowly rotate the handwheel counterclockwise until the Throttle/Stop Valve, 1-MS-3986 (1-MS-3988), is fully open.

   c. Notify 1C43 that the standby AFW PP has been placed in service.

3. Periodically monitor the operating AFW Pump.

4. **GO TO** the Main Turbine to perform Section V, Step AA.

V. ACTIONS OUTSIDE THE CONTROL ROOM

R. **(CRO)** INITIATE AFW FLOW TO SGs.

1. **WHEN** notified that AFW flow control is aligned to 1C43,
   THEN slowly feed the S/Gs by **ANY** of the following methods
   AND restore S/G level to 0 inches.

   - Adjusting 11 AUX FD PP SPEED CONTR, 1-HC-3987B
   - Adjusting 12 AUX FD PP SPEED CONTR, 1-HC-3989B
   - Adjusting 11 S/G STM DRIVEN AFW FLOW CONTR, 1-HC-4511B
   - Adjusting 12 S/G STM DRIVEN AFW FLOW CONTR, 1-HC-4512B

2. **IF** SG level can **NOT** be restored using the Steam Driven AFW Pumps,
   AND 13 AFW PP is **NOT** already running,
   THEN notify the RO to start 13 AFW PP **PER** step S.

3. **IF** 13 AFW PP has been started,
   THEN slowly feed the S/Gs by performing the folowing actions
   AND restore S/G level to 0 inches.

   - Adjusting 11 S/G MOTOR DRIVEN AFW FLOW CONTR, 1-HC-4525B.
   - Adjusting 12 S/G MOTOR DRIVEN AFW FLOW CONTR, 1-HC-4535B.

S. **(RO)** START 13 AFW PP.

1. **IF** notified to start 13 AFW PP,
   THEN perform the following actions:

   a. Depress the CLOSE pushbutton on breaker 152-1116.

   b. Notify 1C43 that 13 AFW PP has been started.

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM...............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

V. ACTIONS OUTSIDE THE CONTROL ROOM

T. (CRO) MONITOR PRESSURIZER LEVEL.

1. Check Pressurizer level stabilizes between 80 and 180 **AND** is trending to 160 inches.
2. **IF** Pressurizer level has **NOT** stabilized, **THEN** perform the following actions:
   a. Determine which Charging Pump(s) are needed to stabilize Pressurizer level.
   b. Notify the RO to manually operate the Charging Pump(s) **PER** Section V, Step V.

U. (CRO) ENERGIZE PRESSURIZER BACKUP HEATER.

CAUTION
The Pressurizer heater low level cutout at 101 inches is inoperable when heaters are operated at 1C43.

1. **IF** Pressurizer pressure is less than 2225 PSIA **AND** Pressurizer level is greater than 101 inches, **THEN** raise Pressurizer pressure:
   a. Insert the keys into the following Pressurizer Backup Heater Transfer Controllers:
      - 11 BACKUP HTR TRANSFER CONTR 1-HS-100-4A
      - 13 BACKUP HTR TRANSFER CONTR 1-HS-100-6A

NOTE
Any combination of Pressurizer Heaters may be used to restore Pressurizer pressure.

   b. Turn key to ON to energize the selected Pressurizer Heater(s).
   c. Cycle the Pressurizer Backup Heater Transfer Controller(s) as necessary to maintain Pressurizer pressure between 2225 and 2275 PSIA.

V. ACTIONS OUTSIDE THE CONTROL ROOM

V. **(RO)** MANUALLY OPERATE THE CHARGING PUMP(S).

CAUTION
Performance of this step may NOT be required. Direction to perform this step will be given from 1C43.

1. **IF** notified to manually operate the Charging Pumps
   THEN perform the following actions as required:

   a. Start the Charging Pump(s) by performing the following actions:

      (1) If necessary, charge the breaker Closing Spring for the charging pump to be started:

      - (11 Charging Pump breaker) 52-1115
      - (13 Charging Pump breaker) 52-1104
      - (12 Charging Pump breaker) 52-1415
      - (13 Charging Pump breaker) 52-1404

      (2) Depress the PUSH TO CLOSE pushbutton on the pump breaker.

   b. Stop the Charging Pump(s) by performing the following actions:

      (1) Depress the TRIP pushbutton on the pump breaker.

      (2) Charge the closing spring, if required.

2. Notify 1C43 of Charging Pump status.

V. ACTIONS OUTSIDE THE CONTROL ROOM

W. (CRO) MAKEUP TO THE VCT.

1. Notify the STA to monitor VCT level, L226, on the Plant Computer.
2. **WHEN** VCT makeup is desired,
   THEN notify the ABO to deenergize CVCS MOVs **PER** Section V, Step X.
3. **WHEN** 1-MOV-504 and 1-MOV-501 have been deenergized,
   THEN notify the ABO to align CHG Pump suction to the RWT **PER** Section V, Step Y.
4. **WHEN** VCT makeup is **NO** longer desired,
   THEN notify the ABO to align CHG Pump suction to the VCT **PER** Section V, Step Z.
5. Repeat Steps 3 and 4 as necessary.

X. (ABO) DEENERGIZE CVCS MOVs.

1. **WHEN** notified to deenergize CVCS MOVs,
   THEN perform the following actions:
   a. **GO TO** MCC 114.
   b. Open the following breakers:
      - REFUELING WATER TNK. STOP 1-MOV-504 breaker 52-11423
      - VOL. CONT. TANK. ISOL 1-MOV-501 breaker 52-11431
2. Notify 1C43 that 1-MOV-504 and 1-MOV-501 have been deenergized.
3. **GO TO** the Unit 1 VCT Room to align Charging Pump suction to the RWT **PER** Section V, Step Y.

V. ACTIONS OUTSIDE THE CONTROL ROOM

Y. (ABO) ALIGN CHARGING PUMP SUCTION TO THE RWT.

1. **WHEN** notified to align Charging Pump suction to the RWT,
   THEN perform the following actions:

   a. Manually open the Charging Pump Suction from the RWT, 1-CVC-504-MOV.

   b. **GO TO** the Unit 1 Charging Pump Room.

   c. Manually shut the VCT Outlet, 1-CVC-501-MOV.

   d. Notify 1C43 that the Charging Pump(s) is taking suction from the RWT.

Z. (ABO) ALIGN CHARGING PUMP SUCTION TO THE VCT.

1. **WHEN** notified to align Charging Pump suction to the VCT,
   THEN perform the following actions:

   a. **GO TO** the Unit 1 Charging Pump Room.

   b. Manually open the VCT Outlet, 1-CVC-501-MOV.

   c. **GO TO** the Unit 1 VCT Room.

   d. Manually shut the Charging Pump Suction from the RWT, 1-CVC-504-MOV.

2. Notify 1C43 that the Charging Pump(s) is taking suction from the VCT.

V. ACTIONS OUTSIDE THE CONTROL ROOM

AA. **(TBO)** CHECK THE STATUS OF THE MAIN TURBINE.

1. **WHEN** Main Turbine speed is estimated to be less than 3 RPM,
   THEN observe proper operation of the Turning Gear.

   a. Observe that the Main Turbine Turning Gear is engaged.

   b. Observe that the Rotor is turning.

2. Observe that the Turbine Lift Pumps are running at the Lift Pump Panel on the 45' of the Turbine Building.

3. **GO TO** 1C43 for further instructions.

END of Section V

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

A. **(RO)** RETURN TO THE CONTROL ROOM.

1. **WHEN** the SM has been notified that control can be re-established to the Control Room,
   THEN GO TO the Control Room.

2. Notify 1C43 that the Control Room is occupied.

B. **(RO)** ADJUST AFW FLOW CONTROLS AT 1C04.

1. On 1C04, adjust the following AFW flow controller setpoints to 0 GPM:

   - AFW Turbine Driven Train Flow Controllers:
     - 11 S/G FLOW CONTR 1-FIC-4511A
     - 12 S/G FLOW CONTR 1-FIC-4512A
   - AFW Motor Driven Train Flow Controllers:
     - 11 S/G FLOW CONTR 1-FIC-4525A
     - 12 S/G FLOW CONTR 1-FIC-4535A

C. **(RO)** ADJUST AFW SPEED CONTROLLERS AT 1C04.

1. On 1C04, open SG AFW STM SUPP & BYPASS valves:

   - (11 SG) 1-MS-4070-CV and 1-MS-4070A-CV
   - (12 SG) 1-MS-4071-CV and 1-MS-4071A-CV

2. On 1C04, place the following AFW Pump Speed Controllers to MIN SPD position (100% output):

   - (11 AFW Pump) 1-HC-3987A
   - (12 AFW Pump) 1-HC-3989A

3. Notify 1C43 to secure AFW flow **PER** Section VI, Step D.

1C43.....3501/5625/3511	AFW...................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM...............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

CAUTION
Steps D through G must be completed in an expeditious manner to avoid excessively low levels in the steam generators.

D. **(CRO)** SECURE AFW FLOW FROM 1C43.

1. Ensure both SG levels are approximately 0 inches.
2. Notify the TBO to perform the following actions:
   a. **GO TO** the SRW Pump Room.
   b. Notify 1C43 upon arrival.
3. **WHEN** the TBO is stationed in the SRW Pump Room,
   THEN perform the following actions:

   NOTE
   Adjustment of Controllers past the controller detent pin will stop valve motion.

   a. Place 11 AFW PP SPEED CONTR, 1-HC-3987B, to MIN SPD.
   b. Place 12 AFW PP SPEED CONTR, 1-HC-3989B, to MIN SPD.
   c. Place 11 S/G FLOW CONTR, 1-HC-4511B, to MIN FLOW.
   d. Place 12 S/G FLOW CONTR, 1-HC-4512B, to MIN FLOW.
   e. Place 11 S/G FLOW CONTR, 1-HC-4525B, to MIN FLOW.
   f. Place 12 S/G FLOW CONTR, 1-HC-4535B, to MIN FLOW.
   g. Notify the TBO to align AFW Flow and Speed Control to 1C04 **PER** Section VI, Step E.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

E. **(TBO)** ALIGN AFW FLOW AND SPEED CONTROL TO 1C04.

1. **WHEN** notified to align AFW Flow and Speed Control to 1C04,
   THEN perform the following actions:

   a. In the SRW Pump Room Upper Level,
      Place in POSITION 1 **ALL** AFW System Valves listed below:

      - **NORTH WALL** (In Hand Transfer Box)
        - 1-IA-4511-HV
        - 1-IA-4512-HV
      - **Stanchion L.O.9** between 1-AFW-4525-CV and 1-AFW-4535-CV (In Hand Transfer Box)
        - 1-IA-4525-HV
        - 1-IA-4535-HV
      - **Southwest Corner** next to U-1 to U-2 AFW X-conn CV, 1-AFW-4550-CV
        - 1-IA-4070-HV
        - 1-IA-4071-HV

   b. **GO TO** the AFW Pump Room.

   c. Place 11 AFW Pump Speed Control Handvalve, 1-HV-3987, to POSITION 1.

   d. Place 12 AFW Pump Speed Control Handvalve, 1-HV-3989, to POSITION 1.

2. Notify the Control Room that the AFW Flow and Speed Controls are aligned to 1C04.

3. Notify 1C43 that the AFW Flow and Speed Controls are aligned to 1C04.

4. **GO TO** the Unit 1 45' Switchgear Room.

5. Notify the Control Room upon arrival.

6. **GO TO** the ADV Handvalve enclosure to align 11 and 12 ADVs to 1C03 **PER** Section VI, Step I.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

F. **(RO)** START FEEDING BOTH SGs FROM 1C04.

1. **WHEN** notified by the TBO that AFW Flow and Speed Control are aligned to 1C04, **THEN** start feeding the SGs with an AFW pump from 1C04.

   a. **IF** 11 or 12 AFW pump is operating, **THEN** perform the following actions:

      (1) Slowly raise the output of the in service AFW Pump's SPEED CONTR to maintain turbine driven discharge header pressure at least 100 PSI greater than S/G pressure.

      - (11 SG) 1-HC-3987A
      - (12 SG) 1-HC-3989A

      (2) Adjust the following controllers as necessary to maintain SG levels between (-)24 and (+)30 inches:

      - (11 SG) 1-FIC-4511A
      - (12 SG) 1-FIC-4512A

   b. **IF** 13 AFW pump is operating, **THEN** adjust the following controllers as necessary to maintain SG levels between (-)24 and (+)30 inches:

   - (11 SG) 1-FIC-4525A
   - (12 SG) 1-FIC-4535A

G. **(RO)** ALIGN ADV CONTROL TO 1C03.

1. **WHEN** the TBO has arrived in the 45' Switchgear Room, **THEN** place ATMOSPHERIC STEAM DUMP CONTR, 1-HIC-4056, in manual.

2. Adjust ATMOSPHERIC STEAM DUMP CONTR, 1-HIC-4056, to 0% output.

3. Notify 1C43 to shut the ADVs at 1C43 **PER** Section VI, Step H.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

H. **(CRO)** SHUT ADVs AT 1C43.

1. **WHEN** notified to shut the ADVs
   THEN place the following ADV CONTRS to SHUT (zero output):
   - (11 ADV) 1-HC-4056A
   - (12 ADV) 1-HC-4056B
2. Notify the TBO to align 11 and 12 ADVs to 1C03 **PER** Section VI, Step I.

I. **(TBO)** ALIGN 11 AND 12 ADVs TO 1C03.

1. **WHEN** notified to align 11 and 12 ADVs to 1C03,
   THEN place the following handvalves to POSITION 1:
   - 11 ADV Aux Shutdown Control Transfer, 1-HV-3938A
   - 11 ADV Quick Open Override Handvalve, 1-HV-3938B
   - 12 ADV Aux Shutdown Control Transfer, 1-HV-3939A
   - 12 ADV Quick Open Override Handvalve, 1-HV-3939B
2. Notify the Control Room that the ADVs are aligned to 1C03.
3. Notify 1C43 the ADVs are aligned to 1C03.

J. **(RO)** CONTROL COLD LEG TEMPERATURES.

1. **WHEN** notified that the ADVs are aligned to 1C03,
   THEN adjust the ATMOSPHERIC STEAM DUMP CONTR, 1-HIC-4056, as necessary to maintain T_{COLD} between 525 and 535° F.
2. **IF** the Turbine Bypass Valves are controlling T_{COLD} between 525 and 535° F,
   THEN place the ATMOSPHERIC STEAM DUMP CONTR , 1-HIC-4056, to AUTO.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

K. (CRO) ALIGN PRESSURIZER HEATER CONTROL TO 1C06.

1. Rotate the keys to REMOTE for the Pressurizer Backup Heater Transfer Controllers:
   - 11 BACKUP HTR TRANSFER CONTR 1-HS-100-4A
   - 13 BACKUP HTR TRANSFER CONTR 1-HS-100-6A
2. Remove the keys from the Pressurizer Backup Heater Transfer Controllers.
3. Notify the Control Room that PZR Backup Heater control has been transferred to 1C06.

L. (CRO) RETURN TO THE CONTROL ROOM.

1. Make a site-wide page announcement informing all plant personnel that control has been shifted from 1C43 to the Control Room.
2. **GO TO** the Control Room.
3. Notify the STA to perform the Final Check of plant status **PER** Section VI, Step M.

M. (STA) PERFORM THE FINAL CHECK OF PLANT STATUS.

1. **WHEN** notified by the CRO to perform the Final Check of plant status, **THEN** return to the Control Room.
2. Perform the Final Check of plant status **PER** Section VII., SAFETY FUNCTION STATUS CHECK, using Control Room instrumentation.
3. **WHEN** the Safety Function Status Check Final Acceptance Criteria are met, **THEN** notify the CRS and the CRO.

1C43.....3501/5625/3511	AFW..................4768	1A DG...5320	ADVs.........5626
27' SWGR......5463/5464	SRW UL/LL..5575/5576	1B DG...5631	INTAKE......5498
2C43....3502/5652/3522	CC RM..............5587	2A DG...5630	13KV MC...5655
72' CMPTR RM.......4404	0C DG................5302	2B DG...5642	U-1 NSSS...5635
69' SWGR...........5675	MCC-104.............5635	MCC-114...5675	

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

N. **(CRO)** ALIGN MSIV CONTROL TO 1C03.

NOTE
Performance of this step may **NOT** be required.

1. **IF** the MSIVs were manually shut,
   THEN place MSIV handswitches to CLOSE:
   - (11 MSIV) 1-HS-4043
   - (12 MSIV) 1-HS-4048
2. Notify the ABO to restore MSIV operation to the Control Room **PER** Section VI, Step O.

O. **(ABO)** RESTORE MSIV OPERATION TO THE CONTROL ROOM.

NOTE
Performance of this step may **NOT** be required. Direction to perform this step will be given from Control Room.

1. **IF** notified to restore MSIV operation to the Control Room,
   THEN perform the following actions:
   a. Place a wrench on the Dump Solenoid stem nut of:
      - (11 MSIV) 1-MSH-4042A-SV (1-MSH-4042B-SV)
      - (12 MSIV) 1-MSH-4047A-SV (1-MSH-4047B-SV)

   b. Rotate the wrench in the counterclockwise direction, approximately three turns, until the wrench stops.

   c. Remove the wrench and replace the Dump Solenoid Valve Cap.

   d. Repeat steps O.1.a through O.1.c for the other MSIV.

   e. Open Instrument Air Isolation to 11 MSIV Hydraulic Pump, 1-IA-1069.

   f. Open Instrument Air Isolation to 12 MSIV Hydraulic Pump, 1-IA-1070.

   g. Notify the Control Room that MSIV operation has been restored to the Control Room.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

P. **(CRO)** RESTORE CVCS CONTROL TO 1C07.

1. Verify that the handswitches for VCT OUT, 1-CVC-501-MOV and RWT CHG PP SUCT valve, 1-CVC-504-MOV, are in the same positions that the ABO left the MOVs in.
2. Notify the ABO to energize CVCS MOVs **PER** Section VI, Step Q.
3. **WHEN** notified that the CVCS MOVs are energized
THEN place the handswitches for VCT OUT, 1-CVC-501-MOV and RWT CHG PP SUCT valve, 1-CVC-504-MOV, in AUTO.
4. Operate Charging and Letdown to maintain Pressurizer level approximately 160 inches.

Q. **(ABO)** ENERGIZE CVCS MOVs.

1. **WHEN** notified to energize CVCS MOVs,
THEN GO TO MCC 114.
2. Shut the following breakers:
   - REFUELING WATER TNK. STOP 1-MOV-504 breaker 52-11423
   - VOL. CONT. TANK. ISOL 1-MOV-501 breaker 52-11431
3. Notify the Control Room that 1-MOV-504 and 1-MOV-501 have been energized.

R. **(OSO)** RETURN SAFE SHUTDOWN EQUIPMENT.

1. Ensure that **ALL** Safe Shutdown Equipment and Keys are returned to the appropriate lockers and enclosure.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

S. **(CRO)** IMPLEMENT APPROPRIATE OPERATING PROCEDURE.

1. **IMPLEMENT** EOP-0, POST TRIP IMMEDIATE ACTIONS.

END of Section VI

VII. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the intermediate and final safety function checks respectively on entry and prior to exiting from this procedure.

B. Perform intermediate safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being met, promptly upon discovery.

REACTIVITY CONTROL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. WRNI	lowering		less than 10^{-4}%	
b. SUR	negative		negative or zero	
c. CEA status	**NO** more than ONE CEA **NOT** fully inserted		**NO** more than ONE CEA **NOT** fully inserted	
OR				
Boration status	greater than or equal to 40 GPM		greater than 2300 ppm	

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 13KV service buses 11 or 21	**NOT** Available		at least ONE energized	______
b. 4KV vital buses 11 or 14	at least ONE energized	___|___|___|___	at least ONE energized	______
c. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___	**ALL** greater than 105 volts	______
d. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___	at least THREE energized	______
e. 1Y09 or 1Y10	**NOT** Available		at least ONE energized	______

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	1850 PSIA to 2300 PSIA		2225 PSIA to 2275 PSIA	
b. Pressurizer level	80 inches to 180 inches		130 inches to 180 inches	
c. RCS subcooling	30°F to 140°F		30°F to 140° F	

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. RCS T_{COLD}	525°F to 535° F		525°F to 535°F	
b. T_{HOT} minus T_{COLD}	less than 10°F		less than 10°F	
c. S/G level 11 or 12	(-)170 inches to (+)30 inches		(-)24 inches to (+)30 inches	
	trending to (-)24 inches to (+)30 inches		N/A	N/A

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 0.7 PSIG		less than 0.7 PSIG	
b. Containment Temperature	less than 120°F		less than 120°F	
c. Containment Radiation Monitor	**NO** unexplained rise		**NO** unexplained rise	
	alarm clear		alarm clear	

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Noble Gas Monitor (1-RIC-5415)	**NO** unexplained rise		**NO** unexplained rise	______
	alarm clear		alarm clear	______
b. Condenser Off-Gas RMS (1-RI-1752)	**NO** unexplained rise		**NO** unexplained rise	______
	alarm clear		alarm clear	______
c. S/G B/D RMS (1-RI-4014)	**NO** unexplained rise		**NO** unexplained rise	______
	alarm clear		alarm clear	______
d. Main Vent Gaseous RMS (1-RI-5415)	**NOT** Available		**NO** unexplained rise	______
			alarm clear	______

VII. SAFETY FUNCTION STATUS CHECK

STATUS CHECK NUMBER	COMPLETED AT TIME
1	
2	
3	
4	
5	
6	
7	
8	

ATTACHMENT (1)
Page 1 of 5

PLACEKEEPER

START	FUNCTION	DONE	PAGE
	SECTION IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM		
	A. (RO) TRIP THE REACTOR.		6
	B. (CRO) TRIP THE MAIN TURBINE, SGFPs AND SECURE BLOWDOWN.		7
	C. (ALL PERSONNEL) EVACUATE THE CONTROL ROOM.		7

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	SECTION V. ACTIONS OUTSIDE THE CONTROL ROOM		
	A. (RO) MANUALLY TRIP THE MAIN TURBINE.		8
	B. (RO) SHUTDOWN 11 AND 12 CEDM MG SETS.		8
	C. (CRO) UNLOCK SAFE SHUTDOWN KEY LOCKER AND EQUIPMENT LOCKER.		8
	D. (SM) DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.		9
	E. (OSO) OBTAIN RADIOS AND REPORT TO 1C43 AND 2C43.		9
	F. (TBO) OBTAIN EQUIPMENT, THEN TRIP 11 AND 12 SGFPs.		10
	G. (ABO) OBTAIN EQUIPMENT, THEN GO TO 45 FOOT AUXILIARY BUILDING.		11
	H. (CRO) VERIFY REACTOR IS SHUTDOWN.		11
	I. (CRO) INITIALIZE ADV CONTROLLERS ON 1C43.		11
(I)	J. (RO) ALIGN 11 AND 12 ADVs TO 1C43.		12
	K. (CRO) VERIFY COLD LEG TEMPERATURES.	C	13
	L. (ABO) IF NOTIFIED, THEN SHUT BOTH MSIVs.		14
	M. (STA) COMMENCE SAFETY FUNCTION STATUS CHECKS.		15
	N. (CRO) COMPLETE INITIALIZATION OF CONTROLLERS ON 1C43.		16

NOTE: Continuously Applicable Steps are designated with a "C" in the Done column.
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)
Page 3 of 5

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	O. (TBO) ALIGN AFW PUMP SPEED CONTROL TO 1C43.		16
	P. (TBO) ALIGN THE AFW FLOW CONTROL TO 1C43.		17
	Q. (TBO) VERIFY AFW PUMP OPERATION.	C	17
(P)	R. (CRO) INITIATE AFW FLOW TO SGs.	C	20
	S. (RO) START 13 AFW PP.		20
	T. (CRO) MONITOR PRESSURIZER LEVEL.	C	21
	U. (CRO) ENERGIZE PRESSURIZER BACKUP HEATER.	C	21
	V. (RO) MANUALLY OPERATE THE CHARGING PUMP(S).		22
	W. (CRO) MAKEUP TO THE VCT.		23
	X. (ABO) DEENERGIZE CVCS MOVs.		23
	Y. (ABO) ALIGN CHARGING PUMP SUCTION TO THE RWT.		24
	Z. (ABO) ALIGN CHARGING PUMP SUCTION TO THE VCT.		24
	AA. (TBO) CHECK THE STATUS OF THE MAIN TURBINE.		25

NOTE: Continuously Applicable Steps are designated with a "C" in the Done column.
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	SECTION VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM		
	A. (RO) RETURN TO THE CONTROL ROOM.		26
	B. (RO) ADJUST AFW FLOW CONTROLS AT 1C04.		26
	C. (RO) ADJUST AFW SPEED CONTROLLERS AT 1CO4.		26
(C)	D. (CRO) SECURE AFW FLOW FROM 1C43.		27
(D)	E. (TBO) ALIGN AFW FLOW AND SPEED CONTROL TO 1C04.		28
(E)	F. (RO) START FEEDING BOTH SGs FROM 1C04.	C	29
	G. (RO) ALIGN ADV CONTROL TO 1C03.		29
(G)	H. (CRO) SHUT ADVs AT 1C43.		30
(H)	I. (TBO) ALIGN 11 AND 12 ADVs TO 1C03.		30
(I)	J. (RO) CONTROL COLD LEG TEMPERATURES.	C	30
	K. (CRO) ALIGN PRESSURIZER HEATER CONTROL TO 1C06.		31
	L. (CRO) RETURN TO THE CONTROL ROOM.		31
	M. (STA) PERFORM THE FINAL CHECK OF PLANT STATUS.		31
	N. (CRO) ALIGN MSIV CONTROL TO 1C03.		32
(N)	O. (ABO) RESTORE MSIV OPERATION TO THE CONTROL ROOM.		32
	P. (CRO) RESTORE CVCS CONTROL TO 1C07.		33

NOTE: Continuously Applicable Steps are designated with a "C" in the Done column.
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	Q. (ABO) ENERGIZE CVCS MOVs.		33
	R. (OSO) RETURN SAFE SHUTDOWN EQUIPMENT.		33
	S. (CRO) IMPLEMENT APPROPRIATE OPERATING PROCEDURE.		34

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

AOP-11

CONTROL ROOM EVACUATION AND SAFE SHUTDOWN NON-FIRE CONDITIONS

REVISION 1

Safety Related

Approval Authority: 5/14/02
signature/date

Effective Date: 05-15-02

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	**REVISION**
1-43	1

ATTACHMENT NUMBER	**REVISION**
1	1

PROCEDURE ALTERATIONS

REVISION/CHANGE	**PAGE NUMBERS**
None	None

TABLE OF CONTENTS

I. PURPOSE

The purpose of this procedure is to provide a means of shutting down the Unit from outside the Control Room and maintaining the Unit in a Mode 3 (hot standby) condition until plant control is reestablished from the Control Room.

II. ENTRY CONDITIONS

1. Any non-fire condition which, in the opinion of the Shift Manager, exposes Control Room personnel to a harmful operating environment.

2. Any non-fire condition which, in the opinion of the Shift Manager, impedes plant control from the Control Room.

III. PRECAUTIONS

The following specific precautions apply prior to or throughout this procedure.

A. WARNINGS

1. Other plant areas may be affected by the same conditions causing the Control Room evacuation.

B. CAUTIONS

1. When the Pressurizer heaters are controlled from panel 2C43, the low level cutoff at 101 inches is inoperable.
2. Valid ESFAS and AFAS signals to equipment shall **NOT** be overridden or blocked unless specifically directed in this procedure. A valid signal is a signal that at the time of initiation, correlated to plant parameters (e.g., the monitored parameter actually reached its setpoint value).

C. NOTES

1. This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM

A. **(RO)** TRIP THE REACTOR.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Trip the Reactor by depressing **ONE** set of Manual Reactor Trip Buttons at 2C05 or 2C15.

2. **IF** RCS dilution is in progress,
   THEN secure RCMU PPs.

3. **GO TO** the Main Turbine Front Standard to perform Section V, Step A.

IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM

B. **(CRO)** TRIP THE MAIN TURBINE SGFPs AND SECURE BLOWDOWN.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Before leaving the Control Room, perform the following actions:

   a. Trip the Main Turbine by depressing the U-2 MAIN TURB TRIP button at 2C02.

   b. Isolate the MSRs by depressing the RESET button on the MSR Control Panel at 2C02.

   c. Trip 21 and 22 SGFPs at 2C03.

   d. Shut the SG BD valves:

      - 2-BD-4010-CV
      - 2-BD-4011-CV
      - 2-BD-4012-CV
      - 2-BD-4013-CV

2. If time permits, make the following site wide page announcement:

   "The Control Room is being evacuated. Plant operators report to their safe shutdown stations, all persons stay clear of the Control Room."

3. **GO TO** Unit 2 45' Switchgear Room to perform Section V, Step C.

IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM

C. **(ALL PERSONNEL)** EVACUATE THE CONTROL ROOM.

1. **WHEN** evacuation is ordered by the SM/CRS,
   THEN all personnel are to leave the Control Room.

2. Report to Safe Shutdown Stations.

END of Section IV

2C43.....3502/5652/3522	AFW..................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM...............5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG................5302	2B DG......5642	U-2 NSSS..5640
MCC-204...........5645	MCC-214...........5687		

V. ACTIONS OUTSIDE THE CONTROL ROOM

A. (RO) MANUALLY TRIP THE MAIN TURBINE.

1. Manually trip the Unit 2 Main Turbine at the Front Standard.
2. **GO TO** the Unit 2 45' Switchgear Room.
3. Notify 2C43 that the Main Turbine is tripped.

B. (RO) SHUTDOWN 21 AND 22 CEDM MG SETS.

1. On the CEDM MG Set Control Panel:
   a. Depress the Local LOAD OFF Pushbutton.
   b. Depress the Remote LOAD OFF Pushbutton.
   c. Depress and hold the Local MOTOR OFF Pushbutton until the MOTOR ON light deenergizes.
   d. Depress and hold the Remote MOTOR OFF Pushbutton until the MOTOR ON light deenergizes.

C. (CRO) UNLOCK SAFE SHUTDOWN KEY LOCKER AND EQUIPMENT LOCKER.

1. Open 22 ADV Handvalve enclosure.
2. Obtain the Safe Shutdown Key Locker door key.
3. Open the Safe Shutdown Key Locker.
4. Obtain the CRO key ring from the Safe Shutdown Key Locker.

NOTE
The key for the Safe Shutdown Equipment Locker is on the 2C43 Panel key ring.

5. Open the Safe Shutdown Equipment Locker.
6. Obtain CRO equipment at the Safe Shutdown Equipment Locker.

V. ACTIONS OUTSIDE THE CONTROL ROOM

D. **(SM)** DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.

NOTE
The SM may designate personnel to notify the offsite agencies.

WARNING
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Determine the appropriate emergency response actions **PER** the ERPIP.

2. Determine reporting requirements of RM-1-101, REGULATORY REPORTING.

V. ACTIONS OUTSIDE THE CONTROL ROOM

E. **(OSO)** OBTAIN RADIOS AND GO TO 1C43 AND 2C43.

CAUTION

**This step is for information only and will be performed under the Unit 1 AOP-11 procedure. The steps are left in this procedure as a placekeeper. IF the controlling step in AOP-11 UNIT 1 procedure is NOT performed,
THEN the OSO step should be performed with this procedure.**

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. **GO TO** the Fire Brigade Locker and retrieve two portable radios.
2. **GO TO** 1C43 and give one radio to the SM.
3. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
4. **GO TO** 2C43 and give the other radio to the CRS.
5. Make the following announcement:

   "The Control Room has been evacuated. The Plant is being controlled from 1C43 and 2C43. All personnel are required to stay clear of the following areas: Control Room, Cable Spreading Room, Shift Managers Office, Security Central Alarm Station, Technical Support Center, Technical Support Computer Room and Control Room Computer Rooms."

6. **GO TO** to 1C43 to provide additional assistance where needed.

V. ACTIONS OUTSIDE THE CONTROL ROOM

F. **(TBO)** OBTAIN EQUIPMENT, THEN TRIP 21 AND 22 SGFPs.

NOTE

This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
2. **GO TO** the SGFPs 12' Turbine Building.
3. Manually trip 21 and 22 SGFPs using the manual trip pushbuttons:
   - 21 SGFP at 2C65
   - 22 SGFP at 2C66
4. **GO TO** the 2 AFW Pump Room to perform Section V, Step O.

V. ACTIONS OUTSIDE THE CONTROL ROOM

G. **(ABO)** OBTAIN EQUIPMENT, THEN GO TO 45 FOOT AUXILIARY BUILDING.

NOTE
This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.
2. **GO TO** 45' Auxiliary Building to the telephone by the Unit 2 NSSS Sample Sink.
3. Notify 2C43 upon arrival.

H. **(CRO)** VERIFY REACTOR IS SHUTDOWN.

1. Observe Reactor Power trending to or is less than 10^{-4}% power and lowering.
2. **WHEN** Reactor Power is less than 10^{-4}% power and constant or lowering, **THEN** Reactivity Control is satisfactory.

I. **(CRO)** ADJUST ADV CONTROLLERS ON 2C43.

NOTE
Adjustment of the ADV controllers past the controller detent pin will stop valve motion.

1. Place 21 ADV CONTR, 2-HC-4056A, to SHUT.
2. Place 22 ADV CONTR, 2-HC-4056B, to SHUT.
3. Notify the RO to align 21 and 22 ADVs to 2C43 **PER** Section V, Step J.

2C43.....3502/5652/3522	AFW...................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM................5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG.................5302	2B DG......5642	U-2 NSSS..5640
MCC-204............5645	MCC-214............5687		

V. ACTIONS OUTSIDE THE CONTROL ROOM

J. **(RO)** ALIGN 21 AND 22 ADVs TO 2C43.

NOTE
This procedure has parallel actions assigned to specific watchstations. When a boxed function is complete, the next assigned boxed function applicable to the Operator's watchstation position shall be implemented. When supporting evolutions are to be completed before execution of another, a conditional statement is used.

WARNING
Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Obtain designated key ring and equipment at Safe Shutdown Key and Equipment Lockers.

2. **WHEN** notified to align 21 and 22 ADVs to 2C43, **THEN GO TO** the ADV Handvalve enclosure.

3. Place the following handvalves to POSITION 2:

   - 21 ADV Aux Shutdown Control Transfer, 2-HV-3939A
   - 21 ADV Quick Open Override Handvalve, 2-HV-3939B
   - 22 ADV Aux Shutdown Control Transfer, 2-HV-3938A
   - 22 ADV Quick Open Override Handvalve, 2-HV-3938B

4. Notify the CRO that the ADVs are aligned to 2C43.

V. ACTIONS OUTSIDE THE CONTROL ROOM

K. **(CRO)** VERIFY COLD LEG TEMPERATURES.

1. Verify the Turbine Bypass Valves are maintaining T_{COLD} between 525 and 535° F.

2. **IF** T_{COLD} is greater than 535° F,
   AND NOT trending to less than 535° F,
   THEN adjust 21 and 22 ADV CONTRs, 2-HC-4056A and 2-HC-4056B, as needed to maintain T_{COLD} between 525 and 535° F.

3. **IF** T_{COLD} is less than 525° F,
   AND NOT trending to greater than 525° F,
   THEN perform the following actions:

NOTE
The ABO is located at the Unit 2 NSSS Sample Sink telephone.

   a. Notify the ABO to shut the MSIVs **PER** Section V, Step L.

   b. **WHEN** notified that the MSIVs are shut,
      THEN adjust 21 and 22 ADV CONTRs, 2-HC-4056A and 2-HC-4056B, as needed to maintain T_{COLD} between 525 and 535° F.

V. ACTIONS OUTSIDE THE CONTROL ROOM

L. **(ABO)** IF NOTIFIED, THEN SHUT BOTH MSIVs.

NOTE
Performance of this step may not be required. Direction to perform this step will be given from 2C43.

CAUTION
Performance of this step will result in a fast closure of the MSIVs.

1. **IF** notified to shut the MSIVs,
   THEN perform the following actions:

   a. Shut Instrument Air Isolation to 21 MSIV Hydraulic Pump, 2-IA-928.

   b. **IF** 21 MSIV is open,
      THEN:

      (1) Remove the Dump Solenoid Valve Cap on **ONE** of the following:

      - 21 MSIV Dump SV Channel A, 2-MSH-4042A-SV

      OR

      - 21 MSIV Dump SV Channel B, 2-MSH-4042B-SV

      (2) Place a wrench on the selected Dump Solenoid stem nut.

      (3) Rotate the wrench in the clockwise direction (approximately three turns) to bleed hydraulic fluid back to the reservoir.

   c. Shut Instrument Air Isolation to 22 MSIV Hydraulic Pump, 2-IA-930.

(continue)

V. ACTIONS OUTSIDE THE CONTROL ROOM

L.1 (continued)

d. **IF** 22 MSIV is open,
THEN:

(1) Remove the Dump Solenoid Valve Cap on **ONE** of the following:

- 22 MSIV Dump SV Channel A, 2-MSH-4047A-SV

OR

- 22 MSIV Dump SV Channel B, 2-MSH-4047B-SV

(2) Place a wrench on the selected Dump Solenoid stem nut.

(3) Rotate the wrench in the clockwise direction (approximately three turns) to bleed hydraulic fluid back to the reservoir.

2. Notify 2C43 that the MSIVs are shut.

3. **GO TO** 45' Auxiliary Building to the telephone by the Unit 2 NSSS Sample Sink.

M. **(STA)** COMMENCE SAFETY FUNCTION STATUS CHECKS.

NOTE

Data to complete the Safety Function Status Checks may be obtained at the 72' Computer Room.

WARNING

Other plant areas may be affected by the same conditions causing the Control Room evacuation.

1. Monitor plant status **PER** Section VII., SAFETY FUNCTION STATUS CHECK .

V. ACTIONS OUTSIDE THE CONTROL ROOM

N. **(CRO)** COMPLETE INITIALIZATION OF CONTROLLERS ON 2C43.

NOTE
Adjustment of Controllers past the controller detent pin will stop valve motion.

1. Adjust 21 AFW PP SPD CONTR, 2-HC-3987B, to MIN SPD.
2. Adjust 22 AFW PP SPD CONTR, 2-HC-3989B, to MIN SPD.
3. Adjust 21 SG STM DRIVEN AFW FLOW CONTR, 2-HC-4511B, to MIN FLOW.
4. Adjust 22 SG STM DRIVEN AFW FLOW CONTR, 2-HC-4512B, to MIN FLOW.
5. Adjust 21 SG MOTOR DRIVEN AFW FLOW CONTR, 2-HC-4525B, to MIN FLOW.
6. Adjust 22 SG MOTOR DRIVEN AFW FLOW CONTR, 2-HC-4535B, to MIN FLOW.
7. Notify the TBO to align AFW Pump Speed Control to 2C43 **PER** Section V, Step O.

O. **(TBO)** ALIGN AFW PUMP SPEED CONTROL TO 2C43.

1. **WHEN** notified to align the AFW Pump Speed Control to 2C43,
   THEN perform the following actions:
   a. Place 21 AFW Pump Speed Control Handvalve, 2-HV-3987, to POSITION 2.
   b. Place 22 AFW Pump Speed Control Handvalve, 2-HV-3989, to POSITION 2.
2. Notify 2C43 that AFW Speed Control is aligned to 2C43.
3. **GO TO** the SRW Pump Room to perform Section V, Step P.

2C43.....3502/5652/3522	AFW...................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM...............5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG................5302	2B DG......5642	U-2 NSSS..5640
MCC-204............5645	MCC-214............5687		

V. ACTIONS OUTSIDE THE CONTROL ROOM

P. (TBO) ALIGN THE AFW FLOW CONTROL TO 2C43.

1. In the SRW Room Upper Level,
   Place in POSITION 2 **ALL** AFW System Valves listed below:

   - **SOUTH WALL** (In Hand Transfer Box)
     - 2-IA-4511-HV
     - 2-IA-4512-HV

   - **Stanchion L50.1** between 2-AFW-4525-CV and 2-AFW-4535-CV (In Hand Transfer Box)
     - 2-IA-4525-HV
     - 2-IA-4535-HV

   - **Northwest Corner** next to U-2 to U-1 AFW X-conn CV, 2-AFW-4550-CV.
     - 2-IA-4070-HV
     - 2-IA-4071-HV

2. Notify 2C43 that the AFW flow control is aligned to 2C43.

3. **GO TO** the AFW Pump Room and verify AFW Pump operation **PER** Section V, Step Q.

Q. (TBO) VERIFY AFW PUMP OPERATION.

1. **IF** the in-service AFW Pump has tripped,
   THEN reset the Throttle/Stop Valve, 2-MS-3986 (2-MS-3988):

NOTE
Cycling the governor MANUAL ADJUSTMENT knob after Turbine Operation releases a hydraulic lock on the speed setting piston.

   a. Reset the Turbine Governor Speed Control as follows:

      (1) Turn the governor MANUAL ADJUSTMENT knob fully counterclockwise to MINIMUM position.

      (2) Turn the governor MANUAL ADJUSTMENT knob fully clockwise to MAXIMUM position.

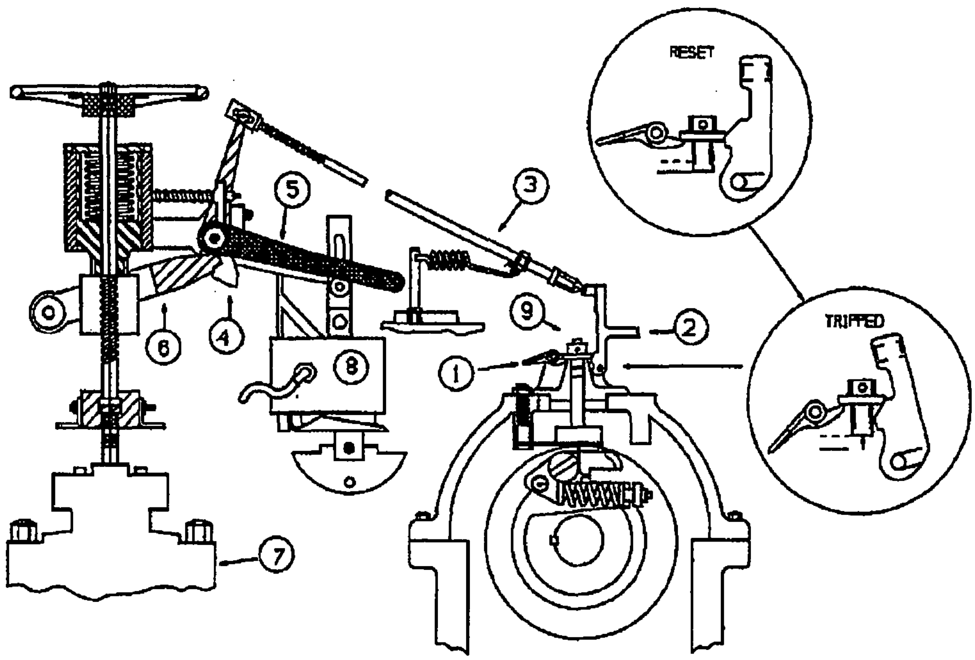
(continue)

2C43.....3502/5652/3522	AFW...................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM................5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG.................5302	2B DG......5642	U-2 NSSS..5640
MCC-204............5645	MCC-214............5687		

V. ACTIONS OUTSIDE THE CONTROL ROOM

Q.1 (continued)

b. **IF** the Overspeed Device has been tripped,
THEN reset the Overspeed Trip by momentarily pulling the VALVE TRIP LEVER LINKAGE Connecting Rod (3) against spring tension toward the AFW Pump Turbine.



1. TURBINE MANUAL TRIP LEVER
2. HEAD LEVER
3. VALVE TRIP LEVER LINKAGE
4. TRIP HOOK
5. TRIP LEVER (VALVE)
6. VALVE TRIP/LATCH LEVER
7. TURBINE THROTTLE STOP VALVE
8. TURBINE TRIP SOLENOID
9. TAPPET NUT

NOTE
Proper engagement between the Tappet Nut and the Head Lever is critical to prevent inadvertent tripping of the AFW Pump.

c. Ensure the flat side of the TAPPET NUT (9) is seated firmly against the HEAD LEVER (2).

(continue)

V. ACTIONS OUTSIDE THE CONTROL ROOM

Q.1 (continued)

d. Reset the Throttle/Stop Valve:

(1) Rotate the handwheel clockwise until the Trip/Latch Lever is lifted over the Trip Hook.

(2) Ensure the Trip/Latch Lever and the Trip Hook are fully engaged.

e. Slowly rotate the handwheel counterclockwise until the Throttle/Stop Valve, 2-MS-3986 (2-MS-3988), is fully open.

2. **IF** the in service AFW Pump fails to operate,
THEN perform the following actions:

a. Notify 2C43 that the standby AFW pump will be placed in service.

b. Slowly rotate the handwheel counterclockwise until the Throttle/Stop Valve, 2-MS-3986 (2-MS-3988), is fully open.

c. Notify 2C43 that the in standby AFW PP has been placed in service.

3. Periodically monitor the operating AFW Pump.

4. **GO TO** the Main Turbine to perform Section V, Step AA.

V. ACTIONS OUTSIDE THE CONTROL ROOM

R. **(CRO)** INITIATE AFW FLOW TO SGs.

1. **WHEN** notified that AFW flow control is aligned to 2C43,
   THEN slowly feed the S/Gs by **ANY** of the following methods
   AND restore S/G level to 0 inches:
   - Adjusting 21 AUX FD PP SPEED CONTR, 2-HC-3987B
   - Adjusting 22 AUX FD PP SPEED CONTR, 2-HC-3989B
   - Adjusting 21 S/G STM DRIVEN AFW FLOW CONTR, 2-HC-4511B
   - Adjusting 22 S/G STM DRIVEN AFW FLOW CONTR, 2-HC-4512B
2. **IF** SG level cannot be restored using the Steam Driven AFW Pumps,
   AND 23 AFW PP is not already running,
   THEN notify the RO to start 23 AFW PP **PER** step S.
3. **IF** 23 AFW PP has been started,
   THEN slowly feed the S/Gs by performing the following actions
   AND restore S/G level to 0 inches:
   - Adjusting 21 S/G MOTOR DRIVEN AFW FLOW CONTR, 2-HC-4525B.
   - Adjusting 22 S/G MOTOR DRIVEN AFW FLOW CONTR, 2-HC-4535B.

S. **(RO)** START 23 AFW PP.

1. **IF** notified to start 23 AFW PP,
   THEN perform the following actions:

   a. Depress the CLOSE pushbutton on breaker 152-2415.

   b. Notify 2C43 that 23 AFW PP has been started.

V. ACTIONS OUTSIDE THE CONTROL ROOM

T. **(CRO)** MONITOR PRESSURIZER LEVEL.

1. Check Pressurizer level stabilizes between 80 and 180
   AND is trending to 160 inches.

2. **IF** Pressurizer level has **NOT** stabilized,
   THEN perform the following actions:

   a. Determine which Charging Pump(s) are needed to stabilize Pressurizer level.

   b. Notify the RO to manually operate the Charging Pump(s) **PER** Section V, Step V.

U. **(CRO)** ENERGIZE PRESSURIZER BACKUP HEATER.

CAUTION
The Pressurizer heater low level cutout at 101 inches is inoperable when heaters are operated at 2C43.

1. **IF** Pressurizer pressure is less than 2225 PSIA
   AND Pressurizer level is greater than 101 inches,
   THEN raise Pressurizer pressure:

   a. Insert the keys into the following Pressurizer Backup Heater Transfer Controllers:

      - 21 BACKUP HTR TRANSFER CONTR   2-HS-100-4A
      - 23 BACKUP HTR TRANSFER CONTR   2-HS-100-6A

NOTE
Any combination of Pressurizer Heaters may be used to restore Pressurizer pressure.

   b. Turn key to ON to energize the selected Pressurizer Heater(s).

   c. Cycle the Pressurizer Backup Heater Transfer Controller(s) as necessary to maintain Pressurizer pressure between 2225 and 2275 PSIA.

2C43.....3502/5652/3522	AFW..................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM...............5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG................5302	2B DG......5642	U-2 NSSS..5640
MCC-204...........5645	MCC-214...........5687		

V. ACTIONS OUTSIDE THE CONTROL ROOM

V. **(RO)** MANUALLY OPERATE THE CHARGING PUMP(S).

CAUTION
Performance of this step may not be required. Direction to perform this step will be given from 2C43.

1. **IF** notified to manually operate the Charging Pumps,
   THEN perform the following actions:

   a. Start the Charging Pump(s) by performing the following actions:

      (1) If necessary, charge the breaker closing spring for the charging pump to be started:

      - (21 Charging Pump Breaker) 52-2115
      - (23 Charging Pump Breaker) 52-2104
      - (22 Charging Pump Breaker) 52-2415
      - (23 Charging Pump Breaker) 52-2404

      (2) Depress the PUSH TO CLOSE pushbutton on the pump breaker.

   b. Stop the Charging Pump(s) by performing the following actions:

      (1) Depress the TRIP pushbutton on the pump breaker.

      (2) Charge the closing spring, if required.

2. Notify 2C43 of Charging Pump status.

V. ACTIONS OUTSIDE THE CONTROL ROOM

W. (CRO) MAKEUP TO THE VCT.

1. Notify the STA to monitor VCT level, L226, on the Plant Computer.
2. **WHEN** VCT makeup is desired,
   THEN notify the ABO to deenergize CVCS MOVs **PER** Section V, Step X.
3. **WHEN** 2-MOV-504 and 2-MOV-501 have been deenergized,
   THEN notify the ABO to align CHG Pump suction to the RWT **PER** Section V, Step Y.
4. **WHEN** VCT makeup is no longer desired,
   THEN notify the ABO to align CHG Pump suction to the VCT **PER** Section V, Step Z.
5. Repeat Steps 3 and 4 as necessary.

X. (ABO) DEENERGIZE CVCS MOVs.

1. **WHEN** notified to deenergize CVCS MOVs,
   THEN perform the following actions:
   a. **GO TO** MCC 214.
   b. Open the following breakers:
      - REFUELING WATER TNK. STOP 2-MOV-504 breaker 52-21423
      - VOL. CONT. TANK. ISOL 2-MOV-501 breaker 52-21431
2. Notify 2C43 that 2-MOV-504 and 2-MOV-501 have been deenergized.
3. **GO TO** the Unit 2 VCT Room to align Charging Pump suction to the RWT **PER** Section V, Step Y.

V. ACTIONS OUTSIDE THE CONTROL ROOM

Y. (ABO) ALIGN CHARGING PUMP SUCTION TO THE RWT.

1. **WHEN** notified to align Charging Pump suction to the RWT,
   THEN perform the following actions:

   a. Manually open the Charging Pump Suction from the RWT, 2-CVC-504-MOV.

   b. **GO TO** the Unit 2 Charging Pump Room.

   c. Manually shut the VCT Outlet, 2-CVC-501-MOV.

   d. Notify 2C43 that the Charging Pump(s) is taking suction from the RWT.

Z. (ABO) ALIGN CHARGING PUMP SUCTION TO THE VCT.

1. **WHEN** notified to align Charging Pump suction to the VCT,
   THEN perform the following actions:

   a. **GO TO** the Unit 2 Charging Pump Room.

   b. Manually open the VCT Outlet, 2-CVC-501-MOV.

   c. **GO TO** the Unit 2 VCT Room.

   d. Manually shut the Charging Pump Suction from the RWT, 2-CVC-504-MOV.

2. Notify 2C43 that the Charging Pump(s) is taking suction from the VCT.

V. ACTIONS OUTSIDE THE CONTROL ROOM

AA. **(TBO)** CHECK THE STATUS OF THE MAIN TURBINE.

1. **WHEN** Main Turbine speed is estimated to be less than 3 RPM, **THEN** observe proper operation of the Turning Gear.
   a. Observe that the Main Turbine Turning Gear is engaged.
   b. Observe that the Rotor is turning.
2. Observe that the Turbine Lift Pump is running at the Main Lube Oil Reservior on the 12' level of the Service Building.
3. **GO TO** 2C43 for further instructions.

END of Section V

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

A. (RO) RETURN TO THE CONTROL ROOM.

1. **WHEN** the SM has been notified that control can be re-established to the Control Room,
   THEN GO TO the Control Room.
2. Notify 2C43 that the Control Room is occupied.

B. (RO) ADJUST AFW FLOW CONTROLS AT 2C04.

1. On 2C04, adjust the following AFW flow controller setpoints to 0 GPM:
   - AFW Turbine Driven Train Flow Controllers:
     - 21 S/G FLOW CONTR 2-FIC-4511A
     - 22 S/G FLOW CONTR 2-FIC-4512A
   - AFW Motor Driven Train Flow Controllers:
     - 21 S/G FLOW CONTR 2-FIC-4525A
     - 22 S/G FLOW CONTR 2-FIC-4535A

C. (RO) ADJUST AFW SPEED CONTROLLERS AT 2CO4.

1. On 2C04, open SG AFW STM SUPP & BYPASS valves:
   - (21 SG) 2-MS-4070-CV and 2-MS-4070A-CV
   - (22 SG) 2-MS-4071-CV and 2-MS-4071A-CV
2. On 2C04, place the following AFW Pump Speed Controllers to MIN SPD position (100% output):
   - (21 AFW Pump) 2-HC-3987A
   - (22 AFW Pump) 2-HC-3989A
3. Notify 2C43 to secure AFW flow **PER** Section VI, Step D.

2C43.....3502/5652/3522	AFW...................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM...............5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG................5302	2B DG......5642	U-2 NSSS..5640
MCC-204...........5645	MCC-214...........5687		

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

CAUTION

Steps D through G must be completed in an expeditious manner to avoid excessively low levels in the steam generators.

D. **(CRO)** SECURE AFW FLOW FROM 2C43.

1. Ensure both SG levels are approximately 0 inches.
2. Notify the TBO to perform the following actions:
   a. **GO TO** the SRW Pump Room.
   b. Notify 2C43 upon arrival.
3. **WHEN** the TBO is stationed in the SRW Pump Room,
   THEN perform the following actions:

   NOTE
   Adjustment of Controllers past the controller detent pin will stop valve motion.

   a. Adjust 21 AFW PP SPD CONTR, 2-HC-3987B, to MIN SPD.
   b. Adjust 22 AFW PP SPD CONTR, 2-HC-3989B, to MIN SPD.
   c. Adjust 21 SG STM DRIVEN AFW FLOW CONTR 2-AFW-4511-CV, 2-HC-4511B, to MIN FLOW.
   d. Adjust 22 SG STM DRIVEN AFW FLOW CONTR 2-AFW-4512-CV, 2-HC-4512B, to MIN FLOW.
   e. Adjust 21 SG MOTOR DRIVEN AFW FLOW CONTR 2-AFW-4525-CV, 2-HC-4525B, to MIN FLOW.
   f. Adjust 22 SG MOTOR DRIVEN AFW FLOW CONTR 2-AFW-4535-CV, 2-HC-4535B, to MIN FLOW.
   g. Notify the TBO to align AFW Flow and Speed Control to 2C04 **PER** Section VI, Step E.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

E. **(TBO)** ALIGN AFW FLOW AND SPEED CONTROL TO 2C04.

1. **WHEN** notified to align AFW Flow and Speed Control to 2C04,
   THEN perform the following actions:

   a. In the SRW Room Upper Level,
      Place in POSITION 1 **ALL** AFW System Valves listed below:

      - **SOUTH WALL** (In Hand Transfer Box)
        - 2-IA-4511-HV
        - 2-IA-4512-HV
      - **Stanchion L50.1** between 2-AFW-4525-CV and 2-AFW-4535-CV (In Hand Transfer Box)
        - 2-IA-4525-HV
        - 2-IA-4535-HV
      - **Northwest Corner** next to U-2 to U-1 AFW X-conn CV, 2-AFW-4550-CV.
        - 2-IA-4070-HV
        - 2-IA-4071-HV

   b. **GO TO** the AFW Pump Room.

   c. Place 21 AFW Pump Speed Control Handvalve, 2-HV-3987, to POSITION 1.

   d. Place 22 AFW Pump Speed Control Handvalve, 2-HV-3989, to POSITION 1.

2. Notify the Control Room that the AFW Flow and Speed Controls are aligned to 2C04.

3. Notify 2C43 that the AFW Flow and Speed Controls are aligned to 2C04.

4. **GO TO** the Unit 2 45' Switchgear Room.

5. Notify the Control Room upon arrival.

6. **GO TO** the ADV Handvalve enclosure to align 21 and 22 ADVs to 2C03 **PER** Section VI, Step I.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

F. (RO) START FEEDING BOTH SGs FROM 2C04.

1. **WHEN** notified by the TBO that AFW Flow and Speed Control are aligned to 2C04, **THEN** start feeding the SGs with an AFW pump from 2C04.

   a. **IF** 21 or 22 AFW pump is operating, **THEN** perform the following actions:

      (1) Slowly raise the output of the in service AFW pump's SPEED CONTR to the maintain pump discharge pressure at least 100 PSI greater than SG pressure.

      - (21 SG) 2-HC-3987A
      - (22 SG) 2-HC-3989A

      (2) Adjust the following controllers as necessary to maintain SG levels between (-)24 and (+)30 inches:

      - (21 SG) 2-FIC-4511A
      - (22 SG) 2-FIC-4512A

   b. **IF** 23 AFW pump is operating, **THEN** adjust the following controllers as necessary to maintain SG levels between (-)24 and (+)30 inches:

   - (21 SG) 2-FIC-4525A
   - (22 SG) 2-FIC-4535A

G. (RO) ALIGN ADV CONTROL TO 2C03.

1. **WHEN** the TBO has arrived in the 45' Switchgear Room, **THEN** place ATMOSPHERIC STEAM DUMP CONTR, 2-HIC-4056, in manual.
2. Adjust ATMOSPHERIC STEAM DUMP CONTR, 2-HIC-4056, to 0% output.
3. Notify 2C43 to shut ADVs at 2C43 **PER** Section VI, Step H.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

H. (CRO) SHUT ADVs AT 2C43.

1. **WHEN** notified to shut the ADVs
   THEN place the following ADV Controllers to SHUT (zero output):

   - (21 ADV) 2-HC-4056A
   - (22 ADV) 2-HC-4056B

2. Notify the TBO to align 21 and 22 ADVs to 2C03 **PER** Section VI, Step I.

I. (TBO) ALIGN 21 AND 22 ADVs TO 2C03.

1. **WHEN** notified to align 21 and 22 ADVs to 2C03,
   THEN place the following handvalves to POSITION 1:

   - 21 ADV Aux Shutdown Control Transfer, 2-HV-3939A
   - 21 ADV Quick Open Override Handvalve, 2-HV-3939B
   - 22 ADV Aux Shutdown Control Transfer, 2-HV-3938A
   - 22 ADV Quick Open Override Handvalve, 2-HV-3938B

2. Notify the Control Room that the ADVs are aligned to 2C03.

3. Notify 2C43 the ADVs are aligned to 2C03.

J. (RO) CONTROL COLD LEG TEMPERATURES.

1. **WHEN** notified that the ADVs are aligned to 2C03,
   THEN adjust the ATMOSPHERIC STEAM DUMP CONTR, 2-HIC-4056, as necessary to maintain T_{COLD} between 525 and 535° F.

2. **IF** the Turbine Bypass Valves are controlling T_{COLD} between 525 and 535° F,
   THEN place the ATMOSPHERIC STEAM DUMP CONTR, 2-HIC-4056, to AUTO.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

K. (CRO) ALIGN PRESSURIZER HEATER CONTROL TO 2C06.

1. Rotate the keys to REMOTE for the Pressurizer Backup Heater Transfer Controllers:
   - (21 Backup Heater) 2-HS-100-4A
   - (23 Backup Heater) 2-HS-100-6A
2. Remove the keys from the Pressurizer Backup Heater Transfer Controllers.
3. Notify the Control Room that PZR Backup Heater control has been transferred to 2C06.

L. (CRO) RETURN TO THE CONTROL ROOM.

1. Make a site-wide page announcement informing all plant personnel that control has been shifted from 2C43 to the Control Room.
2. **GO TO** the Control Room.
3. Notify the STA to perform the Final Check of plant status **PER** Section VI Step M.

M. (STA) PERFORM THE FINAL CHECK OF PLANT STATUS.

1. **WHEN** notified by the CRO to perform the Final Check of plant status, **THEN** return to the Control Room.
2. Perform the Final Check of plant status **PER** Section VII., SAFETY FUNCTION STATUS CHECK , using Control Room instrumentation.
3. **WHEN** the Safety Function Status Check Final Acceptance Criteria are met, **THEN** notify the CRS and the CRO.

2C43.....3502/5652/3522	AFW..................5517	1A DG......5320	ADVs........5648
27' SWGR......5482/5483	SRW UL/LL..5601/5600	1B DG......5631	INTAKE.....5511
1C43.....3501/5625/3511	CC RM...............5590	2A DG......5630	13KV MC..5655
72'CMPTR RM.........4404	0C DG................5302	2B DG......5642	U-2 NSSS..5640
MCC-204...........5645	MCC-214...........5687		

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

N. **(CRO)** ALIGN MSIV CONTROL TO 2C03.

NOTE
Performance of this step may **NOT** be required.

1. **IF** the MSIVs were manually shut,
   THEN place MSIV handswitches to CLOSE:
   - (21 MSIV) 2-HS-4043
   - (22 MSIV) 2-HS-4048
2. Notify the ABO to restore MSIV operation to the Control Room **PER** Section VI, Step O.

O. **(ABO)** RESTORE MSIV OPERATION TO THE CONTROL ROOM.

NOTE
Performance of this step may **NOT** be required. Direction to perform this step will be given from Control Room.

1. **IF** notified to restore MSIV operation to the Control Room,
   THEN perform the following actions:
   a. Place a wrench on the Dump Solenoid stem nut of:
      - (21 MSIV) 2-MSH-4042A-SV (2-MSH-4042B-SV)
      - (22 MSIV) 2-MSH-4047A-SV (2-MSH-4047B-SV)

   b. Rotate the wrench in the counterclockwise direction, approximately three turns, until the wrench stops.

   c. Remove the wrench and replace the Dump Solenoid Valve Cap.

   d. Repeat steps O.1.a through O.1.c for the other MSIV.

   e. Open Instrument Air Isolation to 21 MSIV Hydraulic Pump, 2-IA-928.

   f. Open Instrument Air Isolation to 22 MSIV Hydraulic Pump, 2-IA-930.

   g. Notify the Control Room that MSIV operation has been restored to the Control Room.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

P. **(CRO)** RESTORE CVCS CONTROL TO 2C07.

1. Verify that the handswitches for VCT Outlet, 2-CVC-501-MOV and RWT To Charging PP Suction valve, 2-CVC-504-MOV, are in the same positions that the ABO left the MOVs in.
2. Notify the ABO to energize CVCS MOVs **PER** Section VI, Step Q.
3. **WHEN** notified that the CVCS MOVs are energized,
   THEN place the handswitches for VCT Outlet, 2-CVC-501-MOV and RWT To Charging PP Suction valve, 2-CVC-504-MOV, in AUTO.
4. Operate Charging and Letdown to maintain pressurizer level at approximately 160 inches.

Q. **(ABO)** ENERGIZE CVCS MOVs.

1. **WHEN** notified to energize CVCS MOVs,
   THEN GO TO MCC 214.
2. Shut the following breakers:
   - RWT to Charging Pump Suction Valve, 2-CVC-504-MOV breaker 52-21423
   - VCT Outlet Valve, 2-CVC-501-MOV breaker 52-21431
3. Notify the Control Room that 2-MOV-504 and 2-MOV-501 have been energized.

R. **(OSO)** RETURN SAFE SHUTDOWN EQUIPMENT.

1. Ensure that **ALL** Safe Shutdown Equipment and Keys are returned to the appropriate lockers and enclosure.

VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM

S. **(CRO)** IMPLEMENT APPROPRIATE OPERATING PROCEDURE.

1. **IMPLEMENT** EOP-0, POST TRIP IMMEDIATE ACTIONS.

END of Section VI

VII. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the intermediate and final safety function checks respectively on entry and prior to exiting from this procedure.

B. Perform intermediate safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being met, promptly upon discovery.

REACTIVITY CONTROL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. WRNI	lowering		less than 10^{-4}%	
b. SUR	negative		negative or zero	
c. CEA status	**NO** more than ONE CEA **NOT** fully inserted		**NO** more than ONE CEA **NOT** fully inserted	
OR				
Boration status	greater than or equal to 40 GPM		greater than 2300 ppm	

VII. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 13KV service buses 11 or 21	**NOT** Available		at least ONE energized	____
b. 4KV vital buses 21 or 24	at least ONE energized	____ | ____ | ____ | ____	at least ONE energized	____
c. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	____ | ____ | ____ | ____	**ALL** greater than 105 volts	____
d. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	____ | ____ | ____ | ____	at least THREE energized	____
e. 2Y09 or 2Y10	**NOT** Available		at least ONE energized	____

VII. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	1850 PSIA to 2300 PSIA		2225 PSIA to 2275 PSIA	
b. Pressurizer level	80 inches to 180 inches		130 inches to 180 inches	
c. RCS subcooling	30°F to 140°F		30°F to 140°F	

VII. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. RCS T_{COLD}	525°F to 535°F		525°F to 535° F	
b. T_{HOT} minus T_{COLD}	less than 10°F		less than 10°F	
c. S/G level 21 or 22	(-)170 inches to (+)30 inches		(-)24 inches to (+)30 inches	
	trending to (-)24 inches to (+)30 inches		N/A	N/A

VII. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 0.7 PSIG		less than 0.7 PSIG	
b. Containment Temperature	less than 120°F		less than 120°F	
c. Containment Radiation Monitor	**NO** unexplained rise		**NO** unexplained rise	
	alarm clear		alarm clear	

VII. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Noble Gas Monitor (2-RIC-5415)	**NO** unexplained rise		**NO** unexplained rise	
	alarm clear		alarm clear	
b. Condenser Off-Gas RMS (2-RI-1752)	**NO** unexplained rise		**NO** unexplained rise	
	alarm clear		alarm clear	
c. S/G B/D RMS (2-RI-4014)	**NO** unexplained rise		**NO** unexplained rise	
	alarm clear		alarm clear	
d. Main Vent Gaseous RMS (2-RI-5415)	**NOT** Available		**NO** unexplained rise	
			alarm clear	

VII. SAFETY FUNCTION STATUS CHECK

STATUS CHECK NUMBER	COMPLETED AT TIME
1	
2	
3	
4	
5	
6	
7	
8	

ATTACHMENT (1)

PLACEKEEPER

START	FUNCTION	DONE	PAGE
	SECTION IV. ACTIONS PRIOR TO EVACUATION OF THE CONTROL ROOM		
	A. (RO) TRIP THE REACTOR.		6
	B. (CRO) TRIP THE MAIN TURBINE SGFPs AND SECURE BLOWDOWN.		7
	C. (ALL PERSONNEL) EVACUATE THE CONTROL ROOM.		8

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	SECTION V. ACTIONS OUTSIDE THE CONTROL ROOM		
	A. (RO) MANUALLY TRIP THE MAIN TURBINE.		9
	B. (RO) SHUTDOWN 21 AND 22 CEDM MG SETS.		9
	C. (CRO) UNLOCK SAFE SHUTDOWN KEY LOCKER AND EQUIPMENT LOCKER.		9
	D. (SM) DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.		10
	E. (OSO) OBTAIN RADIOS AND GO TO 1C43 AND 2C43.		11
	F. (TBO) OBTAIN EQUIPMENT, THEN TRIP 21 AND 22 SGFPs.		12
	G. (ABO) OBTAIN EQUIPMENT, THEN GO TO 45 FOOT AUXILIARY BUILDING.		13
	H. (CRO) VERIFY REACTOR IS SHUTDOWN.		13
	I. (CRO) ADJUST ADV CONTROLLERS ON 2C43.		13
(I)	J. (RO) ALIGN 21 AND 22 ADVs TO 2C43.		14
	K. (CRO) VERIFY COLD LEG TEMPERATURES.	C	15
	L. (ABO) IF NOTIFIED, THEN SHUT BOTH MSIVs.		16
	M. (STA) COMMENCE SAFETY FUNCTION STATUS CHECKS.		17
	N. (CRO) COMPLETE INITIALIZATION OF CONTROLLERS ON 2C43.		18
	O. (TBO) ALIGN AFW PUMP SPEED CONTROL TO 2C43.		18

NOTE: *Continuously Applicable Steps are designated with a "C" in the Done column.*
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)
Page 3 of 5

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	P. (TBO) ALIGN THE AFW FLOW CONTROL TO 2C43.		19
	Q. (TBO) VERIFY AFW PUMP OPERATION.	C	19
(P)	R. (CRO) INITIATE AFW FLOW TO SGs.	C	22
	S. (RO) START 23 AFW PP.		22
	T. (CRO) MONITOR PRESSURIZER LEVEL.	C	23
	U. (CRO) ENERGIZE PRESSURIZER BACKUP HEATER.	C	23
	V. (RO) MANUALLY OPERATE THE CHARGING PUMP(S).		24
	W. (CRO) MAKEUP TO THE VCT.		25
	X. (ABO) DEENERGIZE CVCS MOVs.		25
	Y. (ABO) ALIGN CHARGING PUMP SUCTION TO THE RWT.		26
	Z. (ABO) ALIGN CHARGING PUMP SUCTION TO THE VCT.		26
	AA. (TBO) CHECK THE STATUS OF THE MAIN TURBINE.		27

NOTE: Continuously Applicable Steps are designated with a "C" in the Done column.
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	SECTION VI. RE-ESTABLISHING CONTROL FROM THE CONTROL ROOM		
	A. (RO) RETURN TO THE CONTROL ROOM.		28
	B. (RO) ADJUST AFW FLOW CONTROLS AT 2C04.		28
	C. (RO) ADJUST AFW SPEED CONTROLLERS AT 2CO4.		28
(C)	D. (CRO) SECURE AFW FLOW FROM 2C43.		29
(D)	E. (TBO) ALIGN AFW FLOW AND SPEED CONTROL TO 2C04.		30
(E)	F. (RO) START FEEDING BOTH SGs FROM 2C04.	C	31
	G. (RO) ALIGN ADV CONTROL TO 2C03.		31
(G)	H. (CRO) SHUT ADVs AT 2C43.		32
(H)	I. (TBO) ALIGN 21 AND 22 ADVs TO 2C03.		32
(I)	J. (RO) CONTROL COLD LEG TEMPERATURES.	C	32
	K. (CRO) ALIGN PRESSURIZER HEATER CONTROL TO 2C06.		33
	L. (CRO) RETURN TO THE CONTROL ROOM.		33
	M. (STA) PERFORM THE FINAL CHECK OF PLANT STATUS.		33
	N. (CRO) ALIGN MSIV CONTROL TO 2C03.		34
(N)	O. (ABO) RESTORE MSIV OPERATION TO THE CONTROL ROOM.		34
	P. (CRO) RESTORE CVCS CONTROL TO 2C07.		35

NOTE: Continuously Applicable Steps are designated with a "C" in the Done column.
Letters in the START column are prerequisite steps that must be completed prior to initiation of the step.

ATTACHMENT (1)

PLACEKEEPER
(continued)

START	FUNCTION	DONE	PAGE
	Q. (ABO) ENERGIZE CVCS MOVs.		35
	R. (OSO) RETURN SAFE SHUTDOWN EQUIPMENT.		35
	S. (CRO) IMPLEMENT APPROPRIATE OPERATING PROCEDURE.		36

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

AOP-2A

EXCESSIVE REACTOR COOLANT LEAKAGE

REVISION 23

Safety Related

Approval Authority: Chris Jones 12/10/2008
signature/date

Effective Date: 12/16/2008

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-165	23

ATTACHMENT NUMBER	REVISION
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PLACEKEEPER PAGE NUMBERS	REVISION
1	23

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
02300	134

TABLE OF CONTENTS

I. PURPOSE

The purpose of this AOP is to provide direction and actions to be taken for a loss of RCS inventory for all operating conditions except:

1) Reactor Trip related events.

2) During SDC.

II. ENTRY CONDITIONS

Excessive RCS leakage may be indicated by any of the following conditions:

A. One or more Charging Pumps energize automatically during steady state conditions.

B. Charging flow exceeds letdown flow by an abnormal amount during steady state conditions.

C. Charging header pressure is less than RCS pressure.

D. The rate of lowering in VCT level has risen during steady state conditions.

E. Low Pressurizer level occurs during steady state conditions.

F. Quench Tank pressure, level, and/or temperature is high or rising.

G. Acoustic Monitor indicates flow through any of the relief valves, or high temperature exists on their discharge piping (Computer points T106, T107, T108):

- 1-RV-200
- 1-RV-201
- 1-PORV-402
- 1-PORV-404

H. Reactor Coolant Pump seal pressure (upper & middle) is abnormally high or low, and high temperature exists on lower pump seal.

I. Safety Injection Tank check valve leakage pressure is high.

J. Rise in Containment pressure, temperature, and/or humidity.

K. Safety Injection Tank(s) level is rising.

L. Reactor Coolant Drain Tank has abnormal rate of level rise.

M. Component Cooling Head Tank level is high or rising.

N. Reactor Coolant Leakage Evaluation on STP O-27-1 is high.

(continue)

II. (continued)

O. Radiation levels have risen or alarms occur on any of the following:

- Waste Processing Ventilation Radiation Monitors
- Main Vent Radiation Monitors
- Containment Atmosphere Radiation Monitors
- Steam Generator Blowdown Radiation Monitor
- Condenser Off-Gas Radiation Monitor
- Main Steam Line Effluent Radiation Monitors
- Component Cooling Radiation Monitor
- Main Steam/N-16 Radiation Monitors

P. Leakage is observed from primary system piping, flanges, or valve packing.

Q. Portable air samples indicate a rise in activity levels.

R. Rise in Containment Sump Alarm frequency.

S. Identified SG Tube leakage reaching operational limit of 50 GPD through any one SG.

III. PRECAUTIONS

The following specific precautions apply to or throughout this procedure.

A. WARNINGS

1. Radiological conditions in containment may change due to lowering RCS level. Re-entry into Containment is controlled by radiation condition assessment by Rad Con. **[B0138]**

B. CAUTIONS

1. If during the course of implementing this AOP, Pressurizer pressure lowers to the TM/LP pretrip value, the Reactor must be tripped and EOP-0 implemented.
2. Two sections of this AOP address excessive RCS leakage in Modes 3, 4 and 5 when LTOP controls are in effect. The goal of these sections of this AOP is to maintain RCS inventory while ensuring that the RCS components are not subject to an LTOP event. Whenever HPSI Pumps and/or Charging Pumps are maintaining RCS inventory, extreme caution must be exercised to prevent RCS pressure from exceeding the limits of EOP ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, whenever RCS temperature is less than 369° F.
3. Valid ESFAS and AFAS signals to equipment shall **NOT** be overridden or blocked unless specifically directed in this procedure. A valid signal is a signal that at the time on initiation, correlated to plant parameters (e.g., the monitored parameter actually reached its setpoint value).
4. This AOP contains reactivity sensitive steps, actions or consequences. Caution should be used to control parameters that affect reactivity.
5. Solid water operation of the pressurizer should be avoided unless 25° F of subcooling can not be maintained in the RCS. Pressurizer level limits may be exceeded to restore RCS subcooling. Makeup, drainage, heatup or cooldown could cause unfavorable rapid pressure excursions if the RCS is solid.
6. If VCT pressure is significantly reduced, then idle Charging Pumps may become gas bound if **NOT** started or vented.
   - Indication of gas binding in a running Charging Pump include oscillating or reduced amps, flow or discharge pressure.

(continue)

III. (continued)

C. **NOTES**

1. If the Unit is on Shutdown Cooling, then AOP-3B, ABNORMAL SHUTDOWN COOLING CONDITIONS, should be implemented for RCS inventory loss.

2. With the approval of the CRS or SM, two or more steps of this procedure may be performed concurrently. The steps must be evaluated in the sequence listed and determined **NOT** to be dependent upon the actions of other steps of the procedure.

3. Harsh Containment Environment conditions will affect instrument indications. When necessary, modified parameter values designated by braces {} are used to compensate the indicated value for Harsh Containment Environment conditions.

IV. PRELIMINARY

ACTIONS	**ALTERNATE ACTIONS**
A. DETERMINE ACTIONS REQUIRED FOR THE EXISTING PLANT CONDITIONS.	
1. Evacuate **ALL** unnecessary personnel from the Containment **PER** the CONTAINMENT EVACUATION Attachment of ERPIP 3.0. **[B0138]**	
2. Notify Radiation Safety Supervision that excessive RCS leakage exists, and that radiation levels may be changing in the Auxiliary Building and Containment.	
3. Direct Chemistry to perform qualitative samples on both SGs for activity **PER** CP-436.	
4. **IF** the RCS is on Shutdown Cooling, **THEN IMPLEMENT** AOP-3B, ABNORMAL SHUTDOWN COOLING CONDITIONS.	
5. **IF** Pressurizer level is being maintained by **ONE** Charging Pump, **THEN PROCEED** to Section V., RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP, Page 11.	
6. **IF** the Unit is in Mode 1 or 2, **AND** RCS leakage exceeds the capacity of **ONE** Charging Pump, **THEN PROCEED** to Section VI., RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2, Page 27.	

(continue)

IV. PRELIMINARY

ACTIONS	ALTERNATE ACTIONS
A. (continued) 7. **IF** the following conditions exist: • The Reactor is **NOT** critical • RCS leakage exceeds the capacity of **ONE** Charging Pump • LTOP controls are **NOT** in effect **THEN** perform **ONE** of the following: • **IF** pressurizer level is lowering using **ALL** available Charging Pumps, **THEN PROCEED** to Section VII., RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT, Step A, Page 44. • **IF** pressurizer level is being maintained constant or rising using **ALL** available Charging Pumps, **THEN PROCEED** to Section VII., RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT, Step C, Page 46. (continue)	

IV. PRELIMINARY

ACTIONS	ALTERNATE ACTIONS
A. (continued) 8. **IF** LTOP controls are in effect, **AND** RCS leakage exceeds the capacity of **ONE** Charging Pump, **AND** a SG tube leak is identified by observing a rise in **ANY** of the following: • SG sample activities • Condenser Off-Gas radiation levels at 1-RI-1752 • SG Blowdown radiation levels at 1-RIC-4095 or 1-RI-4014 • MAIN STEAM EFFL RAD MONITOR levels at 1-RIC-5421 or 1-RIC-5422 • Feed flow mismatch • SG water level (Unexplained) **THEN PROCEED** to Section VIII., <u>EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT</u>, Page 56. 9. **IF** LTOP controls are in effect **AND** RCS leakage exceeds the capacity of **ONE** Charging Pump, **AND** a SG tube leak has **NOT** been identified, **THEN PROCEED** to Section IX., <u>EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT</u>, Page 106. END of Section IV	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
A. DETERMINE THE APPROPRIATE EMERGENCY RESPONSE.	
1. Determine the appropriate emergency response actions **PER** the ERPIP.	
2. Determine reporting requirements of RM-1-101, REGULATORY REPORTING.	
B. ATTEMPT TO DETERMINE RCS LEAK RATE.	
1. Attempt to determine RCS leak rate by considering the following: • RMS indications **PER** RMS Correlation Graphs • ATTACHMENT (1), ESTIMATE GROSS LEAK RATE • Reactor Coolant Leakage Evaluation, STP O-27-1 • VCT level trend from recorder • CNTMT Sump alarm frequency • Comparison of Charging flow versus Letdown flow	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
C. ATTEMPT TO LOCATE AND ISOLATE THE LEAK.	
1. Determine if a SG tube leak exists by observing a rise in **ANY** of the following: • SG sample activities • Condenser Off-Gas radiation levels at 1-RI-1752 • SG Blowdown radiation levels at 1-RIC-4095 or 1-RI-4014 • MAIN STEAM EFFL RAD MONITOR levels at 1-RIC-5421 or 1-RIC-5422 • MAIN STM N-16 RAD MONITOR levels at 1-RIC-5421A or 1-RIC-5422A • Feed flow mismatch • SG level (Unexplained)	
2. **IF** a SG tube leak is identified, **THEN PROCEED** to Step D, Page 15.	
3. Determine if the leak is in Containment by observing the following: • Rise in Containment temperature, pressure, humidity or sump level alarm frequency • Rise in Containment gaseous or particulate activity • "U-1 WR NOBLE GAS RAD MON" and "UNIT 1 MAIN VENT GASEOUS" alarms clear	
4. **IF** the leak is determined to be inside Containment, **THEN** coordinate with Rad Safety and consider performing a Containment entry to locate the source of the leak.	

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
C. (continued) 5. Determine if the leak is in the Auxiliary Building by observing the following: • Rise in radiation levels on the UNIT 1 WP VENT RMS, 1-RI-5410 • Unexplained rise in the Waste Processing Tank levels 6. **IF** the location of the leak has **NOT** been determined, **THEN** attempt to locate the leak **PER** ATTACHMENT (2), LEAK IDENTIFICATION. 7. **WHEN** the location of the leak has been determined, **AND** plant conditions permit, **THEN** isolate the leak. 8. **IF** the location of the leak has **NOT** been determined, **THEN** perform the following actions: a. Continue to investigate the source of the leak. b. Continue to evaluate the leak rate **PER** Step B, Page 11. 9. **IF** the leak rate exceeds the capacity of **ONE** Charging Pump, **THEN PROCEED** to Section IV., PRELIMINARY, Page 8, to determine actions required for existing plant conditions. (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
C. (continued) 10. **IF** the LCO for Tech. Spec. 3.4.13, RCS Operational Leakage, is exceeded, **THEN** comply with the Actions by placing the plant in cold shutdown **PER** OP-3, NORMAL POWER OPERATION, OP-4, PLANT SHUTDOWN FROM POWER OPERATION TO HOT STANDBY, or OP-5, PLANT SHUTDOWN FROM HOT STANDBY TO COLD SHUTDOWN. 11. **IF** the leak has been isolated, or the leak rate is within the limits of Tech. Spec. 3.4.13, RCS Operational Leakage, **THEN** evaluate the need to place the plant in a cold shutdown condition. 12. **IF** normal operations are to continue, **THEN** perform the following: a. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, LOCKED VALVES • Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES b. **IMPLEMENT** the applicable Operating Procedure.	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D. COMMENCE THE ACTIONS FOR A SG TUBE LEAK.	

NOTE

Leak rate should be qualitatively evaluated by more than one RMS channel prior to commencing plant shutdown. Samples may be used to perform the qualitative evaluation if the leak rate trend is rising less than 20 GPD in any 30 minute period.

1. **IF** the leak rate exceeds 50 GPD through any one SG,
   THEN perform the following:

   a. Continue to evaluate the leak rate **PER** Step B, Page 11.

   b. **IF** the leak rate exceeds the capacity of **ONE** Charging Pump,
      THEN PROCEED to Section IV., PRELIMINARY, Page 8, to determine actions required for existing plant conditions.

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS

D.1 (continued)

c. **IF** the reactor is critical,
THEN commence power reduction:

NOTE

NO action is required for leak rate spikes if the indicated leak rate is returning to within 20 GPD of the previous value in less than 30 minutes.

(1) **IF BOTH** of the following conditions exist:

- The leak rate is greater than 100 GPD
- The leak rate trend is rising greater than 20 GPD in any 30 minute period

THEN perform the following:

(a) Within one hour, reduce power to less than 50% **PER** OP-3, NORMAL POWER OPERATION.

(b) Continue to reduce power to be in Mode 3 within the next 2 hours **PER** OP-3, NORMAL POWER OPERATION, and OP-4, PLANT SHUTDOWN FROM POWER OPERATION TO HOT STANDBY.

(2) Commence an expeditious power reduction **PER** OP-3, NORMAL POWER OPERATION, and OP-4, PLANT SHUTDOWN FROM POWER OPERATION TO HOT STANDBY.

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D. (continued)	
2. Shut the S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV	
3. **IF** an alarm occurs on the UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, **THEN** verify that Blowdown has diverted to the Waste Processing System by observing: a. DISCH TO MWS valve, 1-BD-4097-CV, is open. b. The following Blowdown valves are shut: • DISCH TO CNDSR 1-BD-4096-CV • DISCH TO CIRC WTR 1-BD-4015-CV	3.1 **IF** the Blowdown IXs are bypassed due to high temperature, **AND** an alarm actuates on SG Blowdown Monitor, 1-RI-4014, **THEN** verify that Blowdown has diverted to the Waste Processing System by observing: a. DISCH TO MWS valve, 1-BD-4097-CV, is open. b. The following Blowdown valves are shut: • DISCH TO CNDSR 1-BD-4096-CV • DISCH TO CIRC WTR 1-BD-4015-CV
4. Open the PRECOAT SYS BYP valve, 1-CD-5818-CV.	
5. Verify that Condensate flow through the Demineralizers is maximized.	
6. Determine the affected SG by evaluating the SG activity samples.	
(continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	**ALTERNATE ACTIONS**

D. (continued)

7. Direct Radiation Safety Supervision to begin taking radiation surveys in the Turbine Building and the Water Treatment Area, in order to establish radiological controlled areas.

8. **WHEN** the reactor is shutdown,
   THEN commence a plant cooldown and depressurization **PER** OP-5, PLANT SHUTDOWN FROM HOT STANDBY TO COLD SHUTDOWN.

NOTE
If both SGs are affected, then consider the most affected SG as the affected SG.

9. **WHEN** RCS temperature is less than 515° F,
   THEN isolate the affected SG:

   a. On the affected SG, shut the MSIV:

      - (11 SG) 1-MS-4043-CV
      - (12 SG) 1-MS-4048-CV

   b. On the affected SG, shut the SG FW ISOL valve:

      - (11 SG) 1-FW-4516-MOV
      - (12 SG) 1-FW-4517-MOV

   c. On the affected SG, shut the AFW Flow Control Valves:

      11 SG
      - 1-AFW-4511-CV
      - 1-AFW-4525-CV

      12 SG
      - 1-AFW-4512-CV
      - 1-AFW-4535-CV

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D.9 (continued) d. On the affected SG, shut the motor and steam driven train AFW Block valves: 11 SG • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 SG • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV e. On the affected SG, shut the SG AFW STM SUPP & BYPASS valves: • (11 SG) 1-MS-4070-CV 1-MS-4070A-CV • (12 SG) 1-MS-4071-CV 1-MS-4071A-CV (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D.9 (continued)	
f. On the affected SG, shut the ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 foot Switchgear Room as follows: (1) Verify that the ADV controller at 1C43 for the affected SG is set at 0% output: • (11 SG) 1-HC-4056A • (12 SG) 1-HC-4056B (2) Align the Hand Transfer Valves for the affected SG to POSITION 2 (1C43): 11 SG • 1-HV-3938A • 1-HV-3938B 12 SG • 1-HV-3939A • 1-HV-3939B	f.1 **IF** the ADV will **NOT** shut from 1C43, **THEN** shut the affected SG ADV Manual Isolation valve: • (11 SG) 1-MS-101 • (12 SG) 1-MS-104
g. On the affected SG, verify shut the SG MSIV BYP valve: • (11 SG) 1-MS-4045-MOV • (12 SG) 1-MS-4052-MOV	
h. Shut the upstream drains by placing MS STEAM UPSTREAM DRN ISOL VLVS handswitch, 1-HS-6622, to CLOSE.	
i. Observe locally, from the Auxiliary Building Roof, that the SG Safety Valves are **NOT** leaking.	i.1 **IF** the SG Safety Valves are observed leaking, **THEN** inform Chemistry and Radiation Safety Supervision that an unmonitored radiological release is occurring.

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D. (continued) 10. Verify that the affected SG is isolated by checking the following: • Condenser Off-Gas radiation levels at 1-RI-1752 lowering • SG samples verifies activity higher in the affected SG 11. **IF** the wrong SG was isolated, **THEN** perform the following actions to return the isolated SG to service: a. **IF** Main Feedwater flow has been stopped for greater than 80 minutes, **THEN** perform the following actions: (1) Initiate AFW flow to the unaffected SG. (2) Ensure the SG FW ISOL valves are shut. **CAUTION** **A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** b. Position all valves that were shut in Step D.9 to their desired position. c. Isolate the proper SG **PER** Step D.9. (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D. (continued) **WARNING** **Radiation levels may be higher than normal on the (-)10 and (-)15 foot levels of the Auxiliary Building.** 12. Maintain the level in the isolated SG between (-)24 and (+)60 inches by blowing down to the MWS **PER** OI-8A, BLOWDOWN SYSTEM. 13. Control secondary system contamination. a. Minimize the spread of contamination by performing the following: (1) Ensure the Unit 1 Turbine Building Sump Pumps are in STOP. (2) Isolate Condensate Dump to 11 CST by verifying the following valves are shut: • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 1-CD-232 • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 BYPASS VALVE, 1-CD-234 (3) Verify CONDENSER MAKEUP CV-4406 BYPASS VALVE, 1-CD-238, is shut. (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D.13.a (continued) (4) Reduce moisture carryover into the CAR Discharge Header by fully opening the CONDENSER VACUUM PUMP SERVICE WATER OUTLET VALVEs: • (11 CAR) 1-SRW-211 • (12 CAR) 1-SRW-215 • (13 CAR) 1-SRW-219 • (14 CAR) 1-SRW-223 (5) Ensure Condensate to Circ Water Dump is isolated by verifying the followng valves shut: • CONDENSER DUMP TO CIRCULATING WATER ISOLATION VALVE, 1-CD-239 • CONDENSATE DUMP TO CIRCULATING WATER BYPASS VALVE, 1-CD-455 (6) Ensure condenser expansion joints are **NOT** overflowing by verifying the CONDENSER EXPANSION JOINT FILL VALVEs are shut: • (11 Condenser) 1-CD-306 • (12 Condenser) 1-CD-307 • (13 Condenser) 1-CD-308 (7) Verify shut SRW HEAD TANK MAKEUP ISOLATION VALVE, 1-CD-144. (8) Verify shut COMPONENT COOLING SYSTEM MAKEUP ISOLATION VALVE, 1-CD-145. (9) Notify Plant Chemistry to secure the Hotwell sample pumps and isolate the sample sinks. (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D.13 (continued) b. Control the volume of contaminated condensate inventory by performing the following actions: **CAUTION** **Operating CAR PPs with condenser hotwell level greater than 12 feet may draw excessive water into the CAR PPs.** **CAUTION** **Operating a SGFP with condenser hotwell level greater than 12 feet may actuate the high exhaust casing level trip.** (1) **IF** condenser hotwell level exceeds 12 feet, **THEN** perform the following: (a) Ensure Auxiliary Feedwater flow is established to the unaffected S/G. (b) **IF** a SGFP is in operation, **THEN** secure the SGFP. (c) Secure the CAR PPs. (2) **IF** condenser hotwell level exceeds 14 feet, **THEN** shut the COND SHELL STOPs: • 1-CAR-101 • 1-CAR-102 • 1-CAR-103 • 1-CAR-104 • 1-CAR-105 • 1-CAR-106 (continue)	

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS

D.13.b (continued)

NOTE

Using the Turbine Bypass System with Condensate/Main Feedwater will enable greater cooldown capability without raising contaminated condensate inventory.

CAUTION

An unmonitored radiation release could occur if the Atmospheric Dump Valve is in use and Condensate/Main Feedwater is used to feed the unaffected S/G.

(3) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** attempt to restore the Turbine Bypass System **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.

(4) **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** shut the Hotwell Makeup CV by shifting 1-LIC-4405 to MANUAL with 100% output.

(5) Ensure the Auxiliary Boiler Condensate returns are aligned to Unit 2 by verifying the following:

(a) 0-AHB-211, DEAERATOR OVERFLOW TO 21 CONDENSER ISOLATION VALVE, is open.

(b) 0-AHB-210, DEAERATOR OVERFLOW TO 11 CONDENSER ISOLATION VALVE, is shut.

(continue)

V. RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP

ACTIONS	ALTERNATE ACTIONS
D.13.b (continued) (6) Ensure the RC Waste Evaporators are aligned to Unit 2 or the Auxiliary Boilers **PER** OI-17E, REACTOR COOLANT WASTE EVAPORATOR OPERATION. (7) Ensure Plant Heating is aligned to Unit 2 Reheat Steam or the Auxiliary Boilers **PER** OI-40, PLANT HEATING SYSTEM. 14. Sample the SGs for activity periodically. 15. **WHEN** the cooldown is complete, **THEN** perform the following: a. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, LOCKED VALVES • Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES b. **IMPLEMENT** OP-5, PLANT SHUTDOWN FROM HOT STANDBY TO COLD SHUTDOWN. END of Section V	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
A. DETERMINE THE APPROPRIATE EMERGENCY RESPONSE.	
1. Determine the appropriate emergency response actions **PER** the ERPIP. 2. Determine reporting requirements of RM-1-101, REGULATORY REPORTING.	
B. VERIFY THAT THE EVENT IS NOT CHALLENGING THE RPS.	
1. **IF**, at **ANY** time, PZR pressure reaches the TM/LP pretrip setpoint, **THEN**, with the permission of the SM/CRS, perform the following actions: a. Trip the Reactor b. **IMPLEMENT** EOP-0, POST TRIP IMMEDIATE ACTIONS.	
C. CONTROL PRESSURIZER LEVEL.	
1. Verify that Charging Pumps are maintaining PZR level within 15 inches of programmed level.	1.1 **IF** PZR level is **NOT** being maintained by **ALL** available Charging Pumps, **THEN** shut the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV
2. Makeup to the VCT to maintain level as necessary.	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D. CHECK FOR A SG TUBE LEAK.	
1. Determine if a SG Tube Leak exists by observing a rise in **ANY** of the following: • SG sample activities • Condenser Off-Gas radiation levels at 1-RI-1752 • SG Blowdown radiation levels at 1-RIC-4095 or 1-RI-4014 • MAIN STEAM EFFL RAD MONITOR radiation levels at 1-RIC-5421 or 1-RIC-5422 • MAIN STM N-16 RAD MONITOR levels at 1-RIC-5421A or 1-RIC-5422A • SG water level (Unexplained) • Feed flow mismatch	

(continue)

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D. (continued) 2. **IF** a SG Tube Leak is indicated, **THEN** perform the following actions: a. Shut the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV b. Ensure the S/G B/D valves are shut: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV **NOTE** The intent of the following step is to reduce T_{AVE} to less than 537° F prior to tripping the Reactor so that the SG Safety Valves will **NOT** lift. c. Borate to reduce T_{AVE} to less than 537° F by using **ANY** of the following methods: • Initial boration from the BASTs followed by suction from the RWT: (1) Open the BA DIRECT M/U valve, 1-CVC-514-MOV. (2) Start **ALL** available CHG PPs. (3) Start **ONE** BA PP and operate it for approximately one minute. (4) Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. (5) Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D.2.c (continued) (6) Shut the VCT OUT valve, 1-CVC-501-MOV. • Boration from the BASTs (BA PP): (1) Open the BA DIRECT M/U valve, 1-CVC-514-MOV. (2) Start **ALL** available CHG PPs. (3) Start **ONE** BA PP and operate it for approximately one minute. (4) Operate the BA PP approximately fifteen seconds per minute thereafter. • Boration from the BASTs (gravity feed): (1) Start **ALL** available CHG PPs. (2) Open at least **ONE** BAST GRAVITY FD valve: • 1-CVC-508-MOV • 1-CVC-509-MOV (3) Shut the VCT OUT valve, 1-CVC-501-MOV: • Approximately one minute for initial boration • Approximately fifteen seconds per minute thereafter (4) Open the VCT OUT valve, 1-CVC-501-MOV. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D.2.c (continued) (5) Verify **BOTH** BAST GRAVITY FD valves are shut: • 1-CVC-508-MOV • 1-CVC-509-MOV (6) Repeat steps (2) through (5) as necessary. (7) **IF** desired to shift boration to the RWT, **THEN** perform the following: (a) Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. (b) Shut the VCT OUT valve, 1-CVC-501-MOV. • Boration from the RWT: (1) Start **ALL** available CHG PPs. (2) Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. (3) Shut the VCT OUT valve, 1-CVC-501-MOV. d. Obtain the desired rate of power reduction by using **ANY** of the following methods: • Adjust the boration rate • Using CEAs (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) **CAUTION** **Due to loss of PZR heaters, the reactor must be tripped anytime PZR level can NOT be maintained above 101 inches.** e. Reduce Turbine load as necessary to maintain SG pressure between approximately 800 PSIA and 825 PSIA. f. Shutdown MSRs during Turbine shutdown as follows: (1) Establish communications between Control Room and Operator(s) at local Panel loaders for MSRs. (2) At 575 MWE load, ensure shut MSR 2nd STG HIGH LOAD MOVS: • 1-MS-4017-MOV • 1-MS-4018-MOV (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
D.2.f (continued) **CAUTION** **Exceeding any of the below limits may cause turbine rotor packing rubs and increased turbine vibration.** (3) Adjust **BOTH** second stage panel loader output signals such that load valves, 1-MS-4021-CV and 1-MS-4024-CV, shut to reduce the MSR Second Stage pressure, while observing the following: • Maintain <Monitor><MSR loading> MSR 2nd Stage Pressure, **OR** 1-PI-4020 and 1-PI-4024 at the local Panel Loader, on or to the right and below the <Monitor><MSR loading> SECOND STAGE PRESSURE curve. • Maintain **BOTH** MSR Second Stage Pressures as close to equal as possible during the ramp. • LP Turbine inlet temperature rate of change should **NOT** exceed 125° F/hr as indicated on <Aux><Metal Temps> ISV Crossaround Pipe Differential. • Differential temperature between LP turbine inlets should **NOT** exceed 50° F as indicated on <Monitor><Misc temps> ISV Crossaround Differential Temps. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS

D.2 (continued)

g. Verify the HI LVL DUMP valves for the following Low Pressure Feedwater Heaters are open:

- 11A HI LVL DUMP, 1-HS-1447
- 11B HI LVL DUMP, 1-HS-1449
- 11C HI LVL DUMP, 1-HS-1451

- 12A HI LVL DUMP, 1-HS-1453
- 12B HI LVL DUMP, 1-HS-1455
- 12C HI LVL DUMP, 1-HS-1457

CAUTION

To ensure that the SGFP runback speed will be in the required range when the Reactor Trip occurs, ensure SGFPT SPD BIAS ADJ potentiometer setpoint is maintained greater than or equal to 4.8.

h. Monitor the Feedwater system and adjust the SGFP BIAS as necessary to maintain S/G levels.

i. **WHEN ANY** of the following conditions exist:

- T_{AVE} is less than 537° F
- PZR level can **NOT** be maintained above 101 inches
- PZR pressure reaches the TM/LP pretrip setpoint

THEN, with the permission of the SM/CRS, perform the following actions:

(1) Trip the Reactor.

(2) **IMPLEMENT** EOP-0, POST-TRIP IMMEDIATE ACTIONS.

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
E. ATTEMPT TO ISOLATE THE LEAK. **[B0101]**	
1. Verify that the L/D CNTMT ISOL valves are shut: • 1-CVC-515-CV • 1-CVC-516-CV	
2. Check there is **NO** PORV leakage by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication	2.1 **IF** PORV leakage is indicated, **AND** PZR pressure is less than 2300 PSIA, **THEN** perform the following: a. Shut the appropriate PORV BLOCK valves: • 1-RC-403-MOV • 1-RC-405-MOV b. Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 1-HS-1402 • 1-HS-1404
3. Verify that RCS SAMPLE ISOL valve, 1-PS-5464-CV, is shut.	
4. Verify that the Reactor Vessel Vent valves are shut: • 1-RC-103-SV • 1-RC-104-SV	
5. Verify that the PZR Vent valves are shut: • 1-RC-105-SV • 1-RC-106-SV (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	**ALTERNATE ACTIONS**
E. (continued) **NOTE** A leak on the Charging header which exceeds the capacity of the charging pumps can be identified by Charging header pressure indicating less than RCS pressure. Identification of the leak may be missed if more than one charging pump is running. 6. Determine if the leak is on the Charging header by performing the following actions: a. Stop all but **ONE** CHG PP. b. **IF** Charging header pressure is less than RCS Pressure, **THEN** assume the leak is on the Charging header. c. **IF** the leak is **NOT** on the Charging header, **THEN** start any CHG PPs that were stopped. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
E. (continued) 7. **IF** the leak is on the Charging header, **THEN** perform the following actions: a. Place **ALL** CHG PPs in PULL TO LOCK. b. Dispatch an operator to determine the location of the leak. **NOTE** CHG PP HDR XCONN, 1-CVC-182, is located near 12 Charging Pump. c. **IF** the leak is upstream of CHG PP HDR XCONN, 1-CVC-182, **THEN** shut 1-CVC-182, **AND** start 12 or 13 CHG PP as required. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS

E.7 (continued)

d. **IF** the leak is downstream of 1-CVC-182, **THEN** align Charging to the Auxiliary HPSI Header:

(1) Verify that the following valves are shut:

- AUX SPRAY valve, 1-CVC-517-CV
- LOOP CHG valves:
  - 1-CVC-518-CV
  - 1-CVC-519-CV

NOTE

The Auxiliary HPSI Header is out of service and T.S. 3.5.2 applies when 1-SI-656-MOV is shut.

(2) Shut the HPSI AUX HDR ISOL valve, 1-SI-656-MOV.

(3) Open **ONE** of the following AUX HPSI HDR Valves:

- 1-SI-617-MOV
- 1-SI-627-MOV
- 1-SI-637-MOV
- 1-SI-647-MOV

(4) Open the SI TO CHG HDR valve, 1-CVC-269-MOV.

(continue)

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
E.7.d (continued)	
NOTE REGEN HX CHG INLET, 1-CVC-183, is located in the 27 foot West Penetration Room.	
CAUTION **When a Charging Pump is started, Reactor power will lower due to the concentration of Boric Acid in the Auxiliary HPSI header being 2300 PPM or greater.**	
(5) **IF** the leak is downstream of the REGEN HX CHG INLET valve, 1-CVC-183, **THEN** shut 1-CVC-183, **AND** start any available CHG PP.	(5).1 **IF** 1-CVC-183 in **NOT** accessible, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.
(6) **IF** the leak is upstream of 1-CVC-183, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.	
(7) Declare the Auxiliary HPSI Header out of service and refer to T.S. 3.5.2 ECCS-Operating.	
NOTE If charging via the Auxiliary HPSI header, the Reactor power reduction will result in an initial PZR level reduction.	
e. Verify charging flow by observing a rise in PZR level.	e.1 **IF** PZR level does **NOT** rise with charging flow, **THEN** perform the following: (1) Trip the Reactor. (2) **IMPLEMENT** EOP-0, POST-TRIP IMMEDIATE ACTIONS.
(continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
E. (continued) 8. **IF** the leak is determined to be occurring inside Containment by checking the following indications: • Rise in Containment temperature, pressure, humidity or sump level alarm frequency • Rise in Containment gaseous or particulate activity • "U-1 WR NOBLE GAS RAD MON" and "UNIT 1 MAIN VENT GASEOUS" alarms clear **THEN** perform the following actions: a. Start **ALL** available CNTMT AIR CLRs in HIGH. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. 9. **IF** the leak is **NOT** occurring inside of Containment, **THEN** perform the following actions: a. Place both Penetration Room Exhaust Fans in service. **NOTE** Leakage location may be indicated by sump alarms, room level alarms, or area RMS alarms. b. Attempt to locate and isolate the leak. (continue)	

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	ALTERNATE ACTIONS
E. (continued)	
	CAUTION **Once Letdown is isolated with a Component Cooling to Letdown leak occuring, dilution of the VCT will occur until Component Cooling to the Letdown Heat Exchanger is isolated.**
10. Determine that **NO** leakage into the Component Cooling System is indicated by: • **NO** rising trends on Component Cooling Radiation Monitor, 1-RI-3819 • "CC HEAD TK LVL" high alarm clear	10.1 **IF** leakage into the Component Cooling System is indicated, **AND** shutting the Letdown CNTMT Isolation valves stopped the leak, **THEN** perform the following actions: a. Shift VCT INL, 1-CVC-500-CV, to WPS. b. Isolate Component Cooling to the Letdown HX by performing the following: (1) Place L/D HX TEMP CONTR, 1-TIC-223, in manual with 100% output signal. (2) Shut L/D HX INLET ISOL, 1-CC-166. c. **WHEN** the Component Cooling valves are shut, **THEN** restore 1-CVC-500-CV to the desired position. d. Evaluate continued operation with Letdown isolated. e. **PROCEED** to Step F.
(continue)	(continue)

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

ACTIONS	**ALTERNATE ACTIONS**
E.10 (continued)	E.10 (continued) 10.2 **IF** leakage into the CC System is indicated, **AND** shutting the Letdown CNTMT Isolation valves did **NOT** stop the leak, **THEN**, with the approval of the SM/CRS, perform the following actions: a. Trip the Reactor. b. Perform Reactivity Control immediate actions of EOP-0, POST TRIP IMMEDIATE ACTIONS. c. Stop **ALL** RCPs. d. Shut the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV e. **IMPLEMENT** EOP-0, POST TRIP IMMEDIATE ACTIONS.
F. DETERMINE THE APPROPRIATE ACTIONS FOR RCS LEAKAGE.	
1. Check that the leak has been isolated. (continue)	1.1 **IF** the leak has **NOT** been isolated **AND** the leak is greater than the capacity of **ONE** Charging Pump, **THEN**, with the approval of the SM/CRS, perform the following actions: a. Trip the Reactor. b. **IMPLEMENT** EOP-0, POST TRIP IMMEDIATE ACTIONS. (continue)

VI. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODES 1 & 2

<u>ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
F.1 (continued)	F.1 (continued) 1.2 **IF** the leak rate has been reduced to within the capacity of **ONE** Charging Pump, **THEN** perform the following: a. **IF** the leak was **NOT** on the Letdown line or Charging header, **THEN** evaluate restoring Letdown **PER** OI-2A, <u>CHEMICAL AND VOLUME CONTROL SYSTEM</u>. b. **PROCEED** to Section V., <u>RCS LEAKAGE WITHIN THE CAPACITY OF ONE CHARGING PUMP</u>, Page 11.
2. **IF** the leak was **NOT** on the Letdown line or Charging header, **THEN** restore Letdown **PER** OI-2A, <u>CHEMICAL AND VOLUME CONTROL SYSTEM</u>.	
3. Maintain PZR level within 15 inches of programmed level **NOT** to exceed 225 inches.	
4. Evaluate Technical Specifications requirements for components isolated.	
5. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, <u>LOCKED VALVES</u> • Component Manipulations **PER** NO-1-200, <u>CONTROL OF SHIFT ACTIVITIES</u>	
6. **IMPLEMENT** the applicable Operating Procedure.	
END of Section VI	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

<u>**ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>
A. ESTABLISH PROPER SAFETY INJECTION LINEUP.	

1. **IF** SIAS has actuated,
THEN verify that safety injection is in progress by the following:
• The MAIN HPSI HDR valves are open:
  • 1-SI-616-MOV
  • 1-SI-626-MOV
  • 1-SI-636-MOV
  • 1-SI-646-MOV
• The AUX HPSI HDR valves are open:
  • 1-SI-617-MOV
  • 1-SI-627-MOV
  • 1-SI-637-MOV
  • 1-SI-647-MOV
• 11 and 13 HPSI PPs are running
• The LPSI HDR valves are open:
  • 1-SI-615-MOV
  • 1-SI-625-MOV
  • 1-SI-635-MOV
  • 1-SI-645-MOV
• 11 and 12 LPSI PPs are running
• **ALL** available CHG PPs are running
 	
(continue)
	1.1 **IF** SIAS has **NOT** actuated,
	THEN initiate HPSI as follows:
	a. Open the MAIN HPSI HDR valves:
	  • 1-SI-616-MOV
	  • 1-SI-626-MOV
	  • 1-SI-636-MOV
	  • 1-SI-646-MOV
	b. Open the AUX HPSI HDR valves:
	  • 1-SI-617-MOV
	  • 1-SI-627-MOV
	  • 1-SI-637-MOV
	  • 1-SI-647-MOV
	c. Start 11 and 13 HPSI PPs.
	d. **WHEN** the "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A.
	e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.
	f. **WHEN** PZR pressure is below 1270 PSIA,
	THEN verify appropriate HPSI flow **PER** EOP ATTACHMENT (10), <u>HIGH PRESSURE SAFETY INJECTION FLOW</u>.
	g. Verify that **ALL** available CHG PPs are running.

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
A. (continued) 2. **WHEN** the following conditions can be maintained: • At least 30° F subcooling based on CET temperatures • PZR level greater than 101 inches **{141 inches** if Containment pressure is greater than 4.25 PSIG**}** • At least one SG available for heat removal • Reactor Vessel level above the top of the hot leg **THEN** HPSI flow can be reduced by throttling the HPSI header isolation valves or by stopping the HPSI Pumps one at a time to maintain the following: • RCS subcooling between 30° F and 140° F based on CET temperatures • PZR level between 101 and 180 inches **{141 and 190 inches** if Containment pressure is greater than 4.25 PSIG**}** 3. **IF** PZR pressure is greater than 200 PSIA and either constant or rising, **THEN** the operating LPSI PPs may be stopped. 4. **IF** HPSI or LPSI throttle/termination criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps and restore full flow.	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
B. PERFORM RCP TRIP STRATEGY.	
1. **IF** RCS pressure drops to 1725 PSIA, **THEN** trip RCPs so that either of the following pairs of RCPs remain running: • 11A and 12B RCPs • 11B and 12A RCPs	
2. **IF** CIS has actuated, **OR** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** trip **ALL** RCPs.	
3. **IF** RCS temperature and pressure are less than the minimum pump operating limits **PER** the RCP curve of EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, **THEN** trip **ALL** RCPs.	
C. CHECK FOR A SG TUBE LEAK.	
1. Determine if a SG Tube Leak exists by observing a rise in **ANY** of the following: • SG sample activities • Condenser Off-Gas radiation levels at 1-RI-1752 • SG Blowdown radiation levels at 1-RIC-4095 or 1-RI-4014 • MAIN STEAM EFFL RAD MONITOR radiation levels at 1-RIC-5421 or 1-RIC-5422 • SG water level (Unexplained) • Feed flow mismatch	
2. **IF** a SG Tube Leak is indicated, **THEN IMPLEMENT** EOP-6, <u>STEAM GENERATOR TUBE RUPTURE</u>.	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. ATTEMPT TO ISOLATE THE LEAK. **[B0101]**	
1. Shut the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV	
2. Check there is **NO** PORV leakage by the following indications: • Quench Tank Parameters • PORV discharge piping temperatures, computer points T107 and T108 • Acoustic Monitor indication	2.1 **IF** PORV leakage is indicated, **AND** PZR pressure is less than 2300 PSIA, **THEN** perform the following: a. Shut the appropriate PORV BLOCK valves: • 1-RC-403-MOV • 1-RC-405-MOV b. Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 1-HS-1402 • 1-HS-1404
3. **IF** a Pressurizer Safety Valve is leaking **AND** SIAS has **NOT** actuated, **THEN** attempt to reseat the Pressurizer Safety Valve by reducing pressurizer pressure to 1800 PSIA.	
4. Verify that RCS SAMPLE ISOL valve, 1-PS-5464-CV, is shut.	
5. Verify that the Reactor Vessel Vent valves are shut: • 1-RC-103-SV • 1-RC-104-SV (continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. (continued) 6. Verify that the PZR Vent valves are shut: • 1-RC-105-SV • 1-RC-106-SV **NOTE** A leak on the Charging header which exceeds the capacity of the charging pumps can be identified by Charging header pressure indicating less than RCS pressure. Identification of the leak may be missed if more than one charging pump is running. 7. Determine if the leak is on the Charging header by performing the following actions: a. Stop all but **ONE** CHG PP. b. **IF** Charging header pressure is less than RCS Pressure, **THEN** assume the leak is on the Charging header. c. **IF** the leak is **NOT** on the Charging header, **THEN** start any CHG PPs that were stopped. (continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. (continued) 8. **IF** the leak is on the Charging header, **THEN** perform the following actions: a. Place **ALL** CHG PPs in PULL TO LOCK. b. Dispatch an operator to determine the location of the leak. **NOTE** CHG PP HDR XCONN, 1-CVC-182, is located near 12 Charging Pump. c. **IF** the leak is upstream of CHG PP HDR XCONN, 1-CVC-182, **THEN** shut 1-CVC-182, **AND** start 12 or 13 CHG PP as required. (continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

D.8 (continued)

d. **IF** the leak is downstream of 1-CVC-182,
THEN align Charging to the Auxiliary HPSI Header:

(1) Verify that the following valves are shut:

- AUX SPRAY valve, 1-CVC-517-CV
- LOOP CHG valves:
    - 1-CVC-518-CV
    - 1-CVC-519-CV

NOTE
The Auxiliary HPSI Header is out of service and T.S. 3.5.2 or 3.5.3 applies when 1-SI-656-MOV is shut.

(2) Shut the HPSI AUX HDR ISOL valve, 1-SI-656-MOV.

(3) Open **ONE** of the following AUX HPSI HDR Valves:

- 1-SI-617-MOV
- 1-SI-627-MOV
- 1-SI-637-MOV
- 1-SI-647-MOV

(4) Open the SI TO CHG HDR valve, 1-CVC-269-MOV.

(continue)

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.8.d (continued)	
NOTE REGEN HX CHG INLET, 1-CVC-183, is located in the 27 foot West Penetration Room.	
(5) **IF** the leak is downstream of the REGEN HX CHG INLET valve, 1-CVC-183, **THEN** shut 1-CVC-183, **AND** start any available CHG PP.	(5).1 **IF** 1-CVC-183 in **NOT** accessible, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.
(6) **IF** the leak is upstream of 1-CVC-183, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.	
(7) Declare the Auxiliary HPSI Header out of service and refer to T.S. 3.5.2 <u>ECCS-Operating</u> or 3.5.3 <u>ECCS-Shutdown</u> as applicable.	
e. Verify charging flow by observing a rise in PZR level.	
(continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. (continued)	
9. **IF** the leak is determined to be occurring inside Containment by checking the following indications: • Rise in Containment temperature, pressure, humidity or sump level alarm frequency • Rise in Containment gaseous or particulate activity • "U-1 WR NOBLE GAS RAD MON" and "UNIT 1 MAIN VENT GASEOUS" alarms clear **THEN** perform the following actions: a. Start **ALL** available CNTMT AIR CLRs in HIGH. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs.	
10. **IF** the leak is **NOT** occurring inside of Containment, **THEN** perform the following actions: a. Place both PENETRATION RM VENT FANs in service.	
NOTE Leakage location may be indicated by sump alarms, room level alarms, or area RMS alarms.	
b. Attempt to locate and isolate the leak.	
(continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. (continued)	**CAUTION** **Once Letdown is isolated with a Component Cooling to Letdown leak occuring, dilution of the VCT will occur until Component Cooling to the Letdown Heat Exchanger is isolated.**
11. Determine that **NO** leakage into the Component Cooling System is indicated by: • **NO** rising trends on Component Cooling Radiation Monitor, 1-RI-3819 • "CC HEAD TK LVL" high alarm clear	11.1 **IF** leakage into the Component Cooling System is indicated, **AND** shutting the Letdown CNTMT Isolation valves stopped the leak, **THEN** perform the following actions: a. Shift VCT INL, 1-CVC-500-CV, to WPS. b. Isolate Component Cooling to the Letdown HX by performing the following: (1) Place L/D HX TEMP CONTR, 1-TIC-223, in manual with 100% output signal. (2) Shut L/D HX INLET ISOL, 1-CC-166. c. **WHEN** the Component Cooling valves are shut, **THEN** restore 1-CVC-500-CV to the desired position.
(continue)	(continue)

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.11 (continued)	D.11 (continued) 11.2 **IF** leakage into the CC System is indicated, **AND** shutting the Letdown CNTMT Isolation valves did **NOT** stop the leak, **THEN** perform the following actions: a. Trip **ALL** RCPs. b. Shut the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV
NOTE The entire PZR level band should be utilized whenever the charging system is aligned to the Auxiliary HPSI Header to minimize pump start/stop cycles and thermal shock to the Safety Injection Penetrations into the RCS. 12. **IF** the leak is isolated, **OR** the leak is within the capacity of the available Charging Pumps, **THEN** perform the following actions: a. Maintain Pressurizer level between 130 and 180 inches. b. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, LOCKED VALVES • Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES c. **IMPLEMENT** the appropriate Operating Procedure to continue operations or to cooldown the plant. (continue)	

VII. RCS LEAKAGE EXCEEDS ONE CHARGING PUMP, MODE 3 WITHOUT LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. (continued) 13. **IF** the leak is **NOT** isolated **AND** the leak is greater than the capacity of the available Charging Pumps, **THEN IMPLEMENT** EOP-5, LOSS OF COOLANT ACCIDENT. END of Section VII	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

<u>ACTIONS</u>	<u>ALTERNATE ACTIONS</u>
A. STABILIZE RCS TEMPERATURE.	
1. **IF** an RCS heatup or cooldown is in progress, **THEN** stop the heatup or cooldown and maintain the RCS temperature.	
B. BEGIN AN INTERMEDIATE SAFETY FUNCTION STATUS CHECK **PER** SECTION X., <u>SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT</u>.	
C. DETERMINE THE APPROPRIATE EMERGENCY RESPONSE ACTIONS **PER** THE ERPIP.	
1. Determine the appropriate emergency response actions **PER** the ERPIP. 2. Determine reporting requirements of RM-1-101, <u>REGULATORY REPORTING</u>.	
D. ESTABLISH INVENTORY CONTROL.	
1. Shut the L/D CNTMT ISOL valves: **[B0101]** • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
D. (continued)	
2. Check that the Charging Pumps are maintaining PZR level between 101 and 170 inches.	2.1 **IF ALL** available Charging Pumps can **NOT** maintain Pressurizer level greater than 101 inches, **THEN** complete the following actions: a. Verify STP-O-55A-1, CONTAINMENT CLOSURE VERIFICATION, is complete and current if applicable. b. Stop **ALL** RCPs. c. Verify that the following RWT OUT valves are open: • 1-SI-4142-MOV • 1-SI-4143-MOV d. Verify that the MINI FLOW RETURN TO RWT ISOL valves are open: • 1-SI-659-MOV • 1-SI-660-MOV
(continue)	(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1 (continued) e. **IF** Pressurizer pressure is greater than 180 PSIA, **THEN** commence HPSI flow as follows: (1) Open the HPSI Header Valve for the desired flowpath: • HPSI MAIN HDR ISOL 1-SI-654-MOV • HPSI AUX HDR ISOL 1-SI-656-MOV (2) Align HPSI HDR XCONN valves for selected HPSI Pump: • 1-SI-655-MOV PP HDR POSITION 11 Main Open 12 Main Shut 13 Main Shut 11 Aux Shut 12 Aux Open 13 Aux Open • 1-SI-653-MOV PP HDR POSITION 11 Main Open 12 Main Open 13 Main Shut 11 Aux Shut 12 Aux Shut 13 Aux Open (continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1.e (continued) (3) Verify that the MAIN and AUX HPSI HDR valves are shut: <u>Main</u> • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV <u>Auxiliary</u> • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (4) Start the selected HPSI PP. (5) Throttle open **ONE** MAIN or AUX HPSI HDR valve to maintain **ALL** of the following: • PZR pressure **PER** EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • PZR level between 101 and 170 inches • At least 25° F subcooling f. **IF** PZR pressure is less than 180 PSIA, **THEN** commence LPSI flow as follows: (1) Open the LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-635-MOV • 1-SI-645-MOV (2) Start 11 and 12 LPSI PPs. (continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1 (continued) g. **IF** PZR pressure is less than 180 PSIA and the LPSI Pumps are **NOT** available, **THEN** commence HPSI flow as follows: (1) Perform steps D.2.1.e.(1) through D.2.1.e.(4) of this section. (2) Throttle open **ALL** MAIN or AUX HPSI HDR valves to maintain **ALL** of the following: • PZR pressure **PER** EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • PZR level between 101 and 170 inches • At least 25° F subcooling (continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1 (continued) h. **WHEN** the following conditions exist: • At least 25° F subcooling based on CET temperatures • PZR level greater than 101 inches and controlled • At least one SG available for heat removal • Reactor Vessel level above the top of the hot leg **THEN** throttle HPSI or LPSI HDR valves or stop SI Pumps one at a time to maintain the following: • RCS subcooling between 25° F and 140° F based on CET temperatures • Pressurizer level between 101 and 170 inches 2.2 **IF** pressurizer pressure is greater than 180 PSIA and either constant or rising, **THEN** the operating LPSI PPs may be stopped. 2.3 **IF** HPSI or LPSI throttle/termination criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps and restore flow.

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
D. (continued) 3. **IF** RCS boron concentration is less than 116 percent of the shutdown margin requirement **PER** NEOP-13, TECHNICAL DATA BOOK (UNIT 1), **THEN** commence RCS boration. a. Shut the VCT M/U valve, 1-CVC-512-CV. b. Open the BA DIRECT M/U valve, 1-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV d. Start **ALL** available BA PPs. e. Shut VCT OUT valve, 1-CVC-501-MOV. f. Start **ALL** available CHG PPs. g. Record the time RCS boration was commenced: ___________ h. Record BAST levels: • BAST 11 _______ • BAST 12 _______ (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
D.3 (continued) i. Continue boration until **ONE** of the following conditions is met: (1) 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 108 inches. (3) Boration has been in progress as follows: • For 53 minutes if three charging pumps are operating • For 80 minutes if two charging pumps are operating • For 160 minutes if one charging pump is operating 4. Makeup to the VCT to maintain level as necessary.	
E. PERFORM THE RCP TRIP STRATEGY.	
1. **IF** CIS has actuated, **OR** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** trip **ALL** RCPs. 2. **IF** RCS temperature and pressure are less than the minimum pump operating limits **PER** the RCP curve of EOP Attachment (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, **THEN** trip **ALL** RCPs.	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
F. IDENTIFY THE AFFECTED SG.	
NOTE If both SGs are affected, then consider the most affected SG as the affected SG. 1. Identify the affected SG by observing any of the following: • Unexplained rise in SG level • SG samples • Feed flow mismatch	
G. ISOLATE THE AFFECTED SG.	
1. **IF** the only operating RCPs are in the RCS loop with the affected SG, **THEN** trip the RCPs. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. Isolate the affected SG as follows: a. On the affected SG, verify shut the MSIV: • (11 SG) 1-MS-4043 • (12 SG) 1-MS-4048 b. On the affected SG, verify shut the SG FW ISOL valve: • (11 SG) 1-FW-4516-MOV • (12 SG) 1-FW-4517-MOV c. On the affected SG, verify shut the SG FLOW CONTR valves: 11 SG • 1-AFW-4511-CV • 1-AFW-4525-CV 12 SG • 1-AFW-4512-CV • 1-AFW-4535-CV d. On the affected SG, verify shut the motor and steam driven train SG AFW BLOCK valves: 11 SG • 1-AFW-4520-CV • 1-AFW-4521-CV • 1-AFW-4522-CV • 1-AFW-4523-CV 12 SG • 1-AFW-4530-CV • 1-AFW-4531-CV • 1-AFW-4532-CV • 1-AFW-4533-CV (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
G.2 (continued)	
e. On the affected SG, verify shut the SG AFW STM SUPP & BYPASS valve: • (11 SG) 1-MS-4070-CV 1-MS-4070A-CV • (12 SG) 1-MS-4071-CV 1-MS-4071A-CV	
f. On the affected SG, verify shut the ADV using the Hand Transfer Valves on the West wall of the Unit 1 45 foot SWGR Room as follows: (1) Verify that the ADV CONTR at 1C43 for the affected SG is set at 0% output: • (11 SG) 1-HC-4056A • (12 SG) 1-HC-4056B (2) Align the Hand Transfer Valves for the affected SG to POSITION 2 (1C43): 11 SG • 1-HV-3938A • 1-HV-3938B 12 SG • 1-HV-3939A • 1-HV-3939B	f.1 **IF** the ADV will **NOT** shut from 1C43, **THEN** shut the ADV Manual Isolation valve for the affected SG: • (11 SG) 1-MS-101 • (12 SG) 1-MS-104
g. On the affected SG, verify shut the SG MSIV BYP Valve: • (11 SG) 1-MS-4045-MOV • (12 SG) 1-MS-4052-MOV	
(continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
G.2 (continued)	
h. On the affected SG, verify shut the S/G B/D valves: 11 SG • 1-BD-4010-CV • 1-BD-4011-CV 12 SG • 1-BD-4012-CV • 1-BD-4013-CV	
i. Verify shut the upstream drains by placing MS UPSTREAM DRN ISOL VLVS handswitch 1-HS-6622 in CLOSE.	
j. Observe locally, from the Auxiliary Building Roof, that the SG Safety Valves are **NOT** leaking.	j.1 **IF** the SG Safety Valves are observed leaking, **THEN** inform Chemistry and Radiation Safety Supervision that an unmonitored radiological release is occurring.
3. Verify that the affected SG is isolated by checking the following parameters: • Unaffected SG level change consistent with feed flow • SG samples verifies activity higher in the affected SG	

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
G. (continued)	

4. **IF** the wrong SG was isolated,
   THEN perform the following actions to return the isolated SG to service:

   a. **IF** Main Feedwater flow has been stopped for greater than 80 minutes,
      THEN perform the following actions:

      (1) Initiate AFW flow to the unaffected SG.

      (2) Ensure the SG FW ISOL valves are shut.

CAUTION
A severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.

   b. Position all valves that were shut in Step G.2 to their desired position.

   c. Isolate the proper SG **PER** Step G.2.

H. **WHEN** THE AFFECTED SG IS ISOLATED,
THEN COMMENCE AN RCS COOLDOWN.

1. Maintain unaffected SG level between (-)24 and (+)30 inches.

2. Place the CNDSR HOTWELL MAKEUP & DUMP CONTR, 1-LIC-4405, in MANUAL with a 50% output signal.

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
H. (continued)	
CAUTION **RCS temperature and pressure must be closely monitored to avoid a cooldown greater than the Technical Specification Limit.**	
3. Commence an RCS cooldown to less than 300° F, while **NOT** exceeding the following limits for any one hour. **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr	
	WARNING **The following step could result in an unmonitored radiation release if performed improperly.**
a. **IF** Turbine Bypass Valves are available, **THEN** perform the following: (1) Ensure the ADVs are shut. (2) Conduct the RCS cooldown using the Turbine Bypass System.	a.1 **IF** Turbine Bypass Valves are **NOT** available, **THEN** conduct the RCS cooldown by throttling the ADV on the unaffected SG.
(continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
H.3 (continued)	
b. **IF ALL** RCPs are secured, **THEN** perform the following:	
(1) Reduce the RCS cooldown rate to approximately 35° F per hour.	
NOTE Maintaining flow in the affected loop will prevent the formation of dilute pockets of water due to backflow from the SG.	**NOTE** The maximum cooldown rate to prevent flow stagnation in the affected loop is expected to be between 10° F and 35° F per hour, depending on decay heat removal.
(2) Verify flow in the affected loop by the following indications: • Affected loop T_{COLD} trend consistent with the unaffected loop T_{COLD} • T_{COLD} is greater than T_{HOT}	(2).1 **IF** flow can **NOT** be verified in the affected loop, **THEN** reduce the cooldown rate until flow is established. (2).2 **IF** the cooldown rate can **NOT** be reduced sufficiently to establish flow in the affected loop, **THEN** control RCS pressure **PER** Step I, Page 72, to minimize backflow from the SG.
(3) **IF** 11 SG is the affected SG, **THEN** disable 11A and 11B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 11A RCP 252-11P01 • 11A RCP 252-11P02 • 11B RCP 252-13P01 • 11B RCP 252-13P02	
(4) **IF** 12 SG is the affected SG, **THEN** disable 12A and 12B RCPs by removing the Reactor Coolant Pump Breaker CLOSE CIR fuses. • 12A RCP 252-12P01 • 12A RCP 252-12P02 • 12B RCP 252-14P01 • 12B RCP 252-14P02	
(continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
H. (continued) 4. **WHEN** T_{HOT} is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions: **NOTE** Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists. a. Verify that **ALL** available CAV CLG FANs and CEDM CLG FANs are running. b. Close the SIT OUT breakers. • (1-SI-614-MOV) 52-11442 • (1-SI-624-MOV) 52-11443 • (1-SI-634-MOV) 52-10442 • (1-SI-644-MOV) 52-10443 c. Shut the SIT OUT valves: • 1-SI-614-MOV • 1-SI-624-MOV • 1-SI-634-MOV • 1-SI-644-MOV	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

<u>**ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>

I. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PZR LVL.

ACTIONS

1. **IF** Main Pressurizer Spray is available, **THEN** depressurize the RCS using Main Pressurizer Spray while maintaining the following:

   - RCS pressure approximately equal to affected SG pressure
   - At least 25° F subcooling
   - RCS pressure as close to the NPSH limits **PER** EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, as possible

(continue)

ALTERNATE ACTIONS

1.1 **IF** the Main PZR Spray Valves are **NOT** effective at reducing pressure **OR** Main Spray is **NOT** available, **THEN** depressurize the RCS using Aux Spray while maintaining the following:

- RCS pressure approximately equal to affected SG pressure
- At least 25° F subcooling
- **IF** the RCPs are running, **THEN** maintain RCS pressure as close to the NPSH limits **PER** EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, as possible
- **IF** the SIT OUT valves are open **THEN** maintain RCS pressure greater than SIT pressure

<u>**CAUTION**</u>

TRM 15.4.2 shall be complied with, if the temperature difference between the PZR and the Regenerative HX Outlet is greater than 400° F.

a. Record the temperature difference between PZR WATER TEMP, 1-TI-101, and CHG OUT TEMP, 1-TI-229.

b. Open the AUX SPRAY valve, 1-CVC-517-CV.

c. Operate the LOOP CHG valves as necessary to adjust Aux Spray:

   - 1-CVC-518-CV
   - 1-CVC-519-CV

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
I.1 (continued) (continue)	I.1.1 (continued) d. Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. e. Shut the Pressurizer Spray Valves by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV f. **WHEN** Aux Spray is **NOT** required, **THEN** secure Aux Spray. (1) Open the LOOP CHG valves: • 1-CVC-518-CV • 1-CVC-519-CV (2) Shut the AUX SPRAY valve, 1-CVC-517-CV. g. Maintain the pressurizer cooldown rate less than 200° F/hour.

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS

I. (continued)

NOTE
The RCS is **NOT** water solid if Pressurizer Level or Reactor Vessel level indicates a bubble exists, **AND** either saturated conditions exist in the RCS **OR NO** rapid pressure excursions due to RCS inventory or temperature changes have occurred.

2. **IF** the RCS is **NOT** water solid, **THEN** maintain subcooling within the following limits:

   - Between 25° F and 140° F based on CET temperatures
   - RCS pressure greater than the NPSH limits **PER** EOP ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS
   - RCS pressure approximately equal to affected SG pressure
   - **IF** the SIT OUT valves are open, **THEN** maintain RCS pressure greater than SIT pressure

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.

   a. Raise subcooling by **ANY** of the following methods:

      (1) Secure Pressurizer Spray.

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

      (2) Operate the Pressurizer HTR(s).

(continue)

ALTERNATE ACTIONS

2.1 **IF** the RCS is water solid, **THEN** maintain subcooling within the following limits:

   - Between 25° F and 140° F based on CET temperatures
   - RCS pressure greater than the NPSH limits **PER** EOP ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS
   - RCS pressure approximately equal to affected SG pressure
   - **IF** the SIT OUT valves are open, **THEN** maintain RCS pressure greater than SIT pressure

   a. Lower subcooling by **ANY** of the following methods:

      (1) Lower RCS temperature.

      (2) **IF** the overpressurization is due to the HPSI/Charging flow **AND** the HPSI termination criteria are met, **THEN** throttle or secure flow to restore subcooling to less than 140° F.

      (3) De-energize the Pressurizer HTR(s).

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
I.2.a (continued) (3) Raise the RCS cooldown rate, while **NOT** exceeding the following cooldown limits in any one hour, by using the Turbine Bypass System or Atmospheric Dump Valves: **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr (4) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI header valves which have been throttled or starting the HPSI pump which has been stopped. b. Lower subcooling by any of the following methods: (1) Deenergize the Pressurizer HTR(s). (2) Use Main or Auxiliary Pressurizer Spray. (3) Lower the RCS cooldown rate. (4) **IF** the overpressurization is due to the HPSI/Charging flow **AND** the HPSI termination criteria are met, **THEN** throttle or secure flow to reduce subcooling. (continue)	I.2.a.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.** b. Raise subcooling by **ANY** of the following methods: (1) Raise RCS temperature. (2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI header valves which have been throttled or starting the HPSI pump which has been stopped. **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (3) Operate the Pressurizer HTR(s).

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
I.2.b (continued) (5) Use the Presurizer Vent valves: • 1-RC-105-SV • 1-RC-106-SV 3. **IF ALL** of the following conditions exist: • Backflow from the affected SG to the RCS is anticipated • HPSI termination criteria can be met • A bubble exists in the Pressurizer **THEN** maintain Pressurizer Level between 101 and 120 inches until the backflow is initiated. 4. **IF** a bubble exists in the Pressurizer **AND** HPSI flow has been secured, **THEN** restore and maintain Pressurizer Level between 101 and 170 inches by operating Charging and, if available, Letdown.	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

J. MAINTAIN PRESSURE AND LEVEL CONTROL OF THE AFFECTED SG.

NOTE
If available, narrow range SG level indication should be used to control the affected SG level.

NOTE
The following methods of maintaining affected SG pressure and level are arranged in order of priority. The method with the highest priority should be employed first, based on equipment availability.

CAUTION
SG pressure and RCS pressure should be monitored closely to avoid uncontrolled pressurizer level rises due to backfill from the affected SG.

1. Maintain pressure in the affected SG approximately equal to RCS pressure and SG level between (-)24 and (+)30 inches by performing **ANY** of the following:

   a. Maintain the affected SG level by controlling RCS pressure with backflow to the RCS as follows:

      (1) **IF** the affected SG level is high, **THEN** reduce RCS pressure below the affected SG pressure by **ANY** of the following methods:

      - Deenergize the Pressurizer Heater(s)
      - Use Main or Auxiliary Pressurizer Spray

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
J.1.a(1) (continued) • **IF** the HPSI/LPSI throttle/termination criteria are met, **THEN** throttle or secure flow to reduce RCS pressure (2) Control RCS pressure to maintain the affected SG level approximately constant. (3) **IF** pressure reduction of the affected SG is required, **THEN** steam the affected SG to the condenser by concurrently performing step J.1.d, Page 83. b. On the affected SG, maintain pressure and level by blowing down to the MWS as follows: (1) Place UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095, in OPER alarm at 1C22G: (a) Verify 1-HS-4095B/S1 - OPER BYPASS in OFF. (b) Highlight Stop Pump **AND** press SELECT. (c) Verify the CH 1 green OPER LED extinguishes. (d) Bypass annunciator alarms. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.b (continued) **NOTE** B/D RECVRY DISCH TO MWS valve, 1-BD-4097-CV, B/D RECVRY DISCH TO CIRC WTR valve, 1-BD-4015-CV, and B/D RECVRY DISCH TO CNDSR valve, 1-BD-4096-CV, are operated from 1C107. (2) Open the B/D RECVRY DISCH TO MWS valve, 1-BD-4097-CV. (3) Shut the B/D RECVRY DISCH TO CIRC WTR valve, 1-BD-4015-CV. (4) Shut the B/D RECVRY DISCH TO CNDSR valve, 1-BD-4096-CV. (5) Shut the SG Combined BD Header Throttle Valves: • 1-BD-102 • 1-BD-104 (6) On the affected SG, open the BOT BD Valve by placing its handswitch in RAD TRIP OVERRIDE: • (11 SG) 1-BD-4011-CV • (12 SG) 1-BD-4013-CV (7) On the affected SG, throttle open the SG Combined BD Header Throttle Valve to obtain a blowdown flow of approximately 100 GPM while maintaining 11 BD HX outlet temperature less than 200° F: • (11 SG) 1-BD-102 • (12 SG) 1-BD-104 (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.b (continued) (8) Pump the MWRT **PER** the Processing The Contents Of The MWRT To The RCWMT Through the MWIX section of OI-17D, MISCELLANEOUS WASTE PROCESSING SYSTEM. (9) Monitor MWRT level at 1C33 and maintain MWRT level approximately constant by throttling the SG BD rate while pumping to the RCWMT. (10) Feed and Bleed the affected SG by alternately lowering level to (-)24 inches using SG BD to the MWS and raising level to (+)30 inches using AFW **PER** Step J.2.b, Page 86. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1 (continued) c. Maintain the affected SG pressure and level by blowdown to the condenser as follows: (1) Ensure that at least one Condensate Demin is in service. (2) Open the PRECOAT SYS BYP valve, 1-CD-5818-CV. (3) Shut the COND DEMIN BYP valve, 1-CD-4439-MOV. (4) **IF** AFW is operating, **AND** the Main Feedwater Minflow valves are shut, **THEN** establish maximum condensate flow through the Condensate Demineralizers: (a) Open FEEDWATER DUMP TO CONDENSER ISOLATION valve, 1-FW-135. (b) Throttle open FEEDWATER DUMP TO CONDENSER B/U ISOLATION valve, 1-FW-134 while maintaining COND HDR PRESS greater than 175 PSIG. (5) Shut the Condenser High Level Dump CV Inlet valve, 1-CD-232. (6) Bypass UNIT 1 S/G B/D RECOVERY radiation monitor, 1-RIC-4095: (a) Place 1-HS-4095B/S2 - HIGH BYPASS in BYPASS. (b) Verify 1-HS-4095B/S1 - OPER BYPASS in BYPASS. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.c (continued) **NOTE** B/D RECVRY DISCH TO MWS valve, 1-BD-4097-CV, B/D RECVRY DISCH TO CIRC WTR valve, 1-BD-4015-CV, and B/D RECVRY DISCH TO CNDSR valve, 1-BD-4096-CV are operated from 1C107. (7) Shut the B/D RECVRY DISCH TO MWS valve, 1-BD-4097-CV. (8) Shut the B/D RECVRY DISCH TO CIRC WTR valve, 1-BD-4015-CV. (9) Open the B/D RECVRY DISCH TO CNDSR valve, 1-BD-4096-CV. (10) Shut the SG Combined BD Header Throttle valves: • 1-BD-102 • 1-BD-104 (11) On the affected SG, open the SG BOT blowdown valve by placing its handswitch in RAD TRIP OVERRIDE: • 11 BOT 1-BD-4011-CV • 12 BOT 1-BD-4013-CV (12) On the affected SG, throttle open the SG Combined BD Header Throttle valve to obtain a blowdown flow of approximately 100 GPM while maintaining 11 BD HX outlet temperature less than 200° F: • (11 SG) 1-BD-102 • (12 SG) 1-BD-104 (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.c (continued) (13) Feed and Bleed the affected SG by alternately lowering level to (-)24 inches using SG Blowdown to the Condenser and raising level to (+)30 inches using AFW **PER** Step J.2.b, Page 86. d. On the affected SG, maintain pressure and level by steaming to the Condenser as follows: (1) Ensure that Condenser Vacuum is greater than 20 inches HG. (2) Ensure that at least one Condensate Demin is in service. (3) Open the PRECOAT SYS BYP valve, 1-CD-5818-CV. (4) Shut the COND DEMIN BYP valve, 1-CD-4439-MOV. (5) **IF** AFW is operating, **AND** the Main Feedwater Minflow valves are shut, **THEN** establish maximum condensate flow through the Condensate Demineralizers: (a) Open FEEDWATER DUMP TO CONDENSER ISOLATION valve, 1-FW-135. (b) Throttle open FEEDWATER DUMP TO CONDENSER B/U ISOLATION valve, 1-FW-134 while maintaining COND HDR PRESS greater than 175 PSIG. (6) Shut the Condenser High Level Dump CV Inlet valve, 1-CD-232. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.d (continued) (7) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary to control pressure on the affected SG. (8) Close the power supply breakers to the MSIV Bypass valves: • 1-MOV-4045 breaker, 52-11428 • 1-MOV-4052 breaker, 52-10428 **CAUTION** **Damage to the steam system could occur due to moisture carryover if the MSIV Bypass Valve is operated on a SG whose level exceeds (+)63.5 inches.** (9) **IF** additional steam flow is desired, **AND** SG level is less than (+)63.5 inches, **THEN** operate the MSIV BYP valve on the affected SG: • (11 SG) 1-MS-4045-MOV • (12 SG) 1-MS-4052-MOV (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1 (continued)	
e. **IF** the ADV has **NOT** been manually isolated, **THEN** maintain pressure and level on the affected SG by steaming to the atmosphere from 1C43 as follows: (1) Establish communications between the Control Room and an operator at 1C43. (2) Verify that the ADV controller at 1C43 for the affected SG is set at 0% output: • (11 SG) 1-HC-4056A • (12 SG) 1-HC-4056B (3) Verify that the Hand Transfer Valves for the affected SG are selected to POSITION 2 (1C43): 11 SG • 1-HV-3938A • 1-HV-3938B 12 SG • 1-HV-3939A • 1-HV-3939B (4) Record the total time ADV is open for dose calculations: __________ (5) Direct the adjustment of the ADV from 1C43 as necessary to maintain pressure on the affected SG approximately equal to RCS pressure.	e.1 **IF** the ADV was manually isolated, **THEN** maintain pressure on the affected SG as follows: (1) Record the total time ADV is open for dose calculations: __________ (2) Direct throttling open the ADV Manual Isolation Valve on the affected SG to maintain its pressure approximately equal to RCS pressure: • (11 SG) 1-MS-101 • (12 SG) 1-MS-104
f. **IF** the MSIV, ADV and MSIV BYP valves remain shut, **THEN** the affected SG level may be allowed to fill to the MSIV. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J. (continued)	
2. **IF** the SG level drops below (-)24 inches, **THEN** restore level on the affected SG by performing **ANY** of the following actions:	
a. Reduce the cooldown and depressurization rate of the RCS to allow RCS and SG pressures to equalize so that the affected SG level is maintained above (-)24 inches by leakage from the RCS.	
b. **IF** 13 AFW Pump is available, **THEN** establish Auxiliary Feedwater flow to the affected SG as follows:	b.1 **IF** 13 AFW Pump is **NOT** available to feed the affected SG, **THEN** establish AFW using the Unit 2 to Unit 1 AFW cross connect as follows:
(1) On the affected SG, place the motor driven train SG AFW BLOCK valve handswitches in OPEN: 11 SG • 1-AFW-4522-CV • 1-AFW-4523-CV 12 SG • 1-AFW-4532-CV • 1-AFW-4533-CV	(1) Shut the Unit 2 motor driven train SG AFW BLOCK valves: 21 SG • 2-AFW-4522-CV • 2-AFW-4523-CV 22 SG • 2-AFW-4532-CV • 2-AFW-4533-CV
(continue)	(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS

J.2.b (continued)

(2) **IF** 13 AFW Pump is **NOT** being used to feed the unaffected SG, **THEN** perform the following:

(a) Shut the motor driven train SG AFW BLOCK valves for the unaffected SG:

11 SG
- 1-AFW-4522-CV
- 1-AFW-4523-CV

12 SG
- 1-AFW-4532-CV
- 1-AFW-4533-CV

(b) Start 13 AFW Pump.

CAUTION
13 AFW Pump flow limit is 575 GPM.

(3) Restore and maintain the affected SG level between (-)24 and (+)30 inches, by adjusting the S/G FLOW CONTR valve:

- (11 SG) 1-AFW-4525-CV
- (12 SG) 1-AFW-4535-CV

(4) Do **NOT** exceed the following cooldown limits in any one hour: **[B0126]**

- Greater than 256° F 100° F/hr
- 106° F to 256° F 40° F/hr
- Less than 106° F 35° F/hr

(continue)

ALTERNATE ACTIONS

J.2.b.1 (continued)

(2) Open the Unit 2 to Unit 1 AFW Cross Connect valve, 2-AFW-4550-CV.

(3) Start 23 AFW PP as follows to establish AFW flow to the affected SG:

(a) Shut the Unit 1 S/G FLOW CONTR valves:

- (11 SG) 1-AFW-4525-CV
- (12 SG) 1-AFW-4535-CV

(b) For the affected SG, place the motor driven train SG AFW BLOCK valve handswitches in OPEN:

11 SG
- 1-AFW-4522-CV
- 1-AFW-4523-CV

12 SG
- 1-AFW-4532-CV
- 1-AFW-4533-CV

CAUTION
23 AFW Pump flow limit is 575 GPM.

(c) Start 23 AFW PP.

(d) On the affected SG, adjust the Unit 1 S/G FLOW CONTR valve to maintain SG level between (-)24 and (+)30 inches:

- (11 SG) 1-AFW-4525-CV
- (12 SG) 1-AFW-4535-CV

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.2.b (continued) (continue)	J.2.b.1(3) (continued) (e) Do **NOT** exceed the following cooldown limits in any one hour: **[B0126]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr b.2 **IF** 23 AFW Pump is **NOT** available, **THEN** establish AFW flow to the unaffected SG using 11 or 12 AFW Pump. (1) For the affected SG, place the steam driven train SG AFW Block valve handswitches in OPEN: 11 SG • 1-AFW-4520-CV • 1-AFW-4521-CV 12 SG • 1-AFW-4530-CV • 1-AFW-4531-CV (2) **IF** 11 or 12 AFW Pump is **NOT** being used to feed the unaffected SG, **THEN** shut the steam driven train SG AFW Block valves for the unaffected SG: 11 SG • 1-AFW-4520-CV • 1-AFW-4521-CV 12 SG • 1-AFW-4530-CV • 1-AFW-4531-CV (continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.2.b (continued)	J.2.b.2 (continued) **WARNING** **The following step could result in an unmonitored radiation release if performed improperly.** (3) For the unaffected SG, open the SG AFW STM SUPP & BYPASS valves: • (11 SG) 1-MS-4070-CV 1-MS-4070A-CV • (12 SG) 1-MS-4071-CV 1-MS-4071A-CV (4) Adjust and maintain the 11 or 12 AFW Pump discharge pressure approximately 100 PSI greater than the affected SG pressure using the AFW PP SPEED CONTRs: • 11 AFW PP 1-HC-3987A • 12 AFW PP 1-HC-3989A (5) On the affected SG, adjust the S/G FLOW CONTR to maintain affected SG level between (-)24 and (+)30 inches: • (11 SG) 1-FIC-4511A • (12 SG) 1-FIC-4512A (6) Do **NOT** exceed the following cooldown limits in any one hour: **[B0126]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr (7) Operate the AFW Pump Room ventilation **PER** OI-32A, AUXILIARY FEEDWATER SYSTEM UNIT 1.

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
K. CONTINUE TO TAKE CHEMISTRY AND RAD CON SAMPLES.	
1. Notify Chemistry and Radiation Safety Supervision to perform periodic samples for the following: • RCS boron concentration at least once per hour • RCS activity • SGs boron concentration and activity • Turbine Building Sumps for activity • Condensate and CSTs for activity • Air samples and radiation throughout the plant to determine the spread of contamination	
2. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** NEOP-13, <u>TECHNICAL DATA BOOK (UNIT 1)</u>.	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
L. **IF** RCPs ARE SECURED, **THEN** CONFIRM NATURAL CIRCULATION IN THE UNAFFECTED SG LOOP.	
NOTE Verification of an RCS temperature response to a plant change during Natural Circulation can not be accomplished until approximately 5 to 15 minutes following the action due to increase in loop cycle times. 1. Verify Natural Circulation in at least one loop by the following: • T_{HOT} minus T_{COLD} less than 50° F • T_{COLD} constant or lowering • T_{HOT} constant or lowering • CET temperatures trend consistent with T_{HOT} • Steaming rate affects RCS temperatures	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
M. RESTORE LETDOWN FLOW.	
WARNING **High area radioactivity in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.**	
1. Verify the following: • HPSI throttle/termination criteria are met • Charging flow path exists through LOOP CHG valves or AUX SPRAY valve • At least ONE CHG PP is operating	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step N.
2. Verify the PRZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, in Auto Remote.	
3. Place the L/D PRESS CONTR, 1-PIC-201, in MANUAL with a 20% output.	
4. Place IX BYPASS valve, 1-CVC-520-CV, in BYPASS.	
5. Shift LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 0%.	
6. **IF** the plant computer is **NOT** operating, **THEN** record the following information: • RCS T_{COLD} • CHG OUT TEMP (1-TI-229) • Average CNTMT ambient temperature (1-TI-5309 and 1-TI-5311) • 27' Penetration Room temperature (1-TI-5276 and 1-TI-5280) (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
M. (continued) 7. Check **BOTH** Backpressure Regulating valves and Letdown Control Valves in service by verifying the following: a. **BOTH** Letdown Control Valve Inlet valves open: • 1-CVC-103 • 1-CVC-105 b. **BOTH** Letdown Control Valve Outlet valves open: • 1-CVC-104 • 1-CVC-106 c. **BOTH** Backpressure Regulating Inlet valves open: • 1-CVC-108 • 1-CVC-110 d. **BOTH** Backpressure Regulating Outlet valves open: • 1-CVC-109 • 1-CVC-111 e. L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. BACKPRESS REG VLVS handswitch, 1-HS-201, in **BOTH**. 8. Open L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
M. (continued)	
CAUTION **The setpoint of 1-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.**	
9. Place L/D PRESS CONTR, 1-PIC-201 in service as follows: a. Adjust the setpoint on 1-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift L/D PRESS CONTR, 1-PIC-201 to AUTO.	
10. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow.	
11. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC.	
12. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120 ° F.	
13. **IF** a bubble exists in the pressurizer, **THEN** check pressurizer level is trending to 160.	13.1 **IF** pressurizer level is **NOT** trending to 160 inches, **THEN** shift the PRZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, to Auto Local **AND** adjust the setpoint to 160 inches.

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

N. **IF** THE RCS IS WATER SOLID,
THEN DRAW A BUBBLE IN THE RCS.

1. **IF** the RCS is water solid,
   AND it is desired to draw a bubble in the RCS,
   THEN perform the following actions:

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

   a. Energize the Pressurizer Heater(s).

   b. **IF EITHER** of the following conditions exist:

      - BOTH SG pressures can be maintained less than RCS pressure
      - At least one RCP is running

      THEN draw a bubble in the RCS as follows:

      (1) **IF** the HPSI throttle/termination criteria are met,
      THEN reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow.

      (2) Cooldown the RCS, while **NOT** exceeding the following cooldown limits in any one hour, by using the TBVs or ADVs: **[B0053]**

      - Greater than 256° F 100° F/hr
      - 106° F to 256° F 40° F/hr
      - Less than 106° F 35° F/hr

(continue)

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
N.1 (continued) c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 and 170 inches. d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain level above the top of the hot leg.	
O. MONITOR FOR CORE AND RCS VOIDING.	
CAUTION **Void formation occurs when pressure drops below the saturation pressure for the Reactor Vessel Head temperature.** 1. Monitor for Core and RCS voiding by the following: • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
O. (continued) 2. **IF** voiding causes difficulty in depressurization **OR** threatens heat removal as indicated by **EITHER** of the following: • Reactor Vessel level approaching the top of the Hot Leg with at least 25° F subcooling • The pressure in **BOTH** S/Gs is greater than the saturation pressure of the RCS **THEN** reduce or eliminate the voided area by performing the following actions: a. Verify that the L/D CNTMT ISOL valves are shut: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
O.2 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** b. Stop the depressurization and raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (1) Operate pressurizer heaters. (2) Raise cooldown rate while **NOT** exceeding the following limits for any one hour. **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr (3) **IF** HPSI flow has been reduced, **THEN raise** HPSI flow by opening HPSI header valves which have been throttled or starting HPSI Pumps which have been stopped. (continue)	b.1 **IF** raising RCS subcooling does **NOT** restore heat removal, **THEN** operate Reactor Vessel Vent Valves **PER** the Venting The Reactor Coolant System After An Accident section of OI-1G, REACTOR COOLANT VESSEL HEAD AND PRESSURIZER VENT SYSTEM.

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
O.2 (continued) **NOTE** Voids may form in the SG Tubes if the saturation pressure of a SG is greater than the saturation pressure of the RCS. **CAUTION** **If voids exist in the SG Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** c. **IF** voiding is suspected in the SG tubes, **THEN** cool the SG so that the following RCS cooldown rates are **NOT** exceeded in any one hour: **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr by raising **ANY** of the following: • Steaming rate • Feed rate • SG Blowdown rate	
P. CONTROL SECONDARY SYSTEM CONTAMINATION.	
1. Minimize the spread of contamination by performing the following: a. Ensure the Unit 1 Turbine Building Sump Pumps are in STOP. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) b. Isolate Condensate Dump to 11 CST by verifying the following valves are shut: • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 INLET VALVE, 1-CD-232 • CONDENSER HOTWELL HIGH LEVEL DUMP CV-4405 BYPASS VALVE, 1-CD-234 c. Verify CONDENSER MAKEUP CV-4406 BYPASS VALVE, 1-CD-238, is shut. d. Reduce moisture carryover into the CAR Discharge Header by fully opening the CONDENSER VACUUM PUMP SERVICE WATER OUTLET VALVEs: • (11 CAR) 1-SRW-211 • (12 CAR) 1-SRW-215 • (13 CAR) 1-SRW-219 • (14 CAR) 1-SRW-223 e. Ensure Condensate to Circ Water Dump is isolated by verifying the followng valves shut: • CONDENSER DUMP TO CIRCULATING WATER ISOLATION VALVE, 1-CD-239 • CONDENSATE DUMP TO CIRCULATING WATER BYPASS VALVE, 1-CD-455 f. Ensure condenser expansion joints are **NOT** overflowing by verifying the CONDENSER EXPANSION JOINT FILL VALVEs are shut: • (11 Condenser) 1-CD-306 • (12 Condenser) 1-CD-307 • (13 Condenser) 1-CD-308 (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) g. Verify shut SRW HEAD TANK MAKEUP ISOLATION VALVE, 1-CD-144. h. Verify shut COMPONENT COOLING SYSTEM MAKEUP ISOLATION VALVE, 1-CD-145. i. Notify Plant Chemistry to secure the Hotwell sample pumps and isolate the sample sinks. 2. Control the volume of contaminated condensate inventory by performing the following: **CAUTION** **Operating CAR PPs with condenser hotwell level greater than 12 feet may draw excessive water into the CAR PPs.** **CAUTION** **Operating a SGFP with condenser hotwell level greater than 12 feet may actuate the high exhaust casing level trip.** a. **IF** condenser hotwell level exceeds 12 feet, **THEN** perform the following: (1) Ensure Auxiliary Feedwater flow is established to the unaffected S/G. (2) **IF** a SGFP is in operation, **THEN** secure the SGFP. (3) Secure the CAR PPs. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.2 (continued) b. **IF** condenser hotwell level exceeds 14 feet, **THEN** shut the COND SHELL STOPs: • 1-CAR-101 • 1-CAR-102 • 1-CAR-103 • 1-CAR-104 • 1-CAR-105 • 1-CAR-106 **NOTE** Using the Turbine Bypass System with Condensate/Main Feedwater will enable greater cooldown capability without raising contaminated condensate inventory. **CAUTION** **An unmonitored radiation release could occur if the Atmospheric Dump Valve is in use and Condensate/Main Feedwater is used to feed the unaffected S/G.** c. **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** attempt to restore the Turbine Bypass System **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure. d. **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** shut the Hotwell Makeup CV by shifting 1-LIC-4405 to MANUAL with 100% output. (continue)	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.2 (continued) e. Ensure the Auxiliary Boiler Condensate returns are aligned to Unit 2 by verifying the following: (1) 0-AHB-211, DEAERATOR OVERFLOW TO 21 CONDENSER ISOLATION VALVE, is open. (2) 0-AHB-210, DEAERATOR OVERFLOW TO 11 CONDENSER ISOLATION VALVE, is shut. f. Ensure the RC Waste Evaporators are aligned to Unit 2 or the Auxiliary Boilers **PER** OI-17E, <u>REACTOR COOLANT WASTE EVAPORATOR OPERATION</u>. g. Ensure Plant Heating is aligned to Unit 2 Reheat Steam or the Auxiliary Boilers **PER** OI-40, <u>PLANT HEATING SYSTEM</u>.	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
Q. ATTEMPT TO ESTABLISH SHUTDOWN COOLING CONDITIONS.	
1. **WHEN** the following conditions have been established: • RCS temperature is less than 300° F • RCS pressure is less than 260 PSIA • PZR level is greater than 101 inches • RCS subcooling is greater than 25° F based on CET temperatures **THEN** perform the following actions: a. Contact Radiation Safety Supervision to check that radiation levels are low enough to allow valve repositioning. b. Initiate SDC **PER** OI-3B, <u>SHUTDOWN COOLING UNIT-1</u>. c. Operate HPSI and Charging and Letdown to maintain the following: • Pressurizer level between 101 and 170 inches • RCS pressure within the specified limits **PER** EOP Attachment (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u>, AND less than 260 PSIA	

VIII. EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
R. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. **WHEN** the RCS is aligned to Shutdown Cooling, **THEN** continue to cool the RCS to allow RCS pressure to equalize with the pressure in the affected SG.	
2. **WHEN** the RCS pressure is equal to the pressure in the affected SG, **THEN** ensure that the Safety Function Status Check Final Acceptance Criteria are met.	2.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until Final Acceptance Criteria are met.
3. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, <u>LOCKED VALVES</u> • Component Manipulations **PER** NO-1-200, <u>CONTROL OF SHIFT ACTIVITIES</u>	
4. **IMPLEMENT** the appropriate Operating Procedure.	
END of Section VIII	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

<u>**ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>
A. STABILIZE RCS TEMPERATURE.	
1. **IF** an RCS heatup or cooldown is in progress, **THEN** stop the heatup or cooldown and maintain the RCS temperature.	
B. BEGIN AN INTERMEDIATE SAFETY FUNCTION STATUS CHECK **PER** SECTION XI., <u>SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT</u>.	
C. DETERMINE THE APPROPRIATE EMERGENCY RESPONSE ACTIONS **PER** THE ERPIP.	
1. Determine the appropriate emergency response actions **PER** the ERPIP. 2. Determine reporting requirements of RM-1-101, <u>REGULATORY REPORTING</u>. 3. Evacuate **ALL** unnecessary personnel from the Containment **PER** the <u>CONTAINMENT EVACUATION</u> Attachment of ERPIP 3.0. **[B0138]**	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D. ESTABLISH INVENTORY CONTROL.	
1. Shut the L/D CNTMT ISOL valves: **[B0101]** • 1-CVC-515-CV • 1-CVC-516-CV	
2. Check that the Charging Pumps are maintaining PZR level between 101 and 170 inches.	2.1 **IF ALL** available Charging Pumps can **NOT** maintain Pressurizer level greater than 101 inches, **THEN** complete the following actions: a. Verify STP O-55A-1, <u>CONTAINMENT CLOSURE VERIFICATION</u>, is complete and current if applicable. b. Stop **ALL** RCPs. c. Verify that the following RWT OUT valves are open: • 1-SI-4142-MOV • 1-SI-4143-MOV d. Verify that the MINI FLOW RETURN TO RWT ISOL valves are open. • 1-SI-659-MOV • 1-SI-660-MOV
(continue)	(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1 (continued) e. **IF** Pressurizer pressure is greater than 180 PSIA, **THEN** commence HPSI flow as follows: (1) Open the HPSI Header valve for the desired flowpath: • HPSI MAIN HDR ISOL 1-SI-654 • HPSI AUX HDR ISOL 1-SI-656 (2) Align HPSI HDR XCONN valves for selected HPSI Pump: • 1-SI-655-MOV PP HDR POSITION 11 Main Open 12 Main Shut 13 Main Shut 11 Aux Shut 12 Aux Open 13 Aux Open • 1-SI-653-MOV PP HDR POSITION 11 Main Open 12 Main Open 13 Main Shut 11 Aux Shut 12 Aux Shut 13 Aux Open (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued) (continue)	D.2.1.e (continued) (3) Verify that the MAIN and AUX HPSI HDR valves are shut: Main • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV Auxiliary • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (4) Start the selected HPSI PP. (5) Throttle open **ONE** MAIN or AUX HPSI HDR valve to maintain **ALL** of the following: • PZR pressure **PER** EOP Attachment (1), RCS PRESSURE TEMPERATURE LIMITS • PZR level between 101 and 170 inches • At least 30° F subcooling f. **IF** PZR pressure is less than 180 PSIA **THEN** commence LPSI flow as follows: (1) Open the LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-635-MOV • 1-SI-645-MOV (2) Start 11 and 12 LPSI PPs. (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

<u>**ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>
D.2 (continued) (continue)	D.2.1 (continued) g. **IF** PZR pressure is less than 180 PSIA, **AND** the LPSI Pumps are **NOT** available, **THEN** commence HPSI flow as follows: **[B0141]** (1) Perform steps D.2.1.e.(1) through D.2.1.e.(4) of this section. (2) Throttle open **ALL** MAIN or AUX HPSI HDR valves to maintain **ALL** of the following: • PZR pressure **PER** EOP Attachment (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> • PZR level between 101 and 170 inches • At least 30° F subcooling (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
D.2 (continued)	D.2.1 (continued) h. **WHEN** the following conditions exist: • At least 30° F subcooling based on CET temperatures • PZR level greater than 101 inches and controlled • At least one SG available for heat removal • Reactor Vessel level above the top of the hot leg **THEN** throttle HPSI or LPSI flow to maintain the following conditions: • RCS subcooling between 30° and 140° F based on CET temperatures • Pressurizer level between 101 and 170 inches 2.2 **IF** pressurizer pressure is greater than 180 PSIA and either constant or rising, **THEN** the operating LPSI PPs may be stopped. 2.3 **IF** HPSI or LPSI throttle/termination criteria can **NOT** be maintained after the pumps are throttled or secured, **THEN** restart the appropriate pumps and restore flow.
3. Makeup to the VCT to maintain level as necessary.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
E. PERFORM THE RCP TRIP STRATEGY.	
1. **IF** CIS has actuated, **OR** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** trip **ALL** RCPs. 2. **IF** RCS temperature and pressure are less than the minimum pump operating limits of the RCP curve on EOP ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.	
F. ATTEMPT TO ISOLATE THE LEAK. **[B0101]**	
1. Verify that the RCS SAMPLE ISOL valve, 1-PS-5464-CV, is shut. 2. Verify that the Reactor Vessel Vent valves are shut: • 1-RC-103-SV • 1-RC-104-SV 3. Verify that the PZR Vent valves are shut: • 1-RC-105-SV • 1-RC-106-SV (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
F. (continued)	
4. Determine that the leak is occurring inside Containment by considering the following indications: • Rise in Containment temperature, pressure, humidity or sump level • "U-1 WR NOBLE GAS RAD MON" and "UNIT 1 MAIN VENT GASEOUS" alarms clear	4.1 **IF** the leak is **NOT** occurring inside of Containment, **THEN** perform the following actions: a. Place both PENETRATION RM VENT FANs in service. **NOTE** Leakage location may be indicated by sump alarms, room level alarms, or area RMS alarms. b. Attempt to locate and isolate the leak. **CAUTION** **Once Letdown is isolated with a Component Cooling to Letdown leak occuring, dilution of the VCT will occur until Component Cooling to the Letdown Heat Exchanger is isolated.**
5. Determine that **NO** leakage into the Component Cooling System is indicated by: • **NO** rising trends on Component Cooling Radiation Monitor, 1-RI-3819 • "CC HEAD TK LVL" high alarm clear	5.1 **IF** leakage into the Component Cooling System is indicated, **AND** shutting the Letdown CNTMT Isolation valves stopped the leak, **THEN** perform the following actions: a. Shift VCT INL, 1-CVC-500-CV, to WPS. b. Isolate Component Cooling to the Letdown HX by performing the following: (1) Place L/D HX TEMP CONTR, 1-TIC-223, in manual with 100% output signal. (2) Shut L/D HX INLET ISOL, 1-CC-166.
(continue)	(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
F.5 (continued) **NOTE** A leak on the Charging header which exceeds the capacity of the charging pumps can be identified by Charging header pressure indicating less than RCS pressure. Identification of the leak may be missed if more than one charging pump is running. 6. Determine if the leak is on the Charging header by performing the following actions: a. Verify only **ONE** CHG PP is running. b. **IF** Charging header pressure is less than RCS Pressure, **THEN** assume the leak is on the Charging header. (continue)	F.5.1 (continued) c. **WHEN** the Component Cooling valves are shut, **THEN** restore 1-CVC-500-CV to the desired position. d. **PROCEED** to Step F.8, Page 117. 5.2 **IF** leakage into the CC System is indicated, **AND** shutting the Letdown CNTMT Isolation valves did **NOT** stop the leak, **THEN** perform the following actions: a. Trip **ALL** RCPs. b. Shut the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
F. (continued) 7. **IF** the leak is on the Charging header, **THEN** perform the following actions: a. Place **ALL** CHG PPs in PULL TO LOCK. b. Dispatch an operator to determine the location of the leak. **NOTE** CHG PP HDR XCONN, 1-CVC-182, is located near 12 Charging Pump. c. **IF** the leak is upstream of CHG PP HDR XCONN, 1-CVC-182, **THEN** shut 1-CVC-182, **AND** start 12 or 13 CHG PP as required. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

F.7 (continued)
 	
d. **IF** the leak is downstream of 1-CVC-182, **THEN** align Charging to the Auxiliary HPSI Header:
 	
(1) Verify that the following valves are shut:
• AUX SPRAY valve, 1-CVC-517-CV
• LOOP CHG valves:
  • 1-CVC-518-CV
  • 1-CVC-519-CV
 	
NOTE
The Auxiliary HPSI Header is out of service, refer to T.S. 3.5.3 when 1-SI-656-MOV is shut.
 	
(2) Shut the HPSI AUX HDR ISOL valve, 1-SI-656-MOV.
 	
(3) Open **ONE** of the following AUX HPSI HDR Valves:
• 1-SI-617-MOV
• 1-SI-627-MOV
• 1-SI-637-MOV
• 1-SI-647-MOV
 	
(4) Open the SI TO CHG HDR valve, 1-CVC-269-MOV.
 	
(continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
F.7.d (continued) **NOTE** REGEN HX CHG INLET, 1-CVC-183, is located in the 27 foot West Penetration Room.	
(5) **IF** the leak is downstream of the REGEN HX CHG INLET valve, 1-CVC-183, **THEN** shut 1-CVC-183, **AND** start any available CHG PP.	(5).1 **IF** 1-CVC-183 in **NOT** accessible, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.
(6) **IF** the leak is upstream of 1-CVC-183, **THEN** shut CHG PP HDR XCONN, 1-CVC-182, **AND** start 11 CHG PP.	
(7) Declare the Auxiliary HPSI Header out of service and refer to T.S. 3.5.3 ECCS-Shutdown.	
e. Verify charging flow by observing a rise in PZR level.	
8. **IF** the leak is isolated, **THEN** perform the following actions:	
a. Maintain PZR level between 101 and 170 inches.	
b. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, LOCKED VALVES • Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES	
c. **IMPLEMENT** the appropriate Operating Procedure to continue operations or to cooldown the plant.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
G. MONITOR CONTAINMENT ENVIRONMENT.	
1. **IF** SIAS has **NOT** actuated, **THEN** perform the following actions: a. Start **ALL** available CNTMT AIR CLRs in HIGH. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs.	
2. **IF** Containment pressure rises to 2.8 PSIG, **THEN** verify the ESFAS actuation of the following: • SIAS • CIS	
3. **IF** CIS has actuated, **THEN** trip **ALL** RCPs.	
4. **IF** the leak is in Containment, **THEN** verify that SRW Pump Room Ventilation is in service **PER** <u>SRW Pump Room Ventilation</u> section of OI-15, <u>SERVICE WATER SYSTEM</u>.	
5. Observe that Containment Sump level rises as RWT level lowers.	5.1 **IF** Containment Sump level does **NOT** rise as RWT level lowers, **THEN** maintain RWT level greater than 2 feet by replenishment from any available source.

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
G. (continued) 6. **IF** Containment pressure rises to 4.25 PSIG, **THEN** perform the following actions: a. Verify CSAS actuation. b. Verify that spray flow is approximately 1350 GPM by checking the following flow indicators: • 11 CS HDR FLOW, 1-FI-4148 • 12 CS HDR FLOW, 1-FI-4149 7. Direct Chemistry to place Hydrogen Monitors in service. 8. **IF** Hydrogen concentration rises to 0.5%, **THEN** start the Hydrogen Recombiners **PER** the <u>Post LOCI Recombiner Startup</u> section of OI-41A, <u>HYDROGEN RECOMBINERS</u>. 9. **IF** the Plant Technical Support Center recommends the use of Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, <u>HYDROGEN PURGE SYSTEM OPERATION</u>, until the Plant Technical Support Center recommends its termination.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
H. VERIFY SG LEVEL CONTROL.	
1. Verify that at least one SG is available for controlled heat removal from the following indications: • SG level is between (-)170 and (+)30 inches • Main or Auxiliary Feedwater is operating to maintain level	1.1 **IF** SG WR level drops to (-)170 inches, **THEN** verify AFAS actuation. 1.2 **IF** Feedwater is lost **OR** is excessive, **THEN** perform the following actions: a. Trip the SG Feed Pumps. b. Shut the SG FW ISOL valves: • (11 SG) 1-FW-4516-MOV • (12 SG) 1-FW-4517-MOV **CAUTION** **13 AFW Pump flow limit is 575 GPM.** c. Start an AFW PP. d. Operate AFW System to restore SG levels to between (-)170 and (+)30 inches. e. If required, operate the AFW Pump Room ventilation **PER** OI-32A, AUXILIARY FEEDWATER SYSTEM.
2. Ensure that feed flow is restoring level to between (-)24 and (+)30 inches.	
3. Do **NOT** exceed the following cooldown limits in any one hour: **[B0126]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

I. **IF** T_{HOT} IS GREATER THAN 300° F,
THEN COMMENCE RCS COOLDOWN.

CAUTION
RCS temperature and pressure must be closely monitored to avoid a cooldown greater than Technical Specification Limits.

1. **IF** the leak has **NOT** been isolated, **THEN** conduct a rapid RCS cooldown to less than 300° F using Turbine Bypass or Atmospheric Dump Valves, while **NOT** exceeding the following limits for any one hour. **[B0053]**

   - Greater than 256° F 100° F/hr
   - 106° F to 256° F 40° F/hr
   - Less than 106° F 35° F/hr

2. **WHEN** T_{HOT} is less than 300° F **AND** RCS pressure is less than 300 PSIA, **THEN** perform the following actions:

NOTE
Cavity Cooling and CEDM Cooling aid in cooling Reactor Vessel Head if a void exists.

   a. Verify that **ALL** available CAV CLG FANs and CEDM CLG FANs are running.

   b. Close the SIT OUT:

      - (1-SI-614-MOV) 52-11442
      - (1-SI-624-MOV) 52-11443
      - (1-SI-634-MOV) 52-10442
      - (1-SI-644-MOV) 52-10443

   c. Shut the SIT OUT valves:

      - 1-SI-614-MOV
      - 1-SI-624-MOV
      - 1-SI-634-MOV
      - 1-SI-644-MOV

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS / **ALTERNATE ACTIONS**

J. MAINTAIN RCS SUBCOOLING AND PRESSURIZER LEVEL.

ACTIONS

NOTE
The RCS is **NOT** water solid if Pressurizer Level or Reactor Vessel level indicates a bubble exists, **AND** either saturated conditions exist in the RCS **OR NO** rapid pressure excursions due to RCS inventory or temperature changes have occurred.

1. **IF** the RCS is **NOT** water solid, **THEN** restore and maintain subcooling between 30° F and 140° F based on CET temperatures as follows:

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.

a. Raise subcooling by **ANY** of the following methods:

(1) Secure Pressurizer Spray.

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

(2) Operate the Pressurizer HTR(s).

(3) Raise the RCS cooldown rate, while **NOT** exceeding the following cooldown limits in any one hour, by using the TBVs or ADVs: **[B0053]**

- Greater than 256° F 100° F/hr
- 106° F to 256° F 40° F/hr
- Less than 106° F 35° F/hr

(continue)

ALTERNATE ACTIONS

1.1 **IF** the RCS is water solid, **THEN** restore and maintain subcooling between 30° F and 140° F based on CET temperatures as follows:

a. Lower subcooling by **ANY** of the following methods:

(1) Lower RCS temperature.

(2) **IF** the overpressurization is due to the HPSI/Charging flow **AND** the HPSI termination criteria are met, **THEN** throttle or secure flow to restore subcooling to less than 140° F.

(3) De-energize the Pressurizer HTR(s).

CAUTION
The potential exists for pressurized thermal shock from an excessive cooldown followed by a repressurization.

b. Raise subcooling by **ANY** of the following methods:

(1) Raise RCS temperature.

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
J.1 (continued) (4) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI header valves which have been throttled or starting the HPSI pump which has been stopped. b. Lower subcooling by any of the following methods: (1) Deenergize the Pressurizer HTR(s). (2) **IF ALL** RCPs are operating, **THEN** use Main Spray. (3) Lower the RCS cooldown rate. (4) **IF** the overpressurization is due to the HPSI/Charging flow **AND** the HPSI termination criteria are met, **THEN** throttle or secure flow to reduce subcooling. (continue)	J.1.1.b (continued) (2) **IF** HPSI flow has been reduced, **THEN** raise HPSI flow by opening HPSI header valves which have been throttled or starting the HPSI pump which has been stopped. **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (3) Operate the Pressurizer HTR(s).

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.b (continued) **CAUTION** **TRM 15.4.2 shall be complied with, if the temperature difference between the PZR and the Regenerative HX Outlet is greater than 400° F.** (5) **IF** unable to lower subcooling, **THEN** initiate Auxiliary Spray as follows: (a) **IF** CIS has initiated, **THEN** place the 1-IA-2080-MOV CIS OVERRIDE switch, 1-HS-2080A. in OVERRIDE. (b) **IF** CIS has initiated, **THEN** open the Instrument Air Containment Isolation valve, 1-IA-2080-MOV. (c) Record the temperature difference between PZR WATER TEMP, 1-TI-101, and CHG OUT TEMP, 1-TI-229. (d) Open the AUX SPRAY valve, 1-CVC-517-CV. (e) Operate the LOOP CHG valves as necessary to adjust Aux Spray: • 1-CVC-518-CV • 1-CVC-519-CV (f) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (g) Shut the PZR Spray Valves: • 1-RC-100E-CV • 1-RC-100F-CV (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
J.1.b(5) (continued) (h) **WHEN** Aux Spray is **NOT** required, **THEN** secure Aux Spray. 1) Open the Loop Charging Valves: • 1-CVC-518-CV • 1-CVC-519-CV 2) Shut the AUX SPRAY valve, 1-CVC-517-CV. (6) Use the Presurizer Vent valves: • 1-RC-105-SV • 1-RC-106-SV 2. **IF** a bubble exists in the Pressurizer **AND** HPSI has been secured, **THEN** restore and maintain Pressurizer Level between 101 and 170 inches by operating Charging, and if available, Letdown.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
K. MAINTAIN RCS FLOW VERIFICATION.	
1. **IF** any RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} is less than 10° F in the loop(s) with an operating SG.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with an operating SG, **THEN** trip **ALL** RCPs.
NOTE During Natural Circulation, increased loop transport time causes a 5 to 15 minute delay in temperature responses to a plant change. PZR level and pressure typically provide better indications of RCS response during this period.	
2. **IF** RCPs have been secured, **THEN** verify subcooled Natural Circulation by the following: • T_{HOT} minus T_{COLD} is less than 50° F • T_{COLD} is constant or lowering • T_{HOT} is constant or lowering • RCS subcooling is at least 30° F based on CET temperatures • CET temperatures trend consistent with T_{HOT} • Steaming rate affects RCS temperatures	2.1 **IF** subcooled natural circulation can **NOT** be verified, **THEN** verify adequate RCS cooling flow by the following: • **ALL** available charging pumps are operating • SG steaming and feeding are properly controlled • CET temperatures are less than superheated

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
L. MONITOR FOR CORE AND RCS VOIDING.	
CAUTION **Void formation occurs when pressure drops below the saturation pressure for the Reactor Vessel Head temperature.** 1. Monitor for Core and RCS voiding by the following: • Rapid unexplained rise in pressurizer level during an RCS pressure reduction • Loss of subcooled margin as determined using CET temperatures • "RXV WTR LVL LO" alarm	

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF** voiding causes difficulty in depressurization **OR** threatens heat removal as indicated by **EITHER** of the following: • Reactor Vessel level approaching the top of the Hot Leg with at least 30° F subcooling • The pressure in **BOTH** S/Gs is greater than the saturation pressure of the RCS **THEN** reduce or eliminate the voided area by performing the following actions: a. Verify that the L/D CNTMT ISOL valves are shut: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
L.2 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** b. Stop the depressurization and raise RCS subcooling to as near 140° F as practical by **ANY** of the following methods: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. (1) Operate pressurizer heaters. (2) Raise cooldown rate while **NOT** exceeding the following limits for any one hour: **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr (3) **IF** HPSI flow has been reduced, **THEN raise** HPSI flow by opening HPSI header valves which have been throttled or starting HPSI Pumps which have been stopped. (continue)	b.1 **IF** raising RCS subcooling does **NOT** restore heat removal, **THEN** operate Reactor Vessel Vent Valves **PER** the Venting The Reactor Coolant System After An Accident section of OI-1G, REACTOR COOLANT VESSEL HEAD AND PRESSURIZER VENT SYSTEM.

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
L.2 (continued) **NOTE** Voids may form in the SG Tubes if the saturation pressure of a SG is greater than the saturation pressure of the RCS. **CAUTION** **If voids exist in the SG Tubes, a rapid RCS pressure reduction will occur when the voids collapse.** c. **IF** voiding is suspected in the SG tubes, **THEN** cool the SG so that the following RCS cooldown rates are not exceeded in any one hour: **[B0053]** • Greater than 256° F 100° F/hr • 106° F to 256° F 40° F/hr • Less than 106° F 35° F/hr by raising **ANY** of the following: • Steaming rate • Feed rate • SG Blowdown rate	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
M. **IF** ESFAS ACTUATIONS OCCUR, **THEN** COMMENCE VERIFICATION CHECKLISTS.	
NOTE HPSI and LPSI throttle/termination will affect the system lineup in the checklists used in the following step. 1. Verify that ESFAS equipment, (with the exception of HPSI Pumps, Main and Aux HPSI HDR MOVs, and Charging pumps), is aligned correctly **PER** the following checklists as appropriate: • EOP ATTACHMENT (2), SIAS VERIFICATION CHECKLIST • EOP ATTACHMENT (3), CSAS VERIFICATION CHECKLIST • EOP ATTACHMENT (4), CIS VERIFICATION CHECKLIST	
N. **IF** SIAS HAS ACTUATED, **THEN** SHIFT THE CHARGING PP SUCTION TO THE RWT.	
1. **IF** SIAS has actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Verify that the VCT OUT valve, 1-CVC-501-MOV, is shut. c. Place the Boric Acid Pumps in PULL TO LOCK. d. Ensure CHG PP amps are steady. e. Ensure BAST levels are steady.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
O. PREPARE FOR RAS ACTUATION	
1. **WHEN** RWT level drops to 4 feet, **THEN** perform the following actions:	
a. **IF** CSAS has **NOT** actuated, **THEN** place **BOTH** CS PPs in PULL TO LOCK.	
b. Place the SI PP RECIRC LOCKOUT switches in ON.	
c. Check HPSI flow is greater than 90 GPM per pump, **OR** check the HPSI PPs have been secured.	c.1 **IF** HPSI flow is less than 90 GPM per pump **AND** the HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** the CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
P. VERIFY RAS ACTUATION.	
1. **IF** RWT level drops to less than 0.75 feet, **OR** the "ACTUATION SYS RAS TRIP" alarm is received, **THEN** perform the following actions:	
a. Verify RAS actuation.	

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) b. Ensure that a minimum Containment sump level of at least 28 inches is indicated on the wide range containment water level indication, 1-LI-4146 or 1-LI-4147. c. Verify the RAS lineup **PER** EOP ATTACHMENT (6), <u>RAS VERIFICATION CHECKLIST</u>. d. **IF** the RAS lineup is verified, **THEN** shut the RWT OUT valves: • 1-SI-4142-MOV • 1-SI-4143-MOV e. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SALTWATER OUT valves: • 1-HIC-5206 • 1-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 1-CC-3824-CV • 1-CC-3826-CV (3) Verify TWO CC Pumps in operation. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) f. **IF** a loss of ECCS pump suction is indicated during recirculation by **ANY** of the following: • Lower or unstable HPSI or CS flow • Lower or unstable HPSI or CS PP discharge presure • Lower or unstable HPSI or CS PP motor current • HPSI or CS PP noise **THEN** take actions to prevent HPSI and CS PP damage, **AND** maintain adequate core cooling by performing the following:	
(1) Throttle HPSI flow equally among the four headers to the minimum allowed **PER** EOP ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. (continue)	(1).1 **IF** HPSI flow indication has been lost, **THEN** throttle HPSI MOVs equally among the four headers to maintain the following: • **NO** HPSI PP cavitation • CETs less than 50° F superheated • Core covered 02300

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1.f (continued)	
(2) **IF** HPSI or CS PP performance is **NOT** acceptable, **THEN** perform the following:	
(a) Verify **BOTH** CS PPs stopped.	
(b) Check acceptable HPSI PP performance.	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).
(c) Notify the Plant Technical Support Center.	
(d) **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE.	
g. Commence ECCS Pump Room cooling as follows:	
(1) Open the ECCS AIR CLR INL/OUT VLVs: • 1-SW-5170-CV • 1-SW-5171-CV • 1-SW-5173-CV	
(2) Start 11 EAST and 12 WEST ECCS PP RM CLG FANs.	
h. Place the ECCS PP RM EXH FILT in service.	

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) i. Maintain SRW and Component Cooling temperatures by performing the following: (1) Adjust the CC HX SALTWATER OUT valves to maintain Component Cooling temperature less than 120° F: • 1-HIC-5206 • 1-HIC-5208 (2) **IF EITHER** SRW HX SW BYPASS valve is in AUTO, **THEN** adjust the setpoint as necessary to maintain SRW temperature less than 105° F: • 1-PIC-5154 • 1-PIC-5157 **NOTE** The current maximum SW header pressure limits are recorded on the Shift Turnover Sheet. (3) Verify SW HDR PRESS less than the maximum SW header pressure limit. j. **IF** Charging Pumps are aligned with suction from RWT, **THEN** place the CHG PPs in PULL TO LOCK. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
P.1 (continued) **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** k. Ensure HPSI PP flow is at least 90 GPM during recirculation.	k.1 **IF** HPSI flow is less than 90 GPM per pump during recirculation **AND** HPSI throttle criteria have been met, **THEN** perform the following actions: (1) **IF** CHG PPs are operating, **THEN** turn off ONE CHG PP at a time until HPSI flow is at least 90 GPM per pump. (2) **IF** HPSI flow is still less than 90 GPM GPM per pump with **ALL** CHG PPs secured, **THEN** turn off ONE HPSI PP at a time until HPSI flow is greater than 90 GPM per pump.
Q. **IF** SIAS HAS ACTUATED **THEN** RESTORE CONTAINMENT ENVIRONMENT.	
1. Verify that the IODINE FILT FANs are running. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
Q. (continued) 2. **WHEN** Containment pressure drops to less than 4.0 PSIG, **THEN** perform the following actions: a. Verify the CS HDR handswitches, 1-HS-4150 and 1-HS-4151 in OPEN. b. Reset the CSAS signal. c. Verify that **ALL** available CACs are operating to reduce Containment temperature. d. Restore equipment listed in the EOP ATTACHMENT (3), <u>CSAS VERIFICATION CHECKLIST</u>, to the desired condition. 3. **WHEN** Containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions: a. Reset the SIAS signal. b. Reset the CIS signal. **<u>CAUTION</u>** **At least one Containment Spray Pump shall remain in operation until Containment Temperature can be maintained less than 120° F by the Containment Air Coolers.** c. Secure **ONE** CS PP. d. Restore equipment listed in EOP ATTACHMENTS (2) and (4), the SIAS and CIS VERIFICATION CHECKLISTS, to the desired condition. 4. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP.	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

<u>**ACTIONS**</u>	<u>**ALTERNATE ACTIONS**</u>
R. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	
1. Contact the Operational Support Center to check radiation levels are low enough to allow valve repositioning.	
2. Verify SIAS has **NOT** actuated **OR** has been reset, **AND** initiate actions to make up to the RWT **PER** OI-2B, <u>CVCS BORATION, DILUTION AND MAKEUP OPERATIONS</u>.	
3. Notify the Plant Technical Support Center to review ERPIP-611, <u>SEVERE ACCIDENT MANAGEMENT RESTORATIVE ACTIONS</u> for alternate methods to refill the RWT **AND** actions to inject directly to the RCS bypassing the RWT.	
S. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. Restore SRW to the Turbine Building as follows: a. Verify 21 PA Compressor operating. b. Verify shut Plant Air to Plant Air Header valve, 1-PA-2059-CV. c. Verify open Plant Air To Instrument Air Cross Connect valve, 1-PA-2061-CV. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
S.1 (continued) d. Open the SRW HDR TURB BLDG ISOL valves: • 1-SRW-1600-CV • 1-SRW-1637-CV • 1-SRW-1638-CV • 1-SRW-1639-CV	
2. Restore Instrument Air Compressors to service as follows:	
a. **IF** high temperature alarm exists on the Instrument Air Compressors, **THEN** open the SRW Isolation Valves by placing their override handswitches in OPEN until the temperature alarm clears: • (11) 1-HS-2063 • (12) 1-HS-2065	a.1 **IF** SRW is **NOT** available, **THEN** restore cooling to the IA compressors using the Fire Main **PER** OI-19, INSTRUMENT AIR.
b. Start at least one Instrument Air Compressor **PER** OI-19, INSTRUMENT AIR.	
3. Restore Instrument Air To Containment as follows: a. Open the IA CNTMT ISOL valve, 1-IA-2080-MOV.	
NOTE 1-HS-2085 is located on the West wall of the 27 ft Switchgear Room and is operated by a T112 key (#85 from the Control Room Key Locker). The TBO key ring also has a T112 key.	
b. Open the Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN. (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
S. (continued) 4. **IF** the leak is isolated, **OR** within Charging Pump capacity, **THEN** perform the following: a. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, LOCKED VALVES • Component Manipulations **PER** NO-1-200, CONTROL OF SHIFT ACTIVITIES b. **IMPLEMENT** the appropriate Operating Procedure to continue operations or to cooldown the plant.	
T. RESTORE LETDOWN FLOW.	
WARNING **High area radioactivity in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify the following: • The leak was **NOT** on the letdown line • HPSI throttle/termination criteria are met • Charging flow path exists through LOOP CHG valves or AUX SPRAY valve • At least ONE CHG PP is operating 2. Verify the PRZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, in Auto Remote. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step U.

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
T. (continued) 3. Place the L/D PRESS CONTR, 1-PIC-201, in MANUAL with a 20% output. 4. Place IX BYPASS valve, 1-CVC-520-CV, in BYPASS. 5. Shift LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 0%. 6. **IF** the plant computer is **NOT** operating, **THEN** record the following information: • RCS T_{COLD} • CHG OUT TEMP (1-TI-229) • Average CNTMT ambient temperature (1-TI-5309 and 1-TI-5311) • 27' Penetration Room temperature (1-TI-5276 and 1-TI-5280) (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
T. (continued) 7. Check **BOTH** Backpressure Regulating valves and Letdown Control Valves in service by verifying the following: a. **BOTH** Letdown Control Valve Inlet valves open: • 1-CVC-103 • 1-CVC-105 b. **BOTH** Letdown Control Valve Outlet valves open: • 1-CVC-104 • 1-CVC-106 c. **BOTH** Backpressure Regulating Inlet valves open: • 1-CVC-108 • 1-CVC-110 d. **BOTH** Backpressure Regulating Outlet valves open: • 1-CVC-109 • 1-CVC-111 e. L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. BACKPRESS REG VLVS handswitch, 1-HS-201, in **BOTH**. 8. Open L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
T. (continued) **CAUTION** **The setpoint of 1-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.**	
9. Place L/D PRESS CONTR, 1-PIC-201 in service as follows: a. Adjust the setpoint on 1-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift L/D PRESS CONTR, 1-PIC-201 to AUTO.	
10. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow.	
11. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC.	
12. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F.	
13. Check pressurizer level is trending to 160.	13.1 **IF** pressurizer level is **NOT** trending to 160 inches, **THEN** shift the PRZR LVL CONTR, 1-LIC-110X or 1-LIC-110Y, to Auto Local **AND** adjust the setpoint to 160 inches.

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS

U. **IF** THE RCS IS WATER SOLID,
THEN DRAW A BUBBLE IN THE RCS.

1. **IF** the RCS is water solid,
AND it is desired to draw a bubble in the RCS,
THEN perform the following actions:

NOTE
Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS.

a. Energize the Pressurizer Heater(s).

b. **IF EITHER** of the following conditions exist:

- BOTH SG pressures can be maintained less than RCS pressure
- At least one RCP is running

THEN draw a bubble in the RCS as follows:

(1) **IF** the HPSI throttle/termination criteria are met,
THEN reduce RCS pressure by reducing HPSI/Charging flow or raising letdown flow.

(2) Cooldown the RCS, while **NOT** exceeding the following cooldown limits in any one hour, by using the TBVs or ADVs: **[B0053]**

- Greater than 256° F 100° F/hr
- 106° F to 256° F 40° F/hr
- Less than 106° F 35° F/hr

(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	**ALTERNATE ACTIONS**
U.1 (continued) c. **IF** a bubble forms in the Pressurizer, **THEN** operate HPSI/Charging and Letdown as necessary to restore and maintain Pressurizer level between 101 and 170 inches. d. **IF** a bubble forms in the Reactor Vessel Head, **THEN** operate HPSI/Charging and Letdown as necessary to maintain RCS level above the top of the hotleg.	
V. ESTABLISH SHUTDOWN COOLING.	
1. **WHEN** CET temperatures are less than 300° F, **AND** the following conditions exist: • PZR level is greater than 101 inches • RCS subcooling is greater than 30° F based on CET temperatures **THEN** perform the following actions: a. Direct Radiation Safety Supervision to verify that radiation levels are low enough to allow valve repositioning. b. Initiate Shutdown Cooling **PER** the <u>Initiation of Shutdown Cooling</u> section of OI-3B, <u>SHUTDOWN COOLING - UNIT 1</u>. (continue)	1.1 **IF** CET temperatures are less than 300° F, **AND** the following conditions exist: • Conditions for establishing shutdown cooling can **NOT** be met • RWT level is less than 0.75 feet • Wide range Containment level indicator 1-LI-4146 indicates a level **THEN** commence alternate shutdown cooling as follows: a. Direct Radiation Safety Supervision to verify that radiation levels are low enough to allow valve repositioning. (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
V.1 (continued) c. Operate HPSI, and Charging and Letdown to maintain the following: • PZR level between 101 and 170 inches • RCS pressure within the specified limits **PER** EOP ATTACHMENT (1), <u>RCS PRESSURE TEMPERATURE LIMITS</u> (continue)	V.1.1 (continued) b. Verify that RCS pressure minus Containment pressure is less than 160 PSID. c. Shut 11 Containment Spray Pump Discharge Valve, 1-SI-314. d. Shut 12 Containment Spray Pump Discharge Valve, 1-SI-324. e. Shut 11 SDC HX Outlet To Spray Header Valve, 1-SI-319. f. Shut 12 SDC HX Outlet To Spray Header Valve, 1-SI-329. g. Open 11 SDC HX Inlet Cross Connect Valve, 1-SI-452. h. Open 11 SDC HX Outlet To RCS Valve, 1-SI-456. i. Open 12 SDC HX Inlet Cross Connect Valve, 1-SI-453. j. Open 12 SDC HX Outlet To RCS Valve, 1-SI-457. k. Verify Component Cooling in service as follows: (1) Throttle open BOTH CC HX SALTWATER OUT valves: • 1-HIC-5206 • 1-HIC-5208 (2) Verify BOTH CC HX CC OUT valves are open: • 1-CC-3824-CV • 1-CC-3826-CV (3) Verify TWO CC Pumps in operation. (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
V.1 (continued)	V.1.1 (continued) l. Open 11 SDC HX CC OUT valve, 1-CC-3828-CV. m. Open 12 SDC HX CC OUT valve, 1-CC-3830-CV. n. Open SDC HX LPSI INL isolation, 1-SI-658-MOV. o. **IF** Hot Leg Injection is being used for core flush, **THEN** verify that 12A LPSI HDR valve, 1-SI-635-MOV, is shut. p. **IF** PZR Injection is being used for core flush, **THEN** open 12A LPSI HDR valve, 1-SI-635-MOV. q. Open the LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-645-MOV r. Place the keyswitch for SDC FLOW CONTR, 1-SI-306-CV in AUTO. s. Shift SDC FLOW CONTR, 1-FIC-306, to MANUAL with a 95% output signal. t. Open the 11 CNTMT SUMP DISCH valves: • 1-SI-4144-MOV • 1-SI-4145-MOV u. Shut the MINI FLOW RETURN TO RWT ISOL valves: • 1-SI-659-MOV • 1-SI-660-MOV
(continue)	(continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
V.1 (continued) (continue)	V.1.1 (continued) **CAUTION** **The possibility of cavitation increases when taking suction from the CNTMT Sump.** v. **IF** the LPSI Pumps are **NOT** operating, **THEN** clear RAS from one operable LPSI Pump as follows: (1) Place LPSI PP RAS OVERRIDE switch in OVERRIDE. (2) Start the selected pump. **CAUTION** **The cooldown limit changes from 100° F in any one hour period to 40° F in any one hour period when RCS temperatures are below 256° F.** w. Adjust the signal on 1-FIC-306 to raise flow to 3000 GPM, while maintaining cooldown rate within limits. x. Place the keyswitch for the SDC Temperature Control Valve, 1-SI-657-CV, in AUTO. **CAUTION** **The heatup rate limit for the SDC HXs is 14° F/Minute.** y. Adjust S/D COOLING TEMP CONTR, 1-HIC-3657 to obtain less than 14° F/minute heatup rate at the SDC HX Outlet, 1-TI-303X and 1-TI-303Y. z. **IF** the desired RCS cooldown rate can **NOT** be maintained with one LPSI Pump, **THEN** start the second LPSI Pump and adjust 1-FIC-306 to 6000 GPM. (continue)

IX. EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

ACTIONS	ALTERNATE ACTIONS
V.1 (continued)	V.1.1 (continued) aa. Adjust the S/D COOLING TEMP CONTR, 1-HIC-3657, to obtain the desired cooldown rate. 1.2 **IF** RCS subcooling is less than 30° F based on CET temperatures **AND** SDC or Alternate SDC has **NOT** been established, **THEN** commence core flush between 8 and 11 hours after SIAS was actuated by lining up for Pressurizer Injection **PER** EOP-5, <u>LOSS OF COOLANT ACCIDENT</u>.
W. **IMPLEMENT** THE APPROPRIATE PROCEDURE.	
1. **IF** core flush is in progress **AND** CET temperatures are less than 200° F, **THEN** secure core flush **PER** EOP-5, <u>LOSS OF COOLANT ACCIDENT</u>.	
2. Ensure that the Safety Function Status Check Final Acceptance Criteria are met.	2.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until Final Acceptance Criteria are met.
3. Reestablish normal plant configuration control as required: • Locked Valves **PER** NO-1-205, <u>LOCKED VALVES</u> • Component Manipulations **PER** NO-1-200, <u>CONTROL OF SHIFT ACTIVITIES</u>	
4. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager.	

END of Section IX

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

A. The STA (or person designated by the CRS) will perform the intermediate and final safety function checks respectively on entry and prior to exiting from this procedure.

B. Perform intermediate safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being satisfied, promptly upon discovery.

	REACTIVITY CONTROL PARAMATERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	WRNI	less than 10^{-4}		less than 10^{-4}	
b.	SUR (DPM)	negative or zero		negative or zero	
c.	Boron concentration	appropriate S/D margin		appropriate S/D margin	

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

	VITAL AUXILIARIES	SAFETY FUNCTION ACCEPTANCE CRITERIA: CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	4KV vital buses 11 or 14	at least one energized	__|__|__|__	at least one energized	______
b.	125V DC buses 11, 12 21 and 22	all greater than 106 volts	__|__|__|__	all greater than 106 volts	______
c.	120V AC vital buses 11,12,13,14	at least THREE energized	__|__|__|__	at least THREE energized	______
d.	208/120V instrument buses 11 or 12	at least one energized	__|__|__|__	at least one energized	______

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure (PSIA)	within limits EOP Att. (1)	__|__|__|__	within limits of EOP Att. (1)	______
	OR			
	all available Charging Pumps operating and SIS injecting **AND** less than MAX OPERATING PRESSURE of EOP Att. (1)	__|__|__|__	within limits of EOP Att. (1)	______
b. Pressurizer level (inches) (1)	30 to 250	__|__|__|__	101 to 170	______
	OR			
	Charging and SIS operating	__|__|__|__	101 to 170	______

(1) Water solid operation is acceptable provided the other parameters still indicate a SGTR.

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

RCS PRESSURE AND INVENTORY PARAMETERS (continued)		SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
c.	RCS subcooling (°F)	25 to 140	_|_|_|_	greater than 25	_____
		OR			
		Charging and SIS operating	_|_|_|_	greater than 25	_____
d.	Reactor Vessel level	core covered	_|_|_|_	core covered	_____

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

	CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	T_{HOT} (°F)	less than 385		less than 300	
b.	T_{COLD} (°F)	less than 385		less than 300	
c.	T_{HOT} minus T_{COLD} (°F)				
	natural circulation	less than 50		less than 50	
	OR				
	forced circulation	less than 10		less than 10	
d.	S/G level (inches)(1)	(-)170 to (+)30		(-)24 to (+)30	

(1) SG level criterion is applicable only for the unaffected S/G.

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

CORE AND RCS HEAT REMOVAL PARAMETERS (continued)	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
e. Condensate Storage Tank Level	greater than 5 ft		greater than 5 ft	
			OR	
			shutdown cooling initiated	

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment pressure (PSIG)	less than 0.7		less than 0.7	
b. Containment Temperature (°F)	less than 120		less than 120	
c. Containment Radiation Monitor	alarm clear		alarm clear	
	no unexplained trend		no unexplained trend	

X. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE SG TUBE LEAKAGE WITH LTOP CONTROLS IN EFFECT

RADIATION LEVELS EXTERNAL TO CONTAINMENT	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Noble Gas Monitor	N/A	N/A	alarm clear	______
b. Condenser Off-Gas RMS	N/A	N/A	alarm clear	______
c. S/G B/D RMS	N/A	N/A	alarm clear	______
d. Main Vent Gaseous RMS (1-RI-5415)	N/A	N/A	alarm clear	______

STATUS CHECK NUMBER	COMPLETED AT TIME
1	______
2	______
3	______
4	______
5	______
6	______
7	______
8	______

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

A. The STA (or person designated by the CRS) will perform the intermediate and final safety function checks respectively on entry and prior to exiting from this procedure.

B. Perform intermediate safety function status checks at 15 minute intervals until plant conditions stabilize.

C. Notify the Control Room Supervisor if any safety function is not being satisfied, promptly on discovery.

D. Record Time Of Day ____________ .

	REACTIVITY CONTROL PARAMATERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	WRNI	less than 10^{-4}	__|__|__|__	less than 10^{-4}	______
b.	SUR (DPM)	negative or zero	__|__|__|__	negative or zero	______
c.	Boration status:	appropriate S/D Margin	__|__|__|__	appropriate S/D margin	______

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

	VITAL AUXILIARIES	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	4KV vital buses 11 or 14	at least one energized	__|__|__|__	at least one energized	______
b.	125V DC buses 11, 12 21 and 22	all greater than 106 volts	__|__|__|__	all greater than 106 volts	______
c.	120V AC vital buses 11,12,13,14	at least THREE energized	__|__|__|__	at least THREE energized	______
d.	208/120V instrument buses 11 or 12	at least one energized	__|__|__|__	at least one energized	______

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA: CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	within limits of EOP Att. (1)	_|_|_|_	within limits of EOP Att. (1)	_____
	OR			
	all available Charging Pumps operating and SIS injecting **AND** less than MAX OPERATING PRESSURE of EOP Att. (1)	_|_|_|_	within limits of EOP Att. (1)	_____
b. Pressurizer level (inches) (1)	30 to 170	_|_|_|_	101 to 170	_____
	OR			
	Charging and SIS operating	_|_|_|_	101 to 170	_____

(1) A break at the top of the Pressurizer will result in solid pressurizer indication. This is an acceptable value provided the other parameters still indicate a leak.

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

	RCS PRESSURE AND INVENTORY PARAMETERS (continued)	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
c.	RCS subcooling (°F)	30 to 140		30 to 140	
		OR			
		Charging and SIS operating		30 to 140	
d.	Reactor Vessel level	core covered		core covered	

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than superheated	_|_|_|_	less than superheated	______
b. T_{COLD} (2)	constant or lowering	_|_|_|_	constant or lowering	______
c. T_{HOT} minus T_{COLD} (°F)(2)				
natural circulation	less than 50	_|_|_|_	less than 50	______
OR				
forced circulation	less than 10	_|_|_|_	less than 10	______
d. S/G level (inches)	(-)170 to (+)30	_|_|_|_	(-)24 to (+)30	______
e. Condensate Storage Tank Level	greater than 5 ft	_|_|_|_	greater than 5 ft	______
			OR SDC initiated	______

(2) T_{HOT} and T_{COLD} indication may be influenced by charging or SI temperatures during a large break LOCA. If this occurs, T_{COLD} and T_{HOT} minus T_{COLD} may be deleted from the check provided CET temperatures and S/G level meet their acceptance criteria.

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

	CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
		CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a.	Containment pressure (PSIG)	less than 50		less than 2.8	
b.	Containment Temperature (°F)	less than 276		less than 220	
c.	Containment Radiation Monitor	N/A	N/A	alarm clear	
		no unexplained trend		no unexplained trend	
d.	Hydrogen Concentration (3)	less than 0.5%		less than 0.5%	
		OR			
		all available hydrogen recombiners energized		less than 0.5%	

(3) Hydrogen Concentration acceptance criteria may be omitted until chemistry has been able to place hydrogen monitors in service.

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

RADIATION LEVELS EXTERNAL TO CONTAINMENT	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Noble Gas Monitor	N/A	N/A	alarm clear	______
	no unexplained trend	__|__|__|__	no unexplained trend	______
b. Condenser Off-Gas RMS	alarm clear	__|__|__|__	alarm clear	______
	no unexplained trend	__|__|__|__	no unexplained trend	______
c. S/G B/D RMS	alarm clear	__|__|__|__	alarm clear	______
	no unexplained trend	__|__|__|__	no unexplained trend	______
d. Main Vent Gaseous RMS (1-RI-5415)	N/A	N/A	alarm clear	______
	no unexplained trend	__|__|__|__	no unexplained trend	______

XI. SAFETY FUNCTION STATUS CHECK FOR EXCESSIVE RCS LEAKAGE WITH LTOP CONTROLS IN EFFECT

STATUS CHECK NUMBER	COMPLETED AT TIME
1	
2	
3	
4	
5	
6	
7	
8	

ATTACHMENT (1)
Page 1 of 2

ESTIMATE GROSS LEAK RATE

Record the following information:

a. Initial PZR Level	a. _______	inches
b. Initial RCS Temp., T_{AVE}	b. _______	°F
c. Initial Time	c. _______	
d. Final PZR Level	d. _______	inches
e. Final RCS Temp., T_{AVE}	e. _______	°F
f. Final Time	f. _______	
g. RCS Pressure	g. _______	psia
h. Charging Flow	h. _______	gpm
i. Letdown Flow (average)	i. _______	gpm
j. Total CBO Flow	j. _______	gpm

Determine Factors:

k. Estimate PZR volume factor based on RCS Pressure Step g.

2200 psia = 18.9 gallons/inch
1500 psia = 21.5 gallons/inch
1000 psia = 23.3 gallons/inch
500 psia = 25.5 gallons/inch
200 psia = 27.4 gallons/inch　　k. _______

l. Estimate RCS expansion factor based on RCS Temp., T_{AVE} Step e.

570° F = 86.2 gallons/° F
560° F = 81.5 gallons/° F
550° F = 78.8 gallons/° F
540° F = 73.1 gallons/° F
530° F = 72.3 gallons/° F
500° F = 63.1 gallons/° F
450° F = 55.7 gallons/° F
400° F = 50.4 gallons/° F
350° F = 43.1 gallons/° F
300° F = 38.2 gallons/° F
250° F = 32.1 gallons/° F　　l. _______

ATTACHMENT (1)
Page 2 of 2

ESTIMATE GROSS LEAK RATE

Calculate Leak Rate:

m. PZR Level

(a. _______ - d. _______) x k. _______ gallons/inch = m. _______ gallons

n. RCS Temperature

(b. _______ - e. _______) x l. _______ gallons/° F = n. _______ gallons

o. RCS change

(m. _______ - n. _______) ÷ (f. _______ - c. _______) = o. _______ gpm

p. Calculate Leak Rate

o. _______ + h. _______ - i. _______ - j. _______ = p. _______ gpm

p. _______ gpm = Leak Rate

ATTACHMENT (2)

LEAK IDENTIFICATION

NOTE
The following are possible steps for locating a leak. These steps are to be used as applicable as determined by the Control Room Supervisor or Shift Manager.

1. Check the Charging Pump Rooms for the following indications of leaks:

   a. Check the Charging Pumps for packing leaks.

   b. Check the general vicinity of the Charging Pump room for leaks.

NOTE
Charging Pump Suction Relief Valve flow passes through the diversion integrator.

NOTE
Temperature is measured at a point at least five feet downstream of relief valves to avoid temperature readings being affected by thermal conduction.

   c. Check that the Charging Pump Suction Relief Valves are **NOT** leaking by measuring downstream temperature with a contact pyrometer at a point at least five feet downstream of relief valves:

      - (11 Charging Pump) 1-CVC-315-RV
      - (12 Charging Pump) 1-CVC-318-RV
      - (13 Charging Pump) 1-CVC-321-RV

2. Have Chemistry check the following:

   a. The primary sample sink is properly aligned.

   b. **NO** leaks exist at the Primary Sample Sink.

   c. Sample Drain Return Valves to the Drain Tanks are shut.

      - 1-PS-6529-SV
      - 2-PS-6529-SV

3. Perform a visual inspection for leaks of the following areas:

   - 27 foot and 5 foot West Penetration rooms
   - Letdown Heat Exchanger Room
   - 27 foot Valve Alley
   - VCT room

4. Review the maintenance schedule to determine if the leak could be due to maintenance in progress or recently completed.

5. Notify Radiation Safety Supervision to conduct an airborne activity survey of the Auxiliary Building.

ATTACHMENT (2)
Page 2 of 3

LEAK IDENTIFICATION

6. Bypass and isolate the CVCS Ion Exchangers as follows:

   a. Place IX BYPASS valve handswitch, 1-HS-2520, to BYPASS.

   b. Verify Shut Purification Ion Exchanger Inlet Valves:

      - 1-CVC-126
      - 1-CVC-136
      - 1-CVC-146

   c. Shut Letdown Basket Strainer Inlet Valve, 1-CVC-156.

7. Bypass and isolate the CVCS Letdown Filters as follows:

   a. Open CVCS Filter Bypass Valve, 1-CVC-124.

   b. Shut CVCS Filter Inlet Isolation Valves:

      - (11) 1-CVC-116
      - (12) 1-CVC-120.

   c. Shut CVCS Filter Outlet Isolation Valves:

      - (11) 1-CVC-117
      - (12) 1-CVC-121.

8. Check RCS Drain Tank for raised leakage **PER** the applicable section of REACTOR COOLANT LEAKAGE EVALUATION, STP O-27-1.

9. Check Quench Tank level, pressure and temperature for indication of leak to the Quench Tank.

   a. **IF** leakage to the Quench Tank is indicated,
      THEN determine if a leaking PORV or Safety Valve may be the cause. Check T106, T107 and T108 on the Plant Computer to determine which valve is leaking.

   b. **IF** PORV leakage is indicated,
      AND PZR pressure is less than 2300 PSIA,
      THEN perform the following:

      (1) Shut the appropriate PORV BLOCK valves:

         - 1-RC-403-MOV
         - 1-RC-405-MOV

      (2) Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position:

         - 1-HS-1402
         - 1-HS-1404

LEAK IDENTIFICATION

10. Verify that leak is not caused by improper seating of the CVCS Diversion Valve, 1-CVC-500-CV by shutting its Manual Isolation Valve, 1-CVC-325.

11. Verify that Letdown Relief Valves 1-CVC-345-RV and 1-CVC-354-RV are not leaking by measuring downstream temperature with a contact pyrometer. Measure downstream temperature at a point at least five feet downstream of relief valves to avoid temperature reading being affected by thermal conduction. When checking 1-CVC-354-RV, raise letdown temperature above ambient temperature of 1-CVC-354-RV, so that leakage may be detected by temperature rise.

12. Check that the VCT relief, 1-CVC-115-RV, is not leaking by measuring downstream temperature with a contact pyrometer. Measure downstream temperature at a point at least five feet downstream of relief valves to avoid temperature reading being affected by thermal conduction.

13. Check Safety Injection Tank Levels, RWT level, HPSI and LPSI header pressures to verify that leakage is not into the Safety Injection system.

14. Check for RCS leaks into the Component Cooling System by checking the CC Head Tank and Component Cooling RMS, 1-RI-3819.

AOP-2A UNIT 1
EXCESSIVE REACTOR COOLANT LEAKAGE

TRIP CRITERIA	TRIP CRITERIA	TRIP CRITERIA
SECTION VI. • PZR pressure reaches the TM/LP pretrip setpoint • **IF** a SG Tube Leak is indicated • T_{AVE} is less than 537°F • PZR level can **NOT** be maintained above 101 inches • PZR pressure reaches the TM/LP pretrip setpoint	**SECTION VI.** • **IF** the leak is on the charging header, **AND** charging has been realigned • PZR level does **NOT** rise with charging flow • Leakage into the CC System is indicated, **AND** shutting the Letdown CNTMT Isolation valves did **NOT** stop the leak	**SECTION VI.** • The leak has **NOT** been isolated, **AND** the leak is greater than the capacity of **ONE** Charging Pump

NOTE: Continuously applicable steps are designated with a "C" in the DONE column.