CALVERT CLIFFS NUCLEAR POWER PLANT

UNIT TWO

OP-7

SHUTDOWN OPERATIONS

REVISION 44

SAFETY RELATED

REFERENCE USE

APPROVAL AUTHORITY: J. V. Grooms

EFFECTIVE DATE: 8/2/2010

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1.0 PURPOSE

A. This procedure coordinates and directs actions required during shutdown operations (Mode 5 without a Pressurizer bubble and Mode 6).

2.0 APPLICABILITY/SCOPE

A. This procedure may be used as follows:

- collapse and redraw the Pressurizer bubble while in Mode 5
- take the plant from Mode 5 to Mode 6
- take the plant from Mode 6 to Mode 5
- drain the RCS and perform reduced inventory operations in Mode 5

B. Effective use of this procedure requires that Operations Management review plant status for system availability and out-of-service components, that would impact the planned evolution by entering Technical Specification Action Statements or prohibit system operation. Operations management must determine that adequate equipment is available and that actions are in place to return to service those components needed during the planned evolution.

C. Procedure entry points other than at the beginning:

1. **IF** this procedure is used to collapse the Pressurizer bubble, perform RCS maintenance in reduced inventory and draw a Pressurizer bubble **WITHOUT** entering Mode 6,
THEN sections 6.7 through 6.11 may be omitted in their entirety.

2. **IF** this procedure is used to collapse the Pressurizer bubble, perform RCS maintenance and draw a Pressurizer bubble **WITHOUT** entering reduced inventory operations,
THEN sections 6.3 through 6.5 **AND** 6.7 through 6.11 may be omitted in their entirety.

3. **IF** plant conditions warrant entering this procedure at an off-normal point (somewhere other than the beginning of section 6.1),
THEN the previous steps of section 6.1 may be omitted provided they are reviewed to ensure the minimum requirements for continuing with the section are met. **ALL** steps in the section must be signed off **OR** have CRS/SM permission not to be performed.

4. It is expected to enter and exit the sections of this procedure (i.e.; used to drain and fill the RCS or commence core alterations) several times during an outage. These sections are written to stand alone to allow for repeated performance.

2.0 APPLICABILITY/SCOPE (Continued)

D. This procedure shall be used as follows:

1. With the approval of the CRS or SM, two or more steps within a section may be performed concurrently **OR** out of order. The steps must be evaluated in the sequence listed **AND** be determined not to be dependent upon the actions of other steps within that section.

2. With the approval of the CRS or SM, a step may be delayed **OR** not performed if equipment availability prevents its immediate performance. The step must be evaluated in the sequence listed **AND** determined not to impact the performance of the planned evolution by prohibiting integrated plant operation **OR** entry into Technical Specification Action Statements to which L.C.O. 3.0.4 applies.

3. When encountering a step whose actions have already been performed (e.g.; step says to start a pump and the pump is already running), equipment status shall be reviewed to ensure that existing conditions meet the intent of the step, and with the concurrence of the CRS or SM the step may be signed off.

4. Conditional steps (IF, THEN) may be marked N/A if the condition does not exist or apply.

5. Steps with initial spaces shall be initialed when completed.

6. This procedure may be used in conjunction with OP-1 and OP-2 when performing a plant start-up.

3.0 REFERENCES AND DEFINITIONS

3.1 DEVELOPMENTAL REFERENCES

A. Technical Specifications

B. Technical Requirements Manual (TRM)

C. P&IDs

1. OM-460 (62-729E), REACTOR COOLANT SYSTEM

2. OM-461 (62-744E), CHEMICAL & VOLUME CONTROL SYSTEM

3. OM-462 (62-731E), SAFETY INJECTION & CONTAINMENT SPRAY SYSTEMS

D. Tech Manual 15876-001, V-MAX Oil-Sealed Liquidring Vacuum Pump System

3.2 PERFORMANCE REFERENCES

A. OI-1A, Reactor Coolant System and Pump Operations

B. OI-1B, Quench Tank Operations

3.2 PERFORMANCE REFERENCES (Continued)

C. OI-1E, Reactor Coolant Pump Seal Venting

D. OI-1H, Pressurizer Pressure Control

E. OI-2A, Chemical and Volume Control System

F. OI-2B, CVCS Boration, Dilution and Makeup Operation

G. OI-2D, Purification System Operation

H. OI-3A, Safety Injection and Containment Spray

I. OI-3B, Shutdown Cooling

J. OI-24E, Recirculation of Refueling Water Tanks

K. OI-27C, 4.16 KV System

L. OI-27D, Station Power 480 Volt System

M. STP O-36-2, Shutdown Cooling Hdr Return Isolation Valve Test

N. STP O-55A-2, Containment Closure Verification

O. STP O-59-2, Refueling Machine Hoist Functional Test

P. STP O-60-2, Containment Purge Isolation System Functional Test

Q. STP O-61-2, Mode 6 Nuclear Instrumentation Test

R. STP O-90-2, Breaker Lineup Verification

S. STP O-92-2, Refueling Machine Functional Test

T. STP O-94B-2, RCS/SDC Loop Operability Verification (Modes 4, 5 & 6)

U. STP M-572A, Cold Leg Temperature Instrument Calibration, 2-TE-115 & 2-TE-125

V. STP M-572B, Pressurizer Pressure Calibration Check 2-PT-103 and 2-PT-103-1

W. STP M-672B, Pressurizer Relief Valve (ERV) Channel Functional Test

X. AOP-3B, ABNORMAL SHUTDOWN COOLING CONDITIONS

Y. MN-1-110, Procedure Controlled Activities

Z. EN-1-115, Recording of Plant Transients/Operational Cycles

AA. CNG-OP-1.01-1000, Conduct of Operations

AB. NO-1-103, Conduct of Lower Mode Operations

3.2 PERFORMANCE REFERENCES (Continued)

AC. NO-1-113, Control of Radio Transmitters

AD. NO-1-112, Safety Tagging

AE. NO-1-117, Intergrated Risk Management

AF. NO-1-205, Locked Valves

AG. NO-1-206, Alarm Annunciator Control

AH. CNG-PR-3.01-1000, Records Management

AI. NEOP 301, Operator Surveillance Procedure (U-2)

3.3 DEFINITIONS

A. **MAJOR CHANGES** in RCS boron concentration are defined as any change greater than 50 PPM when one of the following is occurring: **[B0271][B0272]**

- Boration from 0% power to shutdown margin
- Boration from 0% power to refueling boron concentration
- Boration from shutdown margin to refueling boron concentration
- Dilution from shutdown margin to ECC
- Dilution from refueling boron concentration to shutdown margin
- Dilution from refueling boron concentration to ECC

4.0 PREREQUISITES **INITIALS**

CAUTION

- Manual operation of automatically controlled systems should **NOT** be performed unless a malfunction is apparent **OR** automatic system operation will **NOT** support continued plant operation **OR** as needed to conduct testing.
- Systems shifted to manual operation shall be monitored frequently to ensure correct operation.

A. The following systems are in operation:

- Pressurizer Pressure Control ____
- Pressurizer Level Control ____
- VCT Level Control ____
- Shutdown Cooling ____

B. RCS temperature between 100 and 150° F. ____

4.0 PREREQUISITES (Continued) **INITIALS**

C. The minimum essential equipment (MEE) listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, is available **OR** an approved NO-1-103 Contingency Plan is in effect.

1. **CONTINUE** logging the MEE in the Shift Turnover sheet. ____

2. **CONTINUE** checking MEE availability once per 12 hours. ____

D. **IF** entering this procedure following a S/G tube leak, seismic event, LOCA, Main Steam line break **OR** Main Feedwater line break, **THEN NOTIFY** Nuclear Inspection Services that S/G inspections are required **PER** Tech Spec 5.5.9. ____

CAUTION
Do **NOT** attach tygon tubing to the Pressurizer vent rig. Tygon tubing will collapse when RCS level is lowered and block the vent path.

E. **REQUEST** Mechanical Maintenance to perform the following:

1. **INSTALL** the temporary Pressurizer vent rig (flow gauge and vent valve, 2-RC-277) to the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216. ____

2. **INDEPENDENTLY VERIFY** the temporary Pressurizer vent rig installation. ____

3. **INITIATE** MN-1-110 Attachment PC tracking. ____

F. **IF** anticipated to drain RCS level to less than or equal to the Reactor Vessel Flange,
THEN REQUEST I&C to install the Reactor Vessel Flange Temperature Monitor. ____

****** END ******

5.0 PRECAUTIONS

NOTE

- **ALL** equipment tagged for purposes of this procedure shall use red danger tags unless specifically directed to use a caution tag.
- **ALL** caution tags used for LTOP should state that the equipment is under LTOP control and is to be operated only with SM or CRS approval when directed by appropriate procedures.

A. **WHEN** RCS temperature is less than 301° F **AND** the RCS is vented less than eight square inches (8 IN^2),
THEN the following Low Temperature Overpressure Protection (LTOP) controls shall be followed: **[B0064]**

1. **OVERPRESSURE PROTECTION**

   a. The requirements of Tech Spec 3.4.12 are met to provide an adequate vent path.

   b. **IF** the Plant Computer is available **AND** SDC is in operation,
   THEN a computer alarm for points P103 and P103A, with a setpoint below the maximum allowable pressure for the corresponding RCS temperature shall be established to warn the operator of a pressure excursion.

2. **MASS ADDITION SAFEGUARDS**

   a. Two HPSI Pumps are caution tagged with their breakers racked out **OR** their discharge valves locked shut **AND** the third HPSI pump handswitch is caution tagged in PULL TO LOCK.

   b. The third HPSI pump handswitch is caution tagged in PULL TO LOCK.

   c. **ALL** eight MAIN **AND** AUX HPSI Loop Isolation valves are caution tagged shut in PULL TO OVERRIDE.

   d. SI TO CHG HDR, 2-CVC-269-MOV, is caution tagged shut.

   e. **WHEN** the RCS is vented less than 2.6 square inches (2.6 IN^2),
   THEN HPSI injection flow from the RWT shall be limited to less than 210 GPM **AND** through a single HPSI Loop Isolation valve only.

5.0.A PRECAUTIONS (Continued)

3. **INADVERTENT RCP START SAFEGUARDS**

a. **ALL** RCPs are caution tagged by **TWO** of the following four methods:

- RCP handswitches (two per RCP) in PULL TO LOCK and RCP Breaker Trip Fuses (two per RCP) installed
- RCP Feeder Breaker handswitches in PULL TO LOCK and RCP Feeder Breaker Trip Fuses installed
- **ALL** eight RCP breakers racked out
- **BOTH** feeder breakers, 252-1202 and 252-2201, racked out

B. Do **NOT** exceed the following RCS cooldown rates:

RCS Temperature	Maximum Cooldown Rate
Greater than 146° F	100° F per hour
146° F or less	40° F per hour

C. Do **NOT** exceed the following RCS heatup rates:

RCS Temperature	Maximum Heatup Rate
70° F to 246° F	80° F per hour
Greater than 246° F	100° F per hour

D. Pressurizer linear heatup rate is limited to 100° F per hour.

E. Pressurizer cooldown rate is limited to 200° F in any one hour period. **[B0028]**

F. **WHEN** a bubble exists in the Pressurizer,
THEN Pressurizer water temperature shall be maintained at least 30° F greater than the highest RCS Loop temperature.

G. **WHEN** Auxiliary Spray is used,
THEN the temperature difference between the Pressurizer and Auxiliary Spray shall be less than 400° F.

H. **WHILE** filling the RCS from the RWT,
THEN caution shall be exercised to prevent cooling the Reactor Vessel below 70° F.

I. Minimize the time the RCS is solid water to limit exposure to overpressurization events.

J. RCS hydrogen concentration shall be less than 5cc/kg prior to opening the RCS for repair or refueling.

K. When the RCS is drained, an adequate Reactor Vessel Head vent path must be maintained to prevent gas desorption from accumulating in the Reactor Vessel Head, which can lead to erroneous level indication.

5.0 PRECAUTIONS (Continued)

L. **WHEN** the reactor vessel head is tensioned,
THEN the Reactor Vessel flange temperature shall be maintained greater than or equal to 70° F.

M. **WHEN** performing evolutions that could affect RCS inventory, such as manipulating Safety Injection or CVCS components,
THEN RCS **AND** VCT levels shall be closely monitored to prevent an inadvertent loss of RCS inventory. **[B0138]**

N. To prevent challenging SDC suction header piping, RCS pressure shall be maintained less than 250 PSIA whenever the SDC suction valves are open.

O. Criticality shall be anticipated whenever heatup **OR** cooldown **OR** dilution operations **OR** CEA withdrawals are in progress. **[B0138] [B0270]**

P. The plant computer shall **NOT** intentionally be removed from service whenever the RCS is water solid **OR** when water solid conditions are anticipated. **[B0064]**

Q. **WHEN** performing a **MAJOR CHANGE** in RCS boron concentration,
THEN VERIFY that at least one RCP is running **AND** PZR spray is in operation until the desired boron concentration has been **REACHED AND VERIFIED.** **[B0271][B0272]**

R. Any RCS temperature adjustment must be logged using the appropriate heatup or cooldown appendix.

S. Limitations on RCS dilution from non-borated water sources are as follows: **[B0270]**

1. The RCS shall be filled and vented.

2. The amount of dilution water has been calculated for the dilution method used **PER** OI-2B, CVCS BORATION, DILUTION AND MAKEUP OPERATION.

3. Targeted RCS boron concentration is greater than the Shutdown Boron Concentration limit of NEOP 301.

4. Dilution water shall be added in a minimum of two batches with Chemistry sampling and analyzing the RCS after each batch, to ensure the boron concentration is maintained greater than Shutdown Boron Concentration.

5. When a reduction in RCS boron concentration is being made from a source whose boron concentration is LESS THAN the present SDM requirement of the COLR, within one hour of **AND** at least once per hour during the reduction of RCS boron concentration, SDC shall be verified in service with at least 3000 GPM flow through the RCS. (TRM 15.1.1)

6. The dilution rate shall be less than or equal to 88 GPM.

5.0 PRECAUTIONS (Continued)

T. Adequate Mixing Flow is defined as:

At least 3000 GPM flow through the core **AND** at least 500 GPM flow through both S/Gs. **[B0272]**

Adequate Mixing Flow can be verified by ANY of the following:

1. At least one RCP is running with Main or Aux Spray in operation.
2. A Natural Circulation cooldown in progress with Aux Spray initiated.
3. SDC in operation **AND** the following conditions are met:
   - The S/G tubes are full.
   - The S/G temperature is less than or equal to the RCS temperature (as measured by TR-351 and pyrometer).
   - Aux Spray initiated.
     (N/A if the known PZR boron concentration is GREATER than the required Shutdown Margin boron concentration)
   - Steam bubble in the pressurizer.
   - Any Boron changes shall be directed into a loop receiving the SDC flow.

NOTE
The following LPSI Pump combinations ensure at least 500 GPM flow through both S/Gs in either the forward or reverse direction.

- One of the following LPSI pump operation criteria are met:
  - **IF** the reactor is shutdown less than 10 days,
    THEN ONLY one LPSI Pump shall be running.
  - **IF** the reactor is shutdown between 10 and 20 days,
    THEN one or two LPSI Pumps are running.
  - **IF** the reactor is shutdown longer than 20 days,
    THEN BOTH LPSI Pumps shall be running.

U. If diluted pockets are suspected in the RCS, PWR Reload Analysis must be notified to determine a process for starting RCPs. **[B0272]**

5.0 PRECAUTIONS (Continued)

NOTE
Past operating experience has shown that running two LPSI pumps may help in maintaining S/G temperatures warmer.

V. Maintain the following S/G pressure / temperature limitations:

- **WHEN** S/G primary **OR** secondary TEMPERATURE is less than 85° F, **THEN** primary and secondary pressures shall be maintained less than 195 PSIA. (This is 5° F and 20 PSI more restrictive than the requirements of TRM 15.7.1, which requires S/G temperature be greater than 80° F when S/G pressure is greater than 215 PSIA)
- **WHEN** S/G primary **OR** secondary PRESSURE is greater than 195 PSIA, **THEN** primary and secondary temperatures shall be maintained greater than 85° F. (This is 5° F and 20 PSI more restrictive than the requirements of TRM 15.7.1, which requires S/G temperature be greater than 80° F when S/G pressure is greater than 215 PSIA)

W. The following radiological precautions shall be followed:

- **ALL** fluids vented from contaminated systems shall be treated as radioactively contaminated until certified clean by Chemistry
- Radiation Safety Supervision shall be notified of any venting or draining operations in the RCA

NOTE
A S/G is considered available for heat removal when **ALL** of the following conditions exist: **[B0015]**

- Secondary side actual water level is greater than (-)40 inches
- Secondary side is intact
- Associated ADV is available to relieve steam
- Steam-driven AFW Pump available
- RCS is capable of being pressurized

It's preferred to have the S/G tubes full, **BUT NOT** required due to time available would be less for time to boil **AND** equilibrium temperature reached in a long-term LOSDC is higher with U-tubes drained.

X. **IF BOTH** S/Gs are **NOT** available for heat removal **AND** the Pressurizer manway is installed,
THEN the minimum essential equipment (MEE) listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, shall be available for the existing plant condition **OR** an approved NO-1-103 Contingency Plan is in effect. **[B0116]**

5.0 PRECAUTIONS (Continued)

NOTE

The potential for a boron dilution event exists whenever the following conditions exists: **[B0271]**

- The RCS is depressurized.
- Sufficient driving head exists in the S/G secondary side.
- Nozzle dams are **NOT** installed.
- A leak path exists, e.g. via tube/tube sheet leakage

Y. Any unexplained or unanticipated change in RCS inventory during shutdown shall be reported via a Condition Report and shall be promptly investigated. Chemistry shall be notified to commence RCS sampling. The results shall be evaluated for effect on reactivity management prior to exit from Mode 5 into higher operating modes or prior to any activity that would result in a reduction of shutdown margin. **[B0270] [B0271]**

Z. Maximum SDC Flow is 1700 GPM when the Reactor is defueled and the UGS is installed. This will prevent damage to the ICI Thimbles. **[B0424]**

AA. If core alterations are stopped, then prior to recommencing core alterations, the appropriate checks for 72 hours, 24 hours and/or 1 hour after core alterations are required to be completed as appropriate.

AB. To protect the water level in the SFP, the U-2 XFER TUBE ISOL valve, 0-SFP-2 must be shut when the Temporary Reactor Pressure Vessel Cover is installed as a maintenance boundary.

AC. If the S/G tubes have **NOT** been drained, evolutions involving air/gas (placing an unvented SDC heat exchanger in service, gasses coming out of solution, etc.) may cause the RCS level to rise or overflow any openings if the air/gas accumulates in the SG tubes.

AD. RCS level alarm setpoints may be adjusted as necessary to prevent nuisance alarms. When the RCS is in reduced inventory, at least 2 independent RCS level indications shall have their alarms set as directed. When the RCS is **NOT** in reduced inventory, at least one RCS level indication shall have its alarms set as directed. If the minimum level indications with alarms set as directed can **NOT** be obtained, the operator shall check and record the RCS level every 15 minutes. **[B0198] [B0597]**

5.0 PRECAUTIONS (Continued)

AE. RCS level indication 2LE4139 is sensitive to airflow in the still-well area of the instrument. When draining the RCS, cooler air enters the still-well. Additionally, it takes time for the active portion of the RTD to heat up after being uncovered. Until the instrument equilibrates, indicated level will read higher than actual. This results in the level indication lagging behind other level indications during draining. This effect can occur during any air exchange which may be caused by small pressure changes such as installing/removing SG nozzle dams or manways, as well as containment pressure changes. The vendor suggests 10 minutes for the instrument to stabilize after level/pressure changes.

6.0 PROCEDURE **INITIALS**

6.1 COLLAPSE THE PRESSURIZER BUBBLE

A. **ENSURE** RCS temperature less than 150° F. ____

B. **ENSURE ALL** Letdown Control **AND** Back Pressure Regulating valves are in service. ____

NOTE
Pressurizer level instruments read to 360 inches. Pressurizer volume for draining from solid at 404 inches to 350 inches, when the level instruments are on scale, is approximately 1620 gallons. This equates to approximately 1.9 inch RWT level change and 0.75 feet RC Waste Receiver Tank level change.

C. **DETERMINE** the RCS drain path to be used: (check one) ____

☐ LPSI miniflow/ SDC to HPSI suction to RWT: **CALCULATE** the final RWT **[B] PER** APPENDIX 4, CALCULATION OF FINAL RWT CONCENTRATION FOR RCS DRAIN.

☐ CVCS diversion to WPS

☐ RCS loop drain valves to RCDT

NOTE
Steps AE.6.e through AE.6.i may be performed concurrently with the following steps.

☐ WPS via CVCS diversion **AND** SDC Purification

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

D. **IMPLEMENT** the following solid water controls: **[B0064]**

1. **ENSURE ALL** Pressurizer Heaters in OFF. ____

2. **TAGOUT** the Pressurizer Heaters. ____

3. **TAGOUT** the RCPs by **ONE** of the following methods:
(N/A method not used)

   - **BOTH** feeder breakers 252-1202 and 252-2201 racked out ____
   - **ALL** eight RCP breakers racked out ____

4. **ENSURE BOTH** PORVs operable with **ALL** of the following conditions:

   * STPs M-672B, M-572A and M-572B current ____

   * **BOTH** PORV handswitches in SINGLE MPT ENABLE:

     - PORV 402 MPT PROTECTION...2-HS-1406 ____
     - PORV 404 MPT PROTECTION...2-HS-1408 ____

   * **BOTH** PORV Override Shut/Auto handswitches in AUTO:

     - PORV 402 OVERRIDE....2-HS-1402 ____
     - PORV 404 OVERRIDE....2-HS-1404 ____

5. **ENSURE BOTH** PORV Block Valves are full open.

   - PORV 402 BLOCK.....2-RC-403-MOV ____
   - PORV 404 BLOCK.....2-RC-405-MOV ____

6. **ENSURE** two Charging pumps have their breakers racked out and tagged:
(N/A Charging pump not tagged)

   - 21 Charging pump.....52-2115 ____
   - 22 Charging pump.....52-2415 ____
   - 23 Charging pump....52-2104 **AND** 52-2404 ____

6.1.D COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

7. **ISOLATE** HPSI pumps by **ONE** of the following methods:

☐ **RACK OUT AND DANGER TAG** two HPSI pump breakers **AND RACK OUT AND CAUTION TAG** the third HPSI pump breaker **PER** OI-27C, 4.16 KV SYSTEM:

- 21 HPSI pump, 152-2108 ____
- 22 HPSI pump, 152-2408 ____
- 23 HPSI pump, 152-2110 & 152-2410 ____

☐ **LOCK SHUT AND** CAUTION **TAG** ALL three HPSI pump manual discharge valves:

- 21 HPSI PP DISCH ISOL 2-SI-428 ____
- 22 HPSI PP DISCH ISOL 2-SI-415 ____
- 23 HPSI PP DISCH ISOL 2-SI-406 ____

NOTE
The following valves will have their breaker CAUTION Tagged off.

☐ **SHUT AND CAUTION TAG ALL** eight MAIN and AUX HPSI Loop Isolation valves:

HPSI MAIN HDR	HPSI AUX HDR
2-SI-616-MOV	2-SI-617-MOV
2-SI-626-MOV	2-SI-627-MOV
2-SI-636-MOV	2-SI-637-MOV
2-SI-646-MOV	2-SI-647-MOV

____

NOTE
The following valves will have their breaker CAUTION Tagged off.

☐ **SHUT AND** CAUTION **TAG BOTH** MAIN and AUX HPSI Header Isolation valves:

HPSI MAIN HDR ISOL	HPSI AUX HDR ISOL
2-SI-654-MOV	2-SI-656-MOV

____

E. **NOTIFY** Radiation Safety Supervision of collapsing the pressurizer bubble, **AND** the PZR and Rx Vessel vents are to be opened. ____

F. **TERMINATE** operational testing of Safety Injection and CVCS components until normal water level is established in the Pressurizer. **[B0064]** ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

G. **IF** desired to shift makeup control,
THEN perform one of the following:

- Shift to Automatic Makeup Control **PER** OI-2B Section 6.4. ____

OR

- Align for Fast Boration from the RWT **PER** OI-2B Section 6.12.B.2 ____

> **NOTE**
> The dedicated operator is **NOT** required to be stationed when maintaining PZR level constant at <300" in the PZR.

04400

> **CAUTION**
> PORVs which open due to overpressurization, will remain open. The cause of the overpressure condition should be determined **AND** corrected before shutting the PORVs.

H. **STATION** a dedicated licensed operator as the solid water overpressurization watch with the following duties: **[B0593]** ____

- **MONITOR** RCS pressure, Pressurizer level, Letdown flow and Charging pump operation
- **TAKE** necessary corrective actions to prevent overpressurization of the RCS.

I. **ADJUST** the local setpoint on the selected PZR LVL CONTR CH, 2-LIC-110X **OR** 2-LIC-110Y, to maximum, **AND ENSURE** it is in AUTO. ____

> **CAUTION**
> Do **NOT** exceed a PZR cooldown rate of 200° F in any one hour period. **[B0028]**

J. **ENSURE SHUT** the Pressurizer Spray valves:

- 21A PZR SPRAY CV.....2-RC-100E-CV ____
- 21B PZR SPRAY CV.....2-RC-100F-CV ____

K. **PREPARE** the Quench Tank for Low Pressure conditions **PER** OI-1B, QUENCH TANK OPERATIONS, SECTION 6.9, VENTING THE QT TO CNTMT AT LOW RCS PRESSURE. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
Aligning the RWT to AUX SPRAY will aid in Pressurizer degas, and could help avoid a lengthy Pressurizer recirculation. 04400

L. **UTILIZE** Auxiliary Spray **PER** OI-1H, PRESSURIZER PRESSURE CONTROL, to lower Pressurizer pressure to between 25 and 50 PSIA, while continuing with this section. ____

- **CONTINUE** recording Pressurizer cooldown data in APPENDIX 1, PRESSURIZER COOLDOWN LOG. ____

M. **CONTACT** the Operations FSTC or otherwise determine if STP-0-66A should be used to shut the RCP Bleed Cntmt Isolations, 2-CVC-505 and 506. ____

NOTE
Locked valves, controlled under NO-1-205.

N. **WHEN** Pressurizer pressure is less than 100 PSIA, **THEN SHUT** the following valves:

- RCP BLEED CNTMT ISOL.....2-CVC-505-CV ____
- RCP BLEED CNTMT ISOL.....2-CVC-506-CV ____

O. **VERIFY** the setpoint of L/D PRESS controller, 2-PIC-201, is set at 100 PSI and AUTO. ____

P. **ENSURE SHUT** the Letdown Backpressure Control valves:

- L/D BACK PRESS REG.....2-CVC-201P-CV ____
- L/D BACK PRESS REG.....2-CVC-201Q-CV ____

Q. **PLACE** L/D THROTTLE VLV controller, 2-HIC-110, in MANUAL. ____

R. **ADJUST** 2-HIC-110 output to fully open L/D CONTROL valves 2-CVC-110P-CV **AND** 2-CVC-110Q-CV. ____

S. **IF**, at any time, RCS pressure **CANNOT** be maintained less than 150 PSIA,
THEN to prevent lifting RV-199, **OPEN** RCP BLEED CNTMT ISOL valves, 2-CVC-505-CV **AND** 2-CVC-506-CV. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
The L/D Pressure controller may not respond fast enough in auto to maintain pressure below desired value.

CAUTION
When RCS is in a solid water condition, a rise in RCS temperature can cause an overpressure condition.

T. **WHEN** the Pressurizer is nearly full **AND** RCS pressure starts rising with maximum Aux Spray flow,
THEN PERFORM the following:

1. **PLACE** L/D PRESS controller, 2-PIC-201, in MAN. ____
2. **ADJUST** L/D PRESS controller, 2-PIC-201, output to maintain RCS pressure less than 250 PSIA **AND** at least 25 PSI above saturation pressure for the pressurizer. ____
3. **WHEN** RCS pressure is stable less than 250 PSIA,
THEN PLACE L/D PRESS controller, 2-PIC-201, in AUTO. ____
4. **IF** Charging suction is aligned to RWT,
THEN ALIGN Charging suction to the VCT if desired. ____

NOTE
During collapse of the Pressurizer bubble and coodown of the Pressurizer, Pressurizer temperature indication on 2-TI-101 falls to near or below 200° F. As Pressurizer cooldown continues, this temperature may rise above 200° F and then fall again.

U. **CONTINUE** to cool the Pressurizer with Aux Spray to less than 200° F. ____

V. **WHEN** the Pressurizer is less than 200° F,
THEN LOWER L/D PRESS controller, 2-PIC-201, setpoint to minimum. ____

NOTE
RCS draindown to the VCT via L/D will start when all the charging pumps are stopped and will continue until L/D stop valves are shut. VCT level must be monitored until the L/D stop valves are shut.

W. **PLACE ALL** Charging pumps in PULL TO LOCK **AND** continue to **MONITOR** VCT level. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

X. **REQUEST** Plant Chemistry to perform the following:

1. **OBTAIN** an RCS boron sample. **[B0605]** ____

2. **REALIGN** the sample sink returns from the VCT to the waste system. ____

Y. **IF** at any time during the drain **OR** depressurization, the RVLM indicates a void,
THEN VENT the Reactor Vessel Head **AND ALLOW** the space to fill with water as follows: **[B0076]**

> **NOTE**
> The following Reactor Vessel Head vent path becomes less effective as RCS pressure **AND** Pressurizer level are lowered.

1. **OPEN** RX VSL TO QT VENT, 2-RC-103-SV. ____

2. **OPEN** RX VSL VENT B/U, 2-RC-104-SV. ____

3. **WHEN** Quench Tank level rises,
THEN SHUT 2-RC-103-SV **AND** 2-RC-104-SV. ____

4. **IF** necessary to vent the Reactor Vessel Head locally,
THEN OPEN the following Reactor Vessel vents:

   - RX VSL VENT ISOL.....2-RC-279 ____
   - RX VSL VENT STOP.....2-RC-280 ____

5. **WHEN** air free water exits the vent line,
THEN SHUT 2-RC-279 **AND** 2-RC-280. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

The potential for a boron dilution event exists whenever the following conditions exists: **[B0271]**

- The RCS is depressurized.
- Sufficient driving head exists in the S/G secondary side.
- Nozzle dams are **NOT** installed.
- A leak path exists, e.g. via tube/tube sheet leakage

Z. **IF** at anytime during the drain/depressurization an unexplained/unanticipated change in RCS inventory occurs, **THEN PERFORM** the following: **[B0271]**
(N/A if no unexplained/unanticipated change in RCS inventory occurs)

- **NOTIFY** Chemistry to commence RCS boron sampling. ____
- **NOTIFY** Radiation Safety Supervision. ____
- **INVESTIGATE** all potential sources of RCS dilution. ____
- **COMMENCE** continuous monitoring of RCS level. ____
- **INITIATE** a Condition Report. ____

NOTE

This procedure does **NOT** change RCS boron concentration. Any change in RCS boron concentration while draining or depressurizing the RCS should be considered a boron dilution event.

AA. **IF** a boron dilution event is in progress, **THEN PERFORM** the following **[B0271]**
(N/A if no boron dilution event)

- Immediately **STOP** all work activities involving interface with the RCS or that potentially affect RCS inventory. ____
- **IMPLEMENT** AOP-1A, INADVERTENT BORON DILUTION. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
The dedicated operator is **NOT** required to be stationed when maintaining PZR level constant at <300" in the PZR. 04400

AB. **WHEN** pressurizer level is less than 170 inches, **THEN SECURE** the dedicated overpressurization watch. ____

AC. **COMMENCE** continuous monitoring of Pressurizer pressure and level (2-LI-103 and Computer point L110X!, **OR** 2-LI-103 and Computer point L110Y!), **AND** RCS temperature. (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches) ____

NOTE
Pressurizer level instruments read to 360 inches. Pressurizer volume for draining from solid at 404 inches to 350 inches, when the level instruments are on scale, is approximately 1620 gallons. This equates to approximately 1.9 inch RWT level change and 0.75 feet RC Waste Receiver Tank level change.

AD. **IF** any of the following occur **AND** pressurizer level indicates no change:
(N/A if pressurizer level indicates change)

- 30 minutes of draining
- RWT level rises by 1.9 inch
- in service RC Waste Receiver Tank rises by 0.75 feet.
- CVCS Flow Diversion Integrator, 2-FQI-2540, indicates 1620 gallons have been drained from the Pressurizer

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

THEN PERFORM the following:

1. **SECURE** the drain by shutting the valve(s) opened to initiate the drain. ____

2. **PLACE** L/D PRESS controller, 2-PIC-201, in AUTO with a setpoint of 150 PSIG. ____

3. **INVESTIGATE** the cause of no change in level, including, **BUT NOT** limited to: ____

   - Instrumentation malfunction: compare indicated level to Reactor Vessel level to determine need to refill the RCS
   - Valve misalignment in drain path

4. **WHEN** corrective actions are complete **AND** it is desired to continue with collapsing the bubble,
   THEN RE-INITIATE draining **PER** this section. ____

   - **IF** re-initiating drain to RCW,
     THEN LOG Letdown initiation in the Transient Tracking Log. ____

CAUTION

- Dilution tagout required prior to lowering RCS level less than 90 inches.
- The pressurizer vent valves must remain open while draining to prevent decalibration of the pressurizer level instrumentation.

WARNING

The pressurizer vent valves are opened after the drain is established in order to prevent inadvertent Reactor Coolant spill.

AE. **LOWER** Pressurizer level to between 350 and 100 inches using one of the following methods:

1. **DRAIN** to VCT via Letdown:

   a. **MONITOR** VCT level while continuing with this section. ____

   b. **VERIFY** at least one Purification IX in service **PER** OI-2D. ____

   c. **AFTER** establishing the RCS drain rate,
      THEN OPEN the following Pressurizer vent valves (Opening the last vent valve slowly):

      - PZR VENT THROT, 2-RC-277 ____
      - PZR VENT ISOL, 2-RC-215 ____
      - PZR VENT STOP, 2-RC-216 ____

6.1.AE.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

d. **WHEN** draining to the VCT via Letdown is complete, **THEN** perform one of the following: ____

- Commence draining via another method.

OR

- **SHUT** the Letdown valves to secure draining via letdown:
  - L/D STOP.....2-CVC-515-CV
  - L/D CNTMT ISOL.....2-CVC-516-CV

OR

2. **DRAIN** using LPSI Miniflow/SDC to HPSI suction to the RWT:

a. **NOTIFY** Radiation Safety Supervision that the RCS will be drained to the RWT. ____

b. **OPEN** the desired valve to initiate drain down:

- 21 LPSI PP MINIFLOW RTN ISOL, 2-SI-449 ____
- 22 LPSI PP MINIFLOW RTN ISOL, 2-SI-450 ____
- 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV ____
- 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV ____

c. **AFTER** establishing the RCS drain rate, **THEN OPEN** the following Pressurizer vent valves (Opening the last vent valve slowly):

- PZR VENT THROT, 2-RC-277 ____
- PZR VENT ISOL, 2-RC-215 ____
- PZR VENT STOP, 2-RC-216 ____

NOTE
Locked valves controlled under NO-1-205.

d. **WHEN** the Pressurizer is at the desired level, **THEN SHUT** the valves used to drain the RCS:

- 21 LPSI PP MINIFLOW RTN ISOL, 2-SI-449 ____
- 22 LPSI PP MINIFLOW RTN ISOL, 2-SI-450 ____
- 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV ____
- 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV ____

OR

6.1.AE COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
The operation of CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, is controlled by NO-1-205, Locked Valves, when SDC is in operation.

3. **DRAIN** to WPS via CVCS diversion:

   a. **VERIFY** that at least one Purification IX is in service. ____

   b. **VERIFY** CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, is **SHUT**. ____

   c. **SHIFT** the VCT Inlet valve, 2-CVC-500-CV, to the WPS position. ____

   d. **THROTTLE OPEN** CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, to obtain the required drain rate. ____

   e. **AFTER** establishing the RCS drain rate, **THEN OPEN** the following Pressurizer vent valves (Opening the last vent valve slowly):

      - PZR VENT THROT, 2-RC-277 ____
      - PZR VENT ISOL, 2-RC-215 ____
      - PZR VENT STOP, 2-RC-216 ____

   f. **WHEN** the Pressurizer is at the desired level, **THEN LOCK SHUT** 2-CVC-325. ____

OR

4. **DRAIN** using RCS drain valves to the RCDT:

   a. **PUMP** the RCDT until the RCDT Pump stops on low level. ____

6.1.AE.4 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

> **NOTE**
> The RCS Drain valves marked with an asterisk (*) are locked valves. Locked valves are controlled under NO-1-205.

b. **OPEN OR UNLOCK AND OPEN** one or more sets of RCS Drain Valves:

- 21 HOT LEG DRN.....2-RC-107*
  21 HOT LEG DRN.....2-RC-108 ____

OR

- 21A COLD LEG DRN.....2-RC-111*
  21A COLD LEG DRN.....2-RC-112 ____

OR

- 21B COLD LEG DRN.....2-RC-113*
  21B COLD LEG DRN.....2-RC-114 ____

OR

- 22A COLD LEG DRN.....2-RC-115*
  22A COLD LEG DRN.....2-RC-116 ____

OR

- 22B COLD LEG DRN.....2-RC-117*
  22B COLD LEG DRN.....2-RC-118 ____

c. **AFTER** establishing the RCS drain rate, **THEN OPEN** the following Pressurizer vent valves (Opening the last vent valve slowly): ____

- PZR VENT THROT, 2-RC-277
- PZR VENT ISOL, 2-RC-215
- PZR VENT STOP, 2-RC-216

d. **PUMP** the RCDT as necessary to keep the RCDT High Level alarm clear. ____

e. **WHEN** the Pressurizer is at the desired level, **THEN SHUT OR LOCK SHUT** the RCS Drain valves used for the drain. ____

OR

6.1.AE COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

- This drain path will provide draining to the WPS with more flow through the CVCS IXs for cleanup.
- Pzr Level shall be lowered to less than 350 inches prior to draining using this step due to it removes letdown as an over-pressure relief path.

5. **DRAIN** to WPS via SDC Purification:

   a. **ENSURE** Pzr level is less than 350 inches. ____

   b. **NOTIFY** Radiation Safety that the RCS will be draining to the WPS. ____

   c. **CONTACT** the Operations FSTC **OR** otherwise determine if STP O-66A should be used to shut the Letdown Isolation valves. ____

   d. **SHUT** the following Letdown valves:

      - L/D STOP.....2-CVC-515-CV ____
      - L/D CNTMT ISOL.....2-CVC-516-CV ____

   e. **PLACE** SDC purification in service **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

   f. **COMMENCE** draining the RCS **PER** OI-3B, Section DRAINING THE RCS/RFP TO RC WASTE PROCESSING SYSTEM WITH CVCS PURIFICATION ON SDC. ____

   g. **AFTER** establishing the RCS drain rate, **THEN OPEN** the following Pressurizer vent valves (Opening the last vent valve slowly):

      - PZR VENT THROT, 2-RC-277 ____
      - PZR VENT ISOL, 2-RC-215 ____
      - PZR VENT STOP, 2-RC-216 ____

   h. **WHEN** RCS/PZR is at the desired level, **SECURE** draining the RCS **PER** OI-3B, Section DRAINING THE RCS/RFP TO RC WASTE PROCESSING SYSTEM WITH CVCS PURIFICATION ON SDC. ____

OR

6.1.AE COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
The operation of CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, is controlled by NO-1-205, LOCKED VALVES, when SDC is in operation.

6. **DRAIN** to WPS via CVCS diversion **AND** SDC Purification:

   a. **VERIFY** that at least one Purification IX is in service. ____

   b. **VERIFY** CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, is LOCKED OPEN. ____

   c. **SHIFT** the VCT Inlet valve, 2-CVC-500-CV, to the WPS position. ____

WARNING
High temperature RCS fluids may be discharged if residual RCS pressure exists.

   d. **OPEN** the following Pressurizer vent valves (Opening the last vent valve slowly):

      - PZR VENT THROT, 2-RC-277 ____
      - PZR VENT ISOL, 2-RC-215 ____
      - PZR VENT STOP, 2-RC-216 ____

   e. **VERIFY** spool pieces at SDC TO CVCS, 2-SI-465 and CVCS TO SDC, 2-SI-475 are installed. ____

   f. **ENSURE SHUT** the following valves:

      (1) U-2 S/D CLG RTN TO 21 SFP, 0-SFP-152 ____

      (2) SUPP TO U-2 S/D CLG FR 21 SFP, 0-SFP-201 ____

      (3) SI TO CVCS INLET DRN, 2-SI-477 ____

      (4) CVCS TO SDC SPOOL PIECE DRN, 2-SI-478 ____

      (5) U-2 S/D CLG RTN VENT, 0-SFP-153 ____

      (6) U-2 S/D CLG SUPP VENT, 0-SFP-230 ____

   g. **IF** the Ultrasonic flow instrument will be used to verify purification flow,
      THEN:

      (1) **ENSURE** IM has installed the Ultrasonic flow instrument. ____

      (2) **ENSURE** IM has **EQUALIZED AND ISOLATED** 2-FI-500. ____

6.1.AE.6 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

h. **IF** it is desired to use the SDC FLOW INSTRUMENT, 2-FI-500, **AND** 2-FI-500 is **EQUALIZED AND ISOLATED**, **THEN INFORM** IM to place 2-FI-500 back in service. ____

i. **DIRECT** IM to **EQUALIZE AND ISOLATE** the Letdown Flow Transmitter, 2-FT-202. ____

j. **VERIFY** SDC Heat Exchanger Outlet Temperature less than or equal to 130° F, as indicated by 2-TI-303X and 2-TI-303Y. ____

k. Slowly **OPEN** SDC SUPP TO SFP CLR & CVCS ISOL, 2-SI-458. ____

NOTE
A pressure reduction may occur as the piping fills.

l. Slowly **OPEN** SFP CLG & CVCS TO SDC, 2-SI-442. ____

m. **OPEN** SDC TO CVCS, 2-SI-465. ____

n. **THROTTLE OPEN** SDC TO CVCS B/U, 2-SI-464 to maintain the following:

- Purification flow rate less than 120 GPM. ____
- DO **NOT** exceed 175 PSIG as indicated on 2-PIC-201. ____

6.1.AE.6 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

o. **MONITOR** 12 RCWRT level **AND** Alarm window F-02 on 2C07 to check that 2-RV-354 is **NOT** lifting (setpoint is approximately 200 PSIG).

(1) **IF** 2-CVC-354-RV lifts,
THEN shut the following valves:

- SDC TO CVCS B/U, 2-SI-464 ____
- L/D STOP, 2-CVC-515 ____
- LD CNTMT ISOL, 2-CVC-516 ____

(2) **ATTEMPT** to reset the relief valve by mechanical agitation. ____

(3) **RESTORE** flow by performing the following:

(a) **OPEN** the following valves:

- L/D STOP, 2-CVC-515 ____
- LD CNTMT ISOL, 2-CVC-516 ____

(b) **THROTTLE OPEN** SDC TO CVCS B/U, 2-SI-464 to maintain the following:

- Purification flow rate less than 120 GPM. ____
- DO **NOT** exceed 175 PSIG as indicated on 2-PIC-201. ____

p. **WHEN** the Pressurizer is at the desired level,
THEN PERFORM the following simultaneously:

- **OPEN** CVCS TO SDC, 2-SI-475. ____
- **LOCK SHUT** 2-CVC-325. ____
- **THROTTLE** SDC TO CVCS B/U, 2-SI-464 to maintain the following:
  - Purification flow rate:
    - **IF** using the Ultrasonic Flow Instrument(s), less than 180 GPM through any Ion Exchanger. ____
    - **IF** using 2-FI-500, less than 120 GPM ____
  - DO **NOT** exceed 175 PSIG as indicated on 2-PIC-201 ____

q. **SHUT** the following valves:

- BP REG OUT, 2-CVC-109 ____
- BP REG OUT, 2-CVC-111 ____

6.1.AE.6 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
If 2-CVC-500-CV is **NOT** gagged in the WPS position **AND** there was a loss of Instrument Air, 2-CVC-500-CV would shift to the VCT position, losing RCS inventory until the purification alignment was isolated.

r. **IF** the Unit is going into a reduced RCS inventory condition, **THEN VERIFY** the VCT Inlet Valve, 2-CVC-500-CV is gagged in the WPS position. **[B0073]** ____

CAUTION
Potential high dose rates may occur in the Containment if the SITs are filled from SDC shortly after SDC initiation **OR** after Hydrogen Peroxide injection.

AF. **IF** desired ,
THEN fill SITS **PER** OI-3A Section 6.5.4, maintaining Pressurizer level greater than 100 inches. ____

1. **NOTIFY** Radiation Safety that dose rates may rise in containment. ____

AG. **IF** needed, **CONTACT** the Operations FSTC **OR** otherwise **DETERMINE** if
STP O-66A should be used to shut the Letdown Isolation valves. ____

AH. **IF** opened, **SHUT** the following Letdown valves:

- L/D STOP.....2-CVC-515-CV ____
- L/D CNTMT ISOL.....2-CVC-516-CV ____

AI. **IF** desired,
THEN PLACE SDC purification in service **PER** OI-2D, PURIFICATION SYSTEM OPERATION. (N/A if SDC Purification is in service)

1. **IF** SDC Purification is **NOT** in service,
THEN perform the following:

- **OPEN** CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325. ____
- **PLACE** CVC-500-CV to the VCT position. ____

AJ. **ENSURE SHUT** the nitrogen **AND** hydrogen supply valves to the VCT:

- HYDROGEN SUPPLY TO VCT.....2-CVC-189 ____
- NITROGEN SUPP TO UNIT 2 VCT....O-N2-256 ____

AK. **MAINTAIN** RCS temperature between 100 and 150° F. ____

AL. **LOG** termination of Pressurizer cooldown in Transient Tracking Log. ____

6.1 COLLAPSE THE PRESSURIZER BUBBLE (Continued) **INITIALS**

AM. **ATTACH** completed copies of APPENDIX 1, PRESSURIZER COOLDOWN LOG to the Transient Tracking Log. ____

AN. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

CAUTION
WHEN S/G primary **OR** secondary TEMPERATURE is less than 85° F, **THEN** primary and secondary pressures shall be maintained less than 195 PSIA. (This is 5° F and 20 PSI more restrictive than the requirements of TRM 15.7.1, which requires S/G temperature be greater than 80° F when S/G pressure is greater than 215 PSIA)

AO. **IF** RCS temperature is lowered less than 100° F **OR** S/G temperature is lowered less than 85° F, **THEN PERFORM** the following once every hour: (TRM TVR 15.7.1.1) ____

1. **ENSURE** RCS **AND** S/G pressure less than 195 PSIA.

2. **LOG** pressure of the S/Gs and RCS.

AP. **IF** Pressurizer level is less than 170 inches **AND IF** desired, **THEN REMOVE** the RCS water solid tagout. ____

AQ. **IF** final Pressurizer level is between 110 and 100 inches, **THEN VERIFY OPEN** the Reactor Vessel Vent valves:

- RX VSL VENT ISOL, 2-RC-279 ____
- RX VSL VENT STOP, 2-RC-280 ____

AR. **INFORM** the FSTC-OPS to schedule STP 0-93 at a 31 day interval during Modes 5 and 6. ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION

INITIALS

NOTE

- This section directs RCS draining operations where RCS level will be less than 100 inches in the Pressurizer and above the 41 foot elevation. This section is performed even if the RCS will be drained to reduced inventory in section 6.3. RCS level changes where Pressurizer level is maintained greater than 100 inches are performed **PER** OI-3B, SHUTDOWN COOLING.
- This section may be performed more than once during an outage. A working copy of this section shall be made before each use.
- Steps in Section 6.3, ENTERING REDUCED INVENTORY CONDITION up to step AA. may be completed.

A. **IF** draining to reduced inventory conditions, **THEN** steps in Section 6.3, ENTERING REDUCED INVENTORY CONDITION may be performed concurrently with CRS permission. ____

B. **ENSURE** TWO SDC loops are operable with at least ONE in operation **PRIOR** to making the S/Gs unavailable for heat removal, **AND RECORD** in the CRO Log.(Tech Spec 3.4.8) ____

C. **PERFORM** ONE of the following:

NOTE

The Reactor shall be subcritical for 24 hours before the Pressurizer Manway is removed. **[B2172]**

- **REQUEST** Mechanical Maintenance to remove the Pressurizer manway **PER** RCS-10, PRESSURIZER MANWAY COVER REMOVAL AND INSTALLATION ____

OR

- For short outages, with the permission of the GS-SO, **CONTINUE** with the procedure with the PZR manway installed.**[B0145]** ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

D. **IF** the Pressurizer manway has been removed,
THEN PERFORM the following:
(N/A if Pressurizer manway has not been removed)

1. **ENSURE** the minimum essential equipment (MEE) listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, for having the Pressurizer manway removed, is available **OR** an approved NO-1-103 Contingency Plan is in effect. ____

2. **CONTINUE** logging the MEE in the Shift Turnover sheet. ____

3. **CONTINUE** checking MEE availability once per 12 hours. ____

4. **PERFORM** STP-O-93-2 with the PZR manway removed. ____

5. **IF** required,
THEN CLEAR the LTOP tagout. ____

E. **IF** the Pressurizer manway is installed,
THEN PERFORM the following:
(N/A if Pressurizer manway has been removed)

1. **ENSURE** the minimum essential equipment (MEE) listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, is available **OR** an approved NO-1-103 Contingency Plan is in effect. ____

2. **CONTINUE** logging the MEE in the Shift Turnover sheet. ____

3. **CONTINUE** checking MEE availability once per 12 hours. ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

F. **IF** RCS level will be below the bottom of the Pressurizer (48.5 foot elevation),
THEN PERFORM the following:

1. **REQUEST** IM to install **AND** calibrate if necessary the Refueling Level Cart in the Control Room **PER** an approved MO. ____

2. **PLACE** the RCS Wide Range Level Monitoring System in service as follows:

   a. **ENSURE OPEN** the following Reactor Vessel Vent valves:

      - RX VSL VENT ISOL.....2-RC-279 ____
      - RX VSL VENT STOP.....2-RC-280 ____

   b. **SHUT** HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. ____

   c. **OPEN** the following valves to unisolate 2LE4139 **AND** 2-LG-4139:

      - ROOT ISOL FOR LE-4139 & LG-4139.....2-RC-1242 ____
      - B/U ISOL FOR LE-4139 & LG-4139.....2-RC-1243 ____

   d. **DRAIN** water from the upper sensing line by opening 2-PDT-124 Drain isolation valves:

      - 2-RC-PDT-124 DRN ISOL.....2-RC-1150 ____
      - 2-RC-PDT-124 B/U DRN ISOL...2-RC-1151 ____

   e. **WHEN** the water has drained from the sensing line,
      THEN PERFORM the following:

      - **SHUT** 2-RC-1150 ____
      - **SHUT** 2-RC-1151 ____

3. **IF** desired,
   THEN CONTACT IM to install the local RCS level indication tygon tubing at LOCAL REFUEL LVL ISOL, 2-RC-1238 **PER** the following steps:

   a. **INSTALL** Tygon tubing at LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

   b. **PERFORM** an Independent Verification that the tygon tubing has been installed correctly. ____

   c. **INITIATE** MN-1-110, Attachment PC tracking. ____

   d. WALK DOWN the tygon tubing **AND ENSURE** it is free of kinks, loop seals, trapped air and obstructions. ____

6.2.F RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

4. **OPEN** the following Refueling Level Indicator isolation valves:

   - REFUEL LVL IND ISOL.....2-RC-105 ____
   - REFUEL LVL IND STOP.....2-RC-106 ____

5. **SLOWLY OPEN** 2-LT-4140 isolation valves:

   - 2-RC-4140-LT ISOL.....2-RC-1235 ____
   - 2-RC-4140-LT STOP.....2-RC-1236 ____

6. **IF** tygon tubing is installed **AND** being used for local RCS level indication,
   THEN OPEN LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

7. **WHEN** IM has installed the MLMS pressure transducers,
   AND the Pressurizer manway has been removed,
   THEN OPEN the following isolation valves to place the pressure transducers in service:

   - PRESSURIZER HEADER NORTH EAST VENT VALVE, 2-RC-1168 ____
   - PRESSURIZER INSTRUMENT HEADER SOUTH WEST VENT VALVE, 2-RC-1185 ____
   - 2-PDT-111A HP HDR DRN, 2-RC-1276 ____
   - 2-PDT-111A HP B/U HDR DRN, 2-RC-1277 ____
   - 2-PDT-121A HP HDR DRN, 2-RC-1284 ____
   - 2-PDT-121A HP B/U HDR DRN, 2-RC-1285 ____

8. **ENSURE** MLMS Density Compensation on the Refueling Level Cart is updated using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - **SET** RCS temperature on 0CRT4136 ____
   - **SET** RCS temperature on 0CRT4137 ____

9. **VERIFY** at least two CETs, powered from a ZA and a ZB power source, are available with indication in the Control Room **AND** an audible alarm to annunciate on 2C06, "SELECTED COMPUTER POINT" (Group Display 165 or 265). ____

NOTE

2CS4138 **AND** 2CS4139 are located on the East wall of the Cable Spreading Room to the right of the door.

10. **ENERGIZE** the RCS Level Monitoring Systems by placing 2CS4138 **AND** 2CS4139, in ON. ____

6.2.F RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

11. **COMPARE** RCS level indicators 4136, 4137, 2-LG-4139, 2LE4139, 2LT4140, and the tygon tubing, if used. ____

    - **IF** indications are **NOT** within 0.5 feet of each other, **THEN PERFORM** the following:

      a. **INITIATE** a CR to investigate the discrepancies. ____

      b. **CONTACT** the Shift Manager to evaluate available indications prior to performing any additional draining. ____

12. **IF** tygon tubing is being used for local RCS level indication, **THEN SHUT** LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

NOTE

Alternate boundaries may be tagged **IF** ANY of the substeps listed below for limiting Dilution Sources per TS 3.1.1 can **NOT** be met as written (e.g., a listed boundary valve is being overhauled, etc..).

G. **IF** the RC Makeup pumps are **NOT** needed for makeup to the RWT, **THEN ENSURE** RCS dilution sources less than 88 GPM. (Tech Spec 3.1.1) **[B0271]** ____

1. **ENSURE** a boration flow path **PER** TRM 15.1.3 is available. ____

2. **LOCK SHUT AND TAG** the following valves:

   - 21 PURIF IX FLUSH & DRN.....2-CVC-131 ____
   - 22 PURIF IX FLUSH & DRN.....2-CVC-141 ____
   - 23 PURIF IX FLUSH/DRAIN.....2-CVC-151 ____

3. **TAG SHUT** the outlet valve of any purification IX loaded with unborated resin, as applicable:

   - 21 PURIF IX OUTLET.....2-CVC-128 ____
   - 22 PURIF IX OUTLET.....2-CVC-138 ____
   - 23 PURIF IX OUTLET.....2-CVC-148 ____

6.2.G RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

4. **IF** two charging pumps can be disabled,
THEN:

   - **TAG** the discharge valves for the two Charging pumps being disabled in the SHUT position:

     - 21 CHG PP DISCH.....2-CVC-166 ____
     - 22 CHG PP DISCH.....2-CVC-172 ____
     - 23 CHG PP DISCH.....2-CVC-178 ____

   - **TAG** the breakers for two Charging pumps being disabled in the DISCONNECT position:

     - 21 Charging pump.....52-2115 ____
     - 22 Charging pump.....52-2415 ____
     - 23 Charging pump...52-2104 **AND** 52-2404 ____

5. **IF** two charging pumps are required for operation,
THEN:

   a. **SAMPLE** the VCT for boron concentration. ____

   b. **VERIFY** VCT boron concentration is greater than or equal to shutdown boron concentration. ____

6. **TAG** the breakers for **BOTH** RC Makeup pumps in the OFF position:

   - 21 RC MAKEUP.....52-20505 ____
   - 22 RC MAKEUP.....52-21505 ____

7. **TAG SHUT** the discharge and suction valves for **BOTH** RC Makeup pumps:

   - 21 RCMU PP DISCHARGE VALVE, 2-CVC-245 ____
   - 21 RCMU PP SUCTION VALVE, 2-CVC-243 ____
   - 22 RCMU PP DISCHARGE VALVE, 2-CVC-248 ____
   - 22 RCMU PP SUCTION VALVE, 2-CVC-246 ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

NOTE
Alternate boundaries may be tagged **IF** ANY of the substeps listed below for limiting Dilution Sources per TS 3.1.1 can **NOT** be met as written (e.g., a listed boundary valve is being overhauled, etc..).

H. **IF** the RC Makeup pumps **ARE** needed for makeup to the RWT, **THEN ENSURE** RCS dilution sources less than 88 GPM. (Ref. Tech Spec 3.1.1) **[B0271]** ____

1. **ENSURE** a boration flow path **PER** TRM 15.1.3 is available. ____

2. **LOCK SHUT AND TAG** the following valves:

   - 21 PURIF IX FLUSH & DRN.....2-CVC-131 ____
   - 22 PURIF IX FLUSH & DRN.....2-CVC-141 ____
   - 23 PURIF IX FLUSH/DRAIN.....2-CVC-151 ____

3. **TAG SHUT** the outlet valve of any purification IX loaded with unborated resin, as applicable:

   - 21 PURIF IX OUTLET.....2-CVC-128 ____
   - 22 PURIF IX OUTLET.....2-CVC-138 ____
   - 23 PURIF IX OUTLET.....2-CVC-148 ____

4. **TAG SHUT** one of the following set of valves to isolate the Charging header:
   (N/A valves not selected)

   - 21 CHG PP DISCH, 2-CVC-166 ____
   - 22 CHG PP DISCH, 2-CVC-172 ____
   - 23 CHG PP DISCH, 2-CVC-178 ____

   OR

   - CHG DISCH TO SI, 2-CVC-269 ____
   - SI TO CHG HDR, 2-CVC-269-MOV ____
   - REGEN HX CHG INLET, 2-CVC-183 ____

5. **TAG** the breakers for the Charging pumps in the DISCONNECT position:

   - 21 Charging pump.....52-2115 ____
   - 22 Charging pump.....52-2415 ____
   - 23 Charging pump...52-2104 **AND** 52-2404 ____

I. **ESTABLISH** a nitrogen blanket on the VCT **PER** OI-2A, CHEMICAL AND VOLUME CONTROL SYSTEM. ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

J. **IF** preparing to enter a reduced RCS inventory condition, **THEN ENSURE** STP O-55A-2, CONTAINMENT CLOSURE VERIFICATION, has been completed **PER** the requirements of NO-1-114, CONTAINMENT CLOSURE. ____

NOTE
Requirement of NO-1-114, CONTAINMENT CLOSURE.

K. **IF** the RCS will be drained 0.5 feet or more **AND** the Steam Generators are **NOT** available for decay heat removal, **THEN CALCULATE** Time To Boil **PER** APPENDIX 15, CALCULATION OF TIME TO BOIL. ____

NOTE
BOTH channels of Reactor Vessel level indication should remain in service until the RCS level is adjusted to just below the reactor vessel flange (below 43.97 ft) in preparation for entering Mode 6. This provides backup RCS level indication.

L. **IF** the RCS is to be drained below the bottom of the Pressurizer (48.5 foot elevation), **THEN PERFORM** a comparison check between the RCS level indicators and Reactor Vessel level indication **PER** APPENDIX 5, REACTOR VESSEL LEVEL CORRELATION, while draining down. (N/A if Reactor Vessel level indication is disconnected) **[B0076]** ____

M. **IF** RCS level restrictions will be in place, **AND** the Safety Injection Tanks are capable of adding additional inventory to the RCS, **THEN ENSURE** the SIT Outlet MOVs are tagged shut:

- 2-SI-614-MOV ____
- 2-SI-624-MOV ____
- 2-SI-634-MOV ____
- 2-SI-644-MOV ____

N. **IF** the RCS is to be drained below the 41 foot elevation, **THEN** Steps 6.3.A through 6.3.AA may be performed in parallel with the remainder of this section. ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

O. **DETERMINE** the RCS drain path(s) to be used: ____

- ☐ CVCS to WPS: **PERFORM** APPENDIX 6, DRAINING THE RCS VIA CVCS TO WPS in parallel with the remainder of this section
- ☐ CVCS to the VCT: **PERFORM** APPENDIX 7, DRAINING THE RCS VIA CVCS TO THE VCT in parallel with the remainder of this section
- ☐ LPSI miniflow to RWT: **PERFORM** APPENDIX 8, DRAINING THE RCS VIA LPSI MINIFLOW TO RWT in parallel with the remainder of this section
- ☐ RCS Hot Leg drain valves to RCDT: **PERFORM** APPENDIX 9, DRAINING THE RCS VIA RCS DRAIN VALVES in parallel with the remainder of this section
- ☐ **IF** the Reactor Vessel is defueled, **THEN** OI-3B, SHUTDOWN COOLING may be used.

P. Within one hour **AFTER** lowering Pressurizer level less than 90 inches, **AND** every 12 hours thereafter while in Mode 5, **PERFORM** the following:

1. **ENSURE** requirements of TS SRs 3.1.1.2 and 3.1.1.3 are met **AND RECORDED** in the CRO Log for the following:

   - RCS level above the bottom of the hot leg nozzles ____
   - Sources of non-borated water are less than or equal to 88 GPM ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

NOTE

When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**

Q. **IF** at any time during the drain, the Reactor Vessel level indication indicates a void,
THEN VENT the Reactor Vessel Head **AND ALLOW** the space to fill with water as follows:
(N/A if Reactor Vessel level indication does not indicate a void)

1. **OPEN** RX VSL TO QT VENT, 2-RC-103-SV. ____

2. **OPEN** RX VSL VENT B/U, 2-RC-104-SV. ____

3. **WHEN** Quench Tank level rises,
THEN SHUT 2-RC-103-SV **AND** 2-RC-104-SV. ____

R. **IF** draining to reduced inventory is planned,
THEN STOP the drain at 41 foot elevation **AND GO TO** Section 6.3, ENTERING REDUCED INVENTORY CONDITION . ____

6.2 RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

S. **WHEN** the RCS drain down is complete,
THEN PERFORM the following: (N/A if draining to reduced inventory)

> **NOTE**
> LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

1. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - 0CRT4136
     - 2FT306 High Flow Alarm Limit.....150 GPM **ABOVE** SDC flow ____
     - 2FT306 Low Flow Alarm Limit.....150 GPM **BELOW** SDC flow ____
   - 0CRT4137
     - 2FT306 High Flow Alarm Limit.....150 GPM **ABOVE** SDC flow ____
     - 2FT306 Low Flow Alarm Limit.....150 GPM **BELOW** SDC flow ____

6.2.S RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION (Continued) **INITIALS**

NOTE
RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

2. **ADJUST** the setpoints for RCS level alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - 0CRT4136
     - 4136 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 4136 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
     - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
     - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
   - 0CRT4137
     - 4137 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 4137 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
     - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
     - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
     - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____

****** END ******

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] INITIALS

NOTE

- This section may be performed more than once during a refueling outage. A working copy of this section shall be made before each use.
- The RCS shall be considered in Reduced Inventory when fuel is in the vessel **AND** RCS level is three feet or more below the reactor vessel flange (41 foot elevation)

A. **IF** the Reactor Vessel is defueled,
THEN PERFORM the following:

1. **ENSURE** the Pressurizer Manway is removed **OR** an acceptable RCS vent path is established. ____

NOTE
Use the lowest reading RCS level indicator as actual RCS level during draining.

2. **CHECK** at least 2 RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet. ____

- MLMS on the Refueling Level Cart, 4136 ____
- MLMS on the Refueling Level Cart, 4137 ____
- RCS level indicator on the Refueling Level Cart, 2LE4139 ____
- Refueling level indicator on the Refueling Level Cart, 2LT4140 ____
- Local refueling level indicator, 2-LG-4139 or tygon tube ____
  - **IF** a tygon tube is used as the local refueling level indicator, **THEN WALK DOWN** the entire tube to ensure the tubing is free of kinks, no loop seals, trapped air **OR** debris in the tube. ____

a. **IF** the indications do **NOT** agree,
THEN INITIATE a CR to resolve the discrepancy before continuing. ____

b. **DETERMINE** the target RCS level. ____

c. **PROCEED** to Step AB. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

> **NOTE**
> Steps B through X may be performed concurrently or in any order.

B. **ENSURE** RCS boron concentration satisfies the requirements of NEOP 301, for the present Mode. ____

> **NOTE**
> The time associated with the last performance of PEO 0-24-10-O-2A may be used to determine time to align the 0C DG.

C. **IF** the S/G nozzle dams will be installed,
THEN VERIFY the time to core uncovery (after loss of SDC with nozzle dams installed) is greater than the time to align the 0C DG to the required Bus following a loss of power. **[B0370]** ____

- **CALCULATE** time to core uncovery **PER** APPENDIX 16, CALCULATION OF TIME TO CORE UNCOVERY. ____
- **IF** no compensatory measure is in place to reduce 0C DG alignment time to less than 1 hour,
THEN 1 hour should be assumed.

D. **ENSURE** the the following NO-1-103, CONDUCT OF LOWER MODE OPERATIONS, requirements are in place:

- **VERIFY** the availability of equipment for the required MEE list of NO-1-200, CONTROL OF SHIFT ACTIVITIES.
  - **IF** the manway is removed,
  THEN VERIFY the equipment **PER** attachment for a unit in Reduced Inventory **OR** an approved NO-1-117 High Risk Activity Plan is in effect. ____

  OR

  - **IF** the manway is **NOT** removed,
  THEN VERIFY the equipment **PER** attachment for a unit in Mode 5 or 6 with NO S/G available and manway installed **OR** an approved NO-1-103 Contingency Plan is in effect. ____
- **CONTINUE** logging the MEE in the Shift Turnover sheet ____
- **CONTINUE** checking MEE availability once per 12 hours ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

CAUTION
The Pressurizer Manway shall be removed when S/G nozzle dams are installed. **[B0072]**

E. **ENSURE** the Pressurizer Manway is removed **OR** an acceptable RCS vent path is established per PWR Reload Analysis as documented in appropriate engineering documents. **[B0072]** ____

F. **ENSURE** RCS level indications in the Control Room and Containment have been properly installed, vented, calibrated **AND** physically walked down. **[B0072]** ____

G. **OBTAIN** Work Group Supervisor signatures in APPENDIX 10, REDUCED INVENTORY RESPONSIBILITY LIST. ____

NOTE
This requirement will carry over to each crew while in Reduced Inventory.

H. **ENSURE** AOP-3B, ABNORMAL SHUTDOWN COOLING CONDITIONS, Attachment titled, Returning Shutdown Cooling to Service has been briefed. ____

1. **DESIGNATE** an operator available to vent LPSI PPs as required, while in Reduced Inventory. ____

I. **ENSURE** the following RCS makeup paths are available:

1. **HPSI** with:

- suction aligned to the RWT **AND** discharge to the RCS ____
- breaker racked in **AND** handswitch in PULL TO LOCK ____
- manual suction, discharge, **AND** mini-flow valves open ____
- MAIN **OR** AUX HPSI HDR isolation valves to at least two RCS loops are operable from the Control Room ____
- MAIN **AND** AUX HPSI HDR isolation valves shut ____

2. **CONTAINMENT SPRAY** with:

- suction aligned to the RWT **AND** discharge to RCS ____
- breaker racked in **AND** handswitch in PULL TO LOCK ____
- manual suction **AND** mini-flow valves open ____
- manual discharge valve shut ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

J. **VERIFY** the RWT boron concentration is greater than or equal to the requirements of TRM 15.1.3. **[B0270]** ____

K. **ENSURE OPEN** the following vent valves:

- RX VSL VENT ISOL.....2-RC-279 ____
- RX VSL VENT STOP.....2-RC-280 ____

NOTE
At least one channel of Reactor Vessel level indication should remain in operation until the RCS level is adjusted to just below the reactor vessel flange in preparation for entering Mode 6.

L. **IF** this outage will **NOT** require disconnecting of the electrical platform, **THEN ENSURE** at least one channel of Reactor Vessel level indication is available. ____

CAUTION
IF CETs are not available (i.e., head not installed), **THEN** reliable RCS temperature indication will not be available during a loss of SDC unless temporary temperature instrumentation is provided.

M. **IF** the Reactor Vessel Head is in place on top of the Rx Vessel, **THEN REQUEST** IM to install jumpers to provide CET temperature to PAMS from CET groups ZA and ZB. ____

N. **IF** the Reactor Vessel Head will **NOT** be removed, **THEN ENSURE** the desired ZA **AND** ZB CET for use on PAMS. ____

O. **ENSURE** adequate RWT level. **[B0145]**

- **IF** the Reactor Vessel Head is installed, **OR** the Reactor has been shutdown for less than 25 days, **THEN ENSURE** RWT level is greater than 35 feet. ____
- **IF** the Reactor Vessel Head is removed, **AND** the Reactor has been shutdown for 25 days or more, **THEN ENSURE** RWT level is greater than 20 feet. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

P. **ENSURE** STP O-55A-2, CONTAINMENT CLOSURE VERIFICATION, has been performed **PER** the requirements of NO-1-114, CONTAINMENT CLOSURE. ____

> **NOTE**
> While the S/Gs are **NOT** available for heat removal, RCS boiling times must be considered for Containment closure deviations.

1. **IF** Containment closure deviations exist, **THEN REQUEST** the CRS to perform the following: **[B0072]** ____

   - **CALCULATE** RCS time to boiling **PER** APPENDIX 15, CALCULATION OF TIME TO BOIL ____
   - **ENSURE ALL** Containment closure deviations are approved by the GS-SO **AND** restoration plans are in place **PER** NO-1-114, CONTAINMENT CLOSURE, to isolate the penetration **OR** restore the deviation within the RCS time to boil, should a sustained loss of SDC occur ____
   - **CONTINUE** calculating RCS time to boil on a shiftly basis **AND RECORDING** the time to boil on the Shift Turnover Sheet ____

Q. **IF** CET temperature indication is available, **THEN PERFORM** the following:

1. **CHECK** that the CET temperature indication agrees with Shutdown Cooling temperature from RCS, 2-TR-351, within 10° F. ____
2. **ENSURE** 4 CETs (two from group ZA and two from group ZB) are available **PER** NO-1-103. ____
3. **ESTABLISH** a high temperature alarm on the plant computer no more than 20° F above CET temperature, for at least two independent CETs (one from group ZA and one from group ZB) ____
4. **IF EITHER** the CET temperature recorders **OR** the computer temperature alarm is non-functional, **THEN COMMENCE** logging CET temperature twice per hour in the CRO Log. ____

> **NOTE**
> While in reduced inventory, RCS temperature shall be maintained between 100° F and 110° F.

R. **LOWER** RCS temperature to between 100° F and 110° F. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

S. **ENSURE** MLMS Density Compensation on the Refueling Level Cart is updated using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

- **SET** RCS temperature on 0CRT4136 ____
- **SET** RCS temperature on 0CRT4137 ____

T. **IF** CET temperature indication is available on PAMS, **THEN ADJUST** the temperature alarm setpoint **PER** OI-1I, Post Accident Monitoring System Instrumentation, 10° F above the CET input temperature. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE

- Use the lowest reading RCS level indicator as actual RCS level during draining.
- 2LT4140 accuracy is **NOT** adequate to be used as an RCS level indicator in Reduced Inventory. It may be used for trending only.
- Operating experience has shown that due to Shutdown Cooling suction flow on that hot leg, 4136 indication will bounce when RCS level is at the top of the hot leg.
- When RCS level is above the top of the hot leg, 2LE4138 may become erratic or non existent. If being used as the second required level indication, though out of range, 2LE4138 must be available at all times in the event of a transient.
- Generic Letter 88-17 requires at least two independent and continuous RCS water level indications whenever the RCS is in a reduced inventory condition.
  If the indication is not located in the Control Room it must have provision for providing immediate water level values to an operator in the Control Room if significant changes occur (ie. radio or phone). Observations should be recorded at an interval no greater than 15 minutes. These observations may be suspended if evacuation of the observer from the remote readout area is required.
- Per Generic Letter 88-17 ordinary plastic tubing (tygon tube) does **NOT** meet the concept of reliable instumentation for use in Reduced Inventory.
- 2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 4136, 4137 and 2LE4138. 4136, 4137 and 2LE4138 are independent from each other.
- 2-LG-4139 is **NOT** a preferred instrument due to **NOT** being automatically and continuously monitored and alarmed.
- Operating experience has shown that 2LE4139 may lag behind the other level indications when draining.

U. **VERIFY** RCS level indications for Reduced Inventory. **[B0597]**

1. **CHECK** at least 2 independent RCS level indications are available: ____
   - MLMS on the Refueling Level Cart, 4136 ____
   - MLMS on the Refueling Level Cart, 4137 ____
   - RCS level indicator on the Refueling Level Cart, 2LE4139 ____
   - Local refueling level indicator, 2-LG-4139 ____
   - **IF** 2LE4138 will be used,
     THEN VERIFY 2LE4138 is in service and has been calibrated within 5 hours of entering Reduced Inventory. ____

6.3.U ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

2. **CHECK** ALL RCS level indications that will be used, agree within 0.5 feet: ____

   - MLMS on the Refueling Level Cart, 4136
   - MLMS on the Refueling Level Cart, 4137
   - RCS level indicator on the Refueling Level Cart, 2LE4139
   - Local refueling level indicator, 2-LG-4139

   a. **IF** the indications do **NOT** agree,
   THEN INITIATE a CR to resolve the discrepancy before continuing. ____

> **CAUTION**
> Except for emergencies, permission is required from the M-NO or the GS-SO to drain the RCS below the 37.5 foot elevation. Minimize LPSI Pumps shifts while the RCS is below the 37.5 foot elevation. Minimum level to drain the RCS is 36.83 foot elevation.

V. **DETERMINE** the target RCS level. ____

   - **IF** Reactor Vessel level indication is available **AND** outage activity allows,
   THEN the target RCS level should be set to clear the 50 inch Reactor Vessel level sensor. ____

> **NOTE**
> Requirement of NO-1-114, CONTAINMENT CLOSURE.

W. **IF** the RCS will be drained 0.5 feet or more,
THEN CALCULATE Time To Boil **PER** APPENDIX 15, CALCULATION OF TIME TO BOIL. ____

X. **ENSURE** the following are assigned: **[B0072] [B0381]**

   - Designated Lead Point of Contact **PER** NO-1-117 ____
   - Dedicated SRO **PER** NO-1-200 ____

Y. **REQUEST** the Shift Manager review **ALL** containment closure deviations **AND** NO-1-117 HRA and contingency plans within 3 hours prior to draining the RCS. ____

Z. **SUSPEND ALL** evolutions that may cause an RCS **OR** SDC perturbation. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

AA. **OBTAIN** final authorization signatures in APPENDIX 10, REDUCED INVENTORY RESPONSIBILITY LIST. ____

NOTE
Cameras may be used to monitor the local level indication in the Control Room.

AB. **IF** local monitoring of the local refueling level indicator, 2-LG-4139 will be used,
THEN PERFORM the following:

1. **STATION** a Containment Refueling Level Watch with communication available with the Control Room, with the following duties:
(N/A if camera is used) ____

   - Continuously **MONITOR** the local Refueling Level indicator **AND REPORT** the level to the Control Room every 15 minutes

   - Immediately **NOTIFY** the Control Room of sudden **OR** unexpected changes in RCS level

2. **RECORD** level indications that are being monitored locally on ATTACHMENT 5, RCS LEVEL LOG. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE

SDC Flow Control Valve, 2-SI-306-CV, fails open on a loss of Instrument Air. Therefore, SDC flow is controlled by throttling the LPSI Header valves to prevent RCS vortexing at the SDC suction in the event of a loss of Instrument Air.

CAUTION

To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

AC. **IF** the RCS is to be drained to between 41 foot elevation and 37.6 foot elevation,
THEN ESTABLISH LPSI flow control by performing ONE of the following:
(N/A if not applicable, or preparing for vacuum fill)

- **IF** 2LE4138 will **NOT** be used as one of the required RCS level indications,
  THEN:

  1. **VERIFY** no more than one LPSI pump operating.

  2. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate between 3200-3400 GPM.

  3. **THROTTLE** the four (4) LPSI HDR valves in PULL TO OVERRIDE to obtain between 800 and 850 GPM in each LPSI Loop.

  4. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate of approximately 3000 GPM.

6.3.AC ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE
LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

5. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - 0CRT4136
     - 2FT306 High Flow Alarm Limit.....3100 GPM ____
     - 2FT306 Low Flow Alarm Limit.....2900 GPM ____
   - 0CRT4137
     - 2FT306 High Flow Alarm Limit.....3100 GPM ____
     - 2FT306 Low Flow Alarm Limit.....2900 GPM ____

OR

NOTE
SDC flow rates greater than 2000 GPM may cause the indication provided by 2LE4138 to become erratic or non existent due to increased amount of water turbulence in the hot leg.

- **IF** 2LE4138 will be used as one of the required RCS level indications,
  THEN:

  1. **VERIFY** no more than one LPSI pump operating.

NOTE
2-FIC-306 is placed in manual when throttling LPSI HDR isolation valves, to prevent 2-SI-306-CV from opening trying to maintain flow, thus robbing flow from 2-SI-657-CV.

2. **PLACE** SDC Flow Controller, 2-FIC-306, in MANUAL. ____

CAUTION
The boration flow path shall be aligned to a loop with SDC flow.

3. **ENSURE** a LPSI HDR isolation is open in the same loop as the boration flow path **AND SHUT** two (2) LPSI HDR isolation valves **AND ENSURE** they are in PULL TO OVERRIDE. ____

6.3.AC ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

CAUTION
A reduction in RCS boron concentration from a source whose boron concentration is LESS THAN the present SDM requirements of the COLR, is **NOT** permitted when RCS flow is less than 3000 GPM.

4. **THROTTLE** the remaining two (2) LPSI HDR valves in PULL TO OVERRIDE to obtain between 950-1000 GPM in each LPSI Loop. ____

NOTE
Maximum flow to maintain stability on 2LE4138 is 2000 GPM. During draining the additional drain flow past 2LE4138 is additive to the flow value observed on 2-FIC-306.

5. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate between 1750-1800 GPM. ____

   a. **IF** 2-FIC-306 is shut **AND** SDC flowrate is greater than 1800 GPM,
   THEN ADJUST the SDC TEMP CONTR, 2-HIC-3657 to lower flow to less than 1800 GPM. ____

6. **IF** desired to place 2-FIC-306 in AUTO,
   THEN PERFORM the following:

   a. **ADJUST** the setpoint on 2-FIC-306 to match SDC flow. ____

   b. **PLACE** 2-FIC-306 in AUTO. ____

NOTE
LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

7. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - 0CRT4136
     - 2FT306 High Flow Alarm Limit.....1900 GPM ____
     - 2FT306 Low Flow Alarm Limit.....1700 GPM ____
   - 0CRT4137
     - 2FT306 High Flow Alarm Limit.....1900 GPM ____
     - 2FT306 Low Flow Alarm Limit.....1700 GPM ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

AD. **IF** preparing for Vacuum Fill,
THEN ESTABLISH LPSI Flow control **PER** 6.16.A.16. (N/A if **NOT** aligning for Vacuum Fill) ____

NOTE
SDC Flow Control Valve, 2-SI-306-CV, fails open on a loss of Instrument Air. Therefore, SDC flow is controlled by throttling two (2) LPSI Header valves to prevent RCS vortexing at the SDC suction in the event of a loss of Instrument Air. **[B0026]**

CAUTION
To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

AE. **IF** the RCS is to be drained to **OR** below 37.6 foot elevation,
THEN ESTABLISH LPSI flow control using two (2) LPSI Header valves as follows: **[B0072]**

1. **VERIFY** no more than one LPSI pump operating. ____

NOTE
2-FIC-306 is placed in manual when throttling LPSI HDR isolation valves, to prevent 2-SI-306-CV from opening trying to maintain flow, thus robbing flow from 2-SI-657-CV.

2. **PLACE** SDC Flow Controller, 2-FIC-306, in MANUAL. ____

CAUTION
The boration flow path shall be aligned to a loop with SDC flow.

3. **ENSURE** a LPSI HDR isolation is open in the same loop as the boration flow path **AND SHUT** two (2) LPSI HDR isolation valves **AND ENSURE** they are in PULL TO OVERRIDE. ____

CAUTION
A reduction in RCS boron concentration from a source whose boron concentration is LESS THAN the present SDM requirements of the COLR, is **NOT** permitted when RCS flow is less than 3000 GPM.

4. **THROTTLE** the remaining two (2) LPSI HDR valves in PULL TO OVERRIDE to obtain between 950-1000 GPM in each LPSI Loop. ____

6.3.AE ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE
Maximum flow to maintain stability on 2LE4138 is 2000 GPM. During draining the additional drain flow past 2LE4138 is additive to the flow value observed on 2-FIC-306.

5. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate between 1750-1800 GPM. ____

   a. **IF** 2-FIC-306 is shut **AND** SDC flowrate is greater than 1800 GPM,
   THEN ADJUST the SDC TEMP CONTR, 2-HIC-3657 to lower flow to less than 1800 GPM. ____

6. **IF** desired to place 2-FIC-306 in AUTO,
   THEN PERFORM the following:

   a. **ADJUST** the setpoint on 2-FIC-306 to match SDC flow. ____

   b. **PLACE** 2-FIC-306 in AUTO. ____

NOTE
LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

7. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

   - 0CRT4136
     - 2FT306 High Flow Alarm Limit.....1900 GPM ____
     - 2FT306 Low Flow Alarm Limit.....1700 GPM ____
   - 0CRT4137
     - 2FT306 High Flow Alarm Limit.....1900 GPM ____
     - 2FT306 Low Flow Alarm Limit.....1700 GPM ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) INITIALS

NOTE

- The remaining steps in this section should be performed in order.
- Section 6.2, RCS DRAINING BETWEEN 100 INCHES PZR LEVEL AND 41 FT ELEVATION must be completed prior to draining RCS.
- ALL previous steps in Section 6.3, ENTERING REDUCED INVENTORY CONDITION must be completed prior to draining RCS.

CAUTION

If more than one drain path will be required, shifting between drain paths should be performed at the highest RCS level possible. This will reduce perturbations while in reduced inventory conditions.

AF. **DETERMINE** RCS drain path(s) to be used: ____

- ☐ CVCS to WPS: **PERFORM** APPENDIX 6, DRAINING THE RCS VIA CVCS TO WPS in parallel with the remainder of this section
- ☐ CVCS to the VCT: **PERFORM** APPENDIX 7, DRAINING THE RCS VIA CVCS TO THE VCT in parallel with the remainder of this section
- ☐ LPSI miniflow to RWT: **PERFORM** APPENDIX 8, DRAINING THE RCS VIA LPSI MINIFLOW TO RWT in parallel with the remainder of this section
- ☐ RCS Hot Leg drain valves to RCDT: **PERFORM** APPENDIX 9, DRAINING THE RCS VIA RCS DRAIN VALVES in parallel with the remainder of this section
- ☐ **IF** the Reactor Vessel is defueled, **THEN** OI-3B, SHUTDOWN COOLING may be used.

CAUTION

Operating Experience has shown that purification should be secured slowly to reduce the affects on RCS temperature.

AG. **IF** draining via CVCS to WPS will be used, **THEN ENSURE** purification is secured:

1. **ENSURE SHUT** SDC Supply to CVCS B/U, 2-SI-464. ____
2. **ENSURE SHUT** CVCS to SDC, 2-SI-475. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

AH. **NOTIFY** Radiation Safety Supervision the plant will be drained to a reduced inventory condition, and the path to be used. ____

AI. **REFER** to TABLE 4, INVENTORY BALANCE - RCS AND SOURCE VOLUMES to periodically **PERFORM** an inventory balance between the RCS and source volumes prior to and while draining the RCS. ____

AJ. **IF** Reactor Vessel level indication is available,
THEN PERFORM a comparison check between Reactor Vessel level and Refueling Level indications **PER** APPENDIX 5, REACTOR VESSEL LEVEL CORRELATION, while draining the RCS.
(N/A if Reactor Vessel level indication is not available) ____

NOTE

- **IF** the S/G tubes are being gravity drained **AND** RCS level reaches the top of the Hot Leg (39 foot elevation),
THEN level fluctuations will occur until the water held in the S/G tubes by vacuum is released.
- When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level due to the size of the Reactor Vessel vent line. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**
- When draining the RCS with the S/G tubes full, RCS level indication will lower until the level reaches the top of the hot leg (39 foot elevation). The level will stabilize at this level until the S/G tubes drain (S/G tube volume is 1145 ft^3 per S/G, approximately 17,100 gals total). When the S/G tubes are drained, level will lower again.

AK. **IF** RCS level is being lowered to gravity drain the S/G tubes,
THEN CONSIDER the S/G tubes dry when RCS level has been at least 1.0 feet below the top of the Hot Leg (38.08 feet) **AND** level on at least two indicators has been stable for 30 minutes. ____

1. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE
SDC flow rates greater than 2000 GPM may cause the indication provided by 2LE4138 to become erratic or non existent due to increased amount of water turbulence in the hot leg.

AL. **IF** 2LE4138 will be used as one of the two required RCS level indications,
AND RCS level is at 38.6 feet,
THEN PERFORM the following:

1. **IF** 2LE4138 has come on scale,
THEN STOP the drain and **CHECK** RCS level indicator, 2LE4138 is indicating on scale **AND** stable for 10 minutes. ____

   a. **IF** fuel is in the vessel,
   THEN PERFORM the following:

      (1) **CHECK** ALL RCS level indications in use agree within 0.5 feet. **[B0597]** ____

      - MLMS on the Refueling Level Cart, 4136
      - MLMS on the Refueling Level Cart, 4137
      - RCS level indicator on the Refueling Level Cart, 2LE4138
      - RCS level indicator on the Refueling Level Cart, 2LE4139
      - Local refueling level indicator, 2-LG-4139

      (2) **IF** the indications do **NOT** agree,
      THEN INITIATE a CR **AND RESOLVE** the discrepancy before continuing.

         (a) **IF** the oscilloscope is installed on 2LT4138 in the CSR,
         THEN PERFORM the following:

            1) **STATION** an operator in direct communication with the Control Room. ____

            2) **RECORD** 2LT4138 readings at intervals no greater than 15 minutes using APPENDIX 14, OBTAINING 2LT4138 READINGS USING OSCILLOSCOPE to determine RCS level. ____

6.3.AL ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

2. **IF** 2LE4138 has **NOT** come on scale,
   THEN PERFORM the following:

   a. **CONTINUE** draining the RCS to 38.4 feet. ____

   b. **STOP** the drain and **CHECK** RCS level indicator, 2LE4138 is indicating on scale **AND** stable for 10 minutes. ____

   c. **IF** fuel is in the vessel,
      THEN PERFORM the following:

      (1) **CHECK** ALL RCS level indications in use agree within 0.5 feet. **[B0597]** ____

      - MLMS on the Refueling Level Cart, 4136
      - MLMS on the Refueling Level Cart, 4137
      - RCS level indicator on the Refueling Level Cart, 2LE4138
      - RCS level indicator on the Refueling Level Cart, 2LE4139
      - Local refueling level indicator, 2-LG-4139

      (2) **IF** the indications do **NOT** agree,
      THEN INITIATE a CR **AND RESOLVE** the discrepancy before continuing.

      (a) **IF** the oscilloscope is installed on 2LT4138 in the CSR,
      THEN PERFORM the following:

      1) **STATION** an operator in direct communication with the Control Room. ____

      2) **RECORD** 2LT4138 readings at intervals no greater than 15 minutes using APPENDIX 14, OBTAINING 2LT4138 READINGS USING OSCILLOSCOPE to determine RCS level. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE

- 2LT4140 accuracy is **NOT** adequate to be used as an RCS level indicator in Reduced Inventory. It may be used for trending only.
- Generic Letter 88-17 requires at least two independent and continuous RCS water level indications whenever the RCS is in a reduced inventory condition.
  If the indication is not located in the Control Room it must have provision for providing immediate water level values to an operator in the Control Room if significant changes occur (ie. radio or phone). Observations should be recorded at an interval no greater than 15 minutes. These observations may be suspended if evacuation of the observer from the remote readout area is required.
- Per Generic Letter 88-17 ordinary plastic tubing (tygon tube) does **NOT** meet the concept of reliable instumentation for use in Reduced Inventory.
- 2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 2LE4138, 4136 and 4137. 4136, 4137 and 2LE4138 are independent from each other.
- 2-LG-4139 is **NOT** a preferred instrument due to **NOT** being automatically and continuously monitored and alarmed.

AM. **IF** while in Reduced Inventory the required RCS level indication is lost,
THEN PERFORM the following:
(N/A if RCS level indicaiton is not lost) ____

CAUTION
Draining the RCS is **NOT** permitted with less than the required instrumentation.

1. **IF** draining the RCS,
   THEN STOP draining the RCS. ____

6.3.AM ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

2. **USE** all available indications to monitor RCS level:
   - 4136 ____
   - 4137 ____
   - 2LE4138 ____
   - 2LE4139 ____
   - 2-LG-4139 **OR** tygon tube ____
   - 2LT4140 ____

> **NOTE**
> Fluctuations in LPSI pump parameters may be indicative of actual level lower than indicated.

   - LPSI pump suction pressure, discharge pressure, running amps and flow ____

3. **RECORD** readings being used on ATTACHMENT 5, RCS LEVEL LOG. ____

> **NOTE**
> Cameras may be used to monitor the local level indication in the Control Room.

4. **EVALUATE** establishing local RCS level monitoring. ____
   a. **STATION** an operator in direct communication with the Control Room.
   (N/A if camera is used) ____

> **NOTE**
> APPENDIX 14, OBTAINING 2LT4138 READINGS USING OSCILLOSCOPE may be used to obtain readings from 2LT4138 if the oscilloscope is installed in the CSR.

   b. **RECORD** level indications that are being monitored locally at intervals no greater than 15 minutes. ____

5. **SUSPEND ALL** work that could affect RCS inventory **OR** other level instrumentation. ____

6. **MAKE** preparations to refill the RCS and exit Reduced Inventory. ____

6.3.AM ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

7. **EVALUATE** the level indication failure and the risk of remaining in Reduced Inventory. _____ SRO

   - **IF** one of the required RCS level indications is lost, **AND** will **NOT** be restored within one hour, **THEN FILL** the RCS to exit Reduced Inventory.

     a. **IF** the RCS is **NOT** in a conditon to allow filling, **THEN CONSULT** with Outage Management to determine the most expeditious means of restoring RCS integrity.

   - **IF** both of the required RCS level indications are lost, **THEN FILL** the RCS to exit Reduced Inventory.

     a. **IF** the RCS is **NOT** in a conditon to allow filling, **THEN CONSULT** with Outage Management to determine the most expeditious means of restoring RCS integrity.

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

NOTE
RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

AN. **WHEN** RCS draining is complete,
THEN ADJUST the setpoints for RCS level alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

- 0CRT4136
  - 4136 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 4136 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4138 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4138 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
- 0CRT4137
  - 4137 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 4137 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4138 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4138 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____

AO. **IF** the Containment Refueling Level Watch was stationed,
AND RCS level has been stable at its target level for at least 30 minutes,
THEN DISCONTINUE the Containment Refueling Level Watch. ____

6.3 ENTERING REDUCED INVENTORY CONDITION [B0073] (Continued) **INITIALS**

AP. **NOTIFY** Radiation Safety Supervision the RCS draining is complete and the final RCS level. ____

****** END ******

6.4 REDUCED INVENTORY OPERATIONS [B0073] INITIALS

NOTE
The RCS shall be considered in reduced inventory when fuel is in the vessel **AND** RCS level is three feet or more below the reactor vessel flange (41 foot elevation)

A. **MAINTAIN** RCS temperature between 100 and 110° F unless otherwise directed by the GS-SO. ____

NOTE

- 2LT4140 accuracy is **NOT** adequate to be used as an RCS level indicator in Reduced Inventory. It may be used for trending only.
- Generic Letter 88-17 requires at least two independent and continuous RCS water level indications whenever the RCS is in a reduced inventory condition.
  If the indication is not located in the Control Room it must have provision for providing immediate water level values to an operator in the Control Room if significant changes occur (ie. radio or phone). Observations should be recorded at an interval no greater than 15 minutes. These observations may be suspended if evacuation of the observer from the remote readout area is required.
- Per Generic Letter 88-17 ordinary plastic tubing (tygon tube) does **NOT** meet the concept of reliable instumentation for use in Reduced Inventory.
- 2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 4136, 4137 and 2LE4138. 4136, 4137 and 2LE4138 are independent from each other.
- 2-LG-4139 is **NOT** a preferred instrument due to **NOT** being automatically and continuously monitored and alarmed.

B. **IF** while in Reduced Inventory the required RCS level indication is lost, **THEN PERFORM** the following:
(N/A if RCS level indication is not lost) ____

CAUTION
Draining the RCS is **NOT** permitted with less than the required instrumentation.

1. **IF** draining the RCS, **THEN STOP** draining the RCS. ____

6.4.B REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

2. **USE** all available indications to monitor RCS level:

   - 4136 ____
   - 4137 ____
   - 2LE4138 ____
   - 2LE4139 ____
   - 2-LG-4139 **OR** tygon tube ____
   - 2LT4140 ____

> **NOTE**
> Fluctuations in LPSI pump parameters may be indicative of actual level lower than indicated.

   - LPSI pump suction pressure, discharge pressure, running amps and flow ____

3. **RECORD** readings being used on ATTACHMENT 5, RCS LEVEL LOG. ____

> **NOTE**
> Cameras may be used to monitor the local level indication in the Control Room.

4. **EVALUATE** establishing local RCS level monitoring. ____

   a. **STATION** an operator in direct communication with the Control Room.
   (N/A if camera is used) ____

> **NOTE**
> APPENDIX 14, OBTAINING 2LT4138 READINGS USING OSCILLOSCOPE may be used to obtain readings from 2LT4138 if the oscilloscope is installed in the CSR.

   b. **RECORD** level indications that are being monitored locally at intervals no greater than 15 minutes. ____

5. **SUSPEND ALL** work that could affect RCS inventory **OR** other level instrumentation. ____

6. **MAKE** preparations to refill the RCS and exit Reduced Inventory. ____

6.4.B REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

7. **EVALUATE** the level indication failure and the risk of remaining in Reduced Inventory. _____ SRO

   - **IF** one of the required RCS level indications is lost, **AND** will **NOT** be restored within one hour, **THEN FILL** the RCS to exit Reduced Inventory.

     a. **IF** the RCS is **NOT** in a conditon to allow filling, **THEN CONSULT** with Outage Management to determine the most expeditious means of restoring RCS integrity.

   - **IF** both of the required RCS level indications are lost, **THEN FILL** the RCS to exit Reduced Inventory.

     a. **IF** the RCS is **NOT** in a conditon to allow filling, **THEN CONSULT** with Outage Management to determine the most expeditious means of restoring RCS integrity.

C. **ENSURE** the following requirements are met:

1. **IF** Containment closure deviations exist, **THEN REQUEST** the CRS to perform the following:

   - **ENSURE ALL** Containment closure deviations are approved by the GS-SO **AND** restoration plans are in place **PER** NO-1-114, CONTAINMENT CLOSURE, to isolate the penetration **OR** restore the deviation within the lesser of 2 hours or RCS time to boil, should a sustained loss of SDC occur _____

   - **CONTINUE** calculating RCS time to boil on a shiftly basis **AND RECORDING** the time to boil on the Shift Turnover Sheet **[B0072]** _____

2. **ENSURE** the the following NO-1-103, CONDUCT OF LOWER MODE OPERATIONS, requirements are in place:

   - **VERIFY** the availibility of equipment for the required MEE list of NO-1-200, CONTROL OF SHIFT ACTIVITIES.

     - **IF** the manway is removed, **THEN VERIFY** the equipment **PER** attachment for a unit in Reduced Inventory **OR** an approved NO-1-103 Contingency Plan is in effect. _____

     OR

     - **IF** the manway is **NOT** removed, **THEN VERIFY** the equipment **PER** attachment for a unit in Mode 5 or 6 with NO S/G available and manway installed **OR** an approved NO-1-103 Contingency Plan is in effect. _____

6.4.C.2 REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

- **CONTINUE** logging the MEE in the Shift Turnover sheet ____
- **CONTINUE** checking MEE availability once per 12 hours ____

D. **IF** S/G nozzle dams are installed,
THEN ENSURE the following requirements are met:

- Maintenance may be started on **ONE** RCP seal after the unit is shutdown for **SEVEN** days ____
- Maintenance that requires a cold leg opening other than **ONE** RCP seal, shall **NOT** be initiated until after the unit has been shutdown for **TEN** days **[B0089]** ____
- A RCP cover (Upper-half casing) shall **NOT** be removed ____

E. **DOCUMENT** any evolution that may cause RCS or SDC perturbations and enhanced monitoring requirements for that evolution in APPENDIX 12, RCS/SDC PERTURBATION LOG **[B0138]** as follows:

1. **OBTAIN** Shift Manager review and approval of the evolution. ____
2. **LOG** the perturbation and the necessary special precautions and enhanced monitoring in the CRO log. ____
3. **OBTAIN** Shift Manager authorization to terminate the special precautions and enhanced monitoring. ____

F. **WHEN** work is to be performed in or around openings in the RCS **OR** personnel safety may be directly effected by RCS level,
THEN INITIATE ATTACHMENT 1, ESTABLISHING SAFE WORKING CONDITIONS FOR RCS MAINTENANCE. **[B0072]** ____

6.4 REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

G. **IF** needed,
THEN DRAIN the RCS while in reduced inventory **PER** APPENDIX 6, APPENDIX 7, APPENDIX 8 or APPENDIX 9, **WITH** the following additional requirements:

NOTE
Maximum flow to maintain stability on 2LE4138 is 2000 GPM. During draining the additional drain flow past 2LE4138 is additive to the flow value observed on 2-FIC-306.

1. **IF** the RCS is to be drained to **OR** below 37.6 foot elevation,
AND SDC flowrate is greater than 1800 GPM,
THEN PERFORM the following:

NOTE
2-FIC-306 is placed in manual when throttling LPSI HDR isolation valves, to prevent 2-SI-306-CV from opening trying to maintain flow, thus robbing flow from 2-SI-657-CV.

a. **PLACE** SDC Flow Controller, 2-FIC-306, in MANUAL. ____

CAUTION
The boration flow path shall be aligned to a loop with SDC flow.

b. **ENSURE** a LPSI HDR isolation is open in the same loop as the boration flow path **AND SHUT** two (2) LPSI HDR isolation valves **AND ENSURE** they are in PULL TO OVERRIDE. ____

CAUTION
- To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**
- A reduction in RCS boron concentration from a source whose boron concentration is LESS THAN the present SDM requirements of the COLR, is **NOT** permitted when RCS flow is less than 3000 GPM.

c. **THROTTLE** the remaining two (2) LPSI HDR valves in PULL TO OVERRIDE to obtain between 950-1000 GPM in each LPSI Loop. ____

6.4.G.1 REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

d. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate between 1750-1800 GPM. ____

(1) **IF** 2-FIC-306 is shut **AND** SDC flowrate is greater than 1800 GPM,
THEN ADJUST the SDC TEMP CONTR, 2-HIC-3657 to lower flow to less than 1800 GPM. ____

e. **IF** desired to place 2-FIC-306 in AUTO,
THEN PERFORM the following:

(1) **ADJUST** the setpoint on 2-FIC-306 to match SDC flow. ____

(2) **PLACE** 2-FIC-306 in AUTO. ____

NOTE
LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

f. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

- 0CRT4136
  - 2FT306 High Flow Alarm Limit.....1900 GPM ____
  - 2FT306 Low Flow Alarm Limit.....1700 GPM ____
- 0CRT4137
  - 2FT306 High Flow Alarm Limit.....1900 GPM ____
  - 2FT306 Low Flow Alarm Limit.....1700 GPM ____

NOTE
Per Generic Letter 88-17 ordinary plastic tubing (tygon tube) does **NOT** meet the concept of reliable instumentation for use in Reduced Inventory.

2. **IF** tygon tube is used as the local refueling level indicator,
THEN WALK DOWN the entire tube to ensure the tubing is free of kinks, no loop seals, trapped air **OR** debris in the tube. **[B0072]** ____

6.4.G REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

NOTE

- Use the lowest reading RCS level indicator as actual RCS level during draining.
- Operating experience has shown that due to Shutdown Cooling suction flow on that hot leg, 4136 indication will bounce when RCS level is at the top of the hot leg.
- SDC flow rates greater than 2000 GPM may cause the indication provided by 2LE4138 to become erratic or non existent due to increased amount of water turbulence in the hot leg.

3. **CHECK** at least 2 independent RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet. ____
   - MLMS on the Refueling Level Cart, 4136 ____
   - MLMS on the Refueling Level Cart, 4137 ____
   - RCS level indicator on the Refueling Level Cart, 2LE4138 (when less than 39 foot) ____
   - RCS level indicator on the Refueling Level Cart, 2LE4139 ____
   - Local refueling level indicator, 2-LG-4139 ____

   a. **IF** the indications do **NOT** agree, **THEN INITIATE** a CR to resolve the discrepancy before continuing. ____

CAUTION

- Except for emergencies, permission is required from the M-NO or the GS-SO to drain the RCS below the 37.5 foot elevation. Minimize LPSI Pumps shifts while the RCS is below the 37.5 foot elevation. Minimum level to drain the RCS is 36.83 foot elevation.
- While the RCS level is less than the 41 foot elevation, purification should only be in service for draining the RCS unless 2-CVC-500-CV is gagged in the WPS position.

4. **SUSPEND ALL** evolutions that may cause an RCS or SDC perturbation. ____

6.4.G REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

NOTE
Cameras may be used to monitor the local level indication in the Control Room.

5. **IF** local monitoring of the local refueling level indicator, 2-LG-4139 will be used,
THEN PERFORM the following:

   a. **STATION** a Containment Refueling Level Watch with communication available with the Control Room, with the following duties:
   (N/A if camera is used) ____

      - Continuously **MONITOR** the local Refueling Level indicator **AND REPORT** the level to the Control Room every 15 minutes

      - Immediately **NOTIFY** the Control Room of sudden **OR** unexpected changes in RCS level

   b. **RECORD** level indications that are being monitored locally at intervals no greater than 15 minutes on ATTACHMENT 5, RCS LEVEL LOG. ____

6. **REFER** to TABLE 4, INVENTORY BALANCE - RCS AND SOURCE VOLUMES to periodically **PERFORM** an inventory balance between the RCS and source volumes prior to and while draining the RCS. ____

6.4.G REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

NOTE
RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

7. **WHEN** RCS draining is complete,
THEN ADJUST the setpoints for RCS level alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS: **[B0072]**

- 0CRT4136
  - 4136 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 4136 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4138 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4138 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
- 0CRT4137
  - 4137 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 4137 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4138 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4138 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LE4139 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LE4139 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____
  - 2LT4140 High Level Alarm Limit...0.2 FEET **ABOVE** RCS level ____
  - 2LT4140 Low Level Alarm Limit....0.2 FEET **BELOW** RCS level ____

6.4.G REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

8. **IF** the Containment Refueling Level Watch was stationed, **AND** RCS level has been stable at its target level for at least 30 minutes, **THEN DISCONTINUE** the Containment Refueling Level Watch. ____

> **NOTE**
> Do **NOT** use RCS temperature as flange temperature.

H. **IF** the reactor head is tensioned, **THEN MONITOR** actual reactor vessel flange temperature once per shift. ____

I. **IF** needed, **THEN RAISE** RCS level while in reduced inventory **PER** OI-3B, SHUTDOWN COOLING, **WITH** the following additional requirements:

1. **REFER** to TABLE 4, INVENTORY BALANCE - RCS AND SOURCE VOLUMES to periodically **PERFORM** an inventory balance between the RCS and source volumes prior to and while filling the RCS. ____

2. **IF** ALL the following:

   - RCS level has been raised through the 37.6 foot elevation, ____
   - 2LE4138 will **NOT** be used as one of the required RCS level indications, ____
   - It is desired to raise SDC flow, ____

   THEN PERFORM the following:

   a. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate between 3200-3400 GPM. ____

> **CAUTION**
> To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

   b. **THROTTLE** the four (4) LPSI HDR valves in PULL TO OVERRIDE to obtain between 800 and 850 GPM in each LPSI Loop. ____

6.4.I.2 REDUCED INVENTORY OPERATIONS [B0073] (Continued) **INITIALS**

c. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate of approximately 3000 GPM. ____

> **NOTE**
> LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

d. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

- 0CRT4136
  - 2FT306 High Flow Alarm Limit.....3100 GPM ____
  - 2FT306 Low Flow Alarm Limit.....2900 GPM ____
- 0CRT4137
  - 2FT306 High Flow Alarm Limit.....3100 GPM ____
  - 2FT306 Low Flow Alarm Limit.....2900 GPM ____

****** END ******

6.5 EXITING REDUCED INVENTORY OPERATIONS **INITIALS**

A. **ENSURE** the the following NO-1-103, CONDUCT OF LOWER MODE OPERATIONS, requirements are in place:

- **VERIFY** the availibility of equipment for the required MEE list of NO-1-200, CONTROL OF SHIFT ACTIVITIES.

  - **IF** the manway is removed,
    THEN VERIFY the equipment **PER** attachment for a unit with PZR manway removed **OR** an approved NO-1-103 Contingency Plan is in effect. ____

  OR

  - **IF** the manway is **NOT** removed,
    THEN VERIFY the equipment **PER** attachment for a unit in Mode 5 or 6 with NO S/G available and manway installed **OR** an approved NO-1-103 Contingency Plan is in effect. ____

- **CONTINUE** logging the MEE in the Shift Turnover sheet ____

- **CONTINUE** checking MEE availability once per 12 hours ____

B. **REFER** to TABLE 4, INVENTORY BALANCE - RCS AND SOURCE VOLUMES to periodically **PERFORM** an inventory balance between the RCS and source volumes prior to and while filling the RCS. ____

6.5 EXITING REDUCED INVENTORY OPERATIONS (Continued) **INITIALS**

NOTE

- 2LT4140 may be used when **NOT** in Reduced Inventory.
- SDC flow rates greater than 2000 GPM may cause the indication provided by 2LE4138 to become erratic or non existent due to increased amount of water turbulence in the hot leg.
- The RCS is no longer considered in a reduced inventory condition when:
  - Fuel is removed from the vessel

  OR
  - RCS level is greater than 41 foot elevation

C. **RAISE** RCS level greater than 41 foot elevation **PER** OI-3B, SHUTDOWN COOLING, **WITH** the following additional requirements: ____

1. **WHEN** RCS level reaches the 41 foot elevation, **THEN PERFORM** the following:

CAUTION

To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

a. Slowly **OPEN ALL** available LPSI HDR valves **AND ENSURE** that 2-FIC-306 maintains SDC flow less than 3500 GPM. ____

b. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate of approximately 3000 GPM. ____

c. **TAKE ALL** available LPSI HDR valves out of PULL TO OVERRIDE. ____

D. **WHEN** the RCS is no longer in reduced inventory, **THEN SUSPEND** the limits on evolutions that would cause RCS **OR** SDC perturbations. ____

E. **IF** CET temperature indication is available on PAMS, **THEN ADJUST** the temperature alarm setpoint, HICET_SETPT, **PER** OI-1I, Post Accident Monitoring System Instrumentation, to 700° F. ____

F. **NOTIFY** Radiation Safety Supervision the RCS is no longer in a reduced inventory condition. ____

6.5 EXITING REDUCED INVENTORY OPERATIONS (Continued) **INITIALS**

G. **IF** SDC Purification is desired,
THEN PLACE Purification on SDC **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

H. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

****** END ******

6.6 RCS FILLING OPERATIONS WITH LEVEL GREATER THAN 41 FT ELEVATION

INITIALS

NOTE

- **NOTIFY** Radiation Safety Supervision before commencing any RCS filling operations.
- There may be conditions where the use of procedures other then the ones listed may be appropriate.
- If Core Components are going to be moved, it is preferred to have RFP level as high as is allowed, to maximize shielding.

WARNING

To reduce airborne radiation, the preferred method for filling dry RFP cavities is gravity fill from the RWT **PER** OI-24G, FILLING REFUELING POOL. This method eliminates the waterfall effect of overflowing the Reactor Vessel flange. **[B1118]**

A. **FILL** the RCS/RFP using the appropriate method:

- **USING** a charging pump for making up to the RCS/RFP. ____
- **USING** Section 6.12, PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE for filling the RCs to draw a bubble in the PZR. ____
- **USING** OI-24G, SPENT FUEL POOL COOLING SYSTEM, to fill the North and South RFP cavities or changing RFP level. ____
- **USING** OI-3B, SHUTDOWN COOLING, for changing RCS/RFP level ____

B. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

****** END ******

6.7 MODE 6 PREPARATIONS

INITIALS

NOTE

- This section may be performed more than once during a refueling outage. A working copy of this section shall be made before each subsequent use.
- Steps in this section may be performed concurrently or in any order.
- Mode 6 will be declared just prior to detensioning of the last 18 Reactor Vessel studs less than 75% of design pre-load **OR** returning the first fuel element to the Reactor Vessel. **[B0247]**

A. **VERIFY** all filled portions of the RCS and RFP have been sampled and the following boron concentration requirements are met: (Tech Spec 3.9.1) **[B0198]**

- The results are within 100 PPM of each other.
- The results are greater than or equal to the Mode 6 Refueling Boron Concentration requirement **PER** NEOP-301, Operator Surveillance Procedure.

	INITIALS	DATE
Supervisor-Plant Chemistry		

B. **VERIFY** that the CP-204 Mode 6 sampling requirements are in place. (Tech Spec 3.9.1.1).

	INITIALS	DATE
Supervisor-Plant Chemistry		

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

C. **PERFORM** an Administrative Verification that the following equipment is OPERABLE **OR** requirements met, as required by the Tech Spec and TRM LCOs:

EQUIPMENT	LCO	INITIALS
Boration flow path	TRM 15.1.3	
HPSI or Charging Pump	TRM 15.1.3	
Boric Acid Pump (if required)	TRM 15.1.3	
BAST/RWT (borated water source)	TRM 15.1.3	
Containment Radiation Signal (Cntmt Purge Vlvs)(if required)	TS 3.3.7	
Fire Detection Instruments	TRM 15.3.5	
Chemistry specifications	TRM 15.4.1	
Snubbers	TRM 15.7.2	
Fire Spray/Sprinkler Systems	TRM 15.7.6	
Fire Halon Systems	TRM 15.7.7	
Fire Hose Stations	TRM 15.7.8	
Fire Hydrants	TRM 15.7.9	
1 off-site circuit and 1 D/G	TS 3.8.2 TS 3.8.3	
One 4KV bus, 480V bus and Two 120V busses	TS 3.8.8 TS 3.8.10	
Two 125V DC busses and Two 125V DC battery banks	TS 3.8.5 TS 3.8.6	
Nuclear Instrumentation	TS 3.9.2	
SDC - High Water Level	TS 3.9.4	
SDC loop in operation with at least 1500 GPM	TS SR 3.9.4.1	
SDC - Low Water Level	TS 3.9.5	

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

D. **PERFORM** STP O-90-2, BREAKER LINEUP VERIFICATION.

_____/_____
Init Date

E. **NOTIFY** the Operations FSTC to ensure STPs O-90-2 is scheduled to be performed on a weekly basis while in Mode 6. (May be carried as a turn-over item until the FSTC is on site.)

_____/_____
Init Date

F. **IF** the 2A or 2B DG is OOS,
THEN ENSURE OI-49 Operability Verification has been completed within the last eight (8) hours and is scheduled on the shift turnover sheet. (N/A if 2A and 2B DG's are operable) **[B0105]**

_____/_____
Init Date

G. **PERFORM** STP 0-62-2, MONTHLY VALVE POSITION VERIFICATION-UNIT 2, for Mode 6.

_____/_____
Init Date

H. **ENSURE** STP O-94B-2, RCS/SDC LOOP OPERABILITY VERIFICATION (MODES 4,5 and 6), has been completed within 7 days prior to declaring Mode 6. (Tech Spec SR 3.4.6.3, 3.4.7.3, 3.4.8.2, 3.9.5.3)

	INITIALS	DATE	TIME
COMPLETED			

1. **NOTIFY** the Operations FSTC to ensure that STP O-94B-2 is scheduled to be performed on a weekly basis during Modes 4,5 and 6 operation. (May be carried as a turn-over item until the FSTC is on site.)

_____/_____
Init Date

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

I. **REVIEW** the Locked Valve Deviation sheets for operability of equipment required for entry to Mode 6.

	INITIALS	DATE
CRS		

J. **REQUEST** the Plant Testing group have the responsible FSTCs certify **AND** initial that the Surveillance Requirements under their responsibility are current to enter Mode 6:

DISCIPLINE	INITIALS	DATE
Operations		
E&C		
Mechanical Maint		
Fire Protection		
MEIU		
Snubbers		

K. **REQUEST** the responsible Engineering Supervisors certify and initial that no project **OR** modifications are currently outstanding which could impact entering Mode 6.

DISCIPLINE	INITIALS	DATE
Primary Systems Engineering Unit		
BOP Systems Engineering Unit		
E&C Systems Engineering Unit		
PWR Reload Analysis		

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

L. **REVIEW** the Temporary Alteration Log for operability impact of equipment required in Mode 6 **AND VERIFY** the Mode 6 applicability box is checked on the Temporary Alteration Form. (Ref. MD-1-100)

	INITIALS	DATE
CRS		

M. **REVIEW** all active Component Manipulation Forms to ensure operability of equipment required for Mode 6.

	INITIALS	DATE
CRS		

N. **REVIEW AND EVALUATE ALL** procedure controlled temporary plant configuration changes **PER** MN-1-110, Appendix PC, for operability impact of equipment required in Mode 6.

	INITIALS	DATE
CRS		

O. **VERIFY** the CONTAINMENT PURGE ISOLATION SYSTEM FUNCTIONAL TEST, STP O-60, has been completed within 92 days prior to movement of irradiated fuel assemblies within containment with Containment Purge valves open. (T.S.S.R. 3.3.7.3)

_____ / _____
Init Date

P. **REQUEST** the Work Control Unit Supervisor certify and initial there are no tag outs which render equipment required for Mode 6 operation inoperable.

RESPONSIBILITY	INITIALS	DATE
WCU Supervisor		

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

Q. **REQUEST** the SRO, Ops Work Control, with any needed assistance from the Post-Maintenance Test Coordinator, to certify and initial that post-Maintenance testing on completed maintenance orders (status W8, W9, T1, T2, and T3) identified as Mode 6 restraints are complete.

RESPONSIBILITY	INITIALS	DATE
SRO-Ops Work Control		

R. **REQUEST** the Instrument Shop certify and initial that the Containment Area Rad Monitor **AND** Containment Incore Nuclear Instrument Area Rad Monitor detectors 2-RE-5316A, 2-RE-5316B, 2-RE-5316C and 2-RE-5316D, including fuses are installed.

RESPONSIBILITY	INITIALS	DATE
GS-E&C Maintenance		

S. **REQUEST** the responsible maintenance supervisors certify and initial that **ALL** maintenance activities, associated post-maintenance tests and supporting surveillance tests have been completed satisfactorily on components that are required for Mode 6 operation.

	INITIALS	DATE
GS-MECHANICAL MAINTENANCE		
GS-PROJECT MANAGEMENT		
GS-E&C MAINTENANCE		

T. **REQUEST** the PORC Chairman certify and initial that any PORC Open Items that prohibit entry into Mode 6 are appropriately closed.

RESPONSIBILITY	INITIALS	DATE
PORC Chairman		

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

U. **REQUEST** the responsible supervisors certify and initial that there are no open CRs, PGMIs **OR** RHOs that are Mode 6 restraints.

RESPONSIBILITY	INITIALS	DATE
Supervisor-Calvert Cliffs Warehouse Unit (RHOs)		
Outage Manager (CRs, PGMIs)		

V. **REVIEW** the Temporary Notes **AND** Operator Aid Logs for operability of equipment required for entry to Mode 6.

	INITIALS	DATE
CRS		

W. **IF** the Unit is in Mode 5,
THEN ENSURE the MEE listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, for operation in Mode 6 with the Pressurizer manway removed, is available **OR** an approved NO-1-103 Contingency Plan is in effect.

_____ / _____
Init Date

- **CONTINUE** logging the MEE in the Shift Turnover sheet
- **CONTINUE** checking MEE availability once per 12 hours

X. **IF** the Unit is defueled,
THEN ENSURE the MEE listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, for Unit 2 with the Refueling Pool Level greater than 57 feet **OR** an approved NO-1-103 Contingency Plan is in effect.

_____ / _____
Init Date

- **CONTINUE** logging the MEE in the Shift Turnover sheet
- **CONTINUE** checking MEE availability once per 12 hours

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

Y. **IF** the Unit is defueled,
THEN REVIEW the Action Statements in effect when last in Mode 6 **AND RE-ENTER** any appropriate Action Statement prior to re-entry into Mode 6.

	INITIALS	DATE
CRS		

Z. **IF** Unit is in Mode 5,
THEN COMMENCE taking Mode 5 **AND** Mode 6 logs to ensure Mode 6 surveillances are being met.

_____ / _____
Init Date

AA. **IF** Unit is Defueled,
THEN COMMENCE taking Defueled **AND** Mode 6 logs to ensure Mode 6 surveillances are being met.

_____ / _____
Init Date

AB. **ENSURE** the audible source range monitors in the Control Room **AND** Containment are on **AND** audible from the Refueling Machine bridge **AND** in the Control Room. **[B0270]**

_____ / _____
Init Date

1. **COMMENCE** performing a channel check of the audible source range monitors at least once every 12 hours while in Mode 6. (Tech Spec SR 3.9.2.1)

_____ / _____
Init Date

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

AC. **ENSURE** the following conditions are met:

1. BY visual inspection, each ECCS train containment sump suction inlet is not restricted by debris and the suction inlet trash racks and screens show no evidence of structural distress or abnormal corrosion. (Tech Spec SR 3.5.2.8)

   ____/____
   Init Date

2. Normal and Emergency Containment Sump:

   - Herculite removed

     ____/____
     Init Date

   - Free of debris (check inside screen)

     ____/____
     Init Date

   - Top cover of emergency sump free of debris

     ____/____
     Init Date

   - Trench clean

     ____/____
     Init Date

   - Normal sump strainer installed

     ____/____
     Init Date

3. Containment Cleanliness is maintained **PER** NO-1-103.

   ____/____
   Init Date

6.7 MODE 6 PREPARATIONS (Continued) **INITIALS**

AD. **DOCUMENT AND APPROVE** any deviations to the requirements for Mode 6 entry below:

MODE 6 REQUIREMENT	DEVIATION	APPROVAL INITIALS SM	GS-SO

AE. **CERTIFY** the following:

- **ALL** Mode 6 requirement deviations documented and approved
- **ALL** sign-offs, other than the equipment table (Step 6.7.B), are **EITHER** signed within 3 days of the mode change **OR** re-verified by telephone and initialed by the Shift Manager.

Shift Manager _____ Date/time_____/_____

****** END ******

6.8 MODE 6 ENTRY

INITIALS

NOTE
Thermal power shall be the total reactor core heat transfer rate to the reactor coolant excluding decay heat.

A. **WHEN** the following conditions exist:

- Maintenance informs the Control Room that the last 18 Reactor Vessel Head studs are about to be detensioned less than 75% of design pre-load **OR** the first fuel bundle is being moved into the reactor vessel ____
- K_{eff} is less than or equal to 0.95 ____
- % Rated Thermal Power is 0% ____
- RFP temperature is less than or equal to 140° F. (SR 3.9.1.1) **[B0477]** ____

THEN LOG Mode 6 entry in the CRO Log. ____

****** END ******

6.9 CORE ALTERATIONS PREPARATIONS[B0408]

A. CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES

NOTE
Steps in this section may be performed concurrently and in any order.

1. **IF** performing core alterations **MORE THAN 72 HOURS** since the last core alteration,
THEN PERFORM the following: **[B0408]**

NOTE
Steps in this section may be performed concurrently and in any order.

a. **ENSURE** STP O-92-2, REFUELING MACHINE AUX HOIST FUNCTIONAL TEST is completed satisfactorily within 72 hours prior to the initial start of movement of CEA's within the reactor vessel for a refueling operation, consisting of either a fuel offload and onload **OR** a fuel shuffle, to consider the Refueling Machine Aux Hoist operable. (TRM TVR 15.9.3.2) (N/A if not required at this time **OR** if the requirements of TRM TVR 15.9.3.2 have already been satisfied for the current refueling operation.)

	INITIALS	DATE	TIME
START			
COMPLETED			

IF STP O-92-2 is **NOT** performed at this time,
THEN PLACE a note on the shift turnover sheet to ensure it is performed prior to CEA movements within the reactor vessel.
(N/A if the requirements of TRM TVR 15.9.3.2 have already been satisfied for the current refueling operation.)

b. **REVIEW** the Temporary Alteration Log for operability impact of equipment required for core alterations. (Ref MD-1-100)

	INITIALS	DATE
SM		

6.9.A.1 CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

c. **REVIEW AND EVALUATE ALL** procedure controlled temporary plant configuration changes **PER** MN-1-110, Appendix PC, for operability impact of equipment required for core alterations.

	INITIALS	DATE
SM		

d. **REQUEST** the SRO, Ops Work Control, with any needed assistance from the Post-Maintenance Test Coordinator, to certify and initial that post-Maintenance testing on completed maintenance orders (status W8, W9, T1, T2, and T3) and in any working status (W1, W2, and W3) identified as core alterations restraints are complete or will **NOT** impact core alterations.

RESPONSIBILITY	INITIALS	DATE
SRO-Ops Work Control		

e. **REQUEST** the Work Control Unit Supervisor certify and initial there are no tag outs which affect equipment required for core alterations.

RESPONSIBILITY	INITIALS	DATE
WCU Supervisor		

6.9.A.1 CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

f. **REQUEST** the Plant Testing group have the responsible FSTCs certify **AND** initial that the Surveillance Requirements under their responsibility are current to allow core alterations **AND** are established on the the schedule to remain current:

DISCIPLINE	INITIALS	DATE
Operations		
E&C		
Mechanical Maint		
Fire Protection		
MEIU		
Snubbers		

g. **REQUEST** the responsible Engineering Supervisors to certify and initial that no project **OR** modifications are currently outstanding which could impact core alterations.

DISCIPLINE	INITIALS	DATE
Primary Systems Engineering Unit		
BOP Systems Engineering Unit		
E&C Systems Engineering Unit		

h. **REQUEST** the responsible maintenance supervisors certify and initial that **ALL** maintenance activities, associated post-maintenance tests and supporting surveillance tests have been completed satisfactorily on components that are required for performing core alterations.

RESPONSIBILITY	INITIALS	DATE
GS-MECHANICAL MAINTENANCE		
GS-PROJECT MANAGEMENT		
GS-E&C MAINTENANCE		

6.9.A.1 CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

i. **REQUEST** the PORC Chairman certify and initial that any PORC Open Items that prohibit core alterations are appropriately closed.

RESPONSIBILITY	INITIALS	DATE
PORC Chairman		

j. **REQUEST** the responsible supervisors certify and initial that there are no open CRs, PGMIs **OR** RHOs that restrain core alterations.

RESPONSIBILITY	INITIALS	DATE
Supervisor-Calvert Cliffs Warehouse Unit (RHOs)		
Outage Manager (CRs, PGMIs)		

NOTE
Steps in this section may be performed concurrently and in any order.

2. **IF** performing core alterations **MORE THAN 24 HOURS** since the last core alteration,
THEN PERFORM the following: **[B0408]**

a. **VERIFY** the RCS (SDC), RFP, and SFP boron concentrations are greater than the Refueling Boron Concentration **PER** NEOP-23 within 24 hours of core alterations.

	INITIALS	DATE	TIME
COMPLETED			

6.9.A CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

NOTE
Steps in this section may be performed concurrently and in any order.

3. **IF** performing core alterations **MORE THAN ONE HOUR** since the last core alteration,
THEN PERFORM the following: **[B0408]**

NOTE
Communications shall be established for all core alterations.

a. **ESTABLISH** direct communication between the Control Room and personnel at the refueling station within 1 hour prior to core alterations.

	INITIALS	DATE	TIME
COMPLETED			

b. **ADD** note to the Shift Turnover Sheet under non-routine surveillance requirements, to verify communications at a frequency not to exceed **once every 12 hours** during core alterations.

	INITIALS	DATE	TIME
COMPLETED			

c. **IF** uncoupling/coupling the CEAs **OR** moving the UGS,
THEN VERIFY RFP level is greater than 56.7 foot elevation.

	INITIALS	DATE
COMPLETED		

6.9.A.3 CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

WARNING

Dose rates associated with the UGS will rise sharply as level is reduced below the 62 foot elevation. Recommended minimum RFP level with the UGS removed is the 64 foot elevation. **[B1147]**

d. **IF** performing core CEA swaps,
THEN VERIFY RFP level is greater than the 57 foot elevation.

	INITIALS	DATE
COMPLETED		

NOTE

RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

- The RFP level alarm band is set to plus or minus 0.2 ft.

e. **ENSURE** at least one Containment Iodine Filter is available for service. **[B0014]**

	INITIALS	DATE
COMPLETED		

f. The RCS temperature is greater than 70° F and less than or equal to 140° F. (SR 3.9.1.1)**[B0477]**

	INITIALS	DATE
COMPLETED		

g. SDC loop in operation circulating reactor coolant at a flow rate of ≥1500 gpm **OR** meeting the requirements of L.C.O. 3.9.4 note 2. (SR 3.9.4.1, 3.9.5.2)

	INITIALS	DATE
COMPLETED		

6.9.A CHECKLIST FOR CORE ALTERATIONS OTHER THAN FUEL MOVES (Continued)

4. Check list for core alterations other than fuel moves is complete with all issues that will affect core alterations resolved. **[B0408]**

	SIGNATURE	DATE
SM		

****** END ******

6.9 CORE ALTERATIONS PREPARATIONS[B0408] (Continued)

B. CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT

1. **IF** onloading an empty core,
   THEN verify the Core Support Plate cleanliness is acceptable for fuel onload.
   (N/A if **NOT** onloading an empty core.)

	SE INITIALS	DATE
COMPLETED		

NOTE
Steps in this section may be performed concurrently and in any order.

2. **IF** performing core alterations **MORE THAN 72 HOURS** since the last core alteration,
   THEN PERFORM the following: **[B0408]**

   a. **ENSURE** STP O-59-2, REFUELING MACHINE HOIST FUNCTIONAL TEST, is completed satisfactorily within 72 hours prior to the initial start of movement of fuel assemblies within the reactor vessel for a refueling operation consisting of either a fuel offload and onload **OR** a fuel shuffle, to consider the Refueling Machine Main Hoist operable. (TRM TVR 15.9.3.1)
   (N/A if not required at this time **OR** if the requirements of TRM TVR 15.9.3.1 have already been satisfied for the current refueling operation.)

	INITIALS	DATE	TIME
START			
COMPLETED			

   b. **ENSURE** STP O-60-2, CONTAINMENT PURGE ISOLATION SYSTEM FUNCTIONAL TEST, is completed prior to movement of irradiated fuel within Containment. (Tech Spec SR 3.9.3.2)

	INITIALS	DATE
COMPLETED		

   N/A step if already performed within the last 92 days **OR** the action requirements of Tech Spec 3.3.7.B and 3.9.3 are met.

6.9.B.2 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

c. **ENSURE** STP O-55A-2, CONTAINMENT CLOSURE VERIFICATION, is complete **PER** the requirements of NO-1-114, CONTAINMENT CLOSURE. (Tech Spec SR 3.9.3.1) **[B0089]**

	INITIALS	DATE
START		
COMPLETED		

d. **ENSURE** STP O-55A-2 is scheduled to be performed on a weekly basis during movement of irradiated fuel assemblies within containment.

	INITIALS	DATE
COMPLETED		

e. **ENSURE** the Containment Closure tags are controlled by STP O-55A-2 and NO-1-114, CONTAINMENT CLOSURE, during movement of irradiated fuel assemblies within containment. **[B0089]**

	INITIALS	DATE
COMPLETED		

f. **REVIEW** the Temporary Alteration Log for operability impact of equipment required for core alterations. (Ref MD-1-100)

	INITIALS	DATE
SM		

g. **REVIEW AND EVALUATE ALL** procedure controlled temporary plant configuration changes **PER** MN-1-110, Appendix PC, for operability impact of equipment required for core alterations.

	INITIALS	DATE
SM		

6.9.B.2 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

h. **REQUEST** the SRO, Ops Work Control, with any needed assistance from the Post-Maintenance Test Coordinator, to certify and initial that post-Maintenance testing on completed maintenance orders (status W8, W9, T1, T2, and T3) and in any working status (W1, W2, and W3) identified as core alterations restraints are complete or will **NOT** impact core alterations.

RESPONSIBILITY	INITIALS	DATE
SRO-Ops Work Control		

i. **REQUEST** the Work Control Unit Supervisor certify and initial there are no tag outs which affect equipment required for core alterations.

RESPONSIBILITY	INITIALS	DATE
WCU Supervisor		

j. **ENSURE** access to the Fuel Transfer Tube access hatch walkway (45' Cntmt) has been restricted. **[B1243]**
(N/A if coupling CEAs after fuel movement)

	INITIALS	DATE
Radiation Safety		

k. **REQUEST** the Plant Testing group have the responsible FSTCs certify **AND** initial that the Surveillance Requirements under their responsibility are current to allow core alterations **AND** are established on the the schedule to remain current:

DISCIPLINE	INITIALS	DATE
Operations		
E&C		
Mechanical Maint		
Fire Protection		
MEIU		
Snubbers		

6.9.B.2 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

l. **REQUEST** the responsible Engineering Supervisors to certify and initial that no project **OR** modifications are currently outstanding which could impact core alterations.

DISCIPLINE	INITIALS	DATE
Primary Systems Engineering Unit		
BOP Systems Engineering Unit		
E&C Systems Engineering Unit		

m. **REQUEST** the responsible maintenance supervisors certify and initial that **ALL** maintenance activities, associated post-maintenance tests and supporting surveillance tests have been completed satisfactorily on components that are required for performing core alterations.

	INITIALS	DATE
GS-MECHANICAL MAINTENANCE		
GS-PROJECT MANAGEMENT		
GS-E&C MAINTENANCE		

n. **REQUEST** the PORC Chairman certify and initial that any PORC Open Items that prohibit core alterations are appropriately closed.

RESPONSIBILITY	INITIALS	DATE
PORC Chairman		

o. **REQUEST** the responsible supervisors certify and initial that there are no open CRs, PGMIs **OR** RHOs that restrain core alterations.

RESPONSIBILITY	INITIALS	DATE
Supervisor-Calvert Cliffs Warehouse Unit (RHOs)		
Outage Manager (CRs, PGMIs)		

6.9.B CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

NOTE
Steps in this section may be performed concurrently and in any order.

3. **IF** performing core alterations **MORE THAN 24 HOURS** since the last core alteration,
THEN PERFORM the following: **[B0408]**

   a. Approval for the movement of fuel has been received from the Manager-Nuclear Operations.
   (N/A if coupling CEAs after fuel movement)

	INITIALS	DATE
COMPLETED		

   b. **ENSURE** the Reactor has been subcritical for at least 100 hours (TRM TVR 15.9.1.1) prior to movement of irradiated fuel assemblies in the reactor vessel.
   (N/A if coupling CEAs after fuel movement)

Rx S/D DATE / TIME	INITIALS

	INITIALS	DATE	TIME
COMPLETED			

   c. The RCS (SDC), RFP, and SFP boron concentrations are greater than the Refueling Boron Concentration **PER** NEOP-23.

	INITIALS	DATE
COMPLETED		

6.9.B.3 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

NOTE
An evaluation to ensure compliance with the FSAR, is required for instances when these radiation monitors are all out of service.

d. **VERIFY** ONE of the following is in service.
(N/A if coupling CEAs after fuel movement)

- Fuel Handling Area Vent Radiation Monitor, 0-RI-5420
- Spent Fuel Handling Machine Radiation Monitor, 0-RI-7025
- SFP Area Rm 320 El-69 Radiation Monitor, 0-RI-7024

	INITIALS	DATE
COMPLETED		

e. **ENSURE** Required Train of CREVS operable **PER** Tech Spec 3.7.8.
(N/A if coupling CEAs after fuel movement)

	INITIALS	DATE
COMPLETED		

f. **ENSURE** Required Train of CRETS operable **PER** Tech Spec 3.7.9.
(N/A if coupling CEAs after fuel movement)

	INITIALS	DATE
COMPLETED		

6.9.B CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

NOTE
Steps in this section may be performed concurrently and in any order.

4. IF performing core alterations **MORE THAN ONE HOUR** since the last core alteration,
THEN PERFORM the following: **[B0408]**

   a. IF recently irradiated fuel assemblies will be moved in the Auxiliary Building to support core alterations,
   THEN VERIFY SFP Ventilation is in service with charcoal filters in operation **PER** OI-22D, FUEL HANDLING AREA VENTILATION SYSTEM, section titled CHARCOAL FILTER OPERATION, within 12 hours prior to movement of recently irradiated fuel assemblies in the Auxiliary Building and every 12 hours thereafter. (Tech Spec 3.7.11.1)

	INITIALS	DATE	TIME
COMPLETED			

NOTE
Communications shall be established for all core alterations.

   b. **ESTABLISH** direct communication between the Control Room and personnel at the refueling station(s), within 1 hour prior to the start of core alterations (TRM 15.9.2)

	INITIALS	DATE	TIME
COMPLETED			

6.9.B.4 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

NOTE
Communications shall be verified for all core alterations.

c. **ADD** note to the Shift Turnover Sheet under non-routine surveillance requirements, to verify communications at a frequency not to exceed **once every 12 hours** during core alterations.
(TRM TVR 15.9.2.1)

	INITIALS	DATE	TIME
COMPLETED			

d. **VERIFY** RFP level, **PER** the lowest indication, is greater than the 65 foot elevation (normally 67 feet) within 24 hours prior to the movement of irradiated fuel assemblies within Containment and every 24 hours thereafter.
(Tech Spec 3.9.6.1) **[B0407]**
(N/A if coupling CEAs after fuel movement)

	INITIALS	DATE	TIME
COMPLETED			

NOTE
RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

- The RFP level alarm band is set to plus or minus 0.2 ft. ____

e. **ENSURE** at least one Containment Iodine Filter is available for service. **[B0014]**

	INITIALS	DATE
COMPLETED		

6.9.B.4 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

f. **ENSURE** no containment closure deviations exist during movement of irradiated fuel assemblies within Containment.

	INITIALS	DATE
COMPLETED		

g. **ENSURE** the operable WRNIs to be used for refueling meet the requirements of the Fuel Handling procedures to be used for core alterations (i.e. Two operable channels should be in the vicinity of the last fuel assemblies removed during a core offload, and the first fuel assemblies inserted during a core onload).

	SE/NFM INITIALS	DATE
COMPLETED		

h. The RCS temperature is greater than 70° F and less than or equal to 140° F. (SR 3.9.1.1) **[B0477]**

	INITIALS	DATE
COMPLETED		

i. **IF** moving fuel assemblies within containment,
THEN SDC loop in operation circulating reactor coolant at a flow rate of ≥1500 gpm **OR** meeting the requirements of L.C.O. 3.9.4 note 1. (SR 3.9.4.1, 3.9.5.2)

	INITIALS	DATE
COMPLETED		

j. **IF** coupling CEA's,
THEN SDC loop in operation circulating reactor coolant at a flow rate of ≥1500 gpm **OR** meeting the requirements of L.C.O. 3.9.4 note 2. (SR 3.9.4.1, 3.9.5.2)

	INITIALS	DATE
COMPLETED		

6.9.B.4 CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT (Continued)

NOTE
An evaluation to ensure compliance with the FSAR, is required for instances where one or more of the radiation monitors are out of service.

k. **VERIFY** the following radiation monitors are in service:

- **IF** Cntmt Purge is in service,
  THEN 69' Elevation Containment Area Radiation Monitors, 2-RI-5316A thru D, are operable **PER** Tech Spec 3.3.7. This includes a check of the CRS Sensor Modules, ESFAS "A" Logic Modules, ESFAS "A" Manual Actuation Channel **AND** bypass keys on ESFAS. **[B0630]**

- **IF** Cntmt Purge is secured,
  THEN at least one of the 69' Elevation Containment Area Radiation Monitors, 2-RI-5316A thru D.

	INITIALS	DATE
COMPLETED		

5. Core alteration check list complete with all issues that will affect the refueling operation resolved. **[B0408]**

	SIGNATURE	DATE
SM		

****** END ******

6.9 CORE ALTERATIONS PREPARATIONS[B0408] (Continued)

NOTE
Steps in this section may be performed concurrently and in any order.

C. CORE ALTERATION CHECKLIST FOR CEA COUPLING AFTER FUEL MOVEMENT

NOTE
If CEA coupling is delayed, the appropriate steps for 72 hours, 24 hours and/or 1 hour after core alterations are required to be completed as appropriate.

1. **ENSURE** the appropriate steps in Section 6.9.B., CORE ALTERATION CHECKLIST FOR FUEL MOVEMENT have been completed.

	INITIALS	DATE
COMPLETED		

2. **ENSURE** STP O-92-1, REFUELING MACHINE AUX HOIST FUNCTIONAL TEST, is completed satisfactorily within 72 hours prior to the initial start of movement of CEA's within the reactor vessel for a refueling operation, consisting of either a fuel offload and onload **OR** a fuel shuffle, to consider the Refueling Machine Aux Hoist operable. (TRM TVR 15.9.3.2)
(N/A if the requirements of TRM TVR 15.9.3.2 have already been satisfied for the current refueling operation.)

	INITIALS	DATE	TIME
START			
COMPLETED			

6.9.C CORE ALTERATION CHECKLIST FOR CEA COUPLING AFTER FUEL MOVEMENT (Continued)

3. **VERIFY** RFP level is greater than 56.7 foot elevation.

	INITIALS	DATE
COMPLETED		

NOTE
RCS level alarms may be adjusted as necessary to prevent nuisance alarms. **REFER** to Section 5.0 AD.

- The RFP level alarm band is set to plus or minus 0.2 ft. ____

4. Core alteration check list complete with all issues that will affect CEA coupling after fuel movement resolved. **[B0408]**

	SIGNATURE	DATE
SM		

****** END ******

6.10 MODE 5 PREPARATIONS

INITIALS

NOTE
Operations can control both Sections of MODE 5 PREPARATIONS if they desire, BUT Outage Management can only control Section A., MODE 5 CHECKLIST (OUTAGE MANAGEMENT).

A. MODE 5 CHECKLIST (OUTAGE MANAGEMENT)

NOTE
Steps in this section may be performed concurrently and in any order.

1. **SAMPLE** the Waste Gas Surge Tank within 24 hours prior to entering Mode 5. (Tech Spec 5.5.12.A, TRM TVR 15.11.1.2)

	INITIALS	DATE	TIME
WGST SAMPLE			

2. **ENSURE** that the chemistry requirements of TRM 15.4.1 are met. ____

3. **DETERMINE** method to monitor Reactor Vessel Flange temperature when RCS level is less than the Reactor Vessel Flange (43.97 foot elevation): ____

   ☐ Pyrometer

   ☐ Reactor Vessel Flange Temperature Monitor

4. **REQUEST** the Plant Testing group have the responsible FSTCs certify and initial that the Surveillance Requirements under their responsibility are current to enter Mode 5 from Mode 6.

DISCIPLINE	INITIALS	DATE	TIME
Operations			
E&C			
Mechanical Maint			
Fire Protection			
MEIU			
Snubbers			

6.10.A MODE 5 CHECKLIST (OUTAGE MANAGEMENT) (Continued) **INITIALS**

5. **REQUEST** the responsible Engineering Supervisors certify and initial that no project **OR** modifications are currently outstanding which could impact entering Mode 5 from Mode 6.

DISCIPLINE	INITIALS	DATE	TIME
Primary Systems Engineering Unit			
BOP Systems Engineering Unit			
E&C Systems Engineering Unit			
PWR Reload Analysis			

6. **REQUEST** the Work Control Unit Supervisor certify and initial there are no tag outs which render equipment required for Mode 5 operation inoperable.

RESPONSIBILITY	INITIALS	DATE	TIME
WCU Supervisor			

7. **REQUEST** the SRO, Ops Work Control, with any needed assistance from the Post-Maintenance Test Coordinator, to certify and initial that post-Maintenance testing on completed maintenance orders (status W8, W9, T1, T2 and T3) identified as Mode 5 restraints are complete.

RESPONSIBILITY	INITIALS	DATE	TIME
SRO-Ops Work Control			

8. All safety related snubbers required for Mode 5 operation are operable. (TRM 15.7.2)

RESPONSIBILITY	INITIALS	DATE	TIME
MECHANICAL MAINTENANCE			

6.10.A MODE 5 CHECKLIST (OUTAGE MANAGEMENT) (Continued) **INITIALS**

9. **REQUEST** the responsible maintenance supervisors certify and initial that **ALL** maintenance activities, associated post-maintenance tests and supporting surveillance tests have been completed satisfactorily on components that are required for Mode 5 operation.

	INITIALS	DATE
GS-MECHANICAL MAINTENANCE		
GS-PROJECT MANAGEMENT		
GS-E&C MAINTENANCE		

10. **REQUEST** the PORC Chairman certify and initial that any PORC Open Items that prohibit entry into Mode 5 are appropriately closed.

RESPONSIBILITY	INITIALS	DATE	TIME
PORC Chairman			

11. **REQUEST** the responsible supervisors certify and initial that there are no open CRs, PGMIs **OR** RHOs that are Mode 5 restraints.

RESPONSIBILITY	INITIALS	DATE	TIME
Supervisor-Calvert Cliffs Warehouse Unit (RHOs)			
Outage Manager (CRs, PGMIs)			

****** END ******

6.10 MODE 5 PREPARATIONS (Continued) **INITIALS**

B. MODE 5 CHECKLIST (OPERATIONS)

NOTE

- Steps in this section may be performed concurrently and in any order.
- GS-SO permission is required to drain the RCS less than 37.5 foot.

1. **ENSURE** RCS level above the bottom of the hot leg (35.58 foot) by the lowest reading level indicator, within one hour of entering Mode 5. (Tech Spec SR 3.1.1.2)

	INITIALS	DATE	TIME
COMPLETED			

2. **ENSURE** STP 0-62-2, MONTHLY VALVE POSITION VERIFICATION, for Mode 5 is complete.

	INITIALS	DATE	TIME
COMPLETED			

3. **ENSURE ALL** sources of non-borated water greater than or equal to 88 GPM are tagged out within one hour of entering Mode 5. (Tech Spec SR 3.1.1.3) ____

4. **ENSURE** at least two coolant loops are operable. (Tech Spec 3.4.7, 3.4.8) ____

5. **ENSURE** the RCS is vented through a path of greater than or equal to eight square inches. (Tech Spec 3.4.12) ____

6. **ENSURE** a channel check on the Wide Range Neutron Monitors has been completed **PER** the Control Room Logs with at least two Source Range channels operable. (Tech Spec 3.3.12)

	INITIALS	DATE	TIME
COMPLETED			

6.10.B MODE 5 CHECKLIST (OPERATIONS) (Continued) **INITIALS**

7. **REVIEW** the Temporary Alteration Log for operability impact of equipment required in Mode 5 **AND VERIFY** the Mode 5 applicability box is checked on the Temporary Alteration Form. (Ref. MD-1-100)

	INITIALS	DATE
CRS		

8. **REVIEW AND EVALUATE ALL** procedure controlled temporary plant configuration changes **PER** MN-1-110, Appendix PC, for operability impact of equipment required for Mode 5.

	INITIALS	DATE
CRS		

9. **REVIEW** the Locked Valve Deviation sheets for operability of equipment required for entry to Mode 5.

	INITIALS	DATE
CRS		

10. **REVIEW** the Temporary Notes and Operator Aid Logs for operability of equipment required for entry to Mode 5.

	INITIALS	DATE
CRS		

11. **REVIEW** all active Component Manipulation Forms to ensure operability of equipment required for Mode 5.

	INITIALS	DATE
CRS		

6.10.B MODE 5 CHECKLIST (OPERATIONS) (Continued) **INITIALS**

12. **REVIEW** the LCO and PLCO log for Mode 5 applicability.

	INITIALS	DATE
CRS		

13. **ENSURE** the the following NO-1-103, CONDUCT OF LOWER MODE OPERATIONS, requirements are in place:

    - **VERIFY** the availability of equipment for the required MEE list of NO-1-200, CONTROL OF SHIFT ACTIVITIES. ____

      - **IF** the manway is removed,
        THEN VERIFY the equipment **PER** attachment for a unit with PZR manway removed **OR** an approved NO-1-103 Contingency Plan is in effect.

      OR

      - **IF** the manway is **NOT** removed,
        THEN VERIFY the equipment **PER** attachment for a unit in Mode 5 or 6 with NO S/G available and manway installed **OR** an approved NO-1-103 Contingency Plan is in effect.

    - **CONTINUE** logging the MEE in the Shift Turnover sheet ____

    - **CONTINUE** checking MEE availability once per 12 hours ____

14. **COMMENCE** taking Mode 5 and Mode 6 logs to ensure Mode 5 surveillances are being met. ____

15. **PRIOR** to tensioning the first Reactor Vessel stud, **COMMENCE** checking Reactor Vessel flange temperature greater than or equal to 70° F at least once per shift while in Mode 6, by one of the following methods: **[B0247]** ____

    a. **WHEN** the RCS level is greater than the Reactor Vessel Flange (43.97 foot elevation),
       THEN ENSURE SDC temperature from the RCS (as read on 2-TR-351) is greater than or equal to 95° F.

    b. **WHEN** the RCS level is less than the Reactor Vessel Flange (43.97 foot elevation),
       THEN UTILIZE one of the following methods:

       - **USE** a pyrometer to obtain local flange temperature
       - **OBTAIN** flange temperature from a Reactor Vessel Flange Temperature Monitor

6.10.B MODE 5 CHECKLIST (OPERATIONS) (Continued) **INITIALS**

16. **DOCUMENT AND APPROVE** any deviations to the requirements for Mode 5 entry below:

MODE 5 REQUIREMENT	DEVIATION	APPROVAL INITIALS SM	GS-SO

17. **CERTIFY** the following:

- **ALL** Mode 5 requirement deviations documented and approved
- **ALL** sign-offs, other than the equipment table, are **EITHER** signed within 3 days of the mode change **OR** re-verified by telephone and initialed by the Shift Manager.

Shift Manager _____ DATE/TIME_____/_____

a. **FORWARD** this completed section to the GS-SO for retention **PER** CNG-PR-3.01-1000, Records Management.

****** END ******

6.11 MODE 5 ENTRY **INITIALS**

NOTE
The reactor vessel head is considered tensioned when at least 18 equally spaced reactor vessel studs are tensioned to greater than 75% of designed pre-load. Maintenance will request permission to enter Mode 5 prior to tensioning the 18th stud to 75% of designed pre-load. **[B0247]**

A. **WHEN** Maintenance is prepared to tension the 18th equally spaced Reactor Vessel stud to 75% of designed pre-load, **THEN**:

* **LOG** Mode 5 entry in the CRO log. ____

* Within one hour, **ENSURE** requirements of T.S. 3.1.1 are met **AND RECORDED** in the CRO Log for the following:

  - Shutdown Margin ____
  - RCS level above the bottom of the hot leg ____
  - Sources of non-borated water are less than or equal to 88 GPM ____

****** END ******

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE

INITIALS

A. **IF** the RCS will be Vacuum Filled,
THEN PROCEED to Section 6.16, VACUUM FILL, **AND** N/A Sections 6.12, PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE, 6.13, FILL THE RCS AND GO SOLID, 6.14, DRAW PRESSURIZER BUBBLE, and 6.15, VENT THE RCS. ____

B. **IF** the RCS will **NOT** be Vacuum Filled,
THEN N/A Section 6.16, VACUUM FILL. ____

CAUTION
The MLMS pressure transducers should be isolated before the Pressurizer manway is installed to limit their possible pressure exposure.

C. **IF** the MLMS pressure transducers are installed,
THEN SHUT the following isolation valves to isolate the pressure transducers:

- PRESSURIZER HEADER NORTH EAST VENT VALVE, 2-RC-1168 ____
- PRESSURIZER INSTRUMENT HEADER SOUTH WEST VENT VALVE, 2-RC-1185 ____
- 2-PDT-111A HP HDR DRN, 2-RC-1276 ____
- 2-PDT-111A HP B/U HDR DRN, 2-RC-1277 ____
- 2-PDT-121A HP HDR DRN, 2-RC-1284 ____
- 2-PDT-121A HP B/U HDR DRN, 2-RC-1285 ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

- This procedure fills and vents the RCS in preparation for drawing a Pressurizer bubble. RCS level changes in support of outage activities are normally performed under direction of other sections of this procedure.
- Steps in this section may be performed concurrently and in any order.
- This section requires operator actions inside Containment to install temporary vent tubing.

D. **ENSURE** the following: **[B0270]**

* Reactor Vessel Head in place and bolted down ____
* Pressurizer manway installed ____
* **ALL** RCS piping and associated components installed **AND** RCS aligned **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS ____
* RCP shaft couplings installed ____
* The RWT contains sufficient volume to fill the RCS ____
* The RWT boron concentration is greater than the RCS Shutdown Boron Concentration limit of NEOP 301 ____
* **IF** available, Reactor Vessel level indication is in service ____

E. **IF** the temporary Pressurizer vent rig is **NOT** installed, **THEN REQUEST** Mechanical Maintenance to perform the following:

1. **INSTALL** the temporary Pressurizer vent rig (flow gauge and vent valve, 2-RC-277) to the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216. ____
2. **INDEPENDENTLY VERIFY** the temporary Pressurizer vent rig installation. ____
3. **INITIATE** MN-1-110 Attachment PC tracking. ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

F. **IF** RCS level is greater than 49 ft. elevation, **THEN REQUEST** I&C to fill the reference leg, vent, and place in service, the following Quench Tank **AND** Pressurizer Level Transmitters: 04400

1. Quench Tank Level Transmitter:

   - 2-LT-116 ____

2. Pressurizer Level Transmitters:

   - 2-LT-103 ____
   - 2-LT-110X ____
   - 2-LT-110Y ____

G. **IF** RCS level is less than 49 ft. elevation, **THEN ENSURE** RCS Wide Range Level Monitoring System in service. ____

NOTE

IF Radiation Safety allows entry into the Refueling Pool, **THEN** the following temporary tubing should be run to the nearest Refueling Pool cavity drain.

H. **INSTALL** temporary tubing at the following locations:

   * Reactor Vessel Vent, routed to the Refueling Pool ____
   * Pressurizer Vent, routed to the Refueling Pool ____
   * Refueling Pool Cavity Drain to the Containment Sump. ____

I. **IF** the RCS was drained below 39 ft. elevation, **THEN INSTALL** temporary tubing at the Regenerative Heat Exchanger Vent, routed to the Containment Normal Sump. ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
When Pressurizer level is less than 90 inches, two Charging pumps shall be tagged out with their breakers racked out and discharge valves shut to limit dilution sources to less than 88 GPM.

J. **ENSURE** CVCS Charging **AND** Letdown are available for operation with:

* One Charging pump available to be aligned to the RWT ____
* At least one loop Charging Stop, 2-CVC-518-CV or 2-CVC-519-CV, OPEN ____
* L/D STOP, 2-CVC-515-CV shut ____
* LD CNTMT ISOL, 2-CVC-516-CV shut ____

K. **PLACE** at least two Core Exit Thermocouples, one each from ZA **AND** ZB and from different core quadrants, on Recorder Trend. ____

L. **PLACE** Typed Trend Blocks 26 **AND** 27 on a five minute trend for the duration of the RCS fill. ____

M. **ENSURE** with Chemistry that the RWT contents used for filling the RCS meet the RCS Chemistry requirements of CP-204. ____

N. **ENSURE OPEN** Component Cooling Containment isolation valves:

- CC CNTMT SUPPLY.....2-CC-3832-CV ____
- CC CNTMT RETURN.....2-CC-3833-CV ____

O. **ENSURE** S/G nitrogen blankets have been secured **PER** OI-12B, Section titled, SECURING S/G NITROGEN BLANKET. ____

NOTE
- Step O must be completed prior to performing step P.
- Maintaining Quench Tank pressure less than 1.5 PSIG helps prevent PORVs from leaking. **[B0771]**

P. **PREPARE** the Quench Tank for plant startup **PER** OI-1B, QUENCH TANK OPERATIONS, SECTION 6.11, QT LINEUP FOR PLANT STARTUP AT LOW RCS PRESSURE. ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
Actual S/G level may be determined by comparing remote indicated level to FIGURE 6 **OR** by use of the local sightglass.

Q. **ENSURE ONE** of the following conditions exist:

- **BOTH** S/Gs are between (-)40 and (+)60 inches actual level ____
- An exception for S/G level requirement has been approved by the GS-SO or M-NO

  Exception Approval Verified By:_____
  Shift Manager ____

R. **SECURE** SDC Purification **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

CAUTION
Step R must be commenced prior to performing step S. OI-2D will direct when to continue.

S. **UNISOLATE AND PLACE IN SERVICE BOTH** Letdown Control valves and Backpressure Regulating valves as follows:

1. **ENSURE SHUT BOTH** LETDOWN LINE CONTR ISOL valves:

   - L/D STOP.....2-CVC-515-CV ____
   - LD CNTMT ISOL.....2-CVC-516-CV ____

2. **ENSURE OPEN** L/D CV INLET valves:

   - (2-CVC-110P-CV) L/D CV INLET.....2-CVC-105 ____
   - (2-CVC-110Q-CV) L/D CV INLET.....2-CVC-103 ____

3. **ENSURE OPEN** L/D CV OUTLET valves:

   - (2-CVC-110P-CV) L/D CV OUTLET.....2-CVC-106 ____
   - (2-CVC-110Q-CV) L/D CV OUTLET.....2-CVC-104 ____

4. **ENSURE OPEN** BP REG INLET valves:

   - (2-CVC-201P-CV) BP REG INLET.....2-CVC-108 ____
   - (2-CVC-201Q-CV) BP REG INLET.....2-CVC-110 ____

5. **ENSURE OPEN** BP REG OUTLET valves:

   - (2-CVC-201P-CV) BP REG OUTLET.....2-CVC-109 ____
   - (2-CVC-201Q-CV) BP REG OUTLET.....2-CVC-111 ____

6. **PLACE** L/D CONTR VLVS Selector Switch, 2-HS-110-1, in BOTH. ____

6.12.S PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

7. **PLACE** BACKPRESSURE REG VLVS selector switch, 2-HS-201, in BOTH. ____

8. **PLACE** L/D PRESS controller, 2-PIC-201, in AUTO with a setpoint of 100 PSIG. ____

9. **ADJUST** L/D THROTTLE VLV controller 2-HIC-110 in MANUAL to obtain 100% output, to open Letdown Control valves to their open limit. ____

CAUTION
RCS level will lower slightly during the performance of step T.

T. **PERFORM** the following to **ENSURE OPEN BOTH** MINI FLOW RETURN TO RWT ISOL valves: **[B1250]**

1. **ENSURE OPEN** MINI FLOW RETURN TO RWT ISOL, 2-SI-659-MOV. ____

2. **ENSURE OPEN** MINI FLOW RETURN TO RWT ISOL, 2-SI-660-MOV. ____

3. **VERIFY** at least 42 GPM mini flow indicated on the digital flow meter located in 22 ECCS Pump Room by **SLOWLY THROTTLING OPEN** the running LPSI pump mini flow:

   - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449 ____

   OR

   - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450 ____

4. **SHUT** the selected LPSI pump mini flow:

   - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449 ____

   OR

   - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450 ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

> **NOTE**
> The Pressurizer Heaters are **NOT** tagged out for solid water operations here because they are needed to draw the Pressurizer bubble.

U. **IMPLEMENT** the following solid water controls: **[B0064]**

1. **ENSURE ALL** Pressurizer Heaters in OFF. ____

2. **TAGOUT** the RCPs by **ONE** of the following methods:

   - **BOTH** feeder breakers 252-1202 and 252-2201 racked out ____
   - **ALL** eight RCP breakers racked out ____

3. **ENSURE BOTH** PORVs operable with **ALL** of the following conditions:

   * STPs M-572A, M-572B and M-672B current ____

   * **BOTH** PORV handswitches in SINGLE MPT ENABLE:

     - PORV 402 MPT PROTECTION....2-HS-1406 ____
     - PORV 404 MPT PROTECTION....2-HS-1408 ____

   * **BOTH** PORV Override Shut/Auto handswitches in AUTO:

     - PORV 402 OVERRIDE....2-HS-1402 ____
     - PORV 404 OVERRIDE....2-HS-1404 ____

4. **ENSURE BOTH** PORV Block Valves are fully open. ____

5. **ENSURE** two Charging pumps have their breakers racked out and tagged:

   - 21 Charging pump.....52-2115 ____
   - 22 Charging pump.....52-2415 ____
   - 23 Charging pump....52-2104 **AND** 52-2404 ____

6.12.U PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

6. **ISOLATE** HPSI pumps by **ONE** of the following methods:

   a. **RACK OUT AND DANGER TAG ALL** four HPSI pump breakers **PER** OI-27C, 4.16 KV SYSTEM:

      - 21 HPSI pump.....152-2108 ____
      - 22 HPSI pump.....152-2408 ____
      - 23 HPSI pump.....152-2110 ____
      - 23 HPSI pump.....152-2410 ____

   OR

   b. The following valves will be CAUTION Tagged shut **AND** their breakers open (where applicable)

      (1) **LOCK SHUT AND TAG** ALL three HPSI pump manual discharge valves:

      - 21 HPSI PP DISCH ISOL 2-SI-428 ____
      - 22 HPSI PP DISCH ISOL 2-SI-415 ____
      - 23 HPSI PP DISCH ISOL 2-SI-406 ____

      OR

      (2) **ALL** eight MAIN and AUX HPSI Loop Isolation valves:

HPSI MAIN HDR	HPSI AUX HDR
2-SI-616-MOV	2-SI-617-MOV
2-SI-626-MOV	2-SI-627-MOV
2-SI-636-MOV	2-SI-637-MOV
2-SI-646-MOV	2-SI-647-MOV

____

      OR

      (3) **BOTH** MAIN and AUX HPSI Header Isolation valves:

HPSI MAIN HDR ISOL	HPSI AUX HDR ISOL
2-SI-654-MOV	2-SI-656-MOV

____

V. **TERMINATE** operational testing of Safety Injection and CVCS components until normal water level is established in the Pressurizer. **[B0064]** ____

6.12 PREPARE RCS FOR DRAWING PRESSURIZER BUBBLE (Continued) **INITIALS**

W. **CHECK** the following actions complete PRIOR to continuing:

* The temporary Pressurizer vent rig is installed ____

* **IF** RCS level is greater than 49 ft. elevation, **THEN** I&C has completed placing the Quench Tank **AND** Pressurizer Level Transmitters in service ____ 04400

* Section in OI-2D, PURIFICATION SYSTEM OPERATION for securing SDC Purification is complete. ____

****** END ******

6.13 FILL THE RCS AND GO SOLID

INITIALS

NOTE

- This section requires operator actions inside Containment to:
  - Vent the Reactor Vessel
  - Vent the Pressurizer
  - Isolate Reactor Vessel level instrumentation (if needed)
  - Fill the SITs (if needed)
- Advanced determination of the drain path to be used when drawing a bubble minimizes the TIME the RCS is in a solid water condition.

A. **DETERMINE** the drain path to be used when drawing the Pressurizer bubble, as follows: (check one) ____

☐ **IF BOTH** of the following conditions exist, **THEN DRAIN** to the RWT (preferred path):

- At least 10 inches RWT capacity exists ____
- RCS boron concentration is such that final RWT boron concentration will be between 2450 PPM and 2700 PPM, as determined by APPENDIX 4, CALCULATION OF FINAL RWT CONCENTRATION FOR RCS DRAIN. ____

☐ **IF** the RWT is **NOT** available, **THEN DRAIN** to RCW (alternate path).

NOTE

Locked valves, controlled under NO-1-205

B. **ENSURE OPEN** 21 RWT OUT on the selected LPSI pump that will be used to fill the RCS:

- (21 LPSI pump) 21 RWT OUT, 2-SI-4143-MOV ____
- (22 LPSI pump) 21 RWT OUT, 2-SI-4142-MOV ____

CAUTION

Portable radio usage in Containment shall be in accordance with NO-1-113.

C. **DISPATCH** an operator into Containment, with communications available with the Control Room, in preparation for Reactor Vessel and Pressurizer venting operations. ____

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

D. **IF** RCS level is less than 49 ft. elevation,
THEN DISPATCH I&C into Containment to place the Quench Tank Level Transmitter in service,
AND to **PREPARE** to place the Pressurizer Level Transmitters in service,
WHEN Pressurizer Level reaches 50 inches (53 ft. elevation): 04400

1. Quench Tank Level Transmitter:

   - 2-LT-116 ____

2. Pressurizer Level Transmitters:

   - 2-LT-103 ____
   - 2-LT-110X ____
   - 2-LT-110Y ____

E. **NOTIFY** Radiation Safety Supervision of the following:

- Drawing a bubble in the Pressurizer. ____
- Drain path to be used. ____
- Pending venting operations. ____

WARNING
Opening RCS vents could raise airborne contamination levels. **ALL** vented fluids shall be treated as radioactive unless certified clean by Chemistry.

F. **VERIFY OPEN** the following Pressurizer Vent valves:

- PZR VENT ISOL.....2-RC-215 ____
- PZR VENT STOP.....2-RC-216 ____
- PZR VENT THROT.....2-RC-277 ____

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

NOTE

- Locked valves, controlled under NO-1-205.
- The top of the Pressurizer and a full RWT are at approximately the same elevation. The LPSI fill rate should be expected to change as RCS level rises. Pressurizer vent capacity may also affect LPSI fill rate.
- Pressurizer level shall be monitored using one set of the following level indicators: (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches)
  - 2-LI-103 and computer point L110X!

  OR
  - 2-LI-103 and Computer point L110Y!
- RCS cooldown rate shall be monitored using the CETs on the Trend Recorder. SDC to RCS temperature on 2-TR-351 is lower than RCS temperature due to the relatively cold RWT water used to fill the RCS.

CAUTION

- Do **NOT** exceed the following RCS cooldown rates:

RCS Temperature	Maximum Cooldown Rate
Greater than 146° F	100° F per hour
146° F or less	40° F per hour

- To prevent cooling the Reactor Vessel below 70° F and S/Gs below 85° F, CET temperatures must be maintained above 95° F.

G. While monitoring RCS temperature, initiate RCS fill by **THROTTLING OPEN** the selected LPSI PP normal suction valve:

- 21 LPSI PP NORM SUCT ISOL, 2-SI-444 ____
- 22 LPSI PP NORM SUCT ISOL, 2-SI-432 ____

H. **ADJUST** SDC TEMP CONTR, 2-HIC-3657, as necessary to maintain RCS temperature between 95° F and 150° F. ____

I. **START** the selected Charging Pump **PER** OI-2A, Section titled RUNNING A CHARGING PUMP IN MODE 5 OR 6, aligned to the RWT. ____

J. **IF** this RCS fill was started with level below 49 ft. elevation, **THEN VERIFY** I&C has completed placing the Quench Tank Level Transmitter in service 04400

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

K. **IF** this RCS fill was started with level below 49 ft. elevation, **THEN** when Pressurizer level reaches 50 inches (53 ft. elevation) **REQUEST** I&C fill the reference leg, vent, and place in service, the following Pressurizer Level Transmitters **BEFORE** Pressurizer level reaches 150 inches (61.4 ft. elevation): 04400

- 2-LT-103 ____
- 2-LT-110X ____
- 2-LT-110Y ____

CAUTION
Pressurizer Level Transmitters are required in service prior to exceeding 61.4 ft. elevation (150 inches).

L. **IF** necessary, **THEN CONTROL** RCS fill rate to assure Pressurizer level transmitters are in service prior to exceeding 150 inches (61.4 ft. elevation). ____

CAUTION
PORVs which open due to overpressure, will remain open. The cause of the overpressure condition should be determined and corrected before shutting the PORVs.

NOTE
The dedicated operator is not required to be stationed when maintaining PZR level constant at <300" in the PZR.

M. Prior to exceeding 170 inches in the pressurizer, **STATION** a dedicated licensed operator as the solid water overpressurization watch with the following duties: **[B0593]**

* **MONITOR** the following:

- RCS pressure ____
- Pressurizer level ____
- Pressurizer heaters ____
- Letdown flow ____
- Charging pump operation ____

* **TAKE** necessary corrective actions to prevent overpressurization of the RCS. ____

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

N. **WHEN** Pressurizer level reaches 150 inches,
THEN PERFORM the following while continuing to fill the RCS:

1. **OPEN BOTH** LETDOWN LINE CONTR ISOL valves: ____

   - L/D STOP.....2-CVC-515-CV ____
   - LD CNTMT ISOL.....2-CVC-516-CV ____

2. **MAKE** the following log entries in the Transient Tracking Log:

   - Initiation of Pressurizer/RCS heatup ____
   - Letdown initiation ____

3. **COMMENCE** recording Pressurizer Heatup data in APPENDIX 2, PRESSURIZER HEATUP LOG. ____

4. **PLACE** PZR PRESS CONTR 2-PIC-100X and 2-PIC-100Y in AUTO with a setpoint of 2250 PSIA. ____

CAUTION

- Do **NOT** exceed the following RCS heatup rates:

RCS Temperature	Maximum Heatup Rate
70° F to 246° F	80° F per hour
Greater than 246° F	100° F per hour

- Do **NOT** exceed a Pressurizer linear heatup rate of 100° F per hour
- Do **NOT** exceed a Pressurizer temperature of 180° F prior to being filled solid.

5. **ENERGIZE** Pressurizer Backup and Proportional Heaters in AUTO as necessary to maintain Pressurizer Heatup rate less than 100° F per hour **AND** non-solid temperature less than 180° F. ____

6.13.N FILL THE RCS AND GO SOLID (Continued) **INITIALS**

CAUTION
To prevent draining the RCS through the instrument loop, the RCS Wide Range Level Monitoring System shall be isolated before Pressurizer level reaches 229 inches (68 ft. elevation).

6. **SECURE** the RCS Wide Range Level Monitoring System **AND** Refueling Level Panel as follows:

   a. **SHUT** REFUEL LVL IND ISOL, 2-RC-105 ____

   b. **SHUT** REFUEL LVL IND STOP, 2-RC-106 ____

   c. **SHUT** ROOT ISOL FOR LE-4139 & LG-4139, 2-RC-1242 ____

   d. **SHUT** B/U ISOL FOR LE-4139 & LG-4139, 2-RC-1243 ____

   e. **VERIFY** the pipe cap is removed **AND OPEN** HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. **[B0132]** ____

   f. **SHUT** ISOL FOR 2-LT-4140, 2-RC-1236. ____

   g. **IF** RCS level in the sightglass is greater than the 63 ft elevation,
   THEN DRAIN the sightglass using LT-4140 DRAIN, 2-RC-1237 to a desired level below the 63 ft elevation to ensure thermal expansion of water in sightglass does not overflow the vent. ____

   h. **ENSURE SHUT** LT-4140 DRAIN, 2-RC-1237. ____

   i. **SHUT** ISOL FOR 2-LT-4140, 2-RC-1235. ____

NOTE
This step may be performed concurrently with the remainder of this section.

   j. **DE-ENERGIZE** the RCS Level Monitoring Systems by placing 2CS4138 **AND** 2CS4139 in OFF. (located in the Cable Spreading Room on the east wall, just inside the door) ____

NOTE
This step may be performed concurrently with the remainder of this section.

   k. **REQUEST** IM Shop to remove the Refueling Level Cart. ____

6.13.N FILL THE RCS AND GO SOLID (Continued) **INITIALS**

7. **IF** the local Reactor Vessel level indicator tygon tube is in service, **THEN REMOVE** it from service as follows:

   a. **SHUT** LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

   b. **CONTACT** IM to remove **AND** stow the tygon tube. ____

> **NOTE**
> If a pressure reduction is required and the Reactor vessel has been vented, the Reactor vessel head should be vented again. **[B0720]**

O. **WHEN** Pressurizer level reaches 241 inches (69 ft. elevation), **THEN VENT** the Reactor Vessel as follows:

1. **OPEN** the Reactor Vessel Vent valves (located at 69 ft. elevation on the edge of the Refueling Pool, on the Reactor Vessel side of 2-PDT-124): ____

   - RX VSL VENT ISOL.....2-RC-279 ____
   - RX VSL VENT STOP.....2-RC-280 ____

2. **WHEN** a steady stream of air-free water issues from the vent line, **THEN SHUT** the Reactor Vessel Vent valves.

   - RX VSL VENT ISOL.....2-RC-279 ____
   - RX VSL VENT STOP.....2-RC-280 ____

3. **IF** the RCS was **NOT** drained below 39 ft. elevation during the outage, **THEN REMOVE AND STOW** the temporary tubing while continuing with this procedure. ____

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

NOTE
Locked valves, controlled under NO-1-205.

CAUTION
The LPSI PP normal suction valves must be shut before the RCS approaches solid to prevent overpressurizing the suction piping.

P. **WHEN** desired to secure the fill via the LPSI normal suction valve,
OR Pressurizer level reaches 350 inches,
THEN LOCK SHUT the LPSI PP normal suction valve used to fill the RCS:

- 21 LPSI PP NORM SUCT ISOL, 2-SI-444 ____
- 22 LPSI PP NORM SUCT ISOL, 2-SI-432 ____

NOTE
The RCS is now being filled to a solid water condition. To minimize the time the RCS is in a solid water condition, it is desirable to continue heatup of the Pressurizer and draw a bubble once the RCS is filled.

Q. **WHEN** a steady stream of air-free water issues from the Pressurizer vents,
THEN SHUT the Pressurizer Vent valves:

- PZR VENT ISOL.....2-RC-215 ____
- PZR VENT STOP.....2-RC-216 ____
- PZR VENT THROT.....2-RC-277 (temporary valve) ____

R. **ENSURE** RCS pressure maintained approximately 100 PSIG by L/D PRESS CONTR, 2-PIC-201. ____

CAUTION
To prolong RCP seal life, CBO flow should be aligned to the VCT as soon as RCS pressure is greater than VCT pressure.

S. **WHEN** RCS pressure is greater than VCT pressure,
THEN OPEN the RCP CBO Isolation valves:

- RCP BLEED CNTMT ISOL.....2-CVC-505-CV ____
- RCP BLEED CNTMT ISOL.....2-CVC-506-CV ____

6.13 FILL THE RCS AND GO SOLID (Continued) **INITIALS**

T. **WHEN** VCT level is greater than 88 inches,
THEN SHIFT the Charging Pump suction to the VCT:

1. **OPEN** VCT OUT, 2-CVC-501-MOV ____

2. **SHUT** RWT CHG PP SUCT, 2-CVC-504-MOV ____

U. **REQUEST** Mechanical Maintenance perform the following while continuing with this procedure.

1. **REMOVE** the temporary Pressurizer vent rig (flow gauge and vent valve, 2-RC-277) to the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216. ____

2. **INSTALL** the blank flange on the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216. ____

3. **INDEPENDENTLY VERIFY** the temporary Pressurizer vent rig is removed **AND** the vent line flanged off. ____

4. **CLOSE OUT** the MN-1-110 Attachment PC form. ____

****** END ******

6.14 DRAW PRESSURIZER BUBBLE

INITIALS

NOTE

- Pressurizer level shall be monitored using one set of the following level indicators: (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches)
  - 2-LI-103 and computer point L110X!

  OR
  - 2-LI-103 and Computer point L110Y!
- After an outage where RCS level was lowered below the top of the Hot Leg (which drains the S/G tubes) the Pressurizer bubble will form during Pressurizer heatup instead of when draining the RCS. Thermal expansion displaces water from the Pressurizer into the S/G tubes, limiting the pressure rise, resulting in the Pressurizer reaching a saturated condition.

A. **IF** this is the initial fill after an outage where the S/G tubes were drained,
THEN MONITOR for spontaneous Pressurizer bubble formation, while Pressurizer temperature is raised, as indicated by the following parameters: ____

- Pressurizer level decreasing with steady or increasing pressure ____
- Pressurizer temperature corresponds to saturation temperature for Pressurizer pressure ____

B. **ENERGIZE** Backup and Proportional Heaters in AUTO as necessary to maintain Pressurizer Heatup rate less than 100° F per hour **AND COMMENCE** heat up to establish Pressurizer pressure between 100 PSIA and 195 PSIA. ____

- **RECORD** Pressurizer heatup data in APPENDIX 2, PRESSURIZER HEATUP LOG. ____

C. **WHEN** Pressurizer temperature reaches 300° F (approximately 70 PSIA saturation),
THEN STOP the running Charging Pump **AND PLACE** in PULL TO LOCK. ____

CAUTION

The VCT is made a closed system with CBO initiated and Charging secured. Overpressurization of the VCT is possible in this configuration.

D. **COMMENCE** monitoring VCT level and pressure.

- **IF** required to lower VCT pressure,
  THEN VENT the VCT **PER** OI-2A, CHEMICAL AND VOLUME CONTROL SYSTEM. ____
- **IF** required to lower VCT level,
  THEN DRAIN the VCT to RCW by cycling VCT DRN, 2-CVC-161. ____

6.14 DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

E. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

CAUTION
During the formation of the Pressurizer bubble, a large quantity of relatively hot water will enter the RCS from the Pressurizer when the RCS is drained. This may require adjusting SDC temperature to maintain RCS temperature less than 200° F.

F. **COMMENCE** continuous monitoring of Pressurizer pressure and level (2-LI-103 and Computer point L110X!, **OR** 2-LI-103 and Computer point L110Y!), **AND** RCS temperature. (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches) ____

CAUTION
Excessive drain rates may exceed Pressurizer Heater capacity to maintain Pressurizer pressure.

G. **COMMENCE** draining the RCS, using the pre-determined flowpath, as follows:

1. **MAINTAIN** Pressurizer pressure:

   - Greater than 70 PSIA ____
   - Less than 195 PSIA ____

2. **IF** draining to the RWT via the LPSI Miniflow Isolation, **THEN**:

   a. **NOTIFY** Radiation Safety Supervision that the RCS will be drained to the RWT. ____

NOTE
Locked valves, controlled under NO-1-205.

   b. **OPEN** the running LPSI pump Miniflow Isolation:

   - 21 LPSI PP MINI FLOW RTN ISOL.....2-SI-449 ____
   - 22 LPSI PP MINI FLOW RTN ISOL.....2-SI-450 ____

6.14.G.2 **DRAW PRESSURIZER BUBBLE (Continued)** **INITIALS**

> **NOTE**
> Locked valves, controlled under NO-1-205.

c. **IF** desired to raise the drain rate,
THEN OPEN ONE of the following valves:

- 22 SDC HX TO HPSI SUCT.....2-SI-662-MOV ____
- 21 SDC HX TO HPSI SUCT.....2-SI-663-MOV ____

d. **MONITOR** RWT level change. ____

3. **IF** draining to the RWT via SI LEAKOFF TO RWT ISOL, 2-SI-459,
THEN:

a. **NOTIFY** Radiation Safety Supervision that the RCS will be drained to the RWT. ____

> **NOTE**
> Locked valves, controlled under NO-1-205.

b. **OPEN** SDC HX OUT TO RWT, 2-SI-460. ____

> **NOTE**
> Locked valves, controlled under NO-1-205.

c. **THROTTLE OPEN** SI LEAKOFF TO RWT ISOL, 2-SI-459. ____

d. **MONITOR** RWT level change. ____

4. **IF** draining to RCW,
THEN:

a. **DIVERT** Letdown flow to RCW by placing 2-HS-2500 for 2-CVC-500-CV in WPS. ____

b. **PLACE** L/D PRESS controller, 2-PIC-201, in MANUAL. ____

c. **ADJUST** 2-PIC-201 in MANUAL to obtain 100% output, to fully open **BOTH** Backpressure Regulating valves. ____

d. **RESET** Diversion Flow Integrator, 2-FQI-2540 **OR MONITOR** RC Waste Receiver Tank level change. ____

H. **ADJUST** SDC TEMP CONTR, 2-HIC-3657, as necessary to maintain RCS temperature below 200° F. ____

6.14 DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

> **NOTE**
> Pressurizer level instruments read to 360 inches. Pressurizer volume for draining from solid at 404 inches to 350 inches, when the level instruments are on scale, is approximately 1620 gallons. This equates to approximately 1.9 inch RWT level change and 0.75 feet RC Waste Receiver Tank level change.

I. **IF** any of the following occur **AND** pressurizer level indicates no change:

- 30 minutes of draining ____
- RWT level rises by 1.9 inch ____
- in service RC Waste Receiver Tank rises by 0.75 feet. ____
- CVCS Flow Diversion Integrator, 2-FQI-2540, indicates 1620 gallons have been drained from the Pressurizer ____

THEN PERFORM the following:

1. **SECURE** the drain by shutting the valves opened to initiate the drain:

   - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449 ____
   - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450 ____
   - 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV ____
   - 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV ____
   - SI LEAKOFF TO RWT ISOL, 2-SI-459 ____
   - SDC HX OUT TO RWT, 2-SI-460 ____

2. **PLACE** L/D PRESS controller, 2-PIC-201, in AUTO with a setpoint of 150 PSIG. ____

3. **UTILIZE** Pressurizer Heaters to maintain Pressurizer pressure between 50 and 150 PSIA. ____

4. **INVESTIGATE** the cause of no change in level, including, **BUT NOT** limited to: ____

   - Instrumentation malfunction: compare indicated level to Reactor Vessel level to determine need to refill the RCS
   - Valve misalignment in drain path

5. **WHEN** corrective actions are complete **AND** it is desired to continue with drawing the bubble,
   THEN RE-INITIATE draining **PER** this section. ____

   - **IF** re-initiating drain to RCW,
     THEN LOG Letdown initiation in the Transient Tracking Log. ____

6.14 DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

J. **CHECK** Pressurizer bubble established by the following parameters: ____

- Pressurizer level lowering with steady or rising pressure
- Pressurizer temperature corresponds to saturation temperature for Pressurizer pressure

K. **WHEN** the formation of the bubble has been verified, **THEN CONTINUE** draining to lower Pressurizer level to 144 inches (2-LI-103 and Computer point L110X! **OR** 2-LI-103 and Computer point L110Y!). ____

NOTE
Step L is required to be performed only one time after the RCS has been vented to atmosphere. 04400

CAUTION
RCP CBO RV, 2-CVC-199-RV setpoint is approxomately 140 PSIG (154.7 PSIA). 04400

L. **IF** Unit 2 RCS has been vented to atmosphere, **THEN PERFORM** the following to lubricate the vapor seal: 04400

1. **ENSURE** Pressurizer pressure is between 100 and approximately 120 PSIA. ____
2. **SHUT** RCP CBO CV, 2-CVC-505-CV **OR** 2-CVC-506-CV. ____
3. **WHEN** 10 minutes has elapsed, **THEN OPEN** RCP CBO CV, 2-CVC-505-CV **OR** 2-CVC-506-CV. ____

M. **CYCLE** Pressurizer Heaters to maintain Pressurizer pressure between 100 PSIA and 195 PSIA **AND** Pressurizer temperature at least 30° F above the highest RCS loop temperature. ____

6.14 DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

N. **STABILIZE** Pressurizer level at 144 inches (2-LI-103 and Computer point L110X! **OR** 2-LI-103 and Computer point L110Y!) as follows:

> **NOTE**
> Locked valves, controlled under NO-1-205.

1. **IF** draining to the RWT via the LPSI Miniflow Isolation, **THEN SHUT** the running LPSI pump Miniflow Isolation:
   - 21 LPSI PP MINI FLOW RTN ISOL.....2-SI-449 ____
   - 22 LPSI PP MINI FLOW RTN ISOL.....2-SI-450 ____
   - **IF** the following valves were opened, **THEN SHUT**:
     - 22 SDC HX TO HPSI SUCT....2-SI-662-MOV ____
     - 21 SDC HX TO HPSI SUCT....2-SI-663-MOV ____

> **NOTE**
> Locked valves, controlled under NO-1-205.

2. **IF** draining to the RWT via SI LEAKOFF TO RWT ISOL, 2-SI-459, **THEN SHUT**:
   - SI LEAKOFF TO RWT ISOL, 2-SI-459 ____
   - SDC HX OUT TO RWT, 2-SI-460 ____
3. **IF** draining to RCW, **THEN DIRECT** Letdown flow to the VCT by placing 2-HS-2500 for 2-CVC-500-CV in AUTO. ____
4. **ENSURE** the B/U CHG PP SEL switch, 2-HS-224, is selected to a position that does **NOT** have the available CHG PP listed. ____
5. **START** the available CHG PP. ____
6. **ENSURE** L/D PRESS controller, 2-PIC-201, in MANUAL. ____
7. **ADJUST** 2-PIC-201 output to balance Charging and Letdown to maintain Pressurizer level at 144 inches. ____
8. **LOG** initiation of Charging and Letdown in the Transient Tracking Log. ____

O. **OBSERVE** the indication on the selected PZR LVL CONTR CH, 2-LIC-110X **OR** 2-LIC-110Y, that corresponds with a reading of 144 inches on 2-LI-103, **OR** Computer points L110X! **OR** L110Y!. ____

6.14 DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

P. **ADJUST** the local setpoint on the selected PZR LVL CONTR CH, 2-LIC-110X **OR** 2-LIC-110Y, to match the level observed above, **AND PLACE** it in AUTO. ____

Q. **PLACE** L/D THROTTLE VLV controller, 2-HIC-110, in AUTO. ____

R. **ADJUST** 2-PIC-201 to maintain approximately 100 PSIG backpressure **AND** a Pressurizer level of 144 inches. ____

1. **IF** desired,
   THEN PLACE 2-PIC-201 in AUTO. ____

S. **COMMENCE** monitoring VCT level during heatup **AND DIVERT** Letdown to RCW to maintain level as necessary. ____

T. **IF** the Pressurizer was drained to the RWT,
THEN PERFORM the following:

1. **IF** the RCS boron concentration was **NOT** within 10 PPM of the RWT boron concentration,
   THEN INITIATE recirculation of the RWT using the SFP Cooling pump, **PER** OI-24E, RECIRCULATION OF REFUELING WATER TANKS. **[B0029]** ____

2. **IF** the RCS boron concentration **WAS** within 10 PPM of the RWT boron concentration,
   THEN INITIATE recirculation of the RWT using the RWT Recirc pump **OR** the SFP Cooling pump, **PER** OI-24E, RECIRCULATION OF REFUELING WATER TANKS. ____

NOTE

A 2 volume recirc of a full RWT will take 9 hours using a SFP pump **OR** 24 hours using the RWT Recirc pump.

3. **NOTIFY** Chemistry that a 2 volume recirc of the RWT has been started **AND** to obtain and analyze an RWT sample for boron concentration when the 2 volume recirc is complete. ____

U. **IF** necessary to raise S/G temperatures,
THEN CONSIDER using 2 LPSI pump operation on SDC. ____

V. **PRESSURIZE** the Quench Tank for plant Normal Operation **PER** OI-1B, QUENCH TANK OPERATIONS, SECTION 6.1, ADDING DI **OR** N_2 TO THE QT. ____

****** END ******

6.15 VENT THE RCS

INITIALS

NOTE

IF the RCS was drained to less than 39 ft. elevation,
THEN operator actions are required inside Containment to support venting the Regenerative Heat Exchanger and performing RCP venting.

A. **ENSURE** RCPs are available for operation. ____

B. **IF** the RCS was drained below the bottom of the Pressurizer (48 foot elevation) or any other activity was performed that may have introduced air into the Reactor Vessel Head,
THEN REQUEST chemistry to sample the RCS for suspended solids. ____

C. **VERIFY** the primary temperature is greater than 100° F using TR-351 **AND** S/G secondary temperature is greater than 85° F using a hand pyrometer or with other calibrated temperature instruments, with a maximum tolerance of (±) 5°. ____

D. **IF** the RCS was drained below 39 ft. during the outage,
THEN PERFORM S/G tube sweeps as follows:

1. **ENSURE** Pressurizer level is less than 170 inches. **[B0064]** ____

2. **ENERGIZE** Pressurizer Heaters to raise Pressurizer pressure to between 220 PSIA and 250 PSIA. ____

3. **RECORD** Pressurizer heatup data in APPENDIX 2, PRESSURIZER HEATUP LOG. ____

6.15.D VENT THE RCS (Continued) **INITIALS**

NOTE

- If SDC is secured, RCS temperature shall be determined using RCS T_{AVG} (the average of RCS T_{HOT} and T_{COLD}) from the loop with the largest delta T
  - (21 loop) 2-TI-112H, 2-TI-112C
  - (22 loop) 2-TI-122H, 2-TI-122C
- If SDC is in operation, RCS temperature shall be determined using the SDC Temperature Recorder, 2-TR-351, **OR** computer points as follows:
  - If **NO** LPSI flow rate changes have been made in the previous 30 minutes, using the average SDC Temperature (the average of FROM RCS(red pen) and TO RCS(blue pen) **OR** computer points T351X and T351Y
- **IF** SDC is in operation, **AND** RCS temperature can **NOT** be obtained by averaging, **THEN** RCS temperature shall be determined using the SDC Temperature Recorder, 2-TR-351, **OR** computer points as follows:
  - S/G 30° F above RCS temperature: RCS temperature shall be determined using TO RCS(blue pen) **OR** computer point T351X
  - S/G 60° F below RCS temperature: RCS temperature shall be determined using FROM RCS(red pen) **OR** computer point T351Y
- SG temperature is obtained locally on the S/G shell between the S/G tube sheet and water level covering the tubes, using a hand-held surface instrument or with other calibrated temperature instruments, with a maximum tolerance of (±) 5° F.
  - **IF** a steam generator has NO water in the secondary side, **THEN** measure steam generator temperature at the installed thermowell located near the tube sheet.

4. Steam Generator temperature limits are as follows:
   - S/G temperature is no greater than 30° F above RCS temperature **[B0064]** ____
   - S/G temperature is no more than 60° F below RCS temperature **[B0410]** ____

6.15.D VENT THE RCS (Continued) **INITIALS**

5. **IF** a S/G has NO water in the secondary side, **THEN PERFORM** the following:

> **NOTE**
> When the S/G tubes are filled with RCS fluid, the localized dose rates are anticipated to be higher than when drained.

a. **NOTIFY** Outage Management and Radiation Safety Supervisor of possible increased radiation levels in the S/Gs. ____

b. **VERIFY** the following:

- Both S/Gs are completely drained. ____
- At least 48 hours have elapsed since heating due to welding or post weld heat treatment. ____

> **NOTE**
> S/G temperature is obtained using a hand-held surface instrument or with other calibrated temperature instruments with a maximum tolerance of (±) 5° F.

c. **VERIFY** S/G temperatures are within the following limits:

- S/G temperature at the secondary manway is less than 150° F ____
- S/G temperature at the installed thermowell located near the tube sheet is less than 150° F ____

6. **CLEAR** the solid water tagouts. ____

7. **VERIFY** power aligned to the U-2 RCP breakers **PER** OI-27B, Section titled: OPERATION OF RCP BUS FEEDER BREAKERS. ____ 04400

8. **NOTIFY** M/CEU to prepare to monitor RCP vibration while bumping RCPs when sweeping S/Gs. **[B0368]** ____

> **NOTE**
> All 4 RCPs must be run to ensure proper sweeping of the S/G tubes.

9. **PERFORM** RCP seal venting **PER** OI-1E, REACTOR COOLANT PUMP SEAL VENTING PROCEDURE, to sweep air from the S/G tubes. ____

10. **REMOVE AND STOW** the temporary tubing from the Reactor Vessel Head vents while continuing with this procedure. ____

6.15 VENT THE RCS (Continued) **INITIALS**

E. **ESTABLISH** Pressurizer pressure between 220 PSIA and 230 PSIA. ____

F. **IF** S/G tube sweeps are **NOT** performed,
THEN CLEAR the solid water tagout on the RCPs. ____

> **NOTE**
> Steps G, H, I and J may be performed concurrently or in any order.

G. **IF** RCS was drained below 39 ft. during the outage,
THEN VENT the Regenerative Heat Exchanger as follows:

1. **NOTIFY** Radiation Safety Supervision of pending venting operation. ____
2. **SHUT** REGEN HX SHELL VENT THROTTLE, 2-CVC-419 ____
3. **UNLOCK AND OPEN** REGEN HX SHELL VENT, 2-CVC-102. ____
4. **UNLOCK AND OPEN** REGEN HX SHELL VENT B/U, 2-CVC-192. ____
5. **THROTTLE OPEN** 2-CVC-419. ____
6. **WHEN** air-free water is observed in 2-FG-229A,
THEN LOCK SHUT:
   - 2-CVC-102 ____
   - 2-CVC-192 ____
7. **FULLY OPEN** 2-CVC-419. ____
8. **REMOVE AND STOW** the temporary tubing. ____

H. **VENT** the Hot Leg Sample line as follows:

1. **REQUEST** Chemistry to ensure the Primary Sample Sink aligned for sampling. ____
2. **WHEN** the sample sink is aligned,
THEN OPEN RCS SAMPLE ISOL, 2-PS-5464-CV. ____
3. **OPEN** RCS HOT LEG SAMPLE, 2-PS-5467-CV, for approximately two minutes. (2C90) ____
4. **SHUT** 2-PS-5467-CV. ____
5. **SHUT** 2-PS-5464-CV. ____

I. **CLEAR** the solid water tagout on the HPSI system. ____

6.15 VENT THE RCS (Continued) **INITIALS**

J. **ALIGN** Charging and RCMU pumps as follows:

1. **IF** tagged shut for draining of the RCS during the outage, **THEN UNTAG AND OPEN** Charging pump discharge valves:

   - 21 CHG PP DISCH.....2-CVC-166 ____
   - 22 CHG PP DISCH.....2-CVC-172 ____
   - 23 CHG PP DISCH ISOL.....2-CVC-178 ____

2. **IF** tagged shut for draining of the RCS during the outage, **THEN UNTAG AND OPEN** RCMU pump discharge valves:

   - 21 RCMU PP DISCH.....2-CVC-245 ____
   - 22 RCMU PP DISCH.....2-CVC-248 ____

3. **UNTAG AND RACK IN** Charging pump breakers, **PER** OI-27D, STATION POWER 480 VOLT SYSTEM:

   - 21 Charging pump.....52-2115 ____
   - 22 Charging pump.....52-2415 ____
   - 23 Charging pump...52-2104 **AND** 52-2404 ____

4. **IF** tagged open for draining of the RCS during the outage, **THEN UNTAG AND CLOSE** RCMU pump breakers:

   - 21 RCMU pump.....52-20505 ____
   - 22 RCMU pump.....52-21505 ____

5. **PLACE** CHG PPs and RCMU PPs in AUTO/NORMAL. ____

K. **IF** the plant is to remain in Mode 5, **THEN PERFORM** the following:

1. **IF** S/G tube sweeps were performed, **THEN VERIFY** the RCP LTOP tagout is still hanging while continuing with this section. **[B0064]** ____

CAUTION
While in Mode 5, RCS pressure should be maintained at the lower end of the allowable range to minimize the chance of small pressure transients causing a loss of SDC, unless otherwise specified for surveillance testing.

2. **LOWER AND MAINTAIN** Pressurizer pressure between 100 PSIA and 200 PSIA by **ONE** of the following methods:

   - **PER** OI-1H, PRESSURIZER PRESSURE CONTROL, Section on LOW PRESSURE PRESSURIZER CONTROL (preferred method) ____
   - Cycling Pressurizer Heaters ____

6.16 VACUUM FILL [B1143]

INITIALS

A. PREPARE TO DRAW VACUUM

NOTE
Steps in this section may be performed concurrently and in any order.

1. **ENSURE** the following: **[B0270]**

   - Reactor Vessel Head in place and bolted down. ____
   - Pressurizer Manway Vacuum Fill Cover installed. ____
   - **ALL** RCS piping and associated components installed **AND** RCS aligned **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS.
     (N/A if individual component deviations have been evaluated with Shift Manager approval) ____
   - High velocity flush of HPSI and LPSI piping has been completed **PER** OI-3A, SAFETY INJECTION AND CONTAINMENT SPRAY. ____
   - Tagouts affecting vacuum boundaries have been evaluated. ____
   - The RWT boron concentration is greater than the RCS Shutdown Boron Concentration limit of NEOP 301. ____
   - **ENSURE** with Chemistry that the RWT contents used for filling the RCS meet the RCS Chemistry requirements of CP-204. ____
   - The RWT contains sufficient volume to fill the RCS (approximately 44,300 gallons). ____
   - **IF** available, Reactor Vessel level indication is in service. ____

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE
Refer to FIGURE 7, RCS VACUUM FILL EQUIPMENT.

2. **VERIFY** RCS Vacuum Fill Equipment installed.

   - Vacuum Pump skid in containment on 69 ft. elevation and energized. ____
   - Rotation check performed. ____
   - Exhaust HEPA filter installed. ____
   - Vacuum manifold installed with REACTOR COOLANT SYSTEM VACUUM gauge, 0-RVF-16-PI, visible to the Vacuum Pump operator. ____
   - Hose connected from vacuum manifold to RX VSL VENT ISOL, 2-RC-279. ____
   - Hose available from vacuum manifold to HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244, **AND NOT** connected. ____
   - EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6, is OPEN. ____

NOTE
The 4-inch hose connected between the Pressurizer Manway Vacuum Fill Cover and the fall-away plate flange opening is credited to establish the ≥8 in^2 vent for LTOP.

   - 4-inch hose connected from Pressurizer Manway Vacuum Fill Cover to fall-away plate flange and vacuum manifold. ____
     - Fall-away plate flange opening has no obstructions. ____

3. **ENSURE** RCP Seals have been prepared for Vacuum Fill **PER** TA-23, INSTALLATION AND REMOVAL OF RCS VACUUM FILL EQUIPMENT. ____

   - O-ring seals at the RCP couplings are installed.
   - FME caps on the vapor seal leakoff lines are installed.

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

4. **ENSURE** SW header temperature low enough to maintain RCS temperature less than 110° F with 1750 GPM SDC flow rate.

   a. **IF** the Reactor Core has been Refueled,
   AND the Reactor has been shutdown greater than or equal to 16 days,
   THEN ENSURE SW header temperature is less than or equal to 85° F. ____

   b. **IF** the Reactor Core has **NOT** been Refueled,
   AND the Reactor has been shutdown greater than or equal to 8 days,
   THEN ENSURE SW header temperature is less than or equal to 53° F. ____

   c. **IF** the Reactor Core has **NOT** been Refueled,
   AND the Reactor has been shutdown greater than or equal to 4 days and less than 8 days,
   THEN ENSURE SW header temperature is less than or equal to 37° F. ____

   d. **IF** the conditions of Steps 4.a through 4.c are **NOT** met,
   THEN Engineering has evaluated SW header temperature low enough to maintain RCS temperature less than 110° F with 1750 GPM SDC flow rate.

	INITIALS	DATE
Mechanical and Civil Engineering Unit, OR FIN Response		

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE
The Pressurizer Level Transmitter variable legs drain when the RCS level is below the Pressurizer. Operating Experience has shown that filling the reference legs and the sections of the variable legs that do not drain, is adequate for vacuum fill.

5. **VERIFY** with IM the following: 04400

   a. Quench Tank Level Transmitter reference leg filled, **AND** transmitter placed in service:

      - 2-LT-116

   b. Pressurizer Level Transmitters reference legs filled, water added to the variable legs, and transmitters placed in service:

      - 2-LT-103
      - 2-LT-110X
      - 2-LT-110Y

	INITIALS	DATE
Supervisor - Instrument Maintenance		

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE

- RCS level less than 38.9 ft. elevation ensures adequate air flow area in the top of the hot leg.
- RCS level has been selected to maintain the cold legs full, minimize evacuation volume, and provide margin to maximum level to accommodate small void formations.
- The accuracy of the RCS level indicator on the Refueling Level Cart, 2LE4139 is **NOT** adequate to establish RCS level for vacuum fill.

6. **ENSURE** RCS level is established to draw vacuum:

   a. **MEASURE** RCS level with **ALL** of the following RCS level indicators that are available:

      - MLMS on the Refueling Level Cart, 4136 ____
      - MLMS on the Refueling Level Cart, 4137 ____
      - RCS level indicator on the Refueling Level Cart, 2LE4138 ____
      - Local refueling level indicator, 2-LG-4139 ____

      (1) **ENSURE** RCS level is 38.6(+0.2,-0.0) ft. elevation, using the lowest RCS level indicator. ____

      (2) **ENSURE** all RCS level indicators indicate less than 39.08 ft. elevation. ____

NOTE

If SDC is lost, vacuum will be broken. Therefore Time To Boil calculations will continue to be calculated at atmospheric pressure.

CAUTION

RCS temperature should be as low as possible in the range to extend the Time To Boil, low temperature boiling/condensation diluted pocket concerns, and minimize cooldown during RCS fill.

7. **VERIFY** RCS temperature is between 95° F and 110° F using TR-351. ____

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE

- At least two level indications are required during Vacuum Fill. The local Reactor Vessel level indicator tygon tube can **NOT** be used under vacuum. 2LT4140 is required to be isolated. The fill evolution will out range 2LE4138. 2-LG-4139 is a wide range physical level indicator. 2LE4139 is a wide range electronic level indicator. **[B0597]**
- 2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 4136, 4137 and 2LE4138. 4136, 4137 and 2LE4138 are independent from each other.

8. **CHECK** at least 2 independent RCS level indications are available. ____
   - MLMS on the Refueling Level Cart, 4136 ____
   - MLMS on the Refueling Level Cart, 4137 ____
   - RCS level indicator on the Refueling Level Cart, 2LE4139 ____
   - Local refueling level indicator, 2-LG-4139 ____

   a. **IF** 4136 will be used,
   THEN ENSURE the instrument isolations are open:
      - PRESSURIZER HEADER NORTH EAST VENT VALVE, 2-RC-1168 ____
      - 2-PDT-121A HP HDR DRN, 2-RC-1284 ____
      - 2-PDT-121A HP B/U HDR DRN, 2-RC-1285 ____

   b. **IF** 4137 will be used,
   THEN ENSURE the instrument isolations are open:
      - PRESSURIZER INSTRUMENT HEADER SOUTH WEST VENT VALVE, 2-RC-1185 ____
      - 2-PDT-111A HP HDR DRN, 2-RC-1276 ____
      - 2-PDT-111A HP B/U HDR DRN, 2-RC-1277 ____

6.16.A.8 PREPARE TO DRAW VACUUM (Continued) **INITIALS**

c. **IF** 2LE4139 or 2-LG-4139 will be used, **THEN**:

(1) **ENSURE** the instrument drains are shut:

- UPPER DRAIN ISOL LG-4139, 2-RC-1249 ____
- LOWER DRAIN ISOL LG-4139, 2-RC-1251 ____
- DRAIN ISOL LE-4139, 2-RC-1247 ____

(2) **ENSURE** the instrument isolations are open:

- LOWER ISOL LE-4139, 2-RC-1246 ____
- LOWER ISOL LG-4139, 2-RC-1250 ____
- UPPER ISOL LG-4139, 2-RC-1248 ____
- UPPER ISOL LE-4139, 2-RC-1245 ____

CAUTION
Operating experience has shown that 2-RC-1238 must be shut to prevent loss of level indication on 2LE4139 and 2-LG-4139 due to vacuum drawing air through the tygon tube and into the level sensing lines.

d. **ENSURE SHUT** LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

9. **PLACE** at least two Core Exit Thermocouples, one each from ZA **AND** ZB and from different core quadrants, on Recorder Trend. ____

10. **PLACE** Typed Trend Blocks 26 **AND** 27 on a five minute trend for the duration of the RCS fill. ____

11. **ENSURE OPEN** Component Cooling Containment isolation valves: ____

- CC CNTMT SUPPLY, 2-CC-3832-CV
- CC CNTMT RETURN, 2-CC-3833-CV

NOTE
Actual S/G level may be determined by comparing remote indicated level to FIGURE 6 **OR** by use of the local sightglass.

12. **ENSURE** ONE of the following conditions exist:

- BOTH S/Gs are between (-)40 and (+)60 inches actual level. ____
- An exception for S/G level requirement has been approved by the GS-SO or M-NO.

Exception Approval Verified By:_____
Shift Manager

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE
S/G secondary temperature will be required greater than 85° F prior to solid water operation in Section 6.16.D.

13. **CHECK** the S/G secondary temperature using a hand pyrometer or with other calibrated temperature instruments, with a maximum tolerance of (±) 5°.

    S/G Secondary Temperature _____ ° F ____

14. **IF** the S/G secondary temperature is less than 85° F, **THEN PERFORM** Verification Requirements of TRM TVR 15.7.1.1, hourly, as required. ____

15. **ENSURE** SDC Purification SECURED **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

6.16.A PREPARE TO DRAW VACUUM (Continued) **INITIALS**

NOTE

- Calculations show that vapor may form in the SDC suction line high point if actual values exceed 2045 GPM with the RCS at 37.5 ft. elevation, 110° F and 27.38 inHg vacuum. Procedure values account for instrument uncertainties. **[B1143]**
- SDC Flow Control Valve, 2-SI-306-CV, fails open on a loss of Instrument Air. Therefore, SDC flow is controlled by throttling two (2) LPSI Header valves to prevent vapor formation in the SDC suction line high point in the event of a loss of Instrument Air.

CAUTION

To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

16. **ESTABLISH** LPSI flow control using two (2) LPSI Header valves as follows: **[B0072]**
(N/A if conditions have already been established)

    a. **VERIFY** no more than one LPSI pump operating. ____

NOTE

2-FIC-306 is placed in manual when throttling LPSI HDR isolation valves, to prevent 2-SI-306-CV from opening trying to maintain flow, thus robbing flow from 2-SI-657-CV.

    b. **PLACE** SDC Flow Controller, 2-FIC-306, in MANUAL. ____

CAUTION

The boration flow path shall be aligned to a loop with SDC flow.

    c. **ENSURE** a LPSI HDR isolation is open in the same loop as the boration flow path **AND SHUT** two (2) LPSI HDR isolation valves **AND ENSURE** they are in PULL TO OVERRIDE. ____

6.16.A.16 PREPARE TO DRAW VACUUM (Continued) **INITIALS**

CAUTION
A reduction in RCS boron concentration from a source whose boron concentration is LESS THAN the present SDM requirements of the COLR, is **NOT** permitted when RCS flow is less than 3000 GPM.

d. **THROTTLE** the remaining two (2) LPSI HDR valves in PULL TO OVERRIDE to obtain between 900-950 GPM in each LPSI Loop. ____

NOTE
As temperature control allows, SDC flow should be maintained low in the band to maximize NPSH.

e. **ADJUST** SDC Flow Controller, 2-FIC-306, to obtain a SDC flowrate of between 1500 and 1800 GPM. ____

(1) **IF** 2-FIC-306 is shut **AND** SDC flowrate is greater than 1800 GPM,
THEN ADJUST the SDC TEMP CONTR, 2-HIC-3657. ____

f. **PLACE** SDC Flow Controller, 2-FIC-306, in AUTO. ____

NOTE
LPSI flow alarms may be adjusted as necessary to prevent nuisance alarms.

g. **ADJUST** the setpoints for the LPSI flow alarms on the Refueling Level Cart using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS:

- 0CRT4136
  - 2FT306 High Flow Alarm Limit.....1900 GPM ____
  - 2FT306 Low Flow Alarm Limit.....1450 GPM ____
- 0CRT4137
  - 2FT306 High Flow Alarm Limit.....1900 GPM ____
  - 2FT306 Low Flow Alarm Limit.....1450 GPM ____

17. **VERIFY** valves aligned to the VACUUM POSITION **PER** ATTACHMENT 3, RCS FILL VALVE ALIGNMENT. ____

****** END ******

6.16 VACUUM FILL [B1143] (Continued) **INITIALS**

B. DRAW RCS VACUUM

CAUTION
Portable radio usage in Containment shall be in accordance with NO-1-113.

1. **DISPATCH** operators into Containment, with communications available with the Control Room. ____

NOTE
Breaking vacuum from ANY condition will **NOT** have a negative impact on nuclear safety.

2. **IF** SDC is lost at any time while the RCS is under vacuum, **THEN IMPLEMENT** the appropriate AOP, **AND BREAK** vacuum as follows:

   a. **DEPRESS** the Vacuum Pump STOP button. ____

   b. **FULLY OPEN** the EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6. ____

   c. **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

   d. **IF** directed, **THEN EVACUATE** from the Containment. ____

NOTE
2-LT-4140 is **NOT** rated for vacuum. 2-LT-4140 is OOS when 2-RC-1235 is shut.

3. **SHUT** REACTOR VESSEL WATER LEVEL LT-4140 ISOLATION VALVE, 2-RC-1235. ____

4. **ALIGN** Vacuum Pump skid to HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244:

   a. **NOTIFY** Mechanical Maintenance to attach the vacuum hose from vacuum manifold to HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. ____

   b. **ENSURE** hose connected from vacuum manifold to HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. ____

   c. **ENSURE OPEN** HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. ____

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

5. **ENSURE OPEN** the Reactor Vessel Vent valves.

   - RX VSL VENT ISOL, 2-RC-279 ____
   - RX VSL VENT STOP, 2-RC-280 ____

CAUTION

- Do **NOT** remove the oil fill plug while the pump is running.
- Fluid level should be checked at the fill line, while the vacuum pump is **NOT** running, per Tech Manual 15876-001, V-MAX Oil-Sealed Liquidring Vacuum Pump System.

6. **ENSURE** level in separator reservoir at the FILL LINE (+1/2, -0 inches) on the sight gauge. ____

NOTE

Refer to FIGURE 7, RCS VACUUM FILL EQUIPMENT.

7. **ALIGN** the Vacuum Pump.

   a. **ENSURE OPEN** the following valves:

      - REACTOR COOLANT SYSTEM VACUUM GAUGE ISOLATION valve, 0-RVF-20 ____
      - OIL SUPPLY ISOLATION valve, 0-RVF-7 ____
      - EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6 ____

   b. **ENSURE SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

CAUTION

The Vacuum Pump should always have a suction source to prevent cavitation and pump damage.

8. **CRACK OPEN** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4. ____

NOTE

Vacuum Pump will **NOT** start unless the red HIGH TEMP light is reset.

9. **DEPRESS** the Vacuum Pump START button. ____

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

10. **WHEN** the vacuum pump has run for approximately 2-3 minutes, **THEN PERFORM** the following:

    a. **DEPRESS** the Vacuum Pump STOP button. ____

    b. **ENSURE** level in separator reservoir at the FILL LINE (+1/2, -0 inches) on the sight gauge. ____

> **NOTE**
> Vacuum Pump will **NOT** start unless the red HIGH TEMP light is reset.

11. **DEPRESS** the Vacuum Pump START button. ____

12. **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, to **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, between 10 and 15 inHg vacuum. ____

> **NOTE**
> The Vacuum Pump should reach operating temperature in 15-30 minutes.

13. **VERIFY** VACUUM PUMP OUTLET temperature, 0-RVF-13-TI, stabilizes below 185° F. ____

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

NOTE

- In addition to REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, on the vacuum manifold, RCS vacuum may be monitored on 0PT4136A, 0PT4136B, 0PT4137A and 0PT4137B on the Refueling Level Cart if the MLMS pressure transducers are installed.
- SUBCOOLING A/B MARGIN TO SATURATION LO alarms are expected when drawing RCS vacuum.

14. **WHEN** the VACUUM PUMP OUTLET temperature has stabilized, **THEN COMMENCE** drawing vacuum on the RCS. ____

    a. **SHUT** the EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6. ____

NOTE
Steps b. and c. should be performed concurrently.

    b. **SHUT** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4. ____

    c. **THROTTLE OPEN** the INLET ISOLATION valve, 0-RVF-5 to maintain the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, between 10 and 15 inHg vacuum. ____

NOTE
The fall-away plate should remain in place with approximately 0.5 inHg vacuum.

CAUTION
To permit use of the fall-away plate for the ≥8 in^2 vent for LTOP, NO device is permitted to hold the fall-away plate in place. It must be capable of fully opening by gravity in the event that vacuum is lost.

    d. **PLACE** the fall-away plate, centered, on the 4-inch hose flange **AND HOLD** until vacuum maintains the plate in position. ____

6.16.B.14 DRAW RCS VACUUM (Continued) **INITIALS**

NOTE
Maintaining vacuum pump suction pressure close to 10 inHg vacuum by throttling open 0-RVF-5 will draw the RCS vacuum faster.

e. **THROTTLE** the INLET ISOLATION valve, 0-RVF-5, as follows:

(1) **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, between 10 and 15 inHg vacuum. ____

(2) **WHEN** the REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, reaches 10 inHg vacuum, **THEN FULLY OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

NOTE
- 21/22 LPSI PP SUCT PRESS LO alarms are expected. Suction pressure should be between 5 and 7 PSIG initially at full vacuum before fill.
- SDC perturbations should be avoided, however, shifting LPSI pumps is permissible under vacuum conditions.
- Most of the air dissolved in the RCS will be drawn off into the loop piping gas space and into the pressurizer. Industry Operating Experience has shown that a small quantity of air evolves from solution at an intermediate vacuum range (10 - 15 inHg) and may cause temporary oscillations in SDC flow, which diminish as vacuum progresses. This slight fluctuation is to be expected and should **NOT** be construed as pump cavitation.

15. **MONITOR** LPSI PP operation. ____

a. **STATION** an operator locally in the vicinity of the running LPSI PP. ____

b. **IF** desired, **THEN REMOVE** 2C09 "21(22) LPSI PP SUCT PRESS LO" alarms from service. ____ 04400

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

NOTE

- Industry Operating Experience has shown that 2LE4138 may be affected by ripples created by air flow across the surface of the coolant in the hot leg.
- After 0-RVF-5 is fully opened at 10 inHg RCS vacuum, final vacuum should be reached in approximately 70 minutes. Refer to FIGURE 8, RCS EVACUATION TIME.

16. **MONITOR** for in-leakage. ____

    - RCS evacuation time
    - RCS level
    - Quench Tank level/pressure
    - VCT level/pressure

    a. **LOCATE** and **ISOLATE** any leakage sources.

    b. **OPERATE** the Vacuum Pump as required.

CAUTION

High RCS level can prevent adequate evacuation of SG tubes, shortening evacuation time.

    c. **IF** evacuation time is significantly less than FIGURE 8, RCS EVACUATION TIME due to high RCS level, **THEN BREAK** vacuum **AND RE-ESTABLISH** initial conditions to draw vacuum.

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

NOTE
2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 4136, 4137 and 2LE4138. 4136, 4137 and 2LE4138 are independent from each other.

CAUTION
2LT4140 is calibrated to atmospheric pressure and will **NOT** provide accurate level indication under vacuum conditions.

17. **CHECK** at least 2 independent RCS level indicators agree within 0.5 feet, while drawing RCS vacuum. **[B0597]** ____

- MLMS on the Refueling Level Cart, 4136 ____
- MLMS on the Refueling Level Cart, 4137 ____
- RCS level indicator on the Refueling Level Cart, 2LE4138 ____
- RCS level indicator on the Refueling Level Cart, 2LE4139 ____
- Local refueling level indicator, 2-LG-4139 ____

a. **IF** the indications do **NOT** agree,
THEN STOP drawing RCS vacuum and allow system to stabilize before continuing. ____

b. **IF** the indications do **NOT** return to within 0.5 feet,
THEN CONTACT the GS-SO to determine course of action. ____

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

NOTE

- Due to the air density change, head loss in the vacuum hoses is estimated to be 2.3 inHg at the start of the evacuation, lowering to 0.32 inHg at full vacuum.
- It may be desired to run the Vacuum Pump on fresh air to remove moisture from the oil.

18. **PERFORM** the following at any time, to monitor RCS vacuum with no flow, **OR** to run the Vacuum Pump on fresh air:

NOTE
Steps a. and b. should be performed concurrently.

a. **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

b. **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, between 10 and 15 inHg vacuum. ____

c. **CHECK** REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI. ____

NOTE
Steps d. and e. should be performed concurrently.

d. **SLOWLY OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

- **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, at least 10 inHg vacuum.

e. **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum. ____

CAUTION
23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

- **IF** 25.5 inHg can **NOT** be achieved, **THEN MAINTAIN** greater than 23 inHg vacuum.

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

19. **IF** required at any time, while maintaining RCS vacuum, **THEN PERFORM** the following to **STOP** and **RESTART** the Vacuum Pump:

    a. **STOP** the Vacuum Pump:

        (1) **DEPRESS** the Vacuum Pump STOP button. ____

        (2) **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

    b. **RESTART** the Vacuum Pump:

        (1) **CRACK OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

        (2) **DEPRESS** the Vacuum Pump START button. ____

> **NOTE**
> Steps (3) and (4) should be performed concurrently.

        (3) **SLOWLY OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

            - **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, at least 10 inHg vacuum.

        (4) **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum. ____

> **CAUTION**
> 23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

            - **IF** 25.5 inHg can **NOT** be achieved, **THEN MAINTAIN** greater than 23 inHg vacuum.

6.16.B DRAW RCS VACUUM (Continued) **INITIALS**

NOTE
Operating experience has shown that changes in RCS vacuum can affect indicated RCS level. Reducing vacuum leads to a lower indicated RCS level.

20. **MAINTAIN** the REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum (≈2.2-1.7 PSIA) by **THROTTLING** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4. ____

CAUTION
23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

- IF 25.5 inHg can NOT be achieved, THEN **MAINTAIN** greater than 23 inHg vacuum.

****** END ******

6.16 VACUUM FILL [B1143] (Continued) **INITIALS**

C. FILL THE RCS AND BREAK VACUUM

> **CAUTION**
> Once the RCS has been filled above the hot leg, any vacuum reduction will result in RCS level lowering as inventory transfers into the SG tubes. If the top of the hot leg is uncovered the transfer of inventory will terminate.

1. **IF** SDC is lost at any time while the RCS is under vacuum,
   THEN IMPLEMENT the appropriate AOP,
   AND BREAK vacuum as follows:

> **NOTE**
> Step a. should be performed concurrently with the remaining steps.

a. **STOP** filling the RCS:

- **IF** filling via LPSI,
  THEN: ____
  - **SHUT** 21 LPSI PP NORM SUCT ISOL, 2-SI-444.

  OR

  - **SHUT** 22 LPSI PP NORM SUCT ISOL, 2-SI-432.
- **IF** filling via HPSI Header,
  THEN PLACE the open HPSI HDR MOV(s) in PULL TO OVERRIDE, SHUT **[B0064]**. ____

b. **DEPRESS** the Vacuum Pump STOP button. ____

c. **FULLY OPEN** the EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6. ____

d. **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

e. **IF** directed,
   THEN EVACUATE from the Containment. ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE

- Due to the air density change, head loss in the vacuum hoses is estimated to be 2.3 inHg at the start of the evacuation, lowering to 0.32 inHg at full vacuum.
- It may be desired to run the Vacuum Pump on fresh air to remove moisture from the oil.

2. **PERFORM** the following at any time, to monitor RCS vacuum with no flow, **OR** to run the Vacuum Pump on fresh air:

NOTE
Steps a. and b. should be performed concurrently.

a. **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

b. **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, between 10 and 15 inHg vacuum. ____

c. **CHECK** REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI. ____

NOTE
Steps d. and e. should be performed concurrently.

d. **SLOWLY OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

- **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, at least 10 inHg vacuum.

e. **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum. ____

CAUTION
23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

- **IF** 25.5 inHg can **NOT** be achieved, **THEN MAINTAIN** greater than 23 inHg vacuum.

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

3. **IF** required at any time, while maintaining RCS vacuum, **THEN PERFORM** the following to **STOP** and **RESTART** the Vacuum Pump:

   a. **STOP** the Vacuum Pump:

      (1) **DEPRESS** the Vacuum Pump STOP button. ____

      (2) **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

   b. **RESTART** the Vacuum Pump:

      (1) **CRACK OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

      (2) **DEPRESS** the Vacuum Pump START button. ____

> **NOTE**
> Steps (3) and (4) should be performed concurrently.

      (3) **SLOWLY OPEN** the INLET ISOLATION valve, 0-RVF-5. ____

      - **MAINTAIN** the VACUUM PUMP SUCTION pressure, 0-RVF-15-PI, at least 10 inHg vacuum.

      (4) **THROTTLE** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4, as necessary to maintain REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum. ____

> **CAUTION**
> 23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

      - **IF** 25.5 inHg can **NOT** be achieved, **THEN MAINTAIN** greater than 23 inHg vacuum.

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE

- Operating experience has shown that while filling above the top of the Hot leg until the Reactor Vessel Head is filled, 4136 will lag behind the other level instruments.
- 2LE4139 and 2-LG-4139 share a common variable leg and are **NOT** independent from each other. These instruments are independent from 4136, 4137 and 2LE4138. 4136, 4137 and 2LE4138 are independent from each other.
- The upper range of the Ultrasonic Level indicator, 2LE4138 is the top of the hot leg, 39.08 ft. elevation.

CAUTION

2LT4140 is calibrated to atmospheric pressure and will **NOT** provide accurate level indication under vacuum conditions.

4. **CHECK** at least 2 independent RCS level indicators agree within 0.5 feet, during the RCS fill below 55 ft. elevation. **[B0597]** ____

   - MLMS on the Refueling Level Cart, 4136
   - MLMS on the Refueling Level Cart, 4137
   - RCS level indicator on the Refueling Level Cart, 2LE4139
   - Local refueling level indicator, 2-LG-4139

   a. **IF** the indications do **NOT** agree, **THEN STOP** drawing RCS vacuum and allow system to stabilize before continuing. ____

   b. **IF** the indications do **NOT** return to within 0.5 feet, **THEN CONTACT** the GS-SO to determine course of action. ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE

- Operating experience has shown that changes in RCS vacuum can affect indicated RCS level. Reducing vacuum leads to a lower indicated RCS level.
- The INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4 is expected to be throttled in the shut direction during filling operation to maintain vacuum.

5. **MAINTAIN** the REACTOR COOLANT SYSTEM VACUUM, 0-RVF-16-PI, between 25.5 and 26.5 inHg vacuum (≈2.2-1.7 PSIA) by **THROTTLING** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4. ____

CAUTION

23 inHg is the minimum allowable value to be drawn on the SG tubes for success.

- **IF** 25.5 inHg can **NOT** be achieved, **THEN MAINTAIN** greater than 23 inHg vacuum.

CAUTION

To prevent cooling the Reactor Vessel below 70° F and S/Gs below 85° F, CET temperatures must be maintained above 95° F.

6. **ADJUST** SDC TEMP CONTR, 2-HIC-3657, as necessary to maintain RCS temperature between 95° F and 110° F using CETs during the RCS fill. ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE

- Reduced Inventory requirements will be maintained until 216 inches Pressurizer level due to the effect of inventory transferring into the SG tubes when vacuum is broken.
- Filling via the LPSI pump will reduce flow at the SDC suction line high point and raise LPSI suction pressure.

7. **FILL** the RCS by performing one or more of the following:

   - **FILL** the RCS via 21 LPSI PP piping as follows:

     a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

CAUTION

- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can result in moisture being drawn up into vacuum hoses from the Reactor Vessel Head.
- High fill rates can increase deviations between the RCS level indications.

     b. **SLOWLY CRACK OPEN** 21 LPSI PP NORM SUCT ISOL, 2-SI-444 until the desired flow rate is achieved. ____

     c. **CLOSELY MONITOR** the following:

        - RCS cooldown rate
        - RCS level
        - RCS vacuum

   - **FILL** the RCS via 22 LPSI PP piping as follows:

     a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

6.16.C.7 FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

CAUTION

- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can result in moisture being drawn up into vacuum hoses from the Reactor Vessel Head.
- High fill rates can increase deviations between the RCS level indications.

b. **SLOWLY CRACK OPEN** 22 LPSI PP NORM SUCT ISOL, 2-SI-432 until the desired flow rate is achieved. ____

c. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- **IF** desired to fill via HPSI Header, **THEN FILL** the RCS as follows:

  - **IF** desired to fill via the AUX HPSI HDR, **THEN PERFORM** the following:

    a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

    b. **VERIFY OPEN** AUX HPSI HDR ISOL, 2-SI-656-MOV. ____

6.16.C.7.c **FILL THE RCS AND BREAK VACUUM (Continued)** **INITIALS**

CAUTION
Fill rate must be coordinated to ensure RCS vacuum is maintained.

c. **THROTTLE OPEN** the desired Aux HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B AUX HPSI LOOP ISOL, 2-SI-617-MOV
- 21A AUX HPSI LOOP ISOL, 2-SI-627-MOV
- 22B AUX HPSI LOOP ISOL, 2-SI-637-MOV
- 22A AUX HPSI LOOP ISOL, 2-SI-647-MOV

d. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- **IF** desired to fill via the MAIN HPSI HDR, **THEN PERFORM** the following:

a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

b. **VERIFY OPEN** MAIN HPSI HDR ISOL, 2-SI-654-MOV. ____

CAUTION
Fill rate must be coordinated to ensure RCS vacuum is maintained.

c. **THROTTLE OPEN** the desired Main HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B MAIN HPSI LOOP ISOL, 2-SI-616-MOV
- 21A MAIN HPSI LOOP ISOL, 2-SI-626-MOV
- 22B MAIN HPSI LOOP ISOL, 2-SI-636-MOV
- 22A MAIN HPSI LOOP ISOL, 2-SI-646-MOV

d. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

> **NOTE**
> The fill rate is reduced to equalize the Reactor Vessel Head and Pressurizer as the CEDMs are covered.

8. **WHEN** RCS level reaches the 48 ft. elevation,
   THEN REDUCE the RCS fill rate. ____

> **NOTE**
> Pressurizer level shall be monitored using 2-LI-103. Additionally computer point L110X! or L110Y! may be used if available.

9. **WHEN** RCS level reaches the 53 ft. elevation,
   THEN CHECK Pressurizer level indicates 50(± 12) inches. ____

   a. **IF** the indications do **NOT** agree,
      THEN STOP the fill and allow system to stabilize before continuing. ____

   b. **IF** the indications do **NOT** return,
      THEN CONTACT the GS-SO to determine course of action. ____

10. **WHEN** Pressurizer level reaches 200 inches,
    THEN STOP filling the RCS.

    - **IF** filling via LPSI,
      THEN:

      - **SHUT** 21 LPSI PP NORM SUCT ISOL, 2-SI-444. ____

      OR

      - **SHUT** 22 LPSI PP NORM SUCT ISOL, 2-SI-432. ____

    - **IF** filling via HPSI Header,
      THEN perform the following:

      a. **PLACE** the open HPSI HDR MOV(s) in PULL TO OVERRIDE, SHUT **[B0064]** ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE
RCS fill is stopped to ensure the Reactor Vessel Head is full.

11. **IF** Pressurizer level drops below 50 inches,
THEN PERFORM the following:

a. **RECOMMENCE** filling the RCS:

- **FILL** the RCS via 21 LPSI PP piping as follows:

(1) **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

CAUTION
- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can increase deviations between the RCS level indications.

(2) **SLOWLY CRACK OPEN** 21 LPSI PP NORM SUCT ISOL, 2-SI-444 until the desired flow rate is achieved. ____

(3) **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- **FILL** the RCS via 22 LPSI PP piping as follows:

(1) **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

6.16.C.11.a **FILL THE RCS AND BREAK VACUUM (Continued)** **INITIALS**

CAUTION

- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can increase deviations between the RCS level indications.

(2) **SLOWLY CRACK OPEN** 22 LPSI PP NORM SUCT ISOL, 2-SI-432 until the desired flow rate is achieved. ____

(3) **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- **IF** desired to fill via HPSI Header, **THEN FILL** the RCS as follows:

  - **IF** desired to fill via the AUX HPSI HDR, **THEN PERFORM** the following:

    (1) **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

    (2) **VERIFY OPEN** AUX HPSI HDR ISOL, 2-SI-656-MOV. ____

CAUTION

Fill rate must be coordinated to ensure RCS vacuum is maintained.

(3) **THROTTLE OPEN** the desired Aux HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B AUX HPSI LOOP ISOL, 2-SI-617-MOV
- 21A AUX HPSI LOOP ISOL, 2-SI-627-MOV
- 22B AUX HPSI LOOP ISOL, 2-SI-637-MOV
- 22A AUX HPSI LOOP ISOL, 2-SI-647-MOV

(4) **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- **IF** desired to fill via the MAIN HPSI HDR, **THEN PERFORM** the following:

  (1) **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

  (2) **VERIFY OPEN** MAIN HPSI HDR ISOL, 2-SI-654-MOV. ____

6.16.C.11.a.3 **FILL THE RCS AND BREAK VACUUM (Continued)** **INITIALS**

CAUTION
Fill rate must be coordinated to ensure RCS vacuum is maintained.

(3) **THROTTLE OPEN** the desired Main HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B MAIN HPSI LOOP ISOL, 2-SI-616-MOV
- 21A MAIN HPSI LOOP ISOL, 2-SI-626-MOV
- 22B MAIN HPSI LOOP ISOL, 2-SI-636-MOV
- 22A MAIN HPSI LOOP ISOL, 2-SI-646-MOV

(4) **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

b. **WHEN** Pressurizer level reaches 200 inches, **THEN STOP** filling the RCS.

- **IF** filling via LPSI, **THEN**:

  - **SHUT** 21 LPSI PP NORM SUCT ISOL, 2-SI-444. ____

  OR

  - **SHUT** 22 LPSI PP NORM SUCT ISOL, 2-SI-432. ____

- **IF** filling via HPSI Header, **THEN** perform the following:

  (1) **PLACE** the open HPSI HDR MOV(s) in PULL TO OVERRIDE, SHUT **[B0064]** ____

c. **REPEAT** Step 11.a and 11.b as necessary until Pressurizer level is stable above 50 inches for at least 5 minutes. ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE
RCS fill is stopped to ensure the Reactor Vessel Head is full.

12. **WHEN** the RCS fill is stopped, **AND** Pressurizer level has been stable above 50 inches for at least 5 minutes,
THEN RECOMMENCE filling the RCS:

- **FILL** the RCS via 21 LPSI PP piping as follows:

  a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

CAUTION
- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can increase deviations between the RCS level indications.

  b. **SLOWLY CRACK OPEN** 21 LPSI PP NORM SUCT ISOL, 2-SI-444 until the desired flow rate is achieved. ____

  c. **CLOSELY MONITOR** the following:

  - RCS cooldown rate
  - RCS level
  - RCS vacuum

- **FILL** the RCS via 22 LPSI PP piping as follows:

  a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

6.16.C.12 FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

CAUTION

- Fill rate must be coordinated to ensure RCS vacuum is maintained.
- High fill rates can increase deviations between the RCS level indications.

b. **SLOWLY CRACK OPEN** 22 LPSI PP NORM SUCT ISOL, 2-SI-432 until the desired flow rate is achieved. ____

c. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- IF desired to fill via HPSI Header, THEN **FILL** the RCS as follows:

  - IF desired to fill via the AUX HPSI HDR, THEN **PERFORM** the following:

    a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4143-MOV. ____

    b. **VERIFY OPEN** AUX HPSI HDR ISOL, 2-SI-656-MOV. ____

CAUTION

Fill rate must be coordinated to ensure RCS vacuum is maintained.

c. **THROTTLE OPEN** the desired Aux HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B AUX HPSI LOOP ISOL, 2-SI-617-MOV
- 21A AUX HPSI LOOP ISOL, 2-SI-627-MOV
- 22B AUX HPSI LOOP ISOL, 2-SI-637-MOV
- 22A AUX HPSI LOOP ISOL, 2-SI-647-MOV

d. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

- IF desired to fill via the MAIN HPSI HDR, THEN **PERFORM** the following:

  a. **VERIFY OPEN** 21 RWT OUT, 2-SI-4142-MOV. ____

  b. **VERIFY OPEN** MAIN HPSI HDR ISOL, 2-SI-654-MOV. ____

6.16.C.12.c **FILL THE RCS AND BREAK VACUUM (Continued)** **INITIALS**

CAUTION
Fill rate must be coordinated to ensure RCS vacuum is maintained.

c. **THROTTLE OPEN** the desired Main HPSI Loop isolation(s) until the desired flow rate is achieved: ____

- 21B MAIN HPSI LOOP ISOL, 2-SI-616-MOV
- 21A MAIN HPSI LOOP ISOL, 2-SI-626-MOV
- 22B MAIN HPSI LOOP ISOL, 2-SI-636-MOV
- 22A MAIN HPSI LOOP ISOL, 2-SI-646-MOV

d. **CLOSELY MONITOR** the following:

- RCS cooldown rate
- RCS level
- RCS vacuum

13. **WHEN** Pressurizer level reaches 216 inches, **THEN PERFORM** the following:

CAUTION
Vacuum fill hoses are isolated before Pressurizer level is 241 inches (69 ft. elevation) to prevent water introduction to the vacuum fill hoses and vacuum pump.

- **ISOLATE** the RX vessel head vent line and RCS level indication vacuum fill hoses:
  - **SHUT** RX VSL VENT ISOL, 2-RC-279 ____
  - **SHUT** RX VSL VENT STOP, 2-RC-280 ____
  - **SHUT** HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244 ____
- **EXIT** Reduced Inventory requirements:
  - **SUSPEND** the limits on evolutions that would cause RCS **OR** SDC perturbations. ____
  - **NOTIFY** Radiation Safety Supervision the RCS is no longer in a reduced inventory condition. ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

14. **WHEN** pressurizer level reaches 295 inches,
THEN SECURE filling the RCS.

- **IF** filling via LPSI,
THEN:

  - **ENSURE LOCKED SHUT** 21 LPSI PP NORM SUCT ISOL, 2-SI-444. ____

  OR

  - **ENSURE LOCKED SHUT** 22 LPSI PP NORM SUCT ISOL, 2-SI-432. ____

- **IF** filling via HPSI Header,
THEN perform the following:

  a. **PLACE** the open HPSI HDR MOV(s) in PULL TO OVERRIDE, SHUT **[B0064]** ____

  b. **RETURN** AUX and MAIN HPSI HDR ISOL to the desired position **PER** the CRS.

  - AUX HPSI HDR ISOL, 2-SI-656-MOV ____
  - MAIN HPSI HDR ISOL, 2-SI-654-MOV ____

NOTE
A Pressurizer level drop of approximately 100 inches is anticipated when breaking vacuum.

15. **WHEN** the RCS fill is secured,
THEN BREAK vacuum as follows:

  a. **RECORD** initial Pressurizer level: _____ ____

  b. **DEPRESS** the Vacuum Pump STOP button. ____

  c. **OPEN** the INLET VACUUM BREAKER ISOLATION valve, 0-RVF-4. ____

  d. **OPEN** the EMERGENCY VACUUM BREAKER ISOLATION valve, 0-RVF-6. ____

  e. **SHUT** the INLET ISOLATION valve, 0-RVF-5. ____

  f. **WHEN** Pressurizer level stabilizes,
  THEN RECORD final Pressurizer level: _____ ____

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

16. **WHEN** RCS vacuum is broken,
THEN PERFORM the following:

> **CAUTION**
> To prevent damage to the motor operators, LPSI Header valves should **NOT** be jogged more than 5 times in 2 minutes, allowing at least 5 minutes for the motor and overload relay to cool before operating the MOV again. To allow the MOV motor to coast to a stop before reversing direction, there should be a wait of approximately 5 seconds before reversing direction of the MOV valve operator. **[B0038]**

a. Slowly **OPEN ALL** available LPSI HDR valves **AND ENSURE** that 2-FIC-306 maintains SDC flow. ____

b. **ADJUST** SDC flow to 3000 gpm using SDC FLOW CONTR, 2-FIC-306. ____

c. **TAKE ALL** available LPSI HDR valves out of PULL TO OVERRIDE. ____

17. **OPEN** REACTOR VESSEL WATER LEVEL LT-4140 ISOLATION VALVE, 2-RC-1235, to restore 2-LT-4140 to service. ____

> **CAUTION**
> The MLMS pressure transducers should be isolated before the Pressurizer manway is installed to limit their possible pressure exposure.

18. **IF** the MLMS pressure transducers are installed,
THEN prior to installing the Pressurizer Manway, **SHUT** the following isolation valves to isolate the pressure transducers:

- PRESSURIZER HEADER NORTH EAST VENT VALVE, 2-RC-1168 ____
- PRESSURIZER INSTRUMENT HEADER SOUTH WEST VENT VALVE, 2-RC-1185 ____
- 2-PDT-111A HP HDR DRN, 2-RC-1276 ____
- 2-PDT-111A HP B/U HDR DRN, 2-RC-1277 ____
- 2-PDT-121A HP HDR DRN, 2-RC-1284 ____
- 2-PDT-121A HP B/U HDR DRN, 2-RC-1285 ____

19. **IF** desired,
THEN RESTORE 2C09 "21(22) LPSI PP SUCT PRESS LO" alarms to service. ____ 04400

6.16.C FILL THE RCS AND BREAK VACUUM (Continued) **INITIALS**

NOTE
When valves have been restored, APPENDIX 13, PRESSURIZER MANWAY RE-INSTALLATION CHECKLIST may be completed.

20. **RESTORE** valves to the RESTORATION POSITION **PER** ATTACHMENT 3, RCS FILL VALVE ALIGNMENT. ____

21. **ENSURE** TA-23, INSTALLATION AND REMOVAL OF RCS VACUUM FILL EQUIPMENT, has been completed to restore RCP seals. ____

    - O-ring seals at the RCP couplings are removed.
    - FME caps on the vapor seal leakoff lines are removed.

22. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

23. **IF** required,
    THEN ADJUST Pressurizer level to between 50 and 150 inches **PER** OI-3B, SHUTDOWN COOLING. ____

24. **IF** SDC Purification is desired,
    THEN PLACE Purification on SDC **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

****** END ******

6.16 VACUUM FILL [B1143] (Continued) **INITIALS**

D. FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE

1. **VERIFY** with I&C that Quench Tank **AND** Pressurizer Level Transmitter reference legs filled, vented, and placed in service: 04400

   a. Quench Tank Level Transmitter:

      - 2-LT-116 ____

   b. Pressurizer Level Transmitters:

      - 2-LT-103 ____
      - 2-LT-110X ____
      - 2-LT-110Y ____

2. **PREPARE** the Quench Tank for plant startup as follows:

   a. **ENSURE** S/G nitrogen blankets have been secured **PER** OI-12B, Section titled, SECURING S/G NITROGEN BLANKET. ____

> **NOTE**
> Maintaining Quench Tank pressure less than 1.5 PSIG helps prevent PORVs from leaking. **[B0771]**

   b. **PREPARE** the Quench Tank for plant startup **PER** OI-1B, QUENCH TANK OPERATIONS, SECTION 6.11, QT LINEUP FOR PLANT STARTUP AT LOW RCS PRESSURE. ____

3. **ENSURE** the following: **[B0270]**

   - RCP shaft couplings installed. ____
   - Pressurizer manway installed ____
   - The RWT contains sufficient volume to fill the RCS ____
   - The RWT boron concentration is greater than the RCS Shutdown Boron Concentration limit of NEOP 301 ____

4. **VERIFY** the S/G secondary temperature is greater than 85° F using a hand pyrometer or with other calibrated temperature instruments, with a maximum tolerance of (±) 5° . ____

   a. **IF** the S/G secondary temperature is less than 85° F, **THEN ENSURE** S/G primary and secondary pressure is less than 185 PSIG hourly **PER** TVR 15.7.1.1.

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

5. **IF** the temporary Pressurizer vent rig is **NOT** installed, **THEN REQUEST** Mechanical Maintenance to perform the following: ____

   a. **INSTALL** the temporary Pressurizer vent rig (flow gauge and vent valve, 2-RC-277) to the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216.

   b. **INDEPENDENTLY VERIFY** the temporary Pressurizer vent rig installation.

   c. **INITIATE** MN-1-110 Attachment PC tracking.

> **NOTE**
> **IF** Radiation Safety allows entry into the Refueling Pool,
> **THEN** the temporary tubing should be run to the nearest Refueling Pool cavity drain.

6. **INSTALL** temporary tubing at the following locations:

   - Pressurizer Vent, routed to the Refueling Pool ____
   - Refueling Pool Cavity Drain to the Containment Sump. ____

7. **ENSURE** SDC Purification SECURED **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

> **CAUTION**
> When Pressurizer level is less than 90 inches, two Charging pumps shall be tagged out with their breakers racked out and discharge valves shut to limit dilution sources to less than 88 GPM.

8. **ENSURE** CVCS Charging **AND** Letdown are available for operation with:

   - One Charging pump available to be aligned to the RWT ____
   - At least one loop Charging Stop, 2-CVC-518-CV or 2-CVC-519-CV, OPEN. ____
   - L/D STOP, 2-CVC-515-CV shut ____
   - LD CNTMT ISOL, 2-CVC-516-CV shut ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

9. **UNISOLATE AND PLACE IN SERVICE BOTH** Letdown Control valves and Backpressure Regulating valves as follows:

   a. **ENSURE SHUT BOTH** LETDOWN LINE CONTR ISOL valves:

      - L/D STOP.....2-CVC-515-CV ____
      - LD CNTMT ISOL.....2-CVC-516-CV ____

   b. **ENSURE OPEN** L/D CV INLET valves:

      - (2-CVC-110P-CV) L/D CV INLET.....2-CVC-105 ____
      - (2-CVC-110Q-CV) L/D CV INLET.....2-CVC-103 ____

   c. **ENSURE OPEN** L/D CV OUTLET valves:

      - (2-CVC-110P-CV) L/D CV OUTLET.....2-CVC-106 ____
      - (2-CVC-110Q-CV) L/D CV OUTLET.....2-CVC-104 ____

   d. **ENSURE OPEN** BP REG INLET valves:

      - (2-CVC-201P-CV) BP REG INLET.....2-CVC-108 ____
      - (2-CVC-201Q-CV) BP REG INLET.....2-CVC-110 ____

   e. **ENSURE OPEN** BP REG OUTLET valves:

      - (2-CVC-201P-CV) BP REG OUTLET.....2-CVC-109 ____
      - (2-CVC-201Q-CV) BP REG OUTLET.....2-CVC-111 ____

   f. **PLACE** L/D CONTR VLVS Selector Switch, 2-HS-110-1, in BOTH. ____

   g. **PLACE** BACKPRESSURE REG VLVS selector switch, 2-HS-201, in BOTH. ____

   h. **PLACE** L/D PRESS controller, 2-PIC-201, in AUTO with a setpoint of 100 PSIG. ____

   i. **ADJUST** L/D THROTTLE VLV controller 2-HIC-110 in MANUAL to obtain 100% output, to open Letdown Control valves to their open limit. ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
The Pressurizer Heaters are **NOT** tagged out for solid water operations here because they are needed to draw the Pressurizer bubble.

10. **IMPLEMENT** the following solid water controls: **[B0064]**

    a. **ENSURE ALL** Pressurizer Heaters in OFF. ____

    b. **TAGOUT** the RCPs by **ONE** of the following methods: ____

    - **BOTH** feeder breakers 252-1202 and 252-2201 racked out
    - **ALL** eight RCP breakers racked out

    c. **ENSURE BOTH** PORVs operable with **ALL** of the following conditions:

    - STPs M-572A, M-572B and M-672B current ____
    - **BOTH** PORV handswitches in SINGLE MPT ENABLE:
      - PORV 402 MPT PROTECTION....2-HS-1406 ____
      - PORV 404 MPT PROTECTION....2-HS-1408 ____
    - **BOTH** PORV Override Shut/Auto handswitches in AUTO:
      - PORV 402 OVERRIDE....2-HS-1402 ____
      - PORV 404 OVERRIDE....2-HS-1404 ____

    d. **ENSURE BOTH** PORV Block Valves are fully open. ____

    e. **ENSURE** two Charging pumps have their breakers racked out and tagged: ____

    - 21 Charging pump.....52-2115
    - 22 Charging pump.....52-2415
    - 23 Charging pump....52-2104 **AND** 52-2404

6.16.D.10 FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

f. **ISOLATE** HPSI pumps by **ONE** of the following methods: ____

(1) **RACK OUT AND DANGER TAG ALL** four HPSI pump breakers **PER** OI-27C, 4.16 KV SYSTEM:

- 21 HPSI pump.....152-2108
- 22 HPSI pump.....152-2408
- 23 HPSI pump.....152-2110
- 23 HPSI pump.....152-2410

OR

(2) The following valves will be CAUTION Tagged shut **AND** their breakers open (where applicable)

(a) **LOCK SHUT AND TAG** ALL three HPSI pump manual discharge valves:

- 21 HPSI PP DISCH ISOL 2-SI-428
- 22 HPSI PP DISCH ISOL 2-SI-415
- 23 HPSI PP DISCH ISOL 2-SI-406

OR

(b) **ALL** eight MAIN and AUX HPSI Loop Isolation valves:

HPSI MAIN HDR	HPSI AUX HDR
2-SI-616-MOV	2-SI-617-MOV
2-SI-626-MOV	2-SI-627-MOV
2-SI-636-MOV	2-SI-637-MOV
2-SI-646-MOV	2-SI-647-MOV

OR

(c) **BOTH** MAIN and AUX HPSI Header Isolation valves:

HPSI MAIN HDR ISOL	HPSI AUX HDR ISOL
2-SI-654-MOV	2-SI-656-MOV

11. **TERMINATE** operational testing of Safety Injection and CVCS components until normal water level is established in the Pressurizer. **[B0064]** ____

12. **CHECK** the following actions complete PRIOR to continuing:

- The temporary Pressurizer vent rig is installed ____
- E&C has completed venting and placing the Pressurizer Level Transmitters in service ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

- This section requires operator actions inside Containment to:
  - Vent the Pressurizer
  - Isolate Reactor Vessel level instrumentation (if needed)
  - Fill the SITs (if needed)
- Advanced determination of the drain path to be used when drawing a bubble minimizes the TIME the RCS is in a solid water condition.

13. **DETERMINE** the drain path to be used when drawing the Pressurizer bubble, as follows: (check one) ____

☐ **IF BOTH** of the following conditions exist, **THEN DRAIN** to the RWT (preferred path):

- At least 10 inches RWT capacity exists ____
- RCS boron concentration is such that final RWT boron concentration will be between 2450 PPM and 2700 PPM, as determined by APPENDIX 4, CALCULATION OF FINAL RWT CONCENTRATION FOR RCS DRAIN. ____

☐ **IF** the RWT is **NOT** available, **THEN DRAIN** to RCW (alternate path).

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
RCS level will lower slightly during the performance of step 14.

14. **PERFORM** the following to **ENSURE OPEN BOTH** MINI FLOW RETURN TO RWT ISOL valves: **[B1250]**

    a. **ENSURE OPEN** MINI FLOW RETURN TO RWT ISOL, 2-SI-659-MOV. ____

    b. **ENSURE OPEN** MINI FLOW RETURN TO RWT ISOL, 2-SI-660-MOV. ____

    c. **VERIFY** at least 42 GPM mini flow indicated on the digital flow meter located in 22 ECCS Pump Room by **SLOWLY THROTTLING OPEN** the running LPSI pump mini flow:

    - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449 ____

    OR

    - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450 ____

    d. **SHUT** the selected LPSI pump mini flow:

    - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449 ____

    OR

    - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450 ____

NOTE
Locked valves, controlled under NO-1-205

15. **ENSURE OPEN** 21 RWT OUT on the selected LPSI pump that will be used to fill the RCS:

    - (21 LPSI pump) 21 RWT OUT, 2-SI-4143-MOV ____
    - (22 LPSI pump) 21 RWT OUT, 2-SI-4142-MOV ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
Portable radio usage in Containment shall be in accordance with NO-1-113.

16. **DISPATCH** an operator into Containment, with communications available with the Control Room, in preparation for Pressurizer venting operations. ____

17. **NOTIFY** Radiation Safety Supervision of the following: ____

    - Drawing a bubble in the Pressurizer.
    - Drain path to be used.
    - Pending venting operations.

WARNING
Opening RCS vents could raise airborne contamination levels. **ALL** vented fluids shall be treated as radioactive unless certified clean by Chemistry.

18. **VERIFY OPEN** the following Pressurizer Vent valves:

    - PZR VENT ISOL, 2-RC-215 ____
    - PZR VENT STOP, 2-RC-216 ____
    - PZR VENT THROT, 2-RC-277 ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

- Locked valves, controlled under NO-1-205.
- The top of the Pressurizer and a full RWT are at approximately the same elevation. The LPSI fill rate should be expected to change as RCS level rises. Pressurizer vent capacity may also affect LPSI fill rate.
- Pressurizer level shall be monitored using one set of the following level indicators: (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches)
  - 2-LI-103 and computer point L110X!

  OR
  - 2-LI-103 and Computer point L110Y!
- RCS cooldown rate shall be monitored using the CETs on the Trend Recorder. SDC to RCS temperature on 2-TR-351 is lower than RCS temperature due to the relatively cold RWT water used to fill the RCS.

CAUTION

- Do **NOT** exceed the following RCS cooldown rates:

RCS Temperature	Maximum Cooldown Rate
Greater than 146° F	100° F per hour
146° F or less	40° F per hour

- To prevent cooling the Reactor Vessel below 70° F and S/Gs below 85° F, CET temperatures must be maintained above 95° F.

19. While monitoring RCS temperature, initiate RCS fill by **THROTTLING OPEN** the selected LPSI PP normal suction valve:
    - 21 LPSI PP NORM SUCT ISOL, 2-SI-444 ____
    - 22 LPSI PP NORM SUCT ISOL, 2-SI-432 ____
20. **ADJUST** SDC TEMP CONTR, 2-HIC-3657, as necessary to maintain RCS temperature between 95° F and 150° F. ____
21. **START** the selected Charging Pump **PER** OI-2A, Section titled RUNNING A CHARGING PUMP IN MODE 5 OR 6, aligned to the RWT. ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
PORVs which open due to overpressure, will remain open. The cause of the overpressure condition should be determined and corrected before shutting the PORVs.

NOTE
The dedicated operator is not required to be stationed when maintaining PZR level constant at <300" in the PZR.

22. Prior to exceeding 170 inches in the pressurizer, **STATION** a dedicated licensed operator as the solid water overpressurization watch with the following duties: **[B0593]** ____

- **MONITOR** the following:
  - RCS pressure
  - Pressurizer level
  - Pressurizer heaters
  - Letdown flow
  - Charging pump operation
- **TAKE** necessary corrective actions to prevent overpressurization of the RCS.

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

23. **WHEN** Pressurizer level reaches 150 inches, **THEN PERFORM** the following while continuing to fill the RCS:

    a. **OPEN BOTH** LETDOWN LINE CONTR ISOL valves:

    - L/D STOP, 2-CVC-515-CV ____
    - LD CNTMT ISOL, 2-CVC-516-CV ____

    b. **MAKE** the following log entries in the Transient Tracking Log: ____

    - Initiation of Pressurizer/RCS heatup
    - Letdown initiation

    c. **COMMENCE** recording Pressurizer Heatup data in APPENDIX 2, PRESSURIZER HEATUP LOG. ____

    d. **PLACE** PZR PRESS CONTR 2-PIC-100X and 2-PIC-100Y in AUTO with a setpoint of 2250 PSIA. ____

CAUTION

- Do **NOT** exceed the following RCS heatup rates:

RCS Temperature	Maximum Heatup Rate
70° F to 246° F	80° F per hour
Greater than 246° F	100° F per hour

- Do **NOT** exceed a Pressurizer linear heatup rate of 100 ° F per hour
- Do **NOT** exceed a Pressurizer temperature of 180 ° F prior to being filled solid.

    e. **ENERGIZE** Pressurizer Backup and Proportional Heaters in AUTO as necessary to maintain Pressurizer Heatup rate less than 100° F per hour **AND** non-solid temperature less than 180° F. ____

6.16.D.23 FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
To prevent draining the RCS through the instrument loop, the RCS Wide Range Level Monitoring System shall be isolated before Pressurizer level reaches 229 inches (68 ft. elevation).

f. **SECURE** the RCS Wide Range Level Monitoring System **AND** Refueling Level Panel as follows:

(1) **SHUT** REFUEL LVL IND ISOL, 2-RC-105 ____

(2) **SHUT** REFUEL LVL IND STOP, 2-RC-106 ____

(3) **SHUT** ROOT ISOL FOR LE-4139 & LG-4139, 2-RC-1242 ____

(4) **SHUT** B/U ISOL FOR LE-4139 & LG-4139, 2-RC-1243 ____

(5) **VERIFY** the pipe cap is removed **AND OPEN** HDR VENT ISOL LG-4139 & LE-4139, 2-RC-1244. **[B0132]** ____

(6) **SHUT** ISOL FOR 2-LT-4140, 2-RC-1236. ____

(7) **IF** RCS level in the sightglass is greater than the 63 ft elevation,
THEN DRAIN the sightglass using LT-4140 DRAIN, 2-RC-1237 to a desired level below the 63 ft elevation to ensure thermal expansion of water in sightglass does not overflow the vent. ____

(8) **ENSURE SHUT** LT-4140 DRAIN, 2-RC-1237. ____

(9) **SHUT** ISOL FOR 2-LT-4140, 2-RC-1235. ____

NOTE
This step may be performed concurrently with the remainder of this section.

(10) **DE-ENERGIZE** the RCS Level Monitoring Systems by placing 2CS4138 **AND** 2CS4139 in OFF. (located in the Cable Spreading Room on the east wall, just inside the door) ____

NOTE
This step may be performed concurrently with the remainder of this section.

(11) **REQUEST** IM Shop to remove the Refueling Level Cart. ____

6.16.D.23 FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

g. **IF** the local Reactor Vessel level indicator tygon tube is in service, **THEN REMOVE** it from service as follows:

(1) **SHUT** LOCAL REFUEL LVL ISOL, 2-RC-1238. ____

(2) **CONTACT** IM to remove **AND** stow the tygon tube. ____

NOTE
Locked valves, controlled under NO-1-205.

CAUTION
The LPSI PP normal suction valves must be shut before the RCS approaches solid to prevent overpressurizing the suction piping.

24. **WHEN** desired to secure the fill via the LPSI normal suction valve, **OR** Pressurizer level reaches 350 inches, **THEN LOCK SHUT** the LPSI PP normal suction valve used to fill the RCS:

- 21 LPSI PP NORM SUCT ISOL, 2-SI-444 ____
- 22 LPSI PP NORM SUCT ISOL, 2-SI-432 ____

NOTE
The RCS is now being filled to a solid water condition. To minimize the time the RCS is in a solid water condition, it is desirable to continue heatup of the Pressurizer and draw a bubble once the RCS is filled.

25. **WHEN** a steady stream of air-free water issues from the Pressurizer vents, **THEN SHUT** the Pressurizer Vent valves:

- PZR VENT ISOL, 2-RC-215 ____
- PZR VENT STOP, 2-RC-216 ____
- PZR VENT THROT, 2-RC-277 (temporary valve) ____

26. **ENSURE** RCS pressure maintained approximately 100 PSIG by L/D PRESS CONTR, 2-PIC-201. ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

CAUTION
To prolong RCP seal life, CBO flow should be aligned to the VCT as soon as RCS pressure is greater than VCT pressure.

27. **WHEN** RCS pressure is greater than VCT pressure, **THEN OPEN** the RCP CBO Isolation valves:

    - RCP BLEED CNTMT ISOL.....2-CVC-505-CV ____
    - RCP BLEED CNTMT ISOL.....2-CVC-506-CV ____

28. **WHEN** VCT level is greater than 88 inches, **THEN SHIFT** the Charging Pump suction to the VCT:

    a. **OPEN** VCT OUT, 2-CVC-501-MOV ____

    b. **SHUT** RWT CHG PP SUCT, 2-CVC-504-MOV ____

29. **REQUEST** Mechanical Maintenance perform the following while continuing with this procedure. ____

    a. **REMOVE** the temporary Pressurizer vent rig (flow gauge and vent valve, 2-RC-277) to the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216.

    b. **INSTALL** the blank flange on the Pressurizer vent line downstream of PZR VENT ISOL, 2-RC-215 and PZR VENT STOP, 2-RC-216.

    c. **INDEPENDENTLY VERIFY** the temporary Pressurizer vent rig is removed **AND** the vent line flanged off.

    d. **CLOSE OUT** the MN-1-110 Attachment PC form.

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE

- Pressurizer level shall be monitored using one set of the following level indicators: (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches)
  - 2-LI-103 and computer point L110X!

  OR
  - 2-LI-103 and Computer point L110Y!

- After an outage where RCS level was lowered below the top of the Hot Leg (which drains the S/G tubes) the Pressurizer bubble will form during Pressurizer heatup instead of when draining the RCS. Thermal expansion displaces water from the Pressurizer into the S/G tubes, limiting the pressure rise, resulting in the Pressurizer reaching a saturated condition. This will occur to a lesser extent after vacuum fill due to the remaining air pocket in the SG tubes after the partial vacuum.

30. **MONITOR** for spontaneous Pressurizer bubble formation, while Pressurizer temperature is raised, as indicated by the following parameters: ____

    - Pressurizer level decreasing with steady or increasing pressure
    - Pressurizer temperature corresponds to saturation temperature for Pressurizer pressure

31. **ENERGIZE** Backup and Proportional Heaters in AUTO as necessary to maintain Pressurizer Heatup rate less than 100° F per hour **AND COMMENCE** heat up to establish Pressurizer pressure between 100 PSIA and 195 PSIA. ____

    - **RECORD** Pressurizer heatup data in APPENDIX 2, PRESSURIZER HEATUP LOG. ____

32. **WHEN** Pressurizer temperature reaches 300° F (approximately 70 PSIA saturation),
    THEN STOP the running Charging Pump **AND PLACE** in PULL TO LOCK. ____

NOTE

The VCT is made a closed system with CBO initiated and Charging secured. Overpressurization of the VCT is possible in this configuration.

33. **COMMENCE** monitoring VCT level and pressure. ____

    - **IF** required to lower VCT pressure,
      THEN VENT the VCT **PER** OI-2A, CHEMICAL AND VOLUME CONTROL SYSTEM.

    - **IF** required to lower VCT level,
      THEN DRAIN the VCT to RCW by cycling VCT DRN, 2-CVC-161.

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

34. **REQUEST** Plant Chemistry obtain an RCS boron sample. **[B0605]** ____

> **CAUTION**
> During the formation of the Pressurizer bubble, a large quantity of relatively hot water will enter the RCS from the Pressurizer when the RCS is drained. This may require adjusting SDC temperature to maintain RCS temperature less than 200° F.

35. **COMMENCE** continuous monitoring of Pressurizer pressure and level (2-LI-103 and Computer point L110X!, **OR** 2-LI-103 and Computer point L110Y!), **AND** RCS temperature. (L110X! and L110Y! will indicate .0000 U when level is greater than 360 inches) ____

> **CAUTION**
> Excessive drain rates may exceed Pressurizer Heater capacity to maintain Pressurizer pressure.

36. **COMMENCE** draining the RCS, using the pre-determined flowpath, as follows: ____

    a. **MAINTAIN** Pressurizer pressure: ____

    - Greater than 70 PSIA
    - Less than 195 PSIA

    b. **IF** draining to the RWT, **THEN**:

    (1) **NOTIFY** Radiation Safety Supervision that the RCS will be drained to the RWT. ____

> **NOTE**
> Locked valves, controlled under NO-1-205.

    (2) **OPEN** the running LPSI pump Miniflow Isolation: ____

    - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449
    - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450

6.16.D.36.b **FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued)** **INITIALS**

NOTE
Locked valves, controlled under NO-1-205.

(3) **IF** desired to raise the drain rate, **THEN OPEN ONE** of the following valves: ____

- 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV
- 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV

(4) **MONITOR** RWT level change. ____

c. **IF** draining to RCW, **THEN**:

(1) **DIVERT** Letdown flow to RCW by placing 2-HS-2500 for 2-CVC-500-CV in WPS. ____

(2) **PLACE** L/D PRESS controller, 2-PIC-201, in MANUAL. ____

(3) **ADJUST** 2-PIC-201 in MANUAL to obtain 100% output, to fully open **BOTH** Backpressure Regulating valves. ____

(4) **RESET** Diversion Flow Integrator, 2-FQI-2540 **OR MONITOR** RC Waste Receiver Tank level change. ____

37. **ADJUST** SDC TEMP CONTR, 2-HIC-3657, as necessary to maintain RCS temperature below 200° F. ____

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

NOTE
Pressurizer level instruments read to 360 inches. Pressurizer volume for draining from solid at 404 inches to 350 inches, when the level instruments are on scale, is approximately 1620 gallons. This equates to approximately 1.9 inch RWT level change and 0.75 feet RC Waste Receiver Tank level change.

38. **IF** any of the following occur **AND** pressurizer level indicates no change:

- 30 minutes of draining
- RWT level rises by 1.9 inch
- in service RC Waste Receiver Tank rises by 0.75 feet.
- CVCS Flow Diversion Integrator, 2-FQI-2540, indicates 1620 gallons have been drained from the Pressurizer

THEN PERFORM the following:

a. **SECURE** the drain by shutting the valves opened to initiate the drain: ____

- 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449
- 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450
- 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV
- 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV

b. **PLACE** L/D PRESS controller, 2-PIC-201, in AUTO with a setpoint of 150 PSIG. ____

c. **UTILIZE** Pressurizer Heaters to maintain Pressurizer pressure between 50 and 150 PSIA. ____

d. **INVESTIGATE** the cause of no change in level, including, **BUT NOT** limited to: ____

- Instrumentation malfunction: compare indicated level to Reactor Vessel level to determine need to refill the RCS
- Valve misalignment in drain path

e. **WHEN** corrective actions are complete **AND** it is desired to continue with drawing the bubble,
THEN RE-INITIATE draining **PER** this section.

- **IF** re-initiating drain to RCW,
  THEN LOG Letdown initiation in the Transient Tracking Log.

6.16.D FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

39. **CHECK** Pressurizer bubble established by the following parameters: ____

    - Pressurizer level lowering with steady or rising pressure
    - Pressurizer temperature corresponds to saturation temperature for Pressurizer pressure

40. **WHEN** the formation of the bubble has been verified, **THEN CONTINUE** draining to lower Pressurizer level to 144 inches (2-LI-103 and Computer point L110X! **OR** 2-LI-103 and Computer point L110Y!). ____

41. **CYCLE** Pressurizer Heaters to maintain Pressurizer pressure between 100 PSIA and 195 PSIA **AND** Pressurizer temperature at least 30° F above the highest RCS loop temperature. ____

42. **STABILIZE** Pressurizer level at 144 inches (2-LI-103 and Computer point L110X! **OR** 2-LI-103 and Computer point L110Y!) as follows:

> **NOTE**
> Locked valves, controlled under NO-1-205.

a. **IF** draining to the RWT, **THEN SHUT** the running LPSI pump Miniflow Isolation: ____

   - 21 LPSI PP MINI FLOW RTN ISOL, 2-SI-449
   - 22 LPSI PP MINI FLOW RTN ISOL, 2-SI-450

> **NOTE**
> Locked valves, controlled under NO-1-205.

b. **IF** draining to the RWT **AND** the following valves were opened, **THEN SHUT**: ____

   - 22 SDC HX TO HPSI SUCT, 2-SI-662-MOV
   - 21 SDC HX TO HPSI SUCT, 2-SI-663-MOV

c. **IF** draining to RCW, **THEN DIRECT** Letdown flow to the VCT by placing 2-HS-2500 for 2-CVC-500-CV in AUTO. ____

d. **ENSURE** the B/U CHG PP SEL switch, 2-HS-224, is selected to a position that does **NOT** have the available CHG PP listed. ____

e. **START** the available CHG PP. ____

f. **ENSURE** L/D PRESS controller, 2-PIC-201, in MANUAL. ____

6.16.D.42 FILL THE RCS SOLID AND DRAW PRESSURIZER BUBBLE (Continued) **INITIALS**

g. **ADJUST** 2-PIC-201 output to balance Charging and Letdown to maintain Pressurizer level at 144 inches. ____

h. **LOG** initiation of Charging and Letdown in the Transient Tracking Log. ____

43. **OBSERVE** the indication on the selected PZR LVL CONTR CH, 2-LIC-110X **OR** 2-LIC-110Y, that corresponds with a reading of 144 inches on 2-LI-103, **OR** Computer points L110X! **OR** L110Y!. ____

44. **ADJUST** the local setpoint on the selected PZR LVL CONTR CH, 2-LIC-110X **OR** 2-LIC-110Y, to match the level observed above, **AND** **PLACE** it in AUTO. ____

45. **PLACE** L/D THROTTLE VLV controller, 2-HIC-110, in AUTO. ____

46. **ADJUST** 2-PIC-201 to maintain approximately 100 PSIG backpressure **AND** a Pressurizer level of 144 inches. ____

a. **IF** desired,
THEN PLACE 2-PIC-201 in AUTO.

47. **IF** the Pressurizer was drained to the RWT,
THEN PERFORM the following:

a. **IF** the RCS boron concentration was **NOT** within 10 PPM of the RWT boron concentration,
THEN INITIATE recirculation of the RWT using the SFP Cooling pump, **PER** OI-24E, RECIRCULATION OF REFUELING WATER TANKS. **[B0029]** ____

b. **IF** the RCS boron concentration **WAS** within 10 PPM of the RWT boron concentration,
THEN INITIATE recirculation of the RWT using the RWT Recirc pump **OR** the SFP Cooling pump, **PER** OI-24E, RECIRCULATION OF REFUELING WATER TANKS. ____

NOTE
A 2 volume recirc of a full RWT will take 9 hours using a SFP pump **OR** 24 hours using the RWT Recirc pump.

c. **NOTIFY** Chemistry that a 2 volume recirc of the RWT has been started **AND** to obtain and analyze an RWT sample for boron concentration when the 2 volume recirc is complete. ____

****** END ******

6.16 VACUUM FILL [B1143] (Continued) **INITIALS**

E. MAINTAIN RCS

> **NOTE**
> Steps in this section may be performed concurrently and in any order.

1. **CLEAR** the solid water tagouts. ____

2. **COMMENCE** monitoring VCT level **AND** DIVERT Letdown to RCW to maintain level as necessary. ____

3. **IF** necessary to raise S/G temperatures, **THEN CONSIDER** using 2 LPSI pump operation on SDC. ____

4. **PRESSURIZE** the Quench Tank for plant Normal Operation **PER** OI-1B, QUENCH TANK OPERATIONS, SECTION 6.1, ADDING DI OR N2 TO THE QT. ____

5. **VENT** the Regenerative Heat Exchanger as follows:

   a. **NOTIFY** Radiation Safety Supervision of pending venting operation. ____

   b. **INSTALL** temporary tubing at the Regenerative Heat Exchanger Vent, routed to the Containment Normal Sump. ____

   c. **SHUT** REGEN HX SHELL VENT THROTTLE, 2-CVC-419 ____

   d. **UNLOCK AND OPEN** REGEN HX SHELL VENT, 2-CVC-102. ____

   e. **UNLOCK AND OPEN** REGEN HX SHELL VENT B/U, 2-CVC-192. ____

   f. **THROTTLE OPEN** 2-CVC-419. ____

   g. **WHEN** air-free water is observed in 2-FG-229A, **THEN LOCK SHUT**:

      - 2-CVC-102 ____
      - 2-CVC-192 ____

   h. **FULLY OPEN** 2-CVC-419. ____

   i. **REMOVE AND STOW** the temporary tubing. ____

6.16.E MAINTAIN RCS (Continued) **INITIALS**

6. **VENT** the Hot Leg Sample line as follows:

   a. **REQUEST** Chemistry to ensure the Primary Sample Sink aligned for sampling. ____

   b. **WHEN** the sample sink is aligned, **THEN OPEN** RCS SAMPLE ISOL, 2-PS-5464-CV. ____

   c. **OPEN** RCS HOT LEG SAMPLE, 2-PS-5467-CV, for approximately two minutes. (2C90) ____

   d. **SHUT** 2-PS-5467-CV. ____

   e. **SHUT** 2-PS-5464-CV. ____

7. **ALIGN** Charging and RCMU pumps as follows:

   a. **IF** tagged shut for draining of the RCS during the outage, **THEN UNTAG AND OPEN** Charging pump discharge valves: ____

      - 21 CHG PP DISCH.....2-CVC-166
      - 22 CHG PP DISCH.....2-CVC-172
      - 23 CHG PP DISCH ISOL.....2-CVC-178

   b. **IF** tagged shut for draining of the RCS during the outage, **THEN UNTAG AND OPEN** RCMU pump discharge valves: ____

      - 21 RCMU PP DISCH.....2-CVC-245
      - 22 RCMU PP DISCH.....2-CVC-248

   c. **UNTAG AND RACK IN** Charging pump breakers, **PER** OI-27D, STATION POWER 480 VOLT SYSTEM: ____

      - 21 Charging pump.....52-2115
      - 22 Charging pump.....52-2415 ____
      - 23 Charging pump...52-2104 **AND** 52-2404

   d. **IF** tagged open for draining of the RCS during the outage, **THEN UNTAG AND CLOSE** RCMU pump breakers: ____

      - 21 RCMU pump.....52-20505
      - 22 RCMU pump.....52-21505

   e. **PLACE** CHG PPs and RCMU PPs in AUTO/NORMAL. ____

6.16.E MAINTAIN RCS (Continued) **INITIALS**

8. **IF** the plant is to remain in Mode 5,
THEN PERFORM the following:

   a. **VERIFY** the RCP LTOP tagout is still hanging while continuing with this section. **[B0064]** ____

> **CAUTION**
> While in Mode 5, RCS pressure should be maintained at the lower end of the allowable range to minimize the chance of small pressure transients causing a loss of SDC, unless otherwise specified for surveillance testing.

   b. **LOWER AND MAINTAIN** Pressurizer pressure between 100 PSIA and 200 PSIA by **ONE** of the following methods: ____

      - **PER** OI-1H, PRESSURIZER PRESSURE CONTROL, Section on LOW PRESSURE PRESSURIZER CONTROL (preferred method)
      - Cycling Pressurizer Heaters

****** END ******

7.0 POST PERFORMANCE ACTIVITIES

A. Upon completion of this procedure, perform the following:

- Forward the original to the Operations Senior Administrative Assistant for retention **PER** CNG-PR-3.01-1000, RECORDS MANAGEMENT.
- Attach copies of the RCS and Pressurizer Heatup **AND** Cooldown Logs to the Transient Tracking Log (Ref. EN-1-115)

8.0 BASES

[B0014] Establishes requirement to have one Containment IRU available before core alterations start.

[B0015] Delineates criteria for determining S/G availability.

[B0026] Response to NRC Information Notice 90-06 and SER 4-89, which establish requirement to throttle LPSI header valves to prevent SDC flow excursion should 2-SI-306-CV fail open on a loss of instrument air.

[B0028] Engineering calculation that limits Pressurizer cooldown rate to 200° F/hour.

[B0029] Requires that the SFP Cooling pump be used to recirc the RWT if there is a differential between the boron concentration of the RWT and the influent, in order to prevent stratification of RWT contents and inaccurate sample.

[B0038] MOV project recommendations for jogging MOVs.

[B0064] LTOP requirements.

[B0072] Response to SOER 88-03, establishes guidelines on reduced inventory operations and establishing safe working conditions around RCS openings.

[B0073] Response to Generic Letter 88-17 for reduced inventory operations.

[B0076] Response to NRC Inspection Notice 90-23, establishes requirement to vent the Reactor Vessel using manual valves.

[B0079] Establishes requirements for re-installing Pressurizer manway.

[B0089] Establishes requirement for having one train of Containment Coolers, tagging out Containment closure valves and time limits before opening the RCS for maintenance.

[B0105] **PER** LER 91-007, "Loss of Boration Flowpath due to a Fuae Failure",this procedure is to be performed when a DG is to be taken out of service and at least once every 8 hours while it remains out of service.

[B0116] Establishes requirements for RCS heat removal capabilities during partial drain down conditions.

8.0 BASES (Continued)

[B0132] Results of ETP indicate that RCS level indication will be conservative when draining the RCS less than the 51 foot elevation and that 2-RC-1244 will remain open to provide thermal relief protection for the GEMS sight glass.

[B0138] NUMARC 91-06 "GUIDELINES FOR INDUSTRY ACTIONS TO ASSESS SHUTDOWN MANAGEMENT":

- Requires that criticality be anticipated whenever dilution, heatup or CEA withdrawals are occurring, based on industry events
- Requires that controls be established to preclude loss of RCS inventory

[B0145] Establishes RCS gravity feed guidelines for station blackout.

[B0198] Nuclear Fuel Management Memo 93-158, dtd 4/16/93. RFP level alarm set at the desired level + 0.2 ft. is basis captured. +0.2 ft. is to ensure that a 5% SDM is maintained if level increase greater than +0.2 ft. tolerance operator action would occur to investigate the cause of alarm prior to jeopardizing the 5% SDM.

[B0247] 50.59 log# 95-0010-R00, changed the definition for going into Mode 6 from Mode 5. Mode 6 is now declared prior to detensioning the last 18 reactor vessel studs less than 75% designed pre-load.

[B0270] Operator Reactivity Management Procedure Review Guidelines. Letter from B. Shick to M. Navin 9-22-95

[B0271] This is in response to SOER 94-02, recommendation 4.a: Identify procedure activities that can result in low concentrated borated water being transported to the RCS.

[B0272] SOER 94-02, The requirement to keep an RCP running and PZR spray in operation while doing any RCS boration or dilution is to assure adequate RCS mixing to prevent diluted pockets. However, plant conditions are such that it is not always possible to assure that RCPs are running. In these cases it is possible to minimize the probability of diluted pockets during Natural Circulation cooldown or during SDC operation.

[B0328] Added new requirements to be in effect while in a reduced inventory condition. Requirements are based on lessons learned from past reduced inventory evolutions regarding control of work during reduced inventory (Memo from K. Nietmann 5-3-96) and contingency plan and safety shutdown barricades (Memo from D. Holm 5-2-96)

[B0368] RCAR 96-10, recommended PTU augment the vibration monitoring for all normal RCP starts. (i.e. starting RCPs for heatup, sweeping S/Gs...)

[B0370] The reactor must be shutdown at least 72 hours prior to installing S/G nozzle dams to ensure that the time until core uncovery is equal to or greater than the max time needed to align the OC DG (one hour).

8.0 BASES (Continued)

[B0381] Response to SOER 91-01, CONDUCT OF INFREQUENTLY PERFORMED TESTS OR EVOLUTIONS, Recommendations 1.c & 1.d for providing management control for infrequently performed evolutions.

[B0407] Required a minimum RFP level of 65' to ensure that sufficient amount of water (at least 96 inches) covers the fuel assemblies when the hoist is raised to the "HOIST UP" position to provide adequate shielding for personnel on the RFM. (FCR 89-3001 & NCR 11162)

[B0198] NFM interpretation of T.S. 3.9.1, NFM 93-158 which states the 100 PPM limit for refueling samples. Includes memo from Regulatory Matters, dated February 20, 2003.

[B0410] NEU (NEU 01-026) provided the maximum allowable temperature that the S/G can be colder than the RCS to prevent exceeding the max allowable cooldown rate.

[B0424] Limits flowrate through the core when defueled and the UGS is installed to 1700 GPM. (Memo B-MPS-89-103, from Combustion Engineering, 9-12-89)

[B0477] ES1999000665-004, SE00431 updated the COLR, Section 3.9.1 to include limiting RFP temperature to less than or equal to 140° F.

[B0593] SOER 94-01 recommendation 2.d. Provide guidance for recovery from water-solid conditions using appropriate reactor and pressurizer level indications.

[B0597] Letter from Charlie Cruse to the NRC Document Control Desk dated 12/4/97, describing the method of Reactor Coolant System level detection. States at least two instruments will be available under all RCS level and flow conditions, when shutdown.

[B0605] Memo from the boronometer removal task force that describes increased RCS boron sampling requirements due to the removal of the boronometer.

[B0630] Steps revised to include required checks for ensuring the Containment Radiation Signal (CRS) is operable for Tech Spec 3.3.7.

[M0002] Establishes requirement to perform page checks of procedures.

[B0771] Memo (G:\PES\0100\0119-300) from Primary Systems dated June 28, 2001, to maintain QT pressure at a lower range when RCS pressure is low to prevent PORV seat leakage.

[B0300] Filling the Cntmt Emergency Sump piping will provide a thermal barrier to prevent valve heat up after an accident and prior to a RAS. The thermal barrier will provide additional margin to the analysis by reducing peak bonnet pressure. Response to GL 95-07, PRESSURE LOCKING/THERMAL BINDING OF SAFETY RELATED MOVs.

8.0 BASES (Continued)

[B0720] IR3-082-883 Issue Report Resolution Document. Document states that if a pressure reduction is needed after the vessel and CEDMs are vented, then the vessel head and CEDMs should be re-vented to vent any released gases in the RCS.

[B1118] Time Estimate to Gravity Fill the Refueling Pool Using the Refueling Water Tank Inventory.

[B1143] DAR-SEE-05-2, Engineering Evaluation of a Reactor Coolant Vacuum Refill System.

[B1147] DE06098 Minimum Recommended Refueling Pool Water Level During CEA Swap.

[B1243] NRC Bulletin 78-08, Post the high radiation area around the Fuel Transfer Tube during irradiated fuel transfer.

[B2172] NEU Memo 91-289, Request for Evaluation of RCS Response to a Station blackout in MODE 5 with a Pressurizer Bubble, October 18, 1991; and NEU 92-040 memo, Request for Budgetary Estimate Regarding Analysis of RCS Response to a Station Blackout in MODE 5 at Calvert Cliffs, January 31, 1992.

[B2250] DE06398, Filling Pressurizer by Containment Spray Pump.

9.0 RECORDS

Records generated by this procedure shall be transferred to Records Management **PER** CNG-PR-3.01-1000, Records Management.

REACTOR COOLANT SYSTEM LEVELS

WARNING
This table should **NOT** be used to establish boundaries for maintenance.

REFERENCE LEVEL	PZR LEVEL	RCS LEVEL	RX V LVL
Top of Pressurizer		81.74 ft.	
Indicated Top of PZR	360 in.	78.90 ft.	
Top of Refueling Pool	241 in.	69.00 ft.	
Normal Refueling Pool Level	217 in.	67.00 ft.	
UGS Deck Plates	193 in.	65.00 ft.	
Thimble Support Plate	145 in.	61.00 ft.	
ICI Installation	97 in.	57.00 ft.	
TS Refueling Pool Level	93.6 in.	56.70 ft.	
Core Support Barrel Lift Rig Install	73 in.	55.00 ft.	
Indicated Bottom of PZR	0 in.	48.90 ft.	
1st RVLMS Alarm		46.49 ft.	160 in.
2nd RVLMS Alarm		45.74 ft.	151 in.

REACTOR COOLANT SYSTEM LEVELS

REFERENCE LEVEL	PZR LEVEL	RCS LEVEL	RX V LVL
Reactor Vessel Flange		43.97 ft.	
Top of UGS		43.77 ft.	
3rd RVLMS Alarm		42.49 ft.	112 in.
Bot of S/G Primary Manway		39.37 ft.	
Top of Hot Leg 4th RVLMS Alarm & RCP Seal Maint level		39.08 ft.	71 in.
S/G Nozzle Dam Installation		37.66 ft.	
Middle of Hot Leg & 5th RVLMS Alarm		37.33 ft.	50 in.
Minimum Level to Drain RCS		36.83 ft.	
Bottom of Hot Leg & 6th RVLMS Alarm		35.58 ft.	29 in.
7th RVLMS Alarm		34.74 ft.	19 in.
Last RVLMS Alarm		33.99 ft.	10 in.
Top of core		32.90 ft.	

MAJOR RCS OPENINGS

OPENING	AREA PER OPENING (IN2)	QUANTITY
Pzr Spray valves 2-RC-100E-CV 2-RC-100F-CV	5.41 IN2 limited by pipe size with valve bonnet pulled	2
PZR Manway	78 IN2 limited by Surge Line Nozzle size	1
Rx Vessel Head Vent	0.432 IN2	1
ICI w/out guide cluster	16.73 IN2	8
ICI with guide cluster	2.54 IN2	8
PORVs	1.3 IN2	2
Pzr relief valves 2-RC-200-RV 2-RC-201-RV	3.55 IN2 with valve completely removed	2
PORV block valves 2-RC-403-MOV 2-RC-405-MOV	2.95 IN2 with valve completely removed	2
Safety Injection Loop Injection Check valves 2-SI-217, 2-SI-227, 2-SI-237, 2-SI-247	86.59 IN2 limited by pipe size	4

MAJOR RCS OPENINGS

OPENING	AREA PER OPENING (IN^2)	QUANTITY
Aux Spray Check valve 2-CVC-185	2.23 IN^2 with valve completely removed	1
CHG Inlet Check valve 2-CVC-186, 2-CVC-187	2.23 IN^2 with valve completely removed	2
L/D Isol 2-CVC-397	2.24 IN^2 with valve completely removed	1
RCP Vapor Seal 2-RCW-335	3.34 IN^2 with valve completely removed	1
11 RCDT Hx Bypass 2-RCW-320	3.34 IN^2 with valve completely removed	1
11 RCDT Hx Inlet Isol 2-RCW-316	3.34 IN^2 with valve completely removed	1
Leak Header Relief 2-RCW-4252-RV	3.34 IN^2 with valve completly removed	1
SDC Return Isol 2-SI-652-MOV	86.59 IN^2 with valve completely removed	1

TIME TO START BOILING OR CORE UNCOVERY MULTIPLIER [B0072]

NOTE
Post Refueling, if the core has been reloaded with 88 or more new assemblies, the Multiplier is 1.4 times the following "normal" multiplier. (Use only until new fuel is irradiated)

HOURS AFTER S/D	MULTIPLIER	HOURS AFTER S/D	MULTIPLIER
24 (1 day)	1.00	43	1.19
25	1.01	44	1.20
26	1.02	45	1.20
27	1.03	46	1.21
28	1.04	47	1.22
29	1.05	48 (2 days)	1.23
30	1.06	49	1.24
31	1.07	50	1.25
32	1.08	51	1.25
33	1.09	52	1.26
34	1.10	53	1.27
35	1.11	54	1.28
36	1.12	55	1.28
37	1.13	56	1.29
38	1.14	57	1.30
39	1.15	58	1.30
40	1.16	59	1.31
41	1.17	60	1.32
42	1.18	61	1.33

TIME TO START BOILING OR CORE UNCOVERY MULTIPLIER [B0072]

HOURS AFTER S/D	MULTIPLIER	HOURS AFTER S/D	MULTIPLIER
62	1.33	84	1.48
63	1.34	85	1.49
64	1.35	86	1.49
65	1.35	87	1.50
66	1.36	88	1.51
67	1.37	89	1.51
68	1.37	90	1.52
69	1.38	91	1.53
70	1.39	92	1.53
71	1.39	93	1.54
72 (3 days)	1.40	94	1.55
73	1.41	95	1.55
74	1.41	96 (4 days)	1.56
75	1.42	97	1.57
76	1.43	98	1.57
77	1.43	99	1.58
78	1.44	100	1.59
79	1.45	101	1.59
80	1.45	102	1.60
81	1.46	103	1.61
82	1.47	104	1.61
83	1.47	105	1.62

TIME TO START BOILING OR CORE UNCOVERY MULTIPLIER [B0072]

HOURS AFTER S/D	MULTIPLIER	HOURS AFTER S/D	MULTIPLIER
106	1.63	112	1.67
107	1.63	114	1.68
108	1.64	116	1.70
109	1.65	118	1.71
110	1.66	120 (5 days)	1.72

DAYS AFTER S/D	MULTIPLIER	DAYS AFTER S/D	MULTIPLIER
6	1.84	70	5.83
7	1.98	80	6.24
8	2.09	90	6.72
9	2.20	100	7.15
10	2.30	110	7.59
15	2.71	120	8.01
20	3.08	150	8.99
25	3.39	180	10.47
30	3.62	210	11.71
35	3.89	240	13.03
40	4.20	270	13.69
45	4.57	300	14.47
50	4.82	330	15.39
55	5.04	365	16.68
60	5.28		

INVENTORY BALANCE - RCS AND SOURCE VOLUMES

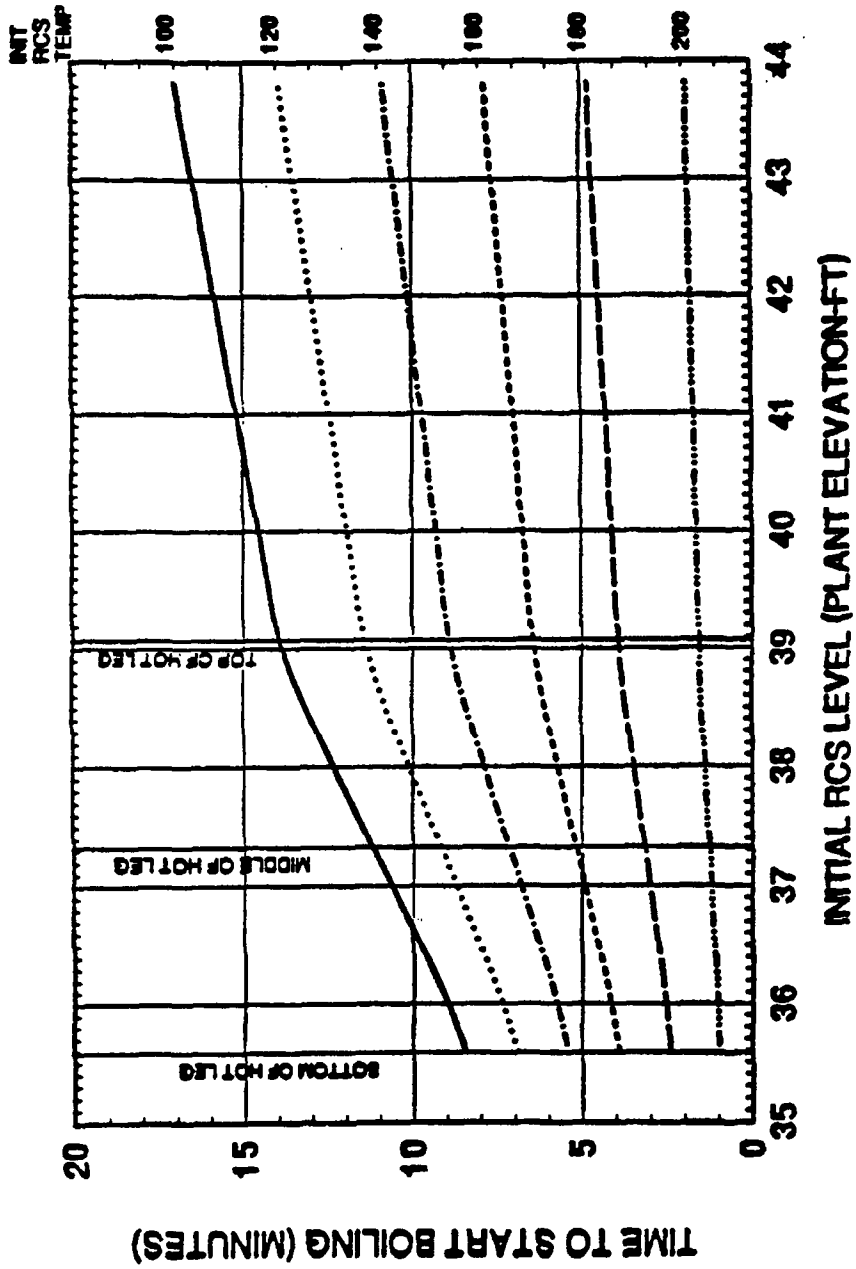
SOURCE	RANGE	Gallons/Inch	Gallons/foot
RWT	All	842.15	10105.83
RX Vessel	Above Hot Leg	68.42	821
RCS (no nozzle dams)	Above Hot Leg	100 **	1200 **
RFP	44-67 feet	1091	13092
U-1 Cavity (North)	34-44 feet	247.58	2971
U-1 Cavity (South)	29.5-44 feet	363.75	4365
U-2 Cavity (North)	29.5-44 feet	363.75	4365
U-2 Cavity (South)	34-44 feet	247.58	2971
Pressurizer	All	30	360
VCT	All	27	324
SIT	All	40	480
RCWRT/RCWMT	All	195	2340.1

RCS total volume, SG tubes dry, 39.1 feet to 38 feet =
4385 gallons (no nozzle dams)
2961 gallons (nozzle dams installed)

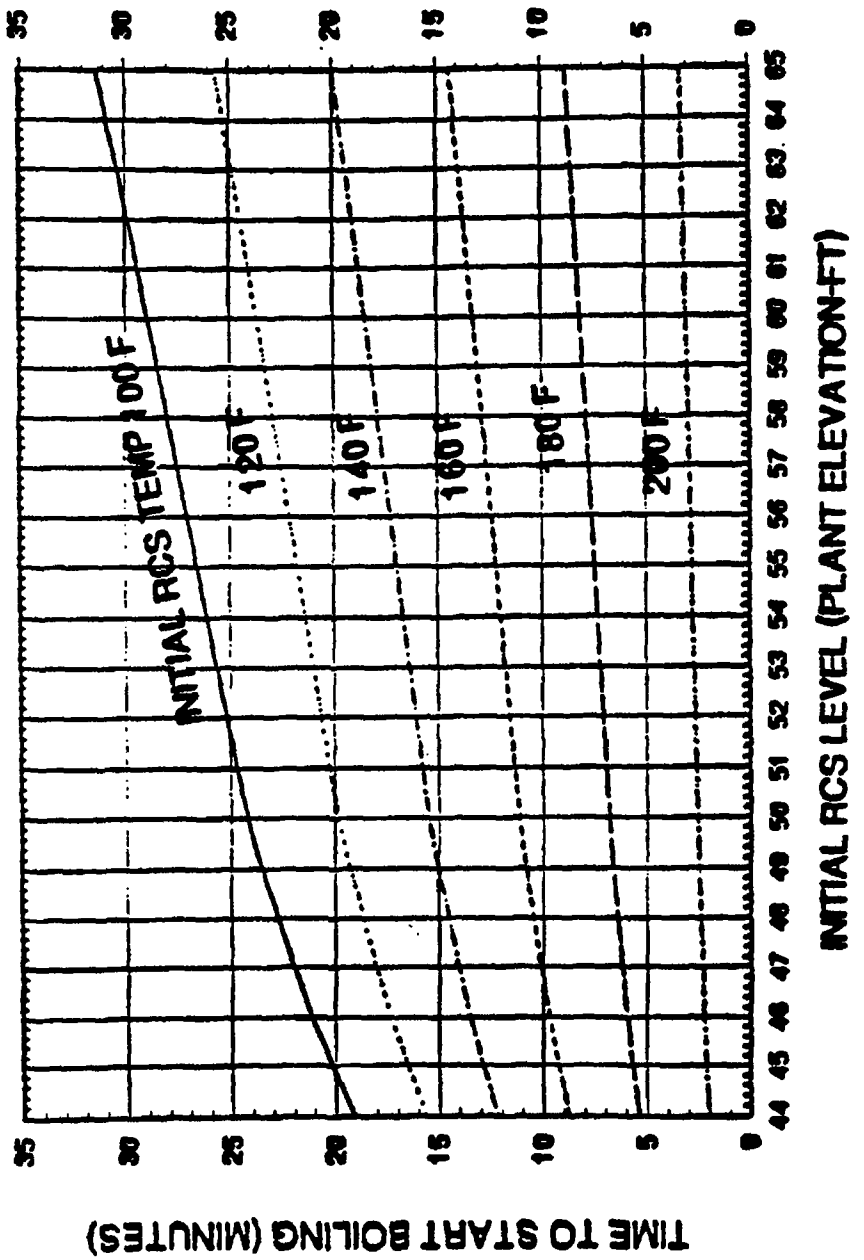
RCS total volume, 38 feet to 37.5 feet =
3259 gallons (no nozzle dams)
2603 gallons (nozzle dams installed)

** The effects of static head pressure on the air volume in the SG tubes will affect the volume of RCS displaced into the SG tubes.

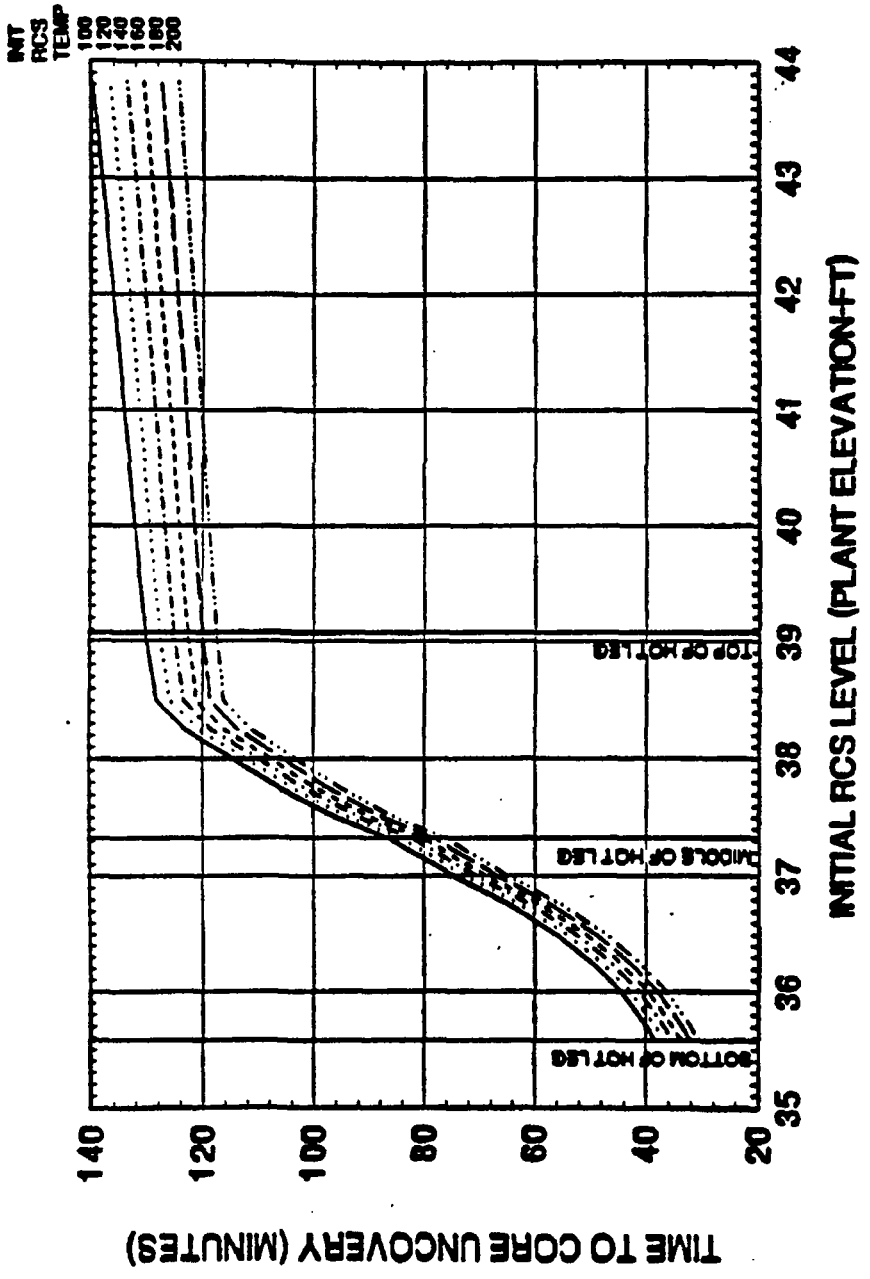
TIME TO START BOILING AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN [B0072]



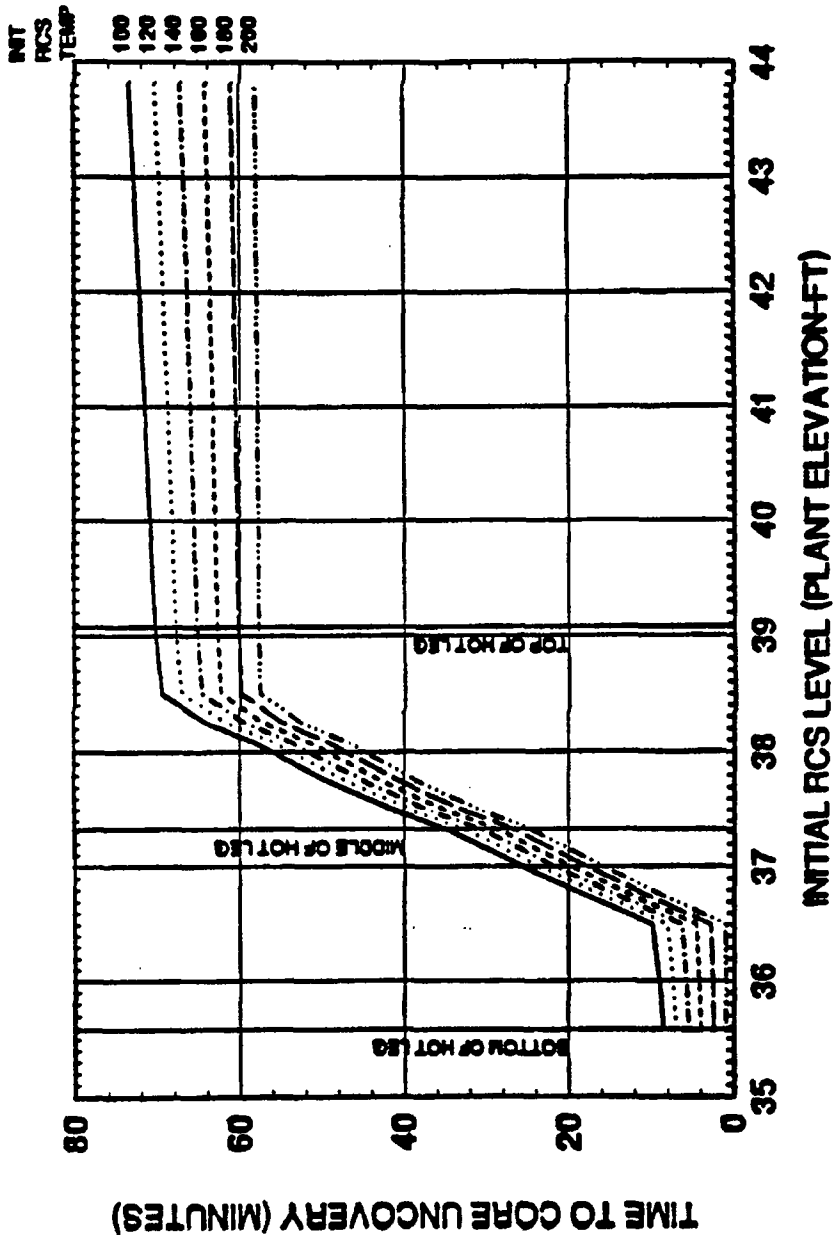
TIME TO START BOILING AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN WITH S/G TUBES FULL [B0072]



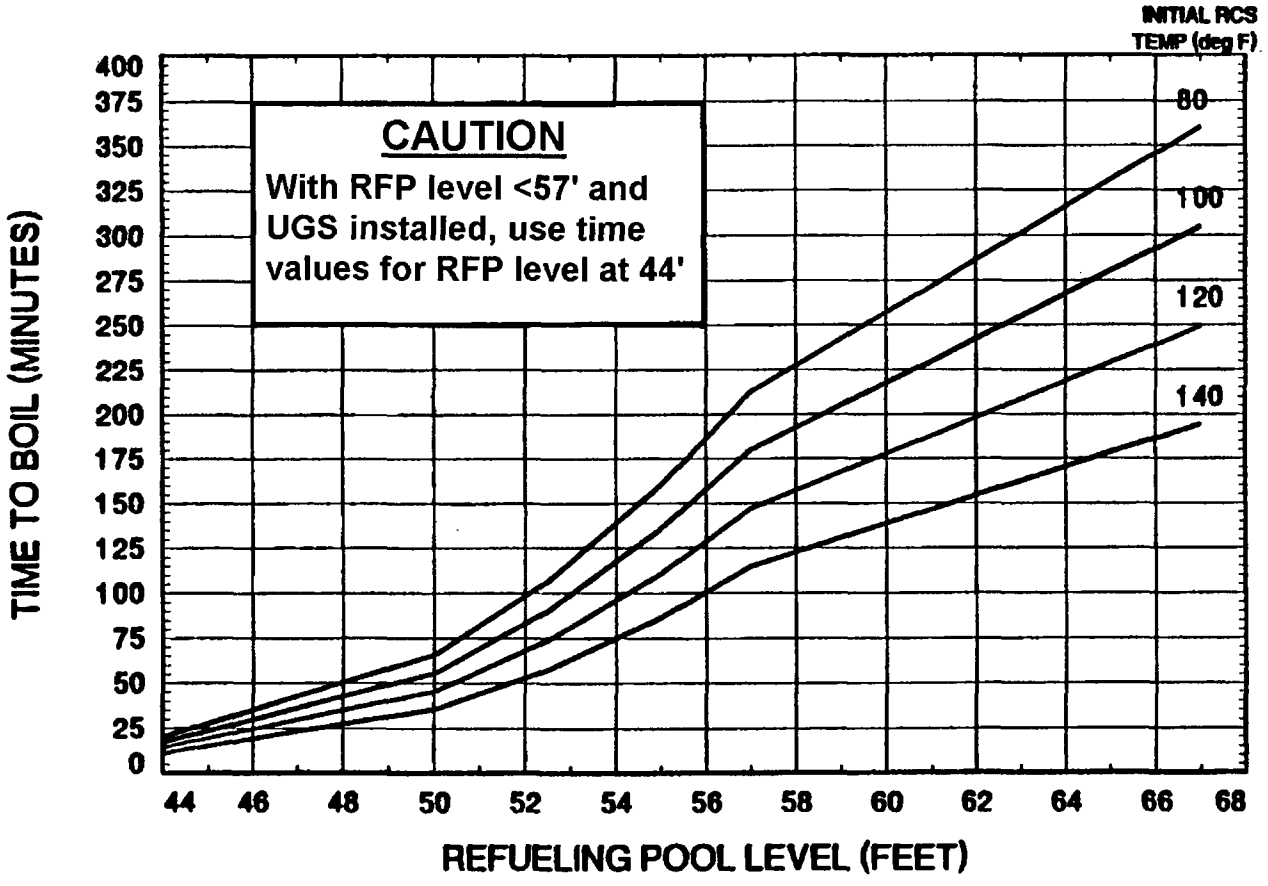
TIME TO CORE UNCOVERY AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN, NO NOZZLE DAMS, NO INJECTION, NO COLD LEG HOLE [B0072]



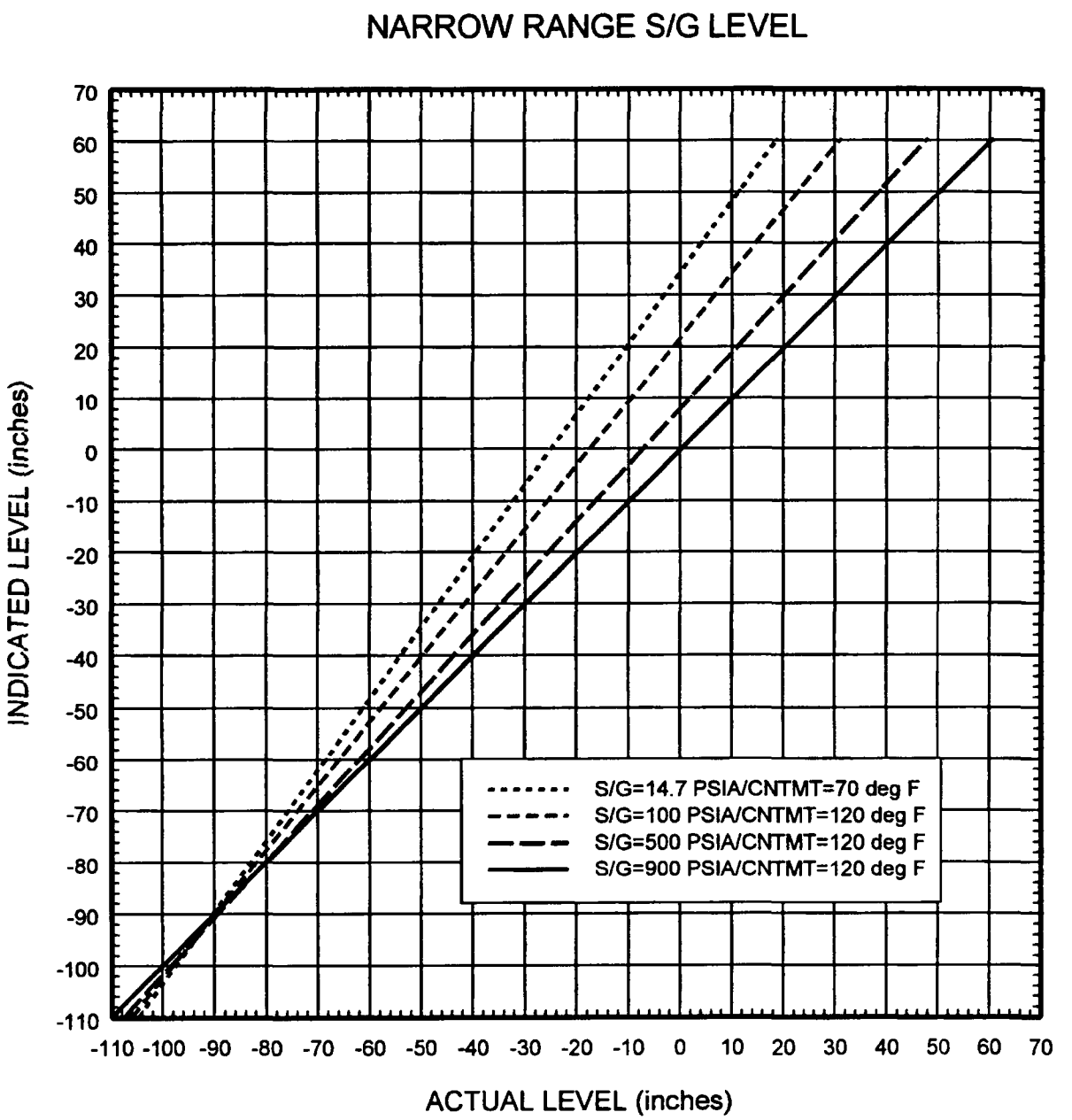
TIME TO CORE UNCOVERY AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN WITH NOZZLE DAMS, NO INJECTION, NO COLD LEG HOLE [B0072]



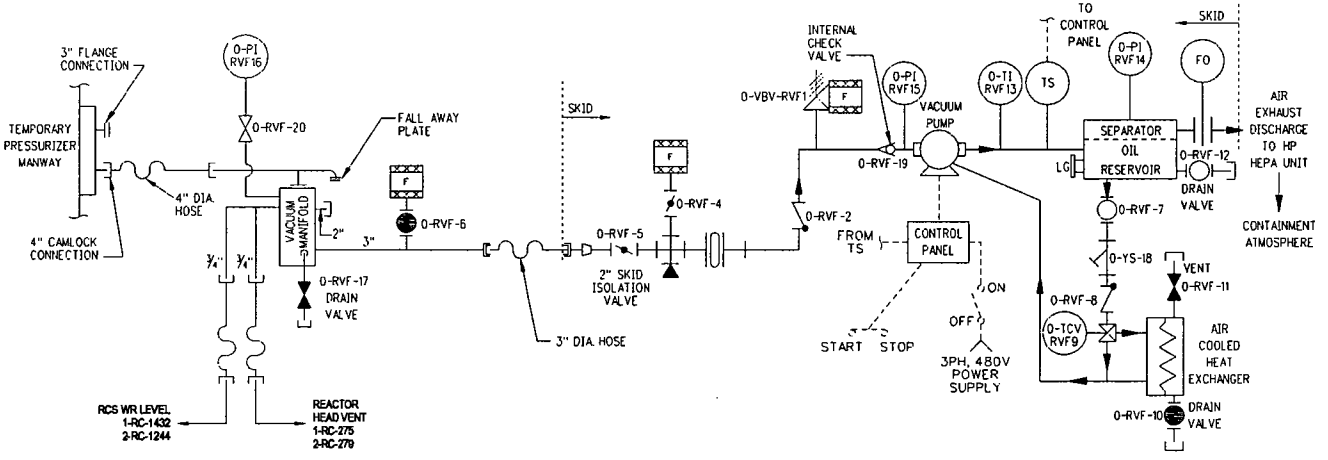
RFP TIME TO BOIL AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN [B0072]



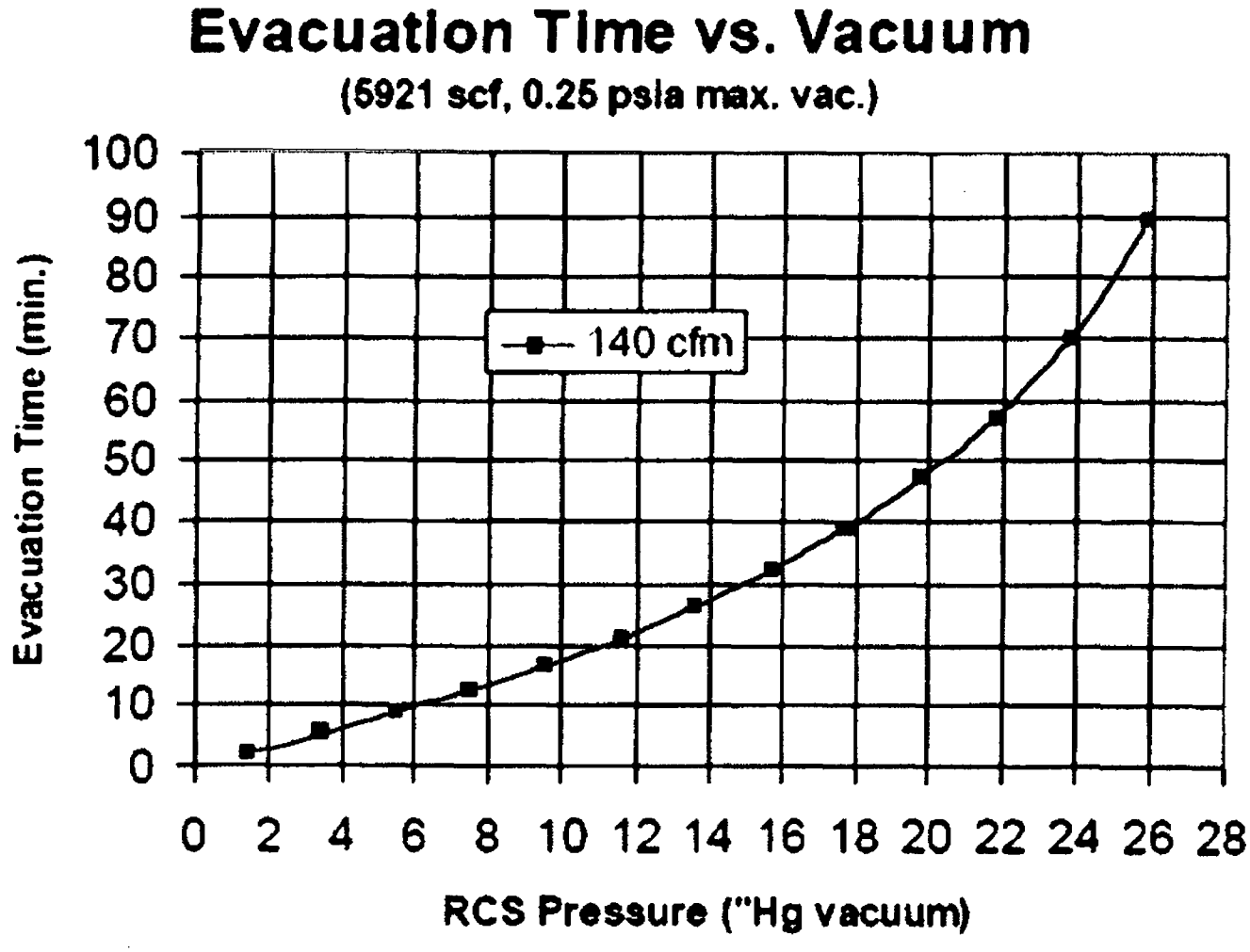
NARROW RANGE S/G LEVEL



RCS VACUUM FILL EQUIPMENT



RCS EVACUATION TIME



PRESSURIZER COOLDOWN LOG

PZR COOLDOWN NO. _____ DATE/TIME C/D STARTED_____

PZR cooldown should be conducted at a linear rate, **NOT** to exceed 200°F in any one hour period. PZR temperature should be recorded every 15 minutes and should **NOT** exceed 50°F in any 15 minute interval. The maximum step change in PZR temperature should **NOT** exceed 33.3°F. A soak period of 10 minutes should occur after each step change in temperature. Operating experience has shown that when collapsing the PZR bubble, layers of stratified water may move past the PZR temperature element indicating step changes greater than 33.3°F. Soak periods are **NOT** required when collapsing the PZR bubble. PZR cooldown shall **NOT** exceed 200°F in any one hour period.

TIME	PZR PRESS (PSIA) (1)	PZR TEMP (°F) (2)	PZR SPRAY TEMP (°F) (3)	PZR C/D RATE (°F/HR)	PZR SPRAY DIFFERENTIAL TEMP (°F) (4)	INIT	CALC. CHECK INIT

Pressure and Temperature parameters may be read on the Control Board **OR** the Plant Computer

REVIEWED BY: _____
(SM or CRS)

[NOTES (1) - (4) ARE ON THE NEXT PAGE]

PRESSURIZER COOLDOWN LOG

(1) RCS Pressure:

Less Than 1550 PSIA: read the higher of PI-103 **OR** PI-103-1 **OR** read PI-105A

Greater Than 1550 PSIA: read PIC-100X **OR** PIC-100Y **OR** read PI-105A

(2) PZR Temperature: read TI-101

(3) Main Spray Temperature: read TIA-103 **OR** TIA-104

AUX Spray Temperature: read TI-229

(4) Maximum Spray ΔT is 400°F (Ref. TRM 15.4.2)

PRESSURIZER HEATUP LOG

PZR HEATUP NO. _____ DATE/TIME H/U STARTED_____

The heatup of the PZR is to be conducted at a linear rate **NOT** to exceed 100°F in any one hour period. PZR temperature should be recorded every 15 minutes and should **NOT** exceed 25°F in any 15 minute interval. The maximum step change in PZR temperature should **NOT** exceed 16.7°F. A soak period of 10 minutes should occur after each step change in temperature.

TIME	PZR PRESS (PSIA) (1)	PZR TEMP (°F) (2)	PZR SPRAY TEMP (°F) (3)	PZR H/U RATE (°F/HR)	PZR SPRAY DIFFERENTIAL TEMP (°F) (4)	INIT	CALC. CHECK INIT

Pressure and Temperature parameters may be read on the Control Board **OR** the Plant Computer

REVIEWED BY: _____
(SM or CRS)

[NOTES (1) - (4) ARE ON THE NEXT PAGE]

PRESSURIZER HEATUP LOG

(1) RCS Pressure:

Less Than 1550 PSIA: read the higher of PI-103 **OR** PI-103-1 **OR** read PI-105A

Greater Than 1550 PSIA: read PIC-100X **OR** PIC-100Y **OR** read PI-105A

(2) PZR Temperature: read TI-101

(3) Main Spray Temperature: read TIA-103 **OR** TIA-104

AUX Spray Temperature: read TI-229

(4) Maximum Spray ΔT is 400°F (Ref. TRM 15.4.2)

RCS HEATUP LOG

RCS HEATUP NO. _____ DATE/TIME H/U STARTED_____

RCS temperature shall be recorded every 15 minutes during heatup. A soak period of 10 minutes should occur after each step change in temperature. Reactor Vessel heatup limits are as follows:

RCS TEMPERATURE	H/U RATE LIMIT	15 MINUTE ΔT	STEP CHANGE ΔT
70°F to 246°F	80°F per hour	20°F	13.3°F
Greater than 246°F	100°F per hour	25°F	16.7°F

TIME	RCS(1) PRESS (PSIA)	RCS (2) TEMP (°F)	H/U RATE (°F/HR)	INIT	CALC. CHECK INIT	TIME	RCS(1) PRESS (PSIA)	RCS (2) TEMP (°F)	H/U RATE (°F/HR)	INIT	CALC. CHECK INIT

Pressure and Temperature parameters may be read on the Control Board **OR** the Plant Computer

REVIEWED BY: _____
(SM or CRS)

[NOTES (1) & (2) ARE ON THE NEXT PAGE]

RCS HEATUP LOG

(1) RCS Pressure:

Less Than 1550 PSIA: read the higher of PIC-103 **OR** PIC-103-1 **OR** read PI-105A

Greater Than 1550 PSIA: read PIC-100X **OR** PIC-100Y **OR** read PI-105A

(2) RCS Temperature: **Forced Flow:** read TI-112C **OR** TI-122C

Natural Circ: RCS Temp Greater than 358°F: read average of at least 2 CETs

RCS Temp Less than 358°F: read lowest valid displayed CET

SDC Flow: read TR-351

CALCULATION OF FINAL RWT CONCENTRATION FOR RCS DRAIN

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____ / _____
Init Date

B. **UTILIZE** the following calculation to determine the final RWT Boron concentration if the RCS will be drained to the RWT:

NOTE

When drawing a Pressurizer bubble, assume that the RWT level change equals 10 inches:
PZR "solid" = 404 in
Drain PZR from 404 in to 144 in = 260 in
PZR volume = 30 gal/in
260 in x 30 gal/in = 7800 gal
RWT = 842 gal/in
(7800 gal)/(842 gal/in) = 9.26 in

$$\frac{C1V1 + C2V2}{V1 + V2} = Cf$$

$$\frac{[(\quad PPM)(\quad in)]+[(\quad PPM)(\quad in)]}{(\quad in)+(\quad in)} = _____ppm$$

Where:

- C1 = Present RWT concentration (PPM)
- V1 = Present RWT level (inches)
- C2 = Present RCS concentration (PPM)
- V2 = change in RWT level (10 inches for drawing Pressurizer bubble)
- Cf = Final RWT concentration (PPM)
- 2450 = Low Administrative limit (PPM)

C. **IF** Cf is less than 2450 PPM,
THEN CONSIDER RAISING RWT Boron concentration to a value that would permit draining **OR DRAIN** to RCW.

REACTOR VESSEL LEVEL CORRELATION

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____ / _____
Init Date

B. **RECORD** RCS level indication at each Reactor Vessel level during drain down, on the table below:

RX V LVL CH A	RCS LEVEL	RCS LEVEL INDICATION	RX V LVL CH B	RCS LEVEL	RCS LEVEL INDICATION	INIT
160 in.	46.49 ft.		160 in.	46.49 ft.		
151 in.	45.74 ft.		151 in.	45.74 ft.		
112 in.	42.49 ft.		112 in.	42.49 ft.		
71 in.	39.08 ft.		71 in.	39.08 ft.		
50 in.	37.33 ft.		50 in.	37.33 ft.		

DRAINING THE RCS VIA CVCS TO WPS

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

____/_____
Init Date

NOTE

- **WHEN** RCS level reaches the top of the Hot Leg, **THEN** level fluctuations will occur until the S/G tubes completely drain.
- When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**

B. **IF** at any time during the draindown, **ALL** RCS level indication is lost, **THEN PERFORM** the following: **[B0072]**

- **IF** tygon tubing is used for local RCS level indication, **THEN SHUT** Local Refueling Level Indicator, 2-RC-1238. ____
- **EVACUATE** personnel from Containment **PER** the CONTAINMENT EVACUATION Attachment of the ERPIP. ____
- **STOP** the RCS drain down **AND EVALUATE** the reason for the loss of the level indication.
  - **IF** the RCS is **NOT** in Reduced Inventory, **AND** at least 2 RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

  OR

  - **IF** the RCS is in Reduced Inventory, **AND** at least 2 independent RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

DRAINING THE RCS VIA CVCS TO WPS

C. **IF** at any time during the draindown, the following parameters fluctuate erratically: **[B0072]**

- SDC flow
- LPSI pump suction or discharge pressure
- LPSI pump motor amps

THEN COMPLETE the following actions:

1. **IF** RCS level is less than 37.6 feet,
   THEN VERIFY SDC flow is approximately 1800 GPM. ____

2. **IF** RCS level is greater than 37.6 feet and less than or equal to 41 feet,
   THEN:

   - **IF** 2LE4138 is **NOT** one of the required RCS level indications,
     AND NOT preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 3000 GPM. ____

   OR

   - **IF** 2LE4138 is one of the required RCS level indications,
     OR preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 1800 GPM. ____

3. **IF** RCS level is greater than 41 feet,
   THEN VERIFY SDC flow is approximately 3000 GPM. ____

4. **IF** SDC flow **CANNOT** be restored,
   THEN COMPLETE the following actions:

   a. **STOP** the operating LPSI Pump(s) ____

   b. **STOP** the RCS draindown. ____

   c. **IMPLEMENT** AOP-3B, Abnormal Shutdown Cooling Conditions. ____

D. **NOTIFY** Radiation Safety Supervision draining RCS to WPS. ____

E. **ENSURE** SDC aligned to CVCS purification **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

F. **ENSURE** VCT LD INLET, 2-CVC-500-CV, selected to WPS. ____

DRAINING THE RCS VIA CVCS TO WPS

NOTE
Use the lowest reading RCS level indicator as actual RCS level.

G. **IF** RCS level is above 41 feet,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
SET the RCS low level alarms at 41 feet **OR** the target level, which ever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

CAUTION
Operating Experience has shown that purification should be secured slowly to reduce the affects on RCS temperature.

H. **ENSURE** purification is secured:

1. **ENSURE SHUT** SDC Supply to CVCS B/U, 2-SI-464. ____
2. **ENSURE SHUT** CVCS to SDC, 2-SI-475. ____

NOTE
The operation of CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325, is controlled by NO-1-205, LOCKED VALVES, when SDC is in operation.

I. **UNLOCK** and **OPEN** CVCS DIVERSION TO DEGAS ISOL, 2-CVC-325. ____

DRAINING THE RCS VIA CVCS TO WPS

NOTE

- The flow rate indicated on 2-FI-500 will indicate RCS drain rate.
- The diversion integrator, 2-FQI-2540 on 1C63 may be used to monitor the RCS drain.

J. **THROTTLE OPEN** SDC Supply to CVCS B/U, 2-SI-464, to obtain the desired drain rate. ____

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

K. **IF** draining the RCS to less than 41 foot elevation **PER** Section 6.4, REDUCED INVENTORY OPERATIONS,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
RESET the RCS low level alarms every two feet **OR** the target level, which ever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

DRAINING THE RCS VIA CVCS TO WPS

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

L. **WHEN** any of the following conditions exist:

- It is desired to stop the draindown to check the RCS level ____
- The RCS is less than the 41 foot elevation **AND** the RCS has been drained two feet. ____
- The RCS is drained to the targeted level. ____

THEN:

1. **SHUT** 2-SI-464. ____
2. **WAIT** at least five minutes,
   THEN COMPARE RCS level indications in use.
   a. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
      THEN ALLOW additional time for the pressures to equalize. ____
   b. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
      THEN REQUEST IM to investigate the discrepancies. ____
3. **WHEN** RCS level indications in use agree within 0.5 feet,
   THEN:
   - **RESET** the RCS low level alarms. ____
   - **IF** RCS level is **NOT** at the targeted level,
     THEN THROTTLE 2-SI-464 to re-initiate draining. ____
4. **REPEAT** steps L.1 - 3 as necessary until the targeted RCS level is reached. ____

DRAINING THE RCS VIA CVCS TO WPS

M. **WHEN** the RCS is at the target level,
THEN:

1. **LOCK SHUT** 2-CVC-325. ____

2. **OPEN** 2-SI-475. ____

CAUTION
Operating Experience has shown that purification should be placed in service slowly to reduce the affects on RCS temperature.

3. **SLOWLY THROTTLE** 2-SI-464 to obtain the desired purification flow rate. ____

NOTE
While the RCS level is less than the 41 foot elevation, purification should only be in service for draining the RCS, unless 2-CVC-500-CV is gagged in the WPS position.

CAUTION
If 2-CVC-500-CV is **NOT** gagged in the WPS position **AND** the plant had a loss of Instrument Air, 2-CVC-500-CV would shift to the VCT position, dumping SDC until the purification alignment was isolated.

N. **IF** RCS level is less than the 41 foot elevation **AND** 2-CVC-500-CV is **NOT** gagged in the WPS position,
THEN SECURE purification on SDC **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

O. **IF** RCS level is greater than the 41 foot elevation,
THEN PLACE SDC purification in the desired alignment. ____

P. **ALLOW** a minimum of 5 minutes for RCS and Containment pressures to equalize. ____

DRAINING THE RCS VIA CVCS TO WPS

NOTE
SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

Q. **COMPARE** RCS level indications in use. ____

1. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet, **THEN ALLOW** additional time for the pressures to equalize. ____

2. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet, **THEN REQUEST** IM to investigate the discrepancies. ____

R. **NOTIFY** Radiation Safety Supervision draining is complete. ____

S. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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DRAINING THE RCS VIA CVCS TO THE VCT

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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NOTE
There is approximately 27 gals/inch in the VCT.

B. **VERIFY** there is adequate room in the VCT. ____

NOTE

- **WHEN** RCS level reaches the top of the Hot Leg, **THEN** level fluctuations will occur until the S/G tubes completely drain.
- When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**

C. **IF** at any time during the draindown, **ALL** RCS level indication is lost, **THEN PERFORM** the following: **[B0072]**

- **IF** tygon tubing is used for local RCS level indication, **THEN SHUT** Local Refueling Level Indicator, 2-RC-1238. ____
- **EVACUATE** personnel from Containment **PER** the CONTAINMENT EVACUATION Attachment of the ERPIP. ____
- **STOP** the RCS drain down **AND EVALUATE** the reason for the loss of the level indication.
  - **IF** the RCS is **NOT** in Reduced Inventory, **AND** at least 2 RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

  OR

  - **IF** the RCS is in Reduced Inventory, **AND** at least 2 independent RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

DRAINING THE RCS VIA CVCS TO THE VCT

D. **IF** the following parameters fluctuate erratically any time during the draindown: **[B0072]**

- SDC flow
- LPSI pump suction or discharge pressure
- LPSI pump motor amps

THEN COMPLETE the following actions:

1. **IF** RCS level is less than 37.6 feet,
   THEN VERIFY SDC flow is approximately 1800 GPM. ____

2. **IF** RCS level is greater than 37.6 feet and less than or equal to 41 feet,
   THEN:

   - **IF** 2LE4138 is **NOT** one of the required RCS level indications,
     AND NOT preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 3000 GPM. ____

   OR

   - **IF** 2LE4138 is one of the required RCS level indications,
     OR preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 1800 GPM. ____

3. **IF** RCS level is greater than 41 feet,
   THEN VERIFY SDC flow is approximately 3000 GPM. ____

4. **IF** SDC flow **CANNOT** be restored,
   THEN COMPLETE the following actions:

   a. **STOP** the operating LPSI Pump(s) ____

   b. **STOP** the RCS draindown. ____

   c. **IMPLEMENT** AOP-3B, Abnormal Shutdown Cooling Conditions. ____

E. **NOTIFY** Radiation Safety Supervision draining RCS to VCT. ____

F. **IF** VCT level indication is lost at any time during the draindown,
THEN immediately **SECURE** the draindown by placing 2-CVC-500-CV in the WPS position. ____

G. **ENSURE** SDC aligned to CVCS purification **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

DRAINING THE RCS VIA CVCS TO THE VCT

NOTE
Use the lowest reading RCS level indicator as actual RCS level.

H. **IF** RCS level is above 41 feet,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
SET the RCS low level alarms at 41 feet **OR** the target level, whichever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

I. **PLACE** VCT LD Inlet, 2-CVC-500-CV in the VCT position. ____

DRAINING THE RCS VIA CVCS TO THE VCT

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

J. **IF** draining the RCS to less than 41 foot elevation **PER** Section 6.4, REDUCED INVENTORY OPERATIONS,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
RESET the RCS low level alarms every two feet **OR** the target level, whichever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

DRAINING THE RCS VIA CVCS TO THE VCT

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

K. **WHEN** any of the following conditions exist:

- It is desired to stop the draindown to check the RCS level ____
- The RCS is less than the 41 foot elevation **AND** the RCS has been drained two feet. ____
- The RCS is drained to the targeted level ____
- VCT level is approaching 108 inches ____

THEN:

1. **PLACE** 2-CVC-500-CV in the WPS position. ____
2. WAIT at least five minutes,
   THEN COMPARE RCS level indications in use.
   a. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
      THEN ALLOW additional time for the pressures to equalize. ____
   b. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
      THEN REQUEST IM to investigate the discrepancies. ____
3. **WHEN** RCS level indications in use agree within 0.5 feet,
   THEN:
   - **RESET** the RCS low level alarms. ____
   - **IF** RCS level is **NOT** at the targeted level,
     THEN PLACE 2-CVC-500-CV in the VCT position. ____
4. **REPEAT** steps K.1 - K.3 as necessary until the target RCS level is reached or VCT level is 108 inches. ____

L. **WHEN** the RCS level is at the target level **OR** the VCT level is 108 inches,
THEN PLACE 2-CVC-500-CV in the WPS position. ____

DRAINING THE RCS VIA CVCS TO THE VCT

CAUTION
If 2-CVC-500-CV is **NOT** gagged in the WPS position **AND** the plant had a loss of Instrument Air, 2-CVC-500-CV would shift to the VCT position, dumping SDC until the purification alignment was isolated.

M. **IF** RCS level is less than the 41 foot elevation **AND** 2-CVC-500-CV is **NOT** gagged in the WPS position,
THEN SECURE purification on SDC **PER** OI-2D, PURIFICATION SYSTEM OPERATION. ____

N. **ALLOW** a minimum of 5 minutes for RCS and Containment pressures to equalize. ____

NOTE
SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

O. **COMPARE** RCS level indications in use. ____

1. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
THEN ALLOW time for the pressures to equalize. ____

2. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
THEN REQUEST IM to investigate the discrepancies. ____

P. **NOTIFY** Radiation Safety Supervision draining is complete. ____

Q. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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B. **VERIFY** with Chemistry that RCS water quality is good enough to go in the RWT. ____

NOTE

- **WHEN** RCS level reaches the top of the Hot Leg, **THEN** level fluctuations will occur until the S/G tubes completely drain.
- When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**

C. **IF** at any time during the draindown, **ALL** RCS level indication is lost, **THEN PERFORM** the following: **[B0072]**

- **IF** tygon tubing is used for local RCS level indication, **THEN SHUT** LOCAL REFUELING LEVEL INDICATOR, 2-RC-1238. ____
- **EVACUATE** personnel from Containment **PER** the CONTAINMENT EVACUATION Attachment of the ERPIP. ____
- **STOP** the RCS drain down **AND EVALUATE** the reason for the loss of the level indication.
  - **IF** the RCS is **NOT** in Reduced Inventory, **AND** at least 2 RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

  OR

  - **IF** the RCS is in Reduced Inventory, **AND** at least 2 independent RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

D. **IF** at any time during the draindown, the following parameters fluctuate erratically: **[B0072]**

- SDC flow
- LPSI pump suction or discharge pressure
- LPSI pump motor amps

THEN COMPLETE the following actions:

1. **IF** RCS level is less than 37.6 feet,
   THEN VERIFY SDC flow is approximately 1800 GPM. ____

2. **IF** RCS level is greater than 37.6 feet and less than or equal to 41 feet,
   THEN:

   - **IF** 2LE4138 is **NOT** one of the required RCS level indications,
     AND NOT preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 3000 GPM. ____

   OR

   - **IF** 2LE4138 is one of the required RCS level indications,
     OR preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 1800 GPM. ____

3. **IF** RCS level is greater than 41 feet,
   THEN VERIFY SDC flow is approximately 3000 GPM. ____

4. **IF** SDC flow **CANNOT** be restored,
   THEN COMPLETE the following actions:

   a. **STOP** the operating LPSI Pump(s) ____

   b. **STOP** the RCS draindown. ____

   c. **IMPLEMENT** AOP-3B, Abnormal Shutdown Cooling Conditions. ____

E. **CALCULATE** the final RWT boron concentration **PER** APPENDIX 4, CALCULATION OF FINAL RWT CONCENTRATION FOR RCS DRAIN. ____

F. **NOTIFY** Radiation Safety Supervision of the pending RCS drain to the RWT. ____

G. Periodically **MONITOR** SFP level during the drain **AND** for 30 minutes after. ____

DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

NOTE
Use the lowest reading RCS level indicator as actual RCS level.

H. **IF** RCS level is above 41 feet,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
SET the RCS low level alarms at 41 feet **OR** the target level, which ever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

NOTE
Locked valves controlled under NO-1-205.

I. **PERFORM** one or both of the following to achieve the desired flowrate to the RWT:

1. **OPEN** the operating LPSI Mini-flow Return Isolation:
   - 21 LPSI PP MINIFLOW RTN ISOL.....2-SI-449 ____
   - 22 LPSI PP MINIFLOW RTN ISOL.....2-SI-450 ____
2. **OPEN** the applicable SDC HX to HPSI suction(s):
   - 21 SDC HX TO HPSI SUCT.....2-SI-663-MOV ____
   - 22 SDC HX TO HPSI SUCT.....2-SI-662-MOV ____

DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

J. **IF** draining the RCS to less than 41 foot elevation **PER** Section 6.4, REDUCED INVENTORY OPERATIONS,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
RESET the RCS low level alarms every two feet **OR** the target level, which ever is higher:

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4138 Low Level Alarm Limit (when less than 39 foot) ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

K. **WHEN** any of the following conditions exist:

- It is desired to stop the draindown to check the RCS level. ____
- The RCS is less than the 41 foot elevation **AND** the RCS has been drained two feet. ____
- The RCS has been drained to the target level. ____

THEN,

1. **IF** opened to drain the RCS,
   THEN SHUT the miniflow isolation on the running LPSI pump:

   - 21 LPSI PP MINIFLOW RTN ISOL....2-SI-449 ____
   - 22 LPSI PP MINIFLOW RTN ISOL....2-SI-450 ____

2. **IF** opened to raise the drain rate,
   THEN SHUT the in service SDC heat exchanger to HPSI pump suction valve(s):

   - 21 SDC HX TO HPSI SUCT...2-SI-663-MOV ____
   - 22 SDC HX TO HPSI SUCT...2-SI-662-MOV ____

3. **WAIT** at least five minutes,
   THEN COMPARE RCS level indications in use.

   a. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
      THEN ALLOW additional time for the pressures to equalize. ____

   b. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
      THEN REQUEST IM to investigate the discrepancies. ____

4. **WHEN** RCS level indications in use agree within 0.5 feet, **IF** desired to re-initiate draining,
   THEN OPEN the selected LPSI pump miniflow **OR** the in service SDC heat exchanger to HPSI pump suction valve. ____

5. **REPEAT** steps K.1-4 as necessary until the target RCS level is reached. ____

DRAINING THE RCS VIA LPSI MINIFLOW TO RWT

L. **WHEN** the RCS is at the target level,
THEN PERFORM the following:

1. **IF** opened to drain the RCS,
THEN LOCK SHUT the miniflow isolation on the running LPSI pump:

   - 21 LPSI PP MINIFLOW RTN ISOL....2-SI-449 ____
   - 22 LPSI PP MINIFLOW RTN ISOL....2-SI-450 ____

2. **IF** opened to raise the drain rate,
THEN SHUT the in service SDC heat exchanger to HPSI pump suction valve:

   - 21 SDC HX TO HPSI SUCT...2-SI-663-MOV ____
   - 22 SDC HX TO HPSI SUCT...2-SI-662-MOV ____

M. **ALLOW** a minimum of 5 minutes for RCS and Containment pressures to equalize. ____

> **NOTE**
> SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

N. **COMPARE** RCS level indications in use.

1. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
THEN ALLOW additional time for the pressures to equalize. ____

2. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
THEN REQUEST IM to investigate the discrepancies. ____

O. **NOTIFY** Radiation Safety Supervision draining is complete. ____

P. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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DRAINING THE RCS VIA RCS DRAIN VALVES

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

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NOTE

- **WHEN** RCS level reaches the top of the Hot Leg, **THEN** level fluctuations will occur until the S/G tubes completely drain.
- When the RCS is draining between the 51 foot elevation and the 39 foot elevation an error may exist between the indicated level and the actual level. The indicated level may be lower than the actual level. The error size will be based on the drain rate. The larger the drain rate the larger the error. **[B0132]**

B. **IF** at any time during the draindown, **ALL** RCS level indication is lost, **THEN PERFORM** the following: **[B0072]**

- **IF** tygon tubing is used for local RCS level indication, **THEN SHUT** LOCAL REFUELING LEVEL INDICATOR, 2-RC-1238. ____
- **EVACUATE** personnel from Containment **PER** the CONTAINMENT EVACUATION Attachment of the ERPIP. ____
- **STOP** the RCS drain down **AND EVALUATE** the reason for the loss of the level indication.
  - **IF** the RCS is **NOT** in Reduced Inventory, **AND** at least 2 RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

  OR

  - **IF** the RCS is in Reduced Inventory, **AND** at least 2 independent RCS level indications are available, **AND** ALL RCS level indications that will be used, agree within 0.5 feet, **THEN CONTINUE** the RCS draindown. **[B0597]** ____

DRAINING THE RCS VIA RCS DRAIN VALVES

C. **IF** at any time during the draindown, the following parameters fluctuate erratically: **[B0072]**

- SDC flow
- LPSI pump suction or discharge pressure
- LPSI pump motor amps

THEN COMPLETE the following actions:

1. **IF** RCS level is less than 37.6 feet,
   THEN VERIFY SDC flow is approximately 1800 GPM. ____

2. **IF** RCS level is greater than 37.6 feet and less than or equal to 41 feet,
   THEN:

   - **IF** 2LE4138 is **NOT** one of the required RCS level indications,
     AND NOT preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 3000 GPM. ____

   OR

   - **IF** 2LE4138 is one of the required RCS level indications,
     OR preparing for Vacuum Fill,
     THEN VERIFY SDC flow is approximately 1800 GPM. ____

3. **IF** RCS level is greater than 41 feet,
   THEN VERIFY SDC flow is approximately 3000 GPM. ____

4. **IF** SDC flow **CANNOT** be restored,
   THEN COMPLETE the following actions:

   a. **STOP** the operating LPSI Pump(s) ____

   b. **STOP** the RCS draindown. ____

   c. **IMPLEMENT** AOP-3B, Abnormal Shutdown Cooling Conditions. ____

D. **NOTIFY** Radiation Safety Supervision draining RCS to the RCDT and pumping to WPS. ____

E. Periodically **MONITOR** SFP level during the drain **AND** for 30 minutes after. ____

F. **PUMP** the RCDT until the RCDT Pump stops on low level. ____

DRAINING THE RCS VIA RCS DRAIN VALVES

NOTE
Use the lowest reading RCS level indicator as actual RCS level.

G. **IF** RCS level is above 41 feet,
THEN, using ATTACHMENT 4, REFUELING LEVEL CART INSTRUCTIONS,
SET the RCS low level alarms at 41 feet **OR** the target level, which ever is higher: ____

- 0CRT4136
  - 4136 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____
- 0CRT4137
  - 4137 Low Level Alarm Limit ____
  - 2LE4139 Low Level Alarm Limit ____
  - 2LT4140 Low Level Alarm Limit ____

DRAINING THE RCS VIA RCS DRAIN VALVES

NOTE
The RCS Drain valves marked with an asterisk (*) are locked valves.

H. **OPEN** one or more sets of RCS Drain Valves:

- 21 HOT LEG DRN.....2-RC-107*
  21 HOT LEG DRN.....2-RC-108 ____

OR

- 21A COLD LEG DRN.....2-RC-111*
  21A COLD LEG DRN.....2-RC-112 ____

OR

- 21B COLD LEG DRN.....2-RC-113*
  21B COLD LEG DRN.....2-RC-114 ____

OR

- 22A COLD LEG DRN.....2-RC-115*
  22A COLD LEG DRN.....2-RC-116
  22A COLD LEG B/U DRN.....2-RC-129 ____

OR

- 22B COLD LEG DRN.....2-RC-117*
  22B COLD LEG DRN.....2-RC-118 ____

I. **PUMP** the RCDT as necessary to keep the RCDT High Level alarm clear. ____

DRAINING THE RCS VIA RCS DRAIN VALVES

NOTE

- Use the lowest reading RCS level indicator as actual RCS level.
- SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

J. **IF** draining the RCS to less than 41 foot elevation,
THEN WHEN the RCS has been drained to the lesser of two feet **OR** the target level using the lowest reading indicator,
THEN SHUT the RCS Drain valves used for the drain.

1. **WAIT** at least five minutes,
THEN COMPARE RCS level indications in use.

   a. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
   THEN ALLOW additional time for the pressures to equalize. ____

   b. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
   THEN REQUEST IM to investigate the discrepancies. ____

2. **WHEN** RCS level indications in use agree within 0.5 feet,
THEN OPEN the RCS Drain valves used previously to re-initiate draining. ____

3. **CONTINUE** to stop the drain and compare RCS level indication every two feet until the target RCS level is reached **PER** Step J. ____

DRAINING THE RCS VIA RCS DRAIN VALVES

NOTE
The RCS Drain valves marked with an asterisk (*) are locked valves.

K. **WHEN** the RCS is at the target level,
THEN SHUT OR LOCK SHUT the RCS Drain valves used for the drain:

- 21 HOT LEG DRN.....2-RC-107*
  21 HOT LEG DRN.....2-RC-108 ____

OR

- 21A COLD LEG DRN.....2-RC-111*
  21A COLD LEG DRN.....2-RC-112 ____

OR

- 21B COLD LEG DRN.....2-RC-113*
  21B COLD LEG DRN.....2-RC-114 ____

OR

- 22A COLD LEG DRN.....2-RC-115*
  22A COLD LEG DRN.....2-RC-116
  22A COLD LEG B/U DRN.....2-RC-129 ____

OR

- 22B COLD LEG DRN.....2-RC-117*
  22B COLD LEG DRN.....2-RC-118 ____

L. **ALLOW** a minimum of 5 minutes for RCS and Containment pressures to equalize. ____

NOTE
SDC flow rates greater than 2000 GPM will cause the indication provided by 2LE4138 to become erratic or non existent due to increasing amount of water turbulence in the hot leg.

M. **COMPARE** RCS level indications in use. ____

1. **IF** the RCS level indications in use do **NOT** agree within 0.5 feet,
   THEN ALLOW additional time for the pressures to equalize. ____

2. **IF** after 30 minutes the RCS level indications in use still do **NOT** agree within 0.5 feet,
   THEN REQUEST IM to investigate the descrepancies. ____

DRAINING THE RCS VIA RCS DRAIN VALVES

N. **NOTIFY** Radiation Safety Supervision draining is complete. ____

O. **NOTIFY** Outage Management to schedule Rep Task 20642086 to have Mechanical Maintenance cold torque the RCS Drain valves operated in this section. ____

P. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

____/_____
Init Date

REDUCED INVENTORY RESPONSIBILITY LIST

As the result of lessons learned from past reduced inventory evolutions, the requirements as listed in NO-1-103 will be in effect **AND** reviewed for all reduced inventory evolutions. **[B0328]**

- Acknowledge and accept responsibility to notify the Shift Outage Manager of any delays that occur or are expected to occur or any work that may be started that would keep the unit in a reduced inventory condition. This responsibility will be acknowledged and accepted by the Work Group Supervisors designated alternate during periods when the Work Group Supervisor is not on site.

WORK GROUP SUPERVISOR	SIGNATURE	DATE
GS-MM		
GS-E&C		
SUPERVISOR-RAD CON		
SUPERVISOR-ALARA		
PRIMARY SYSTEMS ENGINEERING		
BOP SYSTEMS ENGINEERING		
E&C SYSTEMS ENGINEERING		
WCU SUPERVISOR		
OUTAGE MANAGEMENT COORDINATOR		

OBTAIN final approval to enter reduced inventory:

a. Shift Manager certifies **ALL** reduced inventory requirements are met.

_____/_____
SHIFT MANAGER DATE

b. Approval to enter reduced inventory.

_____/_____
GS-SO DATE

PLANS FOR QUICK RECOVERY OF RCS LEVEL [B0072]

DETAILED JOB DESCRIPTION:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

MO#_____ ETP#_____

STP#_____ OTHER_____

This detailed description of the job will be provided to **ALL** groups involved, designating the actions required if SDC **OR** RCS level indication is lost. As a minimum, this will include:

- Communications and the phone numbers as needed
- Names of individuals stationed in the work area who are responsible for the safe evacuation of the workers from the area
- Lead persons on the job
- The RCS water level band to be maintained when in reduced inventory operation to prevent flooding or loss of SDC

PLANS FOR QUICK RECOVERY OF RCS LEVEL [B0072]

NAMES OF DESIGNATED RADIATION SAFETY PERSONNEL TO CALL FOR EVACUATION:

NAME	SHIFT/DATE	PHONE NUMBER

APPROVALS:

_____/_____
RESPONSIBLE WORK GROUP GS DATE

_____/_____
RADIATION SAFETY SUPERVISOR DATE

_____/_____
WCU SUPERVISOR DATE

_____/_____
SHIFT MANAGER DATE

_____/_____
GS-SO (for HPSI PP return to service) DATE

RCS/SDC PERTURBATION LOG [B0073] [B0138]

PERTURBATION:

_____

_____

_____

_____

SPECIAL PRECAUTIONS/ENHANCED MONITORING:

_____

_____

_____

_____

_____

_____

REVIEW AND APPROVAL:

_____/_____
SHIFT MANAGER DATE

PERTURBATION:

START:_____/_____
DATE TIME

START:_____/_____
DATE TIME

APPROVAL TO TERMINATE SPECIAL ACTIONS:

_____/_____
SHIFT MANAGER DATE

PRESSURIZER MANWAY RE-INSTALLATION CHECKLIST [B0079]

NOTE
Use of this Appendix is directed by Maintenance procedure RCS-10 PRESSURIZER MANWAY COVER REMOVAL AND INSTALLATION.

A. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____ / _____
Init Date

B. S/G nozzle dams are removed.

_____ / _____
Init Date

C. **REVIEW** the Temporary Alteration Log **AND CHECK** that there are no outstanding items which require the Pressurizer manway removed.

_____ / _____
Init Date

D. **REVIEW** the Procedure Controlled Plant Configuration Log (PC Log) **AND CHECK** that there are no outstanding items which require the Pressurizer manway removed.

_____ / _____
Init Date

PRESSURIZER MANWAY RE-INSTALLATION CHECKLIST [B0079]

E. **VERIFY** RCS vent path **PER** Tech Spec 3.4.12 is available.

- **IF** PORVs are to be used as a RCS vent path, **THEN PERFORM** an Administrative Verification of PORV **AND** PORV Block valve operability as follows:

  - **REVIEW** the Temporary Alteration Log for items impacting PORV **OR** PORV Block valve operability.

    ____/_____
    Init Date

  - **REVIEW** the Procedure Controlled Plant Configuration Log (PC Log) for items impacting PORV **AND** PORV Block valve operability.

    ____/_____
    Init Date

  - **CHECK** STPs M-572A, M-572B and M-672B are current.

    E&C FSTC _____ DATE _____

  - **CHECK BOTH** Override Shut/Auto handswitches are in AUTO:

    ____/_____
    Init Date

    - PORV 402 OVERRIDE.....2-HS-1402
    - PORV 404 OVERRIDE.....2-HS-1404

  - **CHECK BOTH** PORV handswitches in SINGLE MPT ENABLE:

    ____/_____
    Init Date

    - PORV 402 MPT PROTECTION...2-HS-1406
    - PORV 404 MPT PROTECTION...2-HS-1408

  - **ENSURE** BOTH PORV Block Valves are fully open.

    ____/_____
    Init Date

F. **VERIFY** a RCS pressure alarm is active for Critical High Alarm Limit on computer points P103 and P103A **AND** set at 250 PSIA.

____/_____
Init Date

PRESSURIZER MANWAY RE-INSTALLATION CHECKLIST [B0079]

G. **ADMINISTRATIVELY VERIFY** the SDC Suction Isolation Valves, 2-SI-651-MOV and 2-SI-652-MOV, are capable of being shut from the Control Room.

_____/_____
Init Date

H. **ENSURE** the RCS mass addition HPSI tagout for LTOP control is hung.

_____/_____
Init Date

I. **ENSURE** inadvertent RCP start tagout for LTOP control is hung.

_____/_____
Init Date

J. **ENSURE** the Minimum Essential Equipment listed in NO-1-200, CONTROL OF SHIFT ACTIVITIES, is available for the current plant condition. **[B0116]**

_____/_____
Init Date

K. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____/_____
Init Date

OBTAINING 2LT4138 READINGS USING OSCILLOSCOPE

1. **DETERMINE** the time between the intial wave pulse and the first water reflection signal.

2. **USE** table below to convert time to RCS level.

Time (msec)	Level (ft)	Time (msec)	Level (ft)	Time (msec)	Level (ft)
0.135	35.84	0.600	37.00	1.100	38.25
0.150	35.87	0.650	37.12	1.150	38.37
0.200	36.00	0.700	37.25	1.200	38.50
0.250	36.12	0.750	37.37	1.250	38.62
0.300	36.25	0.800	37.50	1.300	38.75
0.350	36.37	0.850	37.62	1.350	38.87
0.400	36.50	0.900	37.75	1.400	39.00
0.450	36.62	0.950	37.87	1.433	39.08
0.500	36.75	1.000	38.00		
0.550	36.87	1.050	38.12		

CALCULATION OF TIME TO BOIL

1. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]** ____

2. **CALCULATE** Time To Boil:

   a. **DETERMINE** the Time To Boil at 24 hours after shutdown from the appropriate figure, based on RCS level and RCS temperature: (N/A figures not used) ____

      - FIGURE 1, TIME TO START BOILING AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN ____
      - FIGURE 2, TIME TO START BOILING AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN WITH S/G TUBES FULL ____
      - FIGURE 5, RFP TIME TO BOIL AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN ____

   b. **OBTAIN** the multiplier from TABLE 3, TIME TO START BOILING OR CORE UNCOVERY MULTIPLIER, based on time after shutdown. ____

   c. **MULTIPLY** the Time To Boil at 24 hours after shutdown by the multiplier.

_____	X	_____	X	_____	=	_____
TTB at 24 hrs		multiplier		post refueling multiplier (IF applicable)		Time To Boil

   d. **INDEPENDENTLY VERIFY** the calculation. ____

CALCULATION OF TIME TO CORE UNCOVERY

1. This Appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]** ____

2. **CALCULATE** Time To Core Uncovery:

   a. **DETERMINE** the Time To Core Uncovery at 24 hours after shutdown from the appropriate figure, based on RCS level and RCS temperature: (N/A figure not used) ____

   - FIGURE 3, TIME TO CORE UNCOVERY AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN, NO NOZZLE DAMS, NO INJECTION, NO COLD LEG HOLE ____
   - FIGURE 4, TIME TO CORE UNCOVERY AFTER LOSS OF SDC, 24 HOURS AFTER SHUTDOWN WITH NOZZLE DAMS, NO INJECTION, NO COLD LEG HOLE ____

   b. **OBTAIN** the multiplier from TABLE 3, TIME TO START BOILING OR CORE UNCOVERY MULTIPLIER, based on time after shutdown. ____

   c. **MULTIPLY** the Time To Boil at 24 hours after shutdown by the multiplier.

_____	X	_____	X	_____	=	_____
Time to Core Uncovery at 24 hrs		multiplier		post refueling multiplier (IF applicable)		Time To Core Uncovery

   d. **INDEPENDENTLY VERIFY** the calculation. ____

ESTABLISHING SAFE WORKING CONDITIONS FOR RCS MAINTENANCE [B0072]

A. **COMPLETE** APPENDIX 11, PLANS FOR QUICK RECOVERY OF RCS LEVEL.

B. **REQUEST** the responsible supervisors to provide detailed instructions to **ALL** personnel designated to carry out specific actions in APPENDIX 11.

C. **REQUEST** the following supervisors:

- Shift Manager
- Tagging Supervisor
- Radiation Safety
- Responsible work group GS (or designated alternate)

CONDUCT a pre-job briefing covering the following items **PER** NO-1-100, CONDUCT OF OPERATIONS:

- Scope of the job
- Placement of safety tags
- Additional Personnel Safety based on RCS temperature
- Communications
- Specific actions required and personnel designated to carry out those actions should a loss of SDC occur
- Methods for initiating prompt evacuation of personnel from areas in and around the openings of the RCS should SDC **OR** Reactor vessel level indication be lost
- Methods for returning a HPSI Pump to service (N/A if Reactor Vessel defueled)

D. **PROVIDE** a copy of APPENDIX 11 to **ALL** parties involved.

E. **REQUEST** that a pre-shift briefing be conducted to explain the requirements of this plan and the names of the designated individuals shall be jointly reviewed by the responsible maintenance group supervisor and the Radiation Safety representative prior to the start of the work on each shift.

F. **ENSURE** the name of the designated Maintenance Group Supervisor is provided to the Radiation Safety Supervisor.

G. At the Operations shift turnover meeting, the Radiation Safety Supervisor shall **ENSURE** that the Operations Shift Manager is supplied with the name of the person to contact if an evacuation is necessary.

- **IF** notified by Operations to evacuate the area, **THEN** the Radiation Safety Supervisor shall **ENSURE** that the Operations Shift Manager is informed when **ALL** personnel are evacuated.

ESTABLISHING SAFE WORKING CONDITIONS FOR RCS MAINTENANCE [B0072]

H. **PRIOR** to the start of work,
THEN the following work group supervisors shall indicate by their signature on APPENDIX 11, that they are satisfied with the actions taken for personnel and plant safety.

- Work Group GS
- RCSS
- Tagging Supervisor
- OPS Shift Manager

I. **IF** required to rack out **ALL** HPSI pump breakers to allow personnel to enter the RCS,
THEN ENSURE the breakers are tagged out **AND** a plan for restoring a HPSI Pump to service prior to Reactor core uncovery is included in APPENDIX 11. (N/A if Reactor Vessel defueled)

- **ENSURE** this written plan is approved by the Shift Manager, the GS-SO, and the appropriate individual from the associated work group (Supv-NME, GS-MM or PE).

J. To prevent personnel injury if an unexpected fast fill of the RCS were to occur, perform the following:

- **ISOLATE AND TAG ALL** sources of water greater than 50 GPM. (Guidance is provided in ATTACHMENT 2, GUIDELINES FOR THE REDUCED INVENTORY 50 GPM TAGOUT.)
- **ENSURE** a borated water source is available **PER** TRM 15.1.3 (N/A if Reactor Vessel defueled)
- **ENSURE** a plan for restoring a HPSI Pump to service prior to Reactor core uncovery is included in APPENDIX 11 **AND** is used each TIME the RCS level is tagged less than or equal to the 41 foot elevation for personnel protection (N/A if Reactor Vessel defueled)

GUIDELINES FOR THE REDUCED INVENTORY 50 GPM TAGOUT

NOTE

- This Attachment is only to be used as guidance and may be changed with the CRS concurrence.
- It is recommended to start hanging the <50 GPM tagout approximately one hour before the anticipated completion of the draindown (approximately three hours after entering reduced inventory if the S/G tubes are full).
- It is recommended to use red (Danger) tags on valves and breakers in the plant and yellow (Caution) tags on Control Room handswitches.

1. The following equipment should be tagged due to being sources of water of greater than 50 GPM.

CAUTION

There may be approximately 500 gallons of water in each SIT's outlet piping that is below the level transmitter's indicating range.

- Tag shut the SIT Outlet MOVs and breakers.
  (N/A SITs that indicate empty, **IF** an Engineering Evaluation has determined that a total 50 GPM flowrate would **NOT** be exceeded, based on elevation differences, **AND** the consequences of a change in RCS water level on Safety Tagging boundaries, radiation shielding affects, and overall inventory control have also been evaluated.
- Tag shut the SFP Cooling to RFP Inlet valves (N/A if the cavities are empty)
- Tag two of three charging PP breakers locked/disconnected and handswitches PTL; keep the boration flowpath PP untagged (if tags are hanging for the dilution/<90" tagout additional tags do not need to be hung for the 50 GPM tagout)
- Tag both CS PP discharge valves shut, and handswitches PTL.
- Tag shut the LPSI PP normal suction valves.

NOTE

23 HPSI PP should be used as the preferred water source. It is important to have the swing pump available for early reduced inventories since time to boil is so short. If the swing HPSI PP is not available, the available HPSI PP breaker must be disconnected or its discharge valve tagged shut.

- Tag 21 and 22 HPSI PP breakers locked/disconnected and handswitches PTL.

GUIDELINES FOR THE REDUCED INVENTORY 50 GPM TAGOUT

NOTE
It is recommended to tag 23 HPSI PP and the HPSI header MOVs last, after you have reached your destination level and stabilized for five minutes.

- Tag 23 HPSI PP handswitch in PTL and BOTH motor operated disconnect keyswitches locked open with keys removed. (Therefore power can be restored from the Control Room.)
- Tag both HPSI header MOVs shut using their keyswitches.

2. The following steps should be added to APPENDIX 11, PLANS FOR QUICK RECOVERY OF RCS LEVEL for recovery of a HPSI PP, if 23 HPSI PP will be available:

   a. The CRS will verify personnel are clear of the RCS.

   b. The CRO will open the applicable HPSI header MOV.

   c. The CRO will shut the 23 HPSI motor operated disconnect.

   d. When directed by AOP-3B use the 23 HPSI PP as necessary to makeup to the RCS.

3. When Reduced inventory maintenance is complete, clear the running LPSI PP normal suction valve first to allow RCS refilling and timely exit from Reduced Inventory.

RCS FILL VALVE ALIGNMENT

VALVE NUMBER	VACUUM POSITION	INIT	DESCRIPTION	RESTORATION POSITION	INIT
2-RC-215	SHUT		PRESSURIZER VENT VALVE	OPEN	
2-RC-216	SHUT		PRESSURIZER BACKUP VENT VALVE	OPEN	
2-SI-699	SHUT		21B SIT CHECK VALVE LEAKAGE CV-618 INLET ISOLATION VALVE	OPEN	
2-SI-700	SHUT		21A SIT CHECK VALVE LEAKAGE CV-628 INLET ISOLATION VALVE	OPEN	
2-SI-701	SHUT		22B SIT CHECK VALVE LEAKAGE CV-638 INLET ISOLATION VALVE	OPEN	
2-SI-702	SHUT		22A SIT CHECK VALVE LEAKAGE CV-648 INLET ISOLATION VALVE	OPEN	
2-RC-133	SHUT		21A RCP BLEEDOFF FT-150 INLET ISOLATION VALVE	OPEN	
2-RC-157	SHUT		21B RCP BLEEDOFF FT-160 INLET ISOLATION VALVE	OPEN	
2-RC-181	SHUT		22A RCP BLEEDOFF FT-170 INLET ISOLATION VALVE	OPEN	
2-RC-205	SHUT		22B RCP BLEEDOFF FT-180 INLET ISOLATION VALVE	OPEN	
2-RC-100E-CV	OPEN		21A PZR SPRAY CV	AUTO	
2-RC-100F-CV	OPEN		21B PZR SPRAY CV	AUTO	
2-RC-403-MOV	SHUT		2-RC-402-ERV ISOL	OPEN	
2-RC-405-MOV	SHUT		2-RC-404-ERV ISOL	OPEN	
2-CVC-501-MOV	SHUT		VCT OUT	AUTO	
2-CVC-504-MOV	SHUT		RWT TO CHG PP	SHUT/AUTO	

REFUELING LEVEL CART INSTRUCTIONS

- **SWITCH KEYBOARD CONTROL OF DISPLAY SCREENS**

  a. **DEPRESS** Ctrl, Ctrl.

- **MLMS DENSITY COMPENSATION**

> **NOTE**
> The MLMS SETPOINT CHANGE LOG shall be completed when changing values.

  a. **OBTAIN** CRS authorization.

  b. **IF** required for keyboard control,
  THEN SWITCH display screens.

  c. **SELECT** the SYSTEM SETUP block.

  d. **MOVE** cursor to the RCS temperature field in the Compensation block.

  e. **ENTER** the desired value.

  f. **SELECT** the SAVE block to update the data.

  g. **INDEPENDENTLY VERIFY** the correct value has been entered.

- **ADJUST ALARM LIMIT SETPOINT**

> **NOTE**
> The MLMS SETPOINT CHANGE LOG shall be completed when changing values.

  a. **OBTAIN** CRS authorization.

  b. **IF** required for keyboard control,
  THEN SWITCH display screens.

  c. **SELECT** the SET ALARMS block.

  d. **MOVE** cursor to the desired field in the Alarm Limits block.

  e. **ENTER** the desired value.

  f. **REPEAT** Steps d. through e. for other alarms, as desired.

  g. **SELECT** the SAVE block to update the data.

  h. **INDEPENDENTLY VERIFY** the correct value(s) have been entered.

REFUELING LEVEL CART INSTRUCTIONS

- **CHANGE INSTRUMENT STATUS**

  a. **OBTAIN** CRS authorization.

  b. **IF** required for keyboard control,
  THEN SWITCH display screens.

  c. **SELECT** the SYSTEM SETUP block.

  d. **CHANGE** instrument status as desired.

  e. **SELECT** the SAVE block to update the data.

  f. **INDEPENDENTLY VERIFY** the desired instrument status.

- **CHANGE GRAPH SETUP**

  a. **IF** required for keyboard control,
  THEN SWITCH display screens.

  b. **SELECT** the GRAPH SETUP block.

  c. **SELECT** the desired selections.

  d. **SELECT** the SAVE block to update the data.

REFUELING LEVEL CART INSTRUCTIONS

MLMS SETPOINT CHANGE LOG

POINT	NEW VALUE	CRS AUTH (INIT)	CHANGED BY (INIT)	DATE	TIME	VERIFIED BY (INIT)

* Additional copies of this page may be used as necessary.

RCS LEVEL LOG

Readings should be recorded every 15 minutes.
(N/A readings **NOT** used)

DATE / TIME	2-LG-4139 **OR** tygon tube	4136	4137	2LE4138	2LE4139	2LT4140	OPERATING LPSI PP			
							SUCT PRESS	DISCH PRESS	AMPS	FLOW

* Additional copies of this page may be used as necessary.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-0

POST-TRIP IMMEDIATE ACTIONS

REVISION 11

Safety Related

Approval Authority: E.D. Dean III 11/30/2007
signature/date

Effective Date: 1/28/2008

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-27	11

STATUS KEEPER PAGE NUMBERS	REVISION
1	11

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01100	12,13

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	SAFETY FUNCTION STATUS KEEPER	

I. PURPOSE

This procedure provides the immediate operator actions which must be accomplished after a reactor trip has occurred or is required to have occurred. These actions are necessary to ensure the plant, specifically the core, is placed in a safe and stable condition, or that the plant is configured to respond to a continuing emergency. This is the entry procedure for the entire EOP system.

II. ENTRY CONDITIONS

A. Post Trip Actions may be entered when **ANY** of the following symptom(s) of a Reactor Trip exist:

- "REACTOR TRIP BUS U/V RELAY TRIP" alarm (D45)
- CEA Trip Circuit Breaker(s) Trip alarm(s) (D1 - D4)
- CEA bottom lights on
- Rapidly lowering reactor power
- "PROT CH TRIP" alarm (D5)
- RPS Trip Bistable Lights lit

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. Common failure of a standby pump or components 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.

C. NOTES

1. 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.

2. 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.

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

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
A. VERIFY THE REACTIVITY CONTROL SAFETY FUNCTION IS SATISFIED.	
1. Depress ONE set of Manual REACTOR TRIP buttons.	
2. Check the Reactor has tripped by the following: • Prompt drop in NI power • Negative SUR	2.1 **IF** the Reactor has **NOT** tripped, **THEN** perform the following actions: a. De-energize the CEDM Motor Generator Sets: • Open 12A 480V BUS FDR • Open 12A-12B 480V BUS TIE • Open 13A 480V BUS FDR • Open 13A-13B 480V BUS TIE b. Check the Reactor has tripped by the following: • Prompt drop in NI power • Negative SUR **NOTE** When re-energizing 12A and 13A 480V Buses, the breaker lineup should be returned to that existing prior to the trip. c. Energize 12A and 13A 480V Buses as follows: (1) Energize 12A 480V Bus by closing its normal feeder breaker **OR** its tie breaker. (2) Energize 13A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.
(continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
A. (continued)	
	NOTE When Boration has been commenced, the Immediate Action for this step is considered complete.
3. Check that **NO** more than ONE CEA is **NOT** fully inserted.	3.1 **IF** more than ONE CEA fails to fully insert, **THEN** borate the RCS to at least 2300 ppm as follows: 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. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start a BA PP. f. Shut the VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs.
4. Verify demineralized water makeup to the RCS is secured as follows: • 11 and 12 RC M/U PPs are secured • VCT M/U valve, 1-CVC-512-CV, is shut • **IF** RCS Makeup is in Direct Lineup, **THEN** the RWT CHG PP SUCT, 1-CVC-504-MOV, is shut	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
B. ENSURE TURBINE TRIP.	
1. Check the Reactor has tripped.	
2. Ensure the Turbine has tripped by performing the following actions:	
a. Depress **BOTH** TURBINE TRIP buttons.	
b. Check the Turbine Main Stop Valves shut: • MSV 1 • MSV 2 • MSV 3 • MSV 4	b.1 **IF ANY** Turbine Main Stop Valve failed to shut, **THEN** shut **BOTH** MSIVs.
c. Check Turbine Speed drops.	c.1 **IF** Turbine Speed does **NOT** drop, **THEN** shut **BOTH** MSIVs.
d. **IF** the Turbine was paralleled to the grid, **THEN** verify the Turbine Generator Output breakers open: • 11 GEN BUS BKR, 0-CS-552-22 • 11 GEN TIE BKR, 0-CS-552-23	
e. Verify 11 GEN FIELD BKR, 1-CS-41, is open.	
f. Verify 11 EXCITER FIELD BKR, 1-CS-41E, is open.	

(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
B. (continued)	
3. Ensure **BOTH** MSR 2ND STG STM SOURCE MOVS are shut: • 1-MS-4025-MOV (11 MSR) • 1-MS-4026-MOV (12 MSR)	3.1 **IF EITHER** MSR 2ND STG STM SOURCE MOV failed to shut, **THEN** perform the following actions: a. Verify the MSR 2ND STG HIGH LOAD MOV is shut: • (11 MSR) 1-MS-4018-MOV • (12 MSR) 1-MS-4017-MOV b. Dispatch an operator to verify the MSR 2ND STAGE BYPASS CONTROL VALVE panel loader in MANUAL with panel loader output at zero.
C. VERIFY THE VITAL AUXILIARIES SAFETY FUNCTION IS SATISFIED.	
	CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.**
1. Check 11 **OR** 14 4KV Vital Bus is energized.	1.1 **IF BOTH** 4KV Vital Buses are de-energized, **THEN** energize 11 **OR** 14 4KV Vital Bus from a DG by performing the following: a. Start the 0C DG using the 0C DG EMERGENCY START PB, 0-HS-0707. b. Verify 1A or 1B DG is running. (1) Verify the associated DG OUT BKR closed: • 11 Bus - 152-1703 • 14 Bus - 152-1403
(continue)	(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C.1 (continued)	C.1 (continued) 1.2 **IF** 1A and 1B DGs can **NOT** be loaded **AND** 13KV is available, **THEN** energize 11 **OR** 14 4KV Vital Bus as follows: a. Verify the DG OUT BKR is open. b. Place the 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON. c. Insert the sync stick **AND** close the alternate 4KV feeder breaker. **NOTE** Exit from EOP-0 shall **NOT** be delayed in anticipation of 0C DG availability. 1.3 **IF** 11 and 14 4KV Buses are de-energized, **THEN** use the 0C DG to energize 11 **OR** 14 4KV Bus as follows: a. Verify the 0C DG is running. b. Verify 07 4KV BUS FDR, 152-0704 is open. c. Place 0C DG 11 (14) 4KV BUS FDR, 152-1106 (152-1406) in PULL TO LOCK. d. Place 1A (1B) DG OUT BKR, 152-1703 (152-1403) in PULL TO LOCK.
(continue)	(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C.1 (continued)	C.1.3 (continued) **NOTE** Performance of EOP-0 should continue concurrently while an operator is operating disconnects. e. Dispatch an operator to operate disconnects as follows: (1) Obtain the 189-1106 (189-1406) disconnect keys from the CR key locker. (2) Close 0C DG 11 (14) 4KV BUS DISC, 189-1106 (189-1406). f. **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 closed. g. **WHEN** disconnect 189-1106 (189-1406) is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (1) Close 07 4KV BUS TIE, 152-0701. (2) Insert the sync stick **AND** close the 0C DG 11 (14) 4KV BUS FDR, 152-1106 (152-1406).
2. **IF EITHER** 11 **OR** 14 4KV Vital Bus is **NOT** energized **AND** the 0C DG is **NOT** running, **THEN** depress the 0C DG EMERGENCY START PB, 0-HS-0707. (continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C. (continued) 3. Check **ALL** 125V DC BUS VOLTS greater than 105 volts: • 11 • 12 • 21 • 22 4. Check at least THREE 120V AC Vital Buses are energized: • 11 • 12 • 13 • 14 5. Check **EITHER** 1Y09 **OR** 1Y10 energized.	
6. Verify Component Cooling flow to the RCPs.	6.1 **IF** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** verify **ALL** RCPs are secured. 01100
7. **IF ANY** electrical bus perturbations have occurred, **THEN** dispatch an operator to verify Switchgear Room Ventilation operating **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING.	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
D. VERIFY THE RCS PRESSURE AND INVENTORY CONTROL SAFETY FUNCTION IS SATISFIED.	
1. Check pressurizer pressure stabilizes between 1850 and 2300 PSIA **AND** is trending to 2250 PSIA.	1.1 Operate heaters and sprays to restore and maintain pressurizer pressure between 1850 and 2300 PSIA. 1.2 **IF** pressurizer pressure is less than 2300 PSIA, **AND** the PORV(s) can **NOT** be verified closed as indicated by the PRESSURIZER RV FLOW MONITOR or red PORV energized light, **THEN** perform the following: 01100 a. Shut the associated PORV BLOCK valve(s). b. Place the associated PORV OVERRIDE handswitch(s) in the OVERRIDE TO CLOSE position. 1.3 **IF** pressurizer pressure drops to 1725 PSIA, **THEN** verify SIAS actuation.
(continue)	(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
D.1 (continued)	D.1 (continued) 1.4 Perform the RCP Trip Strategy as follows: a. **IF** RCS pressure drops to 1725 PSIA, **THEN** trip RCPs so **EITHER** of the following pairs remains running: • 11A and 12B RCPs • 11B and 12A RCPs b. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. c. **IF** RCS pressure drops below the minimum pump operating limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.
2. Check pressurizer level stabilizes between 80 and 180 inches **AND** is trending to 160 inches.	2.1 Operate charging and letdown to restore and maintain pressurizer level between 80 and 180 inches.
3. Ensure RCS subcooling is greater than 30° F.	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
E. VERIFY THE CORE AND RCS HEAT REMOVAL SAFETY FUNCTION IS SATISFIED.	
	NOTE Shutting the MSIVs causes a loss of Main Feedwater and the Turbine Bypass Valves.
1. Verify the TURB BYP valves **OR** the ADVs operate to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F	1.1 **IF** S/G pressure drops to 800 PSIA, **THEN** shut both MSIVs. 1.2 **IF** S/G pressure drops to 685 PSIA, **THEN** verify SGIS actuated. 1.3 **IF** the pressure differential between 11 and 12 S/G is 115 PSID or greater, **THEN** verify AFAS Block is actuated to the S/G with the lower pressure. 1.4 **IF** SGIS has actuated, **AND** the cooldown terminates, **THEN** stabilize T_{COLD}.
2. Verify at least ONE S/G is available for controlled heat removal: • S/G level between (-)170 and (+)30 inches • Main or Auxiliary Feedwater operating in Auto or Manual control to maintain level • T_{COLD} greater than 525° F	2.1 **IF** S/G WR level drops to (-)170 inches, **THEN** verify AFAS actuation. 2.2 **IF** Feedwater flow is lost **OR** excessive, **THEN** perform the following actions: **CAUTION** **13 AFW PP flow limit is 575 GPM.** • Start an AFW PP • Trip the SGFPs • Shut the SG FW ISOL valves • Operate the AFW System to restore S/G levels to between (-)170 and (+)30 inches
(continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
E. (continued)	
3. Check at least ONE RCP is operating in a loop with a S/G available for heat removal.	3.1 **IF NO** RCPs are operating in a loop with a S/G available for heat removal, **THEN** trip **ALL** RCPs.
4. **IF ANY** RCPs are operating, **THEN** check T_{HOT} minus T_{COLD} is less than 10° F in the loop(s) with a S/G available for heat removal.	4.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with a S/G available for heat removal, **THEN** trip **ALL** RCPs.
F. VERIFY THE CONTAINMENT ENVIRONMENT SAFETY FUNCTION IS SATISFIED.	
1. Check containment pressure is less than 0.7 PSIG.	1.1 **IF** containment pressure exceeds 0.7 PSIG, **THEN** perform the following: a. Verify **ALL** available CNTMT AIR CLRs are operating. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. 1.2 **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 1.3 **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 1.4 **IF** containment pressure exceeds 4.25 PSIG, **THEN** verify CSAS actuation.
(continue)	

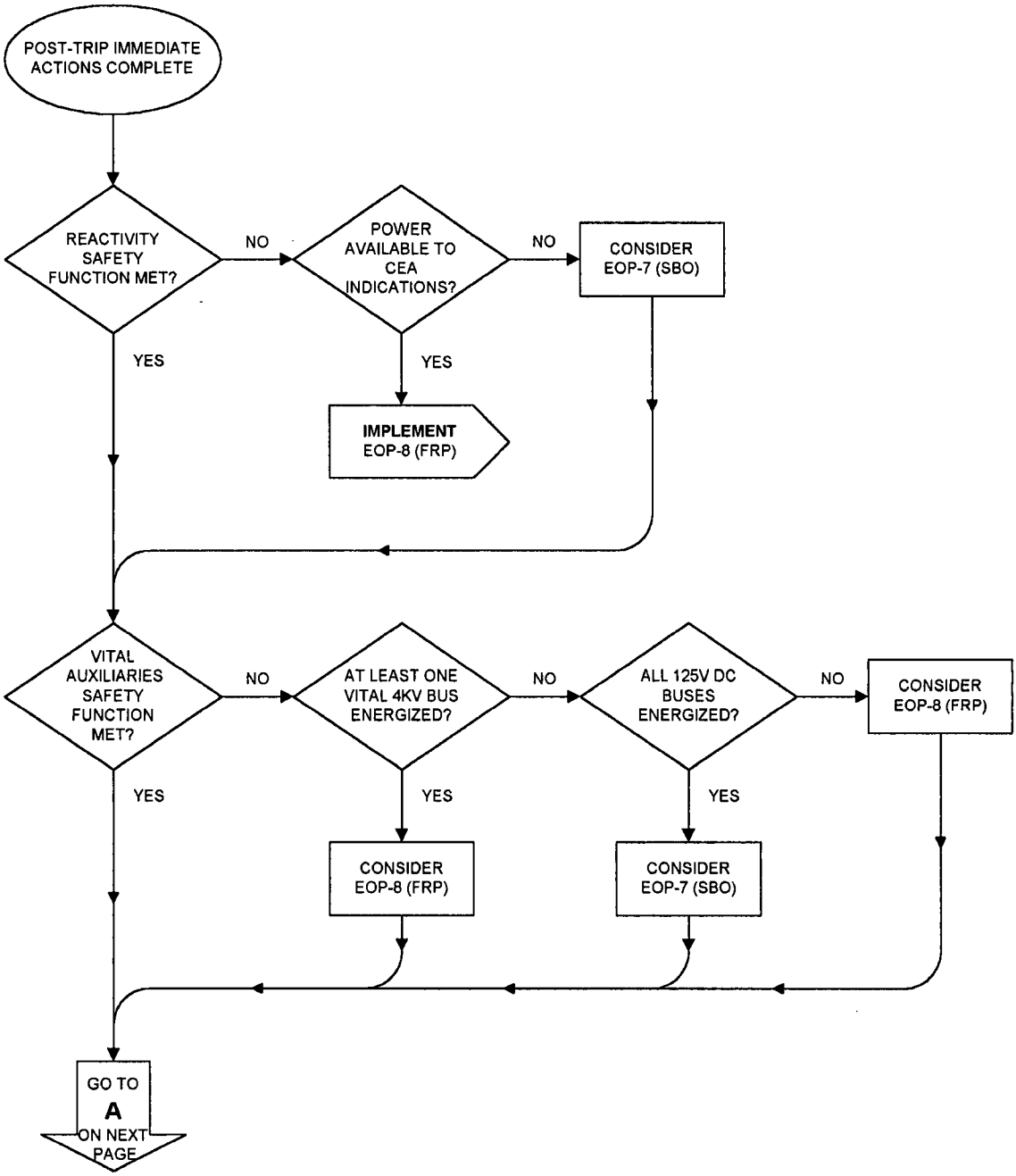
IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
F. (continued)	
2. Check containment temperature is less than 120° F.	2.1 **IF** containment temperature exceeds 120° F, **THEN** perform the following: a. Verify **ALL** available CNTMT AIR CLRs are operating. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. **NOTE** IODINE FILT 13 DISCs should be shifted, as required, to start at least TWO IODINE FILT FANs.
3. Check containment radiation monitor alarms are clear with **NO** unexplained rise.	3.1 **IF ANY** valid containment radiation monitor alarm is received, **THEN** start **ALL** available IODINE FILT FANs.
G. VERIFY THE RADIATION LEVELS EXTERNAL TO CONTAINMENT SAFETY FUNCTION IS SATISFIED.	
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.

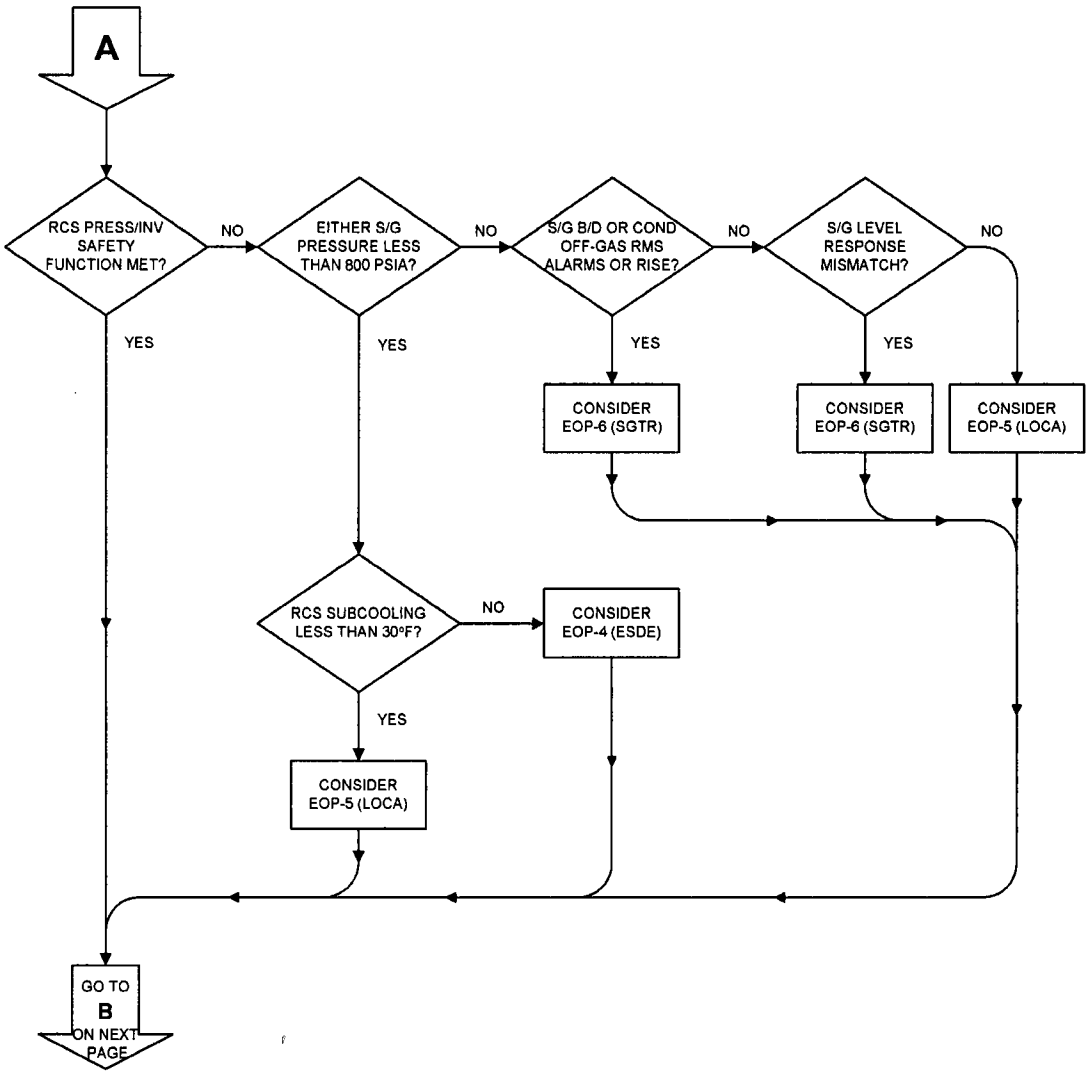
IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
H. PERFORM DIAGNOSTIC ACTIONS.	
1. Determine the appropriate Recovery Procedure **PER** the Diagnostic Flowchart. 2. **IMPLEMENT** the appropriate Emergency Operating Procedure. END of Section IV	

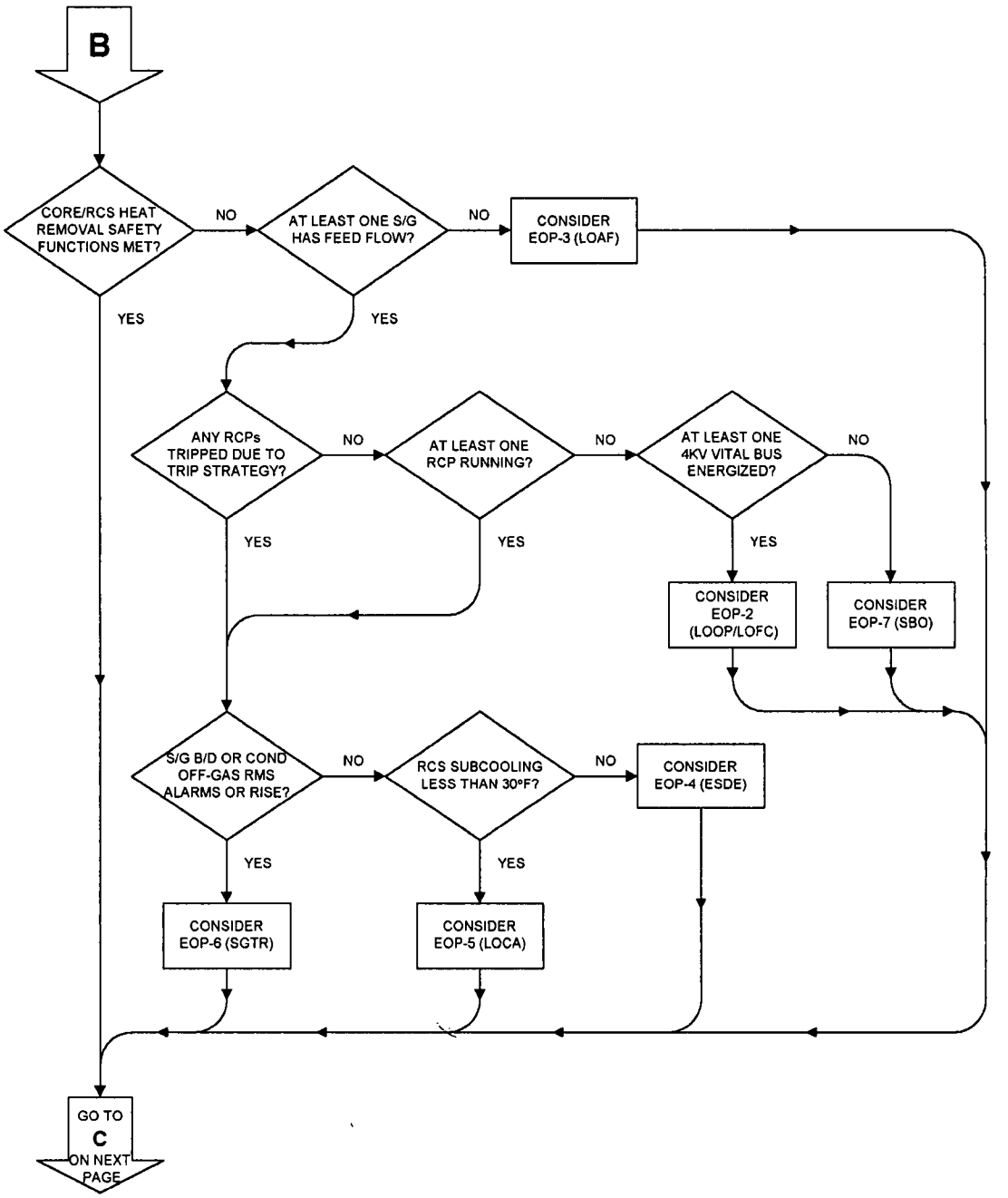
V. DIAGNOSTIC FLOWCHART



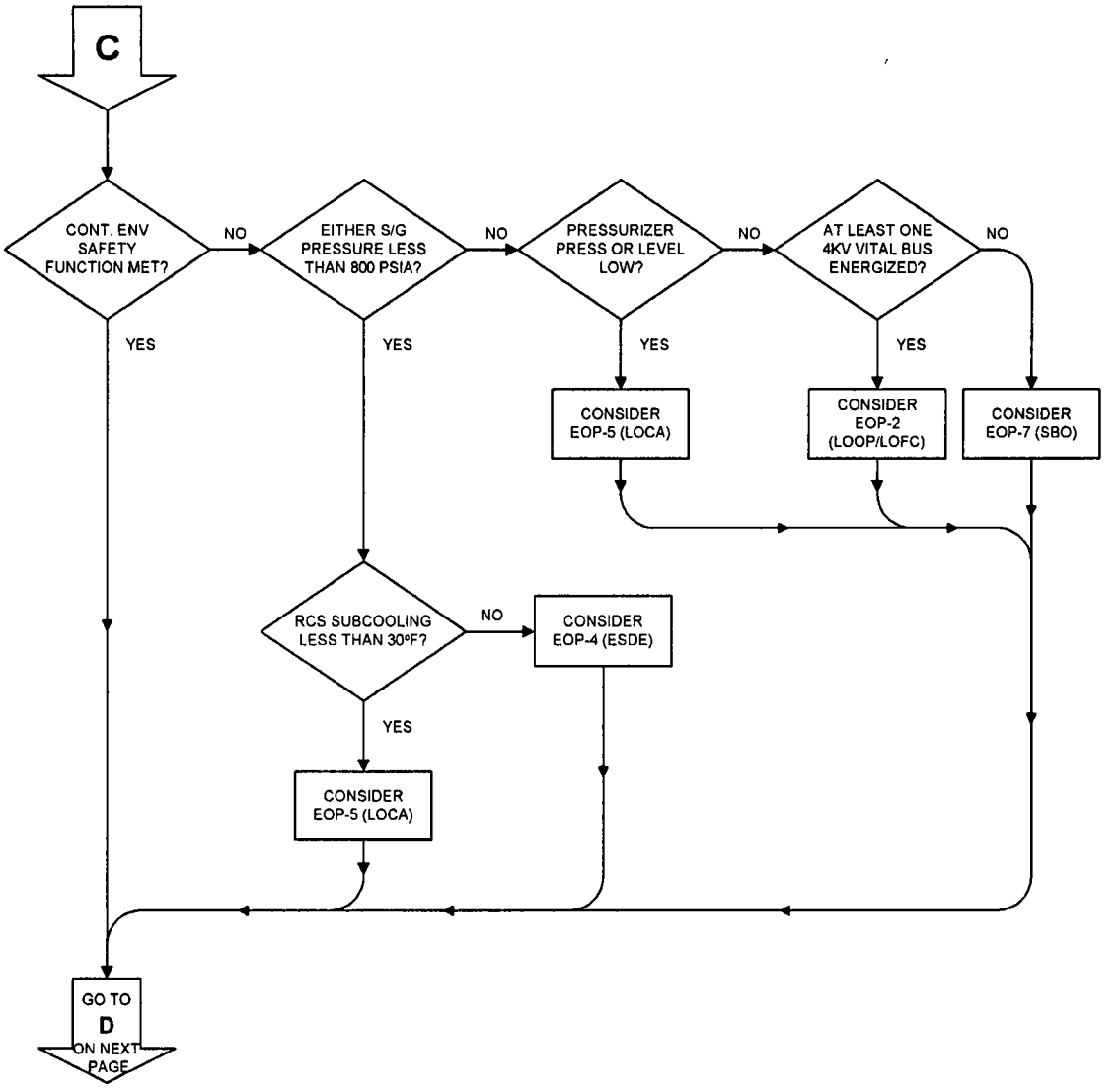
V. DIAGNOSTIC FLOWCHART



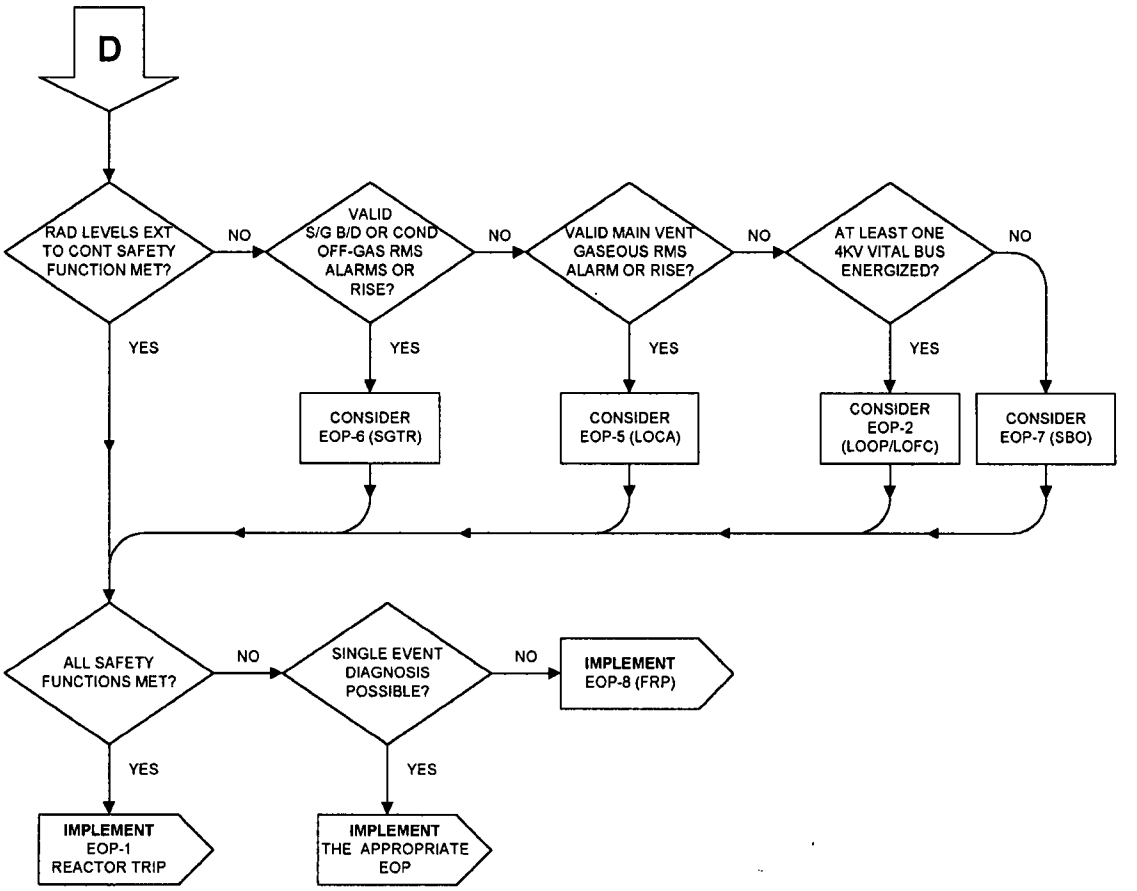
V. DIAGNOSTIC FLOWCHART



V. DIAGNOSTIC FLOWCHART



V. DIAGNOSTIC FLOWCHART



VI. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the safety function status checks on entry into this procedure.

B. Notify the Control Room Supervisor if any safety function acceptance criteria is not being satisfied, promptly upon full completion of the safety function status check.

	SAFETY PARAMETERS ACCEPTANCE CRITERIA	
REACTIVITY CONTROL PARAMETERS	**ACCEPTANCE CRITERIA**	**STATUS CHECK**
a. WRNI	lowering	_____
b. SUR	negative	_____
c. CEA status	**NO** more than ONE CEA **NOT** fully inserted	_____
OR		
Boration status	RCS boration in progress	_____

VI. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. 4KV vital buses 11 **OR** 14	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	_____
e. 1Y09 or 1Y10	at least ONE energized	_____

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. Pressurizer pressure	1850 PSIA to 2300 PSIA	_____
b. Pressurizer level	80 inches to 180 inches	_____
c. RCS subcooling	greater than 30°F	_____

VI. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. RCS T_{COLD}	525°F to 535°F	_____
b. T_{HOT} minus T_{COLD}	less than 10°F	_____
c. RCPs operating per loop	1 **OR** 2	_____
d. S/G level 11 **OR** 12	(-)170 inches to (+)30 inches	_____

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. Containment pressure	less than 0.7 PSIG	_____
b. Containment Temperature	less than 120°F	_____
c. Containment Radiation Monitors	alarm clear with **NO** unexplained rise	_____

VI. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
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	_____
c. S/G B/D RMS (1-RI-4014)	alarm clear with **NO** unexplained rise	_____
d. Main Vent Gaseous RMS (1-RI-5415)	alarm clear with **NO** unexplained rise	_____

SAFETY FUNCTION STATUS KEEPER

STEP COMPLETE	FUNCTION	ALTERNATE ACTIONS PERFORMED	SAFETY FUNCTION CAN **NOT** BE MET
	A. REACTIVITY CONTROL SAFETY FUNCTION.		
	B. ENSURE TURBINE TRIP.		N/A
	C. VITAL AUXILIARIES SAFETY FUNCTION.		
	D. RCS PRESSURE AND INVENTORY SAFETY FUNCTION.		
	E. CORE AND RCS HEAT REMOVAL SAFETY FUNCTION.		
	F. CONTAINMENT ENVIRONMENT SAFETY FUNCTION.		
	G. RADIATION LEVELS EXTERNAL TO CONTAINMENT SAFETY FUNCTION.		

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-0

POST-TRIP IMMEDIATE ACTIONS

REVISION 10

Safety Related

Approval Authority: E.D. Dean III 11/30/2007
signature/date

Effective Date: 1/28/2008

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-27	10

STATUS KEEPER PAGE NUMBERS	REVISION
1	10

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01000	12,13

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V.	DIAGNOSTIC FLOWCHART	19
VI.	SAFETY FUNCTION STATUS CHECK	24
	SAFETY FUNCTION STATUS KEEPER	

I. PURPOSE

This procedure provides the immediate operator actions which must be accomplished after a reactor trip has occurred or is required to have occurred. These actions are necessary to ensure the plant, specifically the core, is placed in a safe and stable condition, or that the plant is configured to respond to a continuing emergency. This is the entry procedure for the entire EOP system.

II. ENTRY CONDITIONS

A. Post Trip Actions may be entered when **ANY** of the following symptom(s) of a Reactor Trip exist:

- "REACTOR TRIP BUS U/V RELAY TRIP" alarm (D45)
- CEA Trip Circuit Breaker(s) Trip alarm(s) (D1 - D4)
- CEA bottom lights on
- Rapidly lowering reactor power
- "PROT CH TRIP" alarm (D5)
- RPS Trip Bistable Lights lit

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. Common failure of a standby pump or components 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.

C. NOTES

1. 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.

2. 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.

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

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
A. VERIFY THE REACTIVITY CONTROL SAFETY FUNCTION IS SATISFIED.	
1. Depress ONE set of Manual RX TRIP buttons.	
2. Check the Reactor has tripped by the following: • Prompt drop in NI power • Negative SUR	2.1 **IF** the Reactor has **NOT** tripped, **THEN** perform the following actions: a. De-energize the CEDM Motor Generator Sets: • Open 22A 480V BUS FDR • Open 22A-22B 480V BUS TIE • Open 23A 480V BUS FDR • Open 23A-23B 480V BUS TIE b. Check the Reactor has tripped by the following: • Prompt drop in NI power • Negative SUR **NOTE** When re-energizing 22A and 23A 480V Buses, the breaker lineup should be returned to that existing prior to the trip. c. Energize 22A and 23A 480V Buses as follows: (1) Energize 22A 480V Bus by closing its normal feeder breaker **OR** its tie breaker. (2) Energize 23A 480V Bus by closing its normal feeder breaker **OR** its tie breaker.
(continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
A. (continued)	
	NOTE When Boration has been commenced, the Immediate Action for this step is considered complete.
3. Check that **NO** more than ONE CEA is **NOT** fully inserted.	3.1 **IF** more than ONE CEA fails to fully insert, **THEN** borate the RCS to at least 2300 ppm as follows: a. Shut the VCT M/U valve, 2-CVC-512-CV. b. Open the BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start a BA PP. f. Shut the VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs.
4. Verify demineralized water makeup to the RCS is secured as follows: • 21 and 22 RCMU PPs are secured • VCT M/U valve, 2-CVC-512-CV, is shut • **IF** RCS Makeup is in Direct Lineup, **THEN** the RWT CHG PP SUCT, 2-CVC-504-MOV, is shut	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
B. ENSURE TURBINE TRIP.	
1. Check the Reactor has tripped.	
2. Ensure the Turbine has tripped by performing the following actions:	
a. Depress the U-2 MAIN TURB TRIP button.	
b. Check the TURBINE THROTTLE valves shut.	b.1 **IF ANY** TURBINE THROTTLE valve failed to shut, **THEN** shut **BOTH** MSIVs.
c. Check Turbine speed drops.	c.1 **IF** Turbine speed does **NOT** drop, **THEN** shut **BOTH** MSIVs.
	NOTE If Coastdown is initiated, the Turbine Generator Output breakers will remain closed for up to 20 seconds.
d. **IF** the Turbine was paralleled to the grid, **THEN** check the Turbine Generator Output breakers open: • 21 GEN BUS BKR, 0-CS-552-61 • 21 GEN TIE BKR, 0-CS-552-63	d.1 **IF** the Unit 2 "COAST DOWN INTIATED" alarm is clear, **OR** the Turbine has been tripped for 20 seconds, **THEN** open the Turbine Generator Output breakers: • 21 GEN BUS BKR, 0-CS-552-61 • 21 GEN TIE BKR, 0-CS-552-63
e. Verify 21 GEN EXCITER FIELD BKR, 2-CS-41, is open.	
(continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
B. (continued) 3. Isolate the MSR as follows: a. Depress the RESET Button on the MSR Control Panel. b. Verify the Main Steam to MSR Second Stage Control Valves shut: • VALVE #1 (2-MS-4018-CV) • VALVE #2 (2-MS-4019-CV) • VALVE #3 (2-MS-4017-CV) • VALVE #4 (2-MS-4020-CV)	b.1 **IF ANY** Main Steam to MSR Second Stage Control Valve fails to shut, **THEN** dispatch an operator to shut the MAIN STEAM SUPPLY TO MSR 2ND STAGE ISOLATION VALVE: • (2-MS-4018-CV) 2-MS-341 • (2-MS-4019-CV) 2-MS-343 • (2-MS-4017-CV) 2-MS-346 • (2-MS-4020-CV) 2-MS-348
C. VERIFY THE VITAL AUXILIARIES SAFETY FUNCTION IS SATISFIED.	
1. Check 21 **OR** 24 4KV Vital Bus is energized. (continue)	**CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1.1 **IF BOTH** 4KV Vital Buses are de-energized, **THEN** energize 21 **OR** 24 4KV Vital Bus from a DG by performing the following: a. Start the 0C DG using the 0C DG EMERGENCY START PB, 0-HS-0707. b. Verify 2A or 2B DG is running. (1) Verify the associated DG OUT BKR closed: • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C.1 (continued)	C.1 (continued) 1.2 **IF** 2A and 2B DGs can **NOT** be loaded **AND** 13KV is available, **THEN** energize 21 **OR** 24 4KV Vital Bus as follows: a. Verify the DG OUT BKR is open. b. Place the 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitch in ON. c. Insert the sync stick **AND** close the alternate 4KV feeder breaker. **NOTE** Exit from EOP-0 shall **NOT** be delayed in anticipation of 0C DG availability. 1.3 **IF** 21 and 24 4KV Buses are de-energized, **THEN** use the 0C DG to energize 21 **OR** 24 4KV Bus as follows: a. Verify the 0C DG is running. b. Verify 07 4KV BUS FDR, 152-0704 is open. c. Place 0C DG 21 (24) 4KV BUS FDR, 152-2106 (152-2406) in PULL TO LOCK. d. Place 2A (2B) DG OUT BKR, 152-2103 (152-2403) in PULL TO LOCK.
(continue)	(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C.1 (continued)	C.1.3 (continued) **NOTE** Performance of EOP-0 should continue concurrently while an operator is operating disconnects. e. Dispatch an operator to operate disconnects as follows: (1) Obtain the 189-2106 (189-2406) disconnect keys from the CR key locker. (2) Close 0C DG 21 (24) 4KV BUS DISC, 189-2106 (189-2406). f. **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify the 0C DG OUT BKR, 152-0703 closed. g. **WHEN** disconnect 189-2106 (189-2406) is closed **AND** breaker 152-0703 is closed, **THEN** perform the following: (1) Close 07 4KV BUS TIE, 152-0701. (2) Insert the sync stick **AND** close the 0C DG 21 (24) 4KV BUS FDR, 152-2106 (152-2406).
2. **IF EITHER** 21 **OR** 24 4KV Vital Bus is **NOT** energized **AND** the 0C DG is **NOT** running, **THEN** depress the 0C DG EMERGENCY START PB, 0-HS-0707. (continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
C. (continued) 3. Check **ALL** 125V DC BUS VOLTS greater than 105 volts: • 11 • 12 • 21 • 22 4. Check at least THREE 120V AC Vital Buses are energized: • 21 • 22 • 23 • 24 5. Check **EITHER** 2Y09 **OR** 2Y10 energized.	
6. Verify Component Cooling flow to the RCPs.	6.1 **IF** Component Cooling flow can **NOT** be verified to the RCPs, **THEN** verify **ALL** RCPs are secured. 01000
7. **IF ANY** electrical bus perturbations have occurred, **THEN** dispatch an operator to verify Switchgear Room Ventilation operating **PER** OI-22H, SWITCHGEAR VENTILATION AND AIR CONDITIONING.	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
D. VERIFY THE RCS PRESSURE AND INVENTORY CONTROL SAFETY FUNCTION IS SATISFIED.	
1. Check pressurizer pressure stabilizes between 1850 and 2300 PSIA **AND** is trending to 2250 PSIA.	1.1 Operate heaters and sprays to restore and maintain pressurizer pressure between 1850 and 2300 PSIA. 1.2 **IF** pressurizer pressure is less than 2300 PSIA, **AND** the PORV(s) can **NOT** be verified closed as indicated by the PZR RV FLOW MON or red PORV energized light, **THEN** perform the following: 01000 a. Shut the associated PORV BLOCK valve(s). b. Place the associated PORV OVERRIDE handswitch(s) in the OVERRIDE TO CLOSE position. 1.3 **IF** pressurizer pressure drops to 1725 PSIA, **THEN** verify SIAS actuation.
(continue)	(continue)

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
D.1 (continued)	D.1 (continued) 1.4 Perform the RCP Trip Strategy as follows: a. **IF** RCS pressure drops to 1725 PSIA, **THEN** trip RCPs so **EITHER** of the following pairs remains running: • 21A and 22B RCPs • 21B and 22A RCPs b. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. c. **IF** RCS pressure drops below the minimum pump operating limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.
2. Check pressurizer level stabilizes between 80 and 180 inches **AND** is trending to 160 inches.	2.1 Operate charging and letdown to restore and maintain pressurizer level between 80 and 180 inches.
3. Ensure RCS subcooling is greater than 30° F.	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
E. VERIFY THE CORE AND RCS HEAT REMOVAL SAFETY FUNCTION IS SATISFIED.	
	NOTE Shutting the MSIVs causes a loss of Main Feedwater and the Turbine Bypass Valves.
1. Verify the TURB BYP valves **OR** the ADVs operate to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F	1.1 **IF** S/G pressure drops to 800 PSIA, **THEN** shut both MSIVs. 1.2 **IF** S/G pressure drops to 685 PSIA, **THEN** verify SGIS actuated. 1.3 **IF** the pressure differential between 21 and 22 S/G is 115 PSID or greater, **THEN** verify AFAS Block is actuated to the S/G with the lower pressure. 1.4 **IF** SGIS has actuated, **AND** the cooldown terminates, **THEN** stabilize T_{COLD}.
2. Verify at least ONE S/G is available for controlled heat removal: • S/G level between (-)170 and (+)30 inches • Main or Auxiliary Feedwater operating in Auto or Manual control to maintain level • T_{COLD} greater than 525° F	2.1 **IF** S/G WR level drops to (-)170 inches, **THEN** verify AFAS actuation. 2.2 **IF** Feedwater flow is lost **OR** excessive, **THEN** perform the following actions: **CAUTION** **23 AFW PP flow limit is 300 GPM when supplied by a DG; otherwise the limit is 575 GPM.** • Start an AFW PP. • Trip the SGFPs. • Shut the SG FW ISOL valves. • Operate the AFW System to restore S/G levels to between (-)170 and (+)30 inches.
(continue)	

IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
E. (continued)	
3. Check at least ONE RCP is operating in a loop with a S/G available for heat removal.	3.1 **IF NO** RCPs are operating in a loop with a S/G available for heat removal, **THEN** trip **ALL** RCPs.
4. **IF ANY** RCPs are operating, **THEN** check T_{HOT} minus T_{COLD} is less than 10° F in the loop(s) with a S/G available for heat removal.	4.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with a S/G available for heat removal, **THEN** trip **ALL** RCPs.
F. VERIFY THE CONTAINMENT ENVIRONMENT SAFETY FUNCTION IS SATISFIED.	
1. Check containment pressure is less than 0.7 PSIG.	1.1 **IF** containment pressure exceeds 0.7 PSIG, **THEN** perform the following: a. Verify **ALL** available CACs are operating. b. Open the CAC EMERGENCY OUT valves for the operating CACs. 1.2 **IF** containment pressure exceeds 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 1.3 **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 1.4 **IF** containment pressure exceeds 4.25 PSIG, **THEN** verify CSAS actuation.
(continue)	

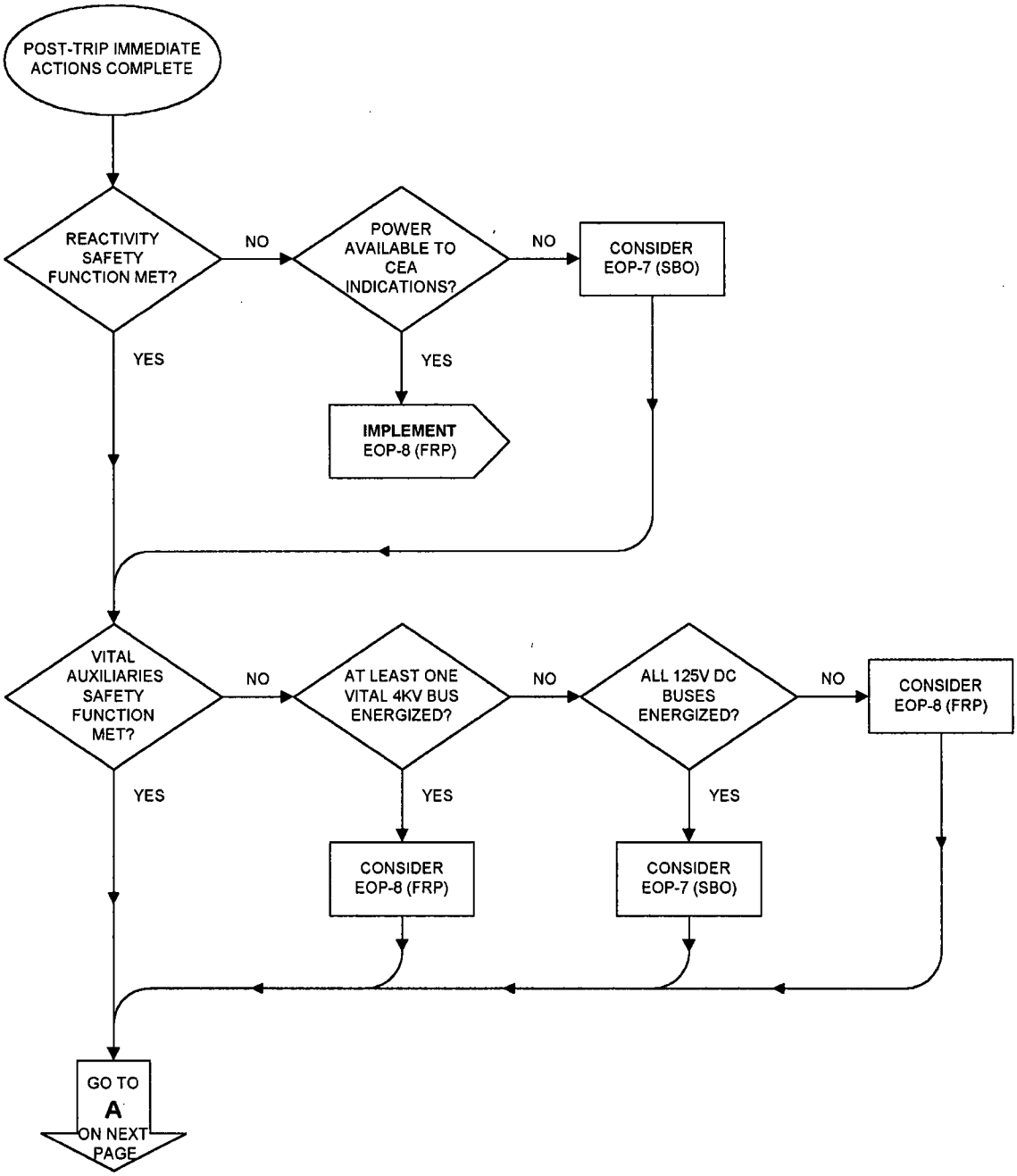
IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
F. (continued)	
2. Check containment temperature is less than 120° F.	2.1 **IF** containment temperature exceeds 120° F, **THEN** perform the following: a. Verify **ALL** available CACs are operating. b. Open the CAC EMERGENCY OUT valves for the operating CACs. **NOTE** 23 IODINE FILT DISCs should be shifted, as required, to start at least TWO IODINE FILT FANs.
3. Check containment radiation monitor alarms are clear with **NO** unexplained rise.	3.1 **IF ANY** valid containment radiation monitor alarm is received, **THEN** start **ALL** available IODINE FILT FANs.
G. VERIFY THE RADIATION LEVELS EXTERNAL TO CONTAINMENT SAFETY FUNCTION IS SATISFIED.	
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.

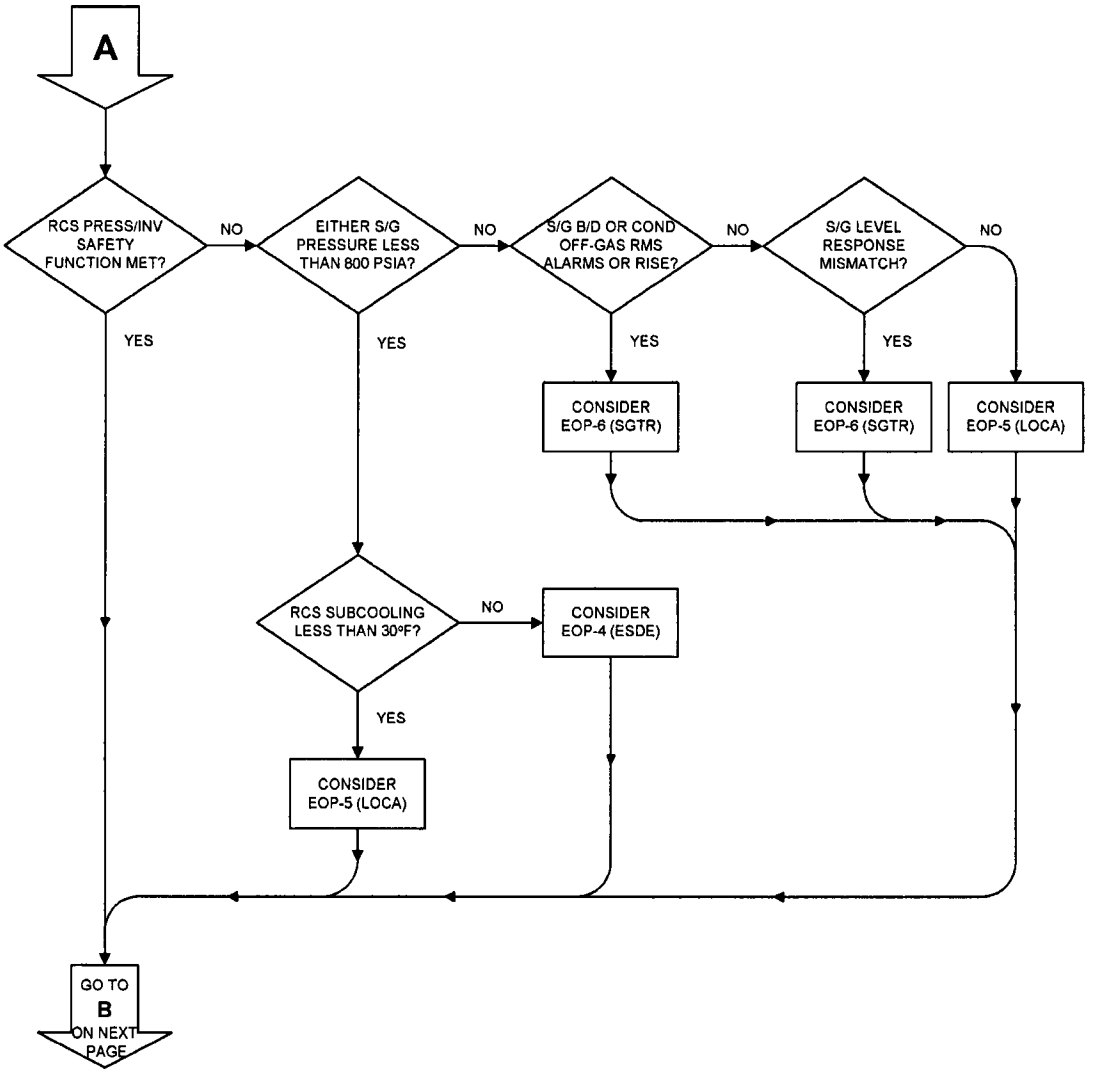
IV. ACTIONS

IMMEDIATE ACTIONS	ALTERNATE ACTIONS
H. PERFORM DIAGNOSTIC ACTIONS.	
1. Determine the appropriate Recovery Procedure **PER** the Diagnostic Flowchart. 2. **IMPLEMENT** the appropriate Emergency Operating Procedure. END of Section IV	

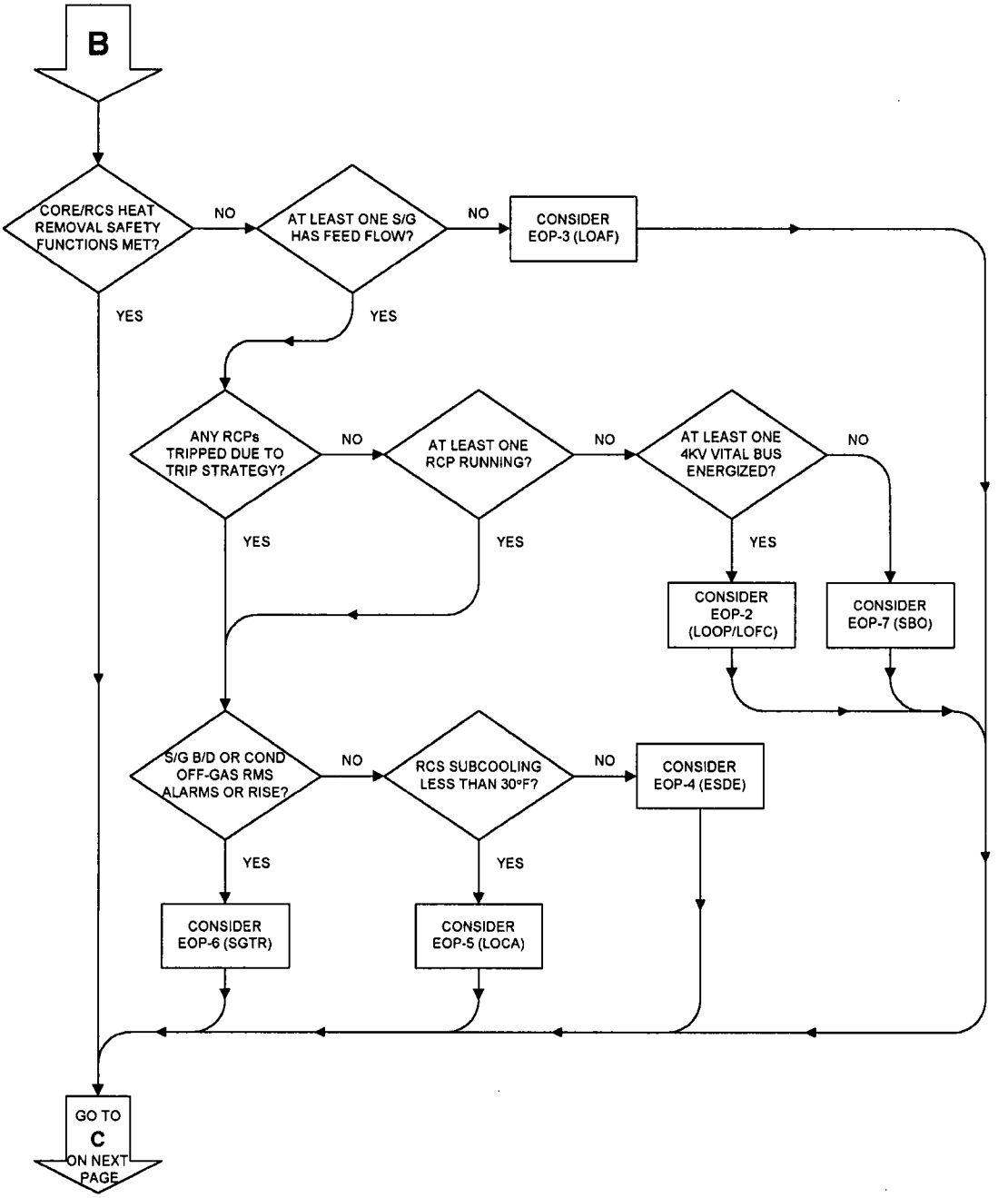
V. DIAGNOSTIC FLOWCHART



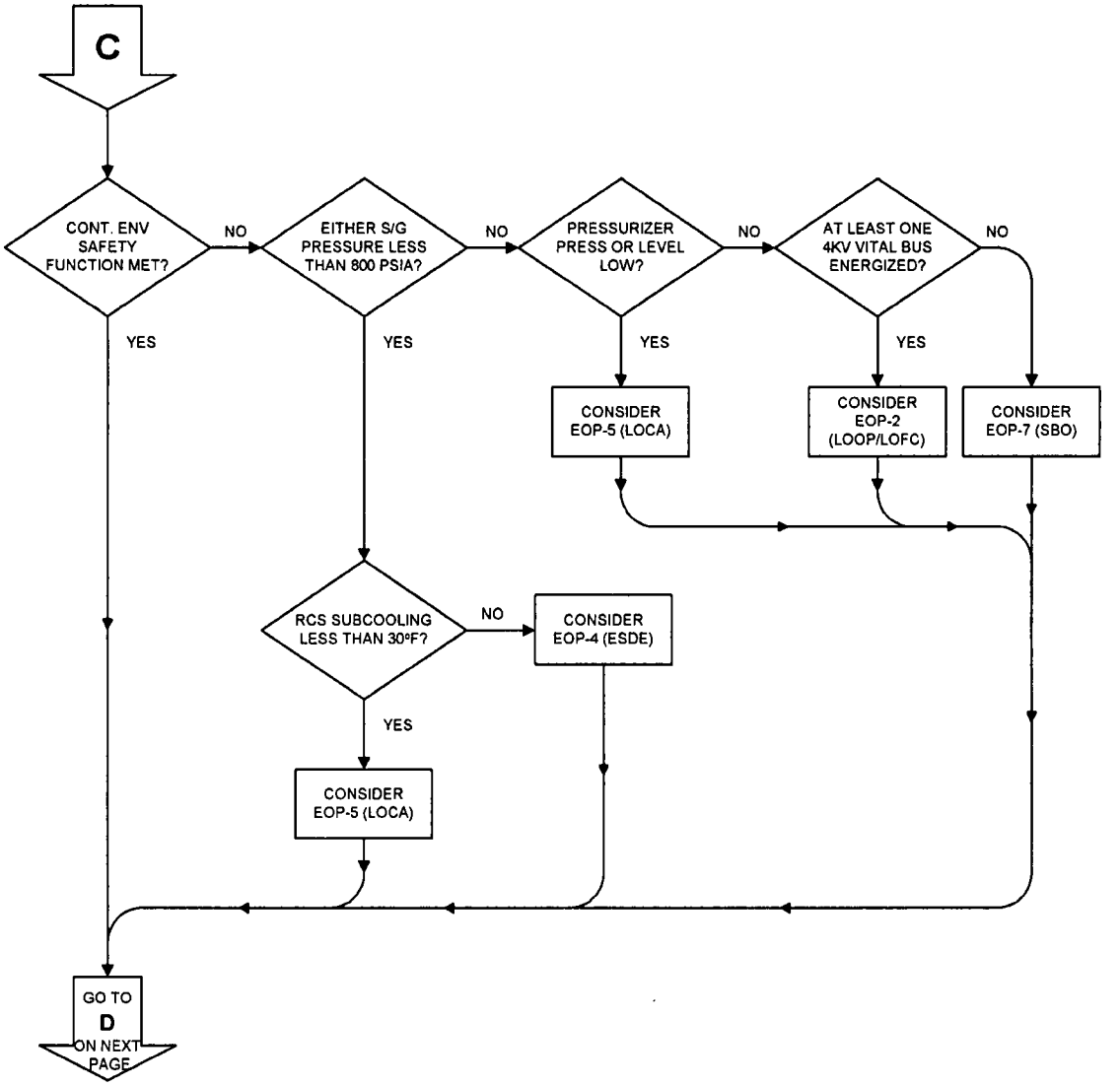
V. DIAGNOSTIC FLOWCHART



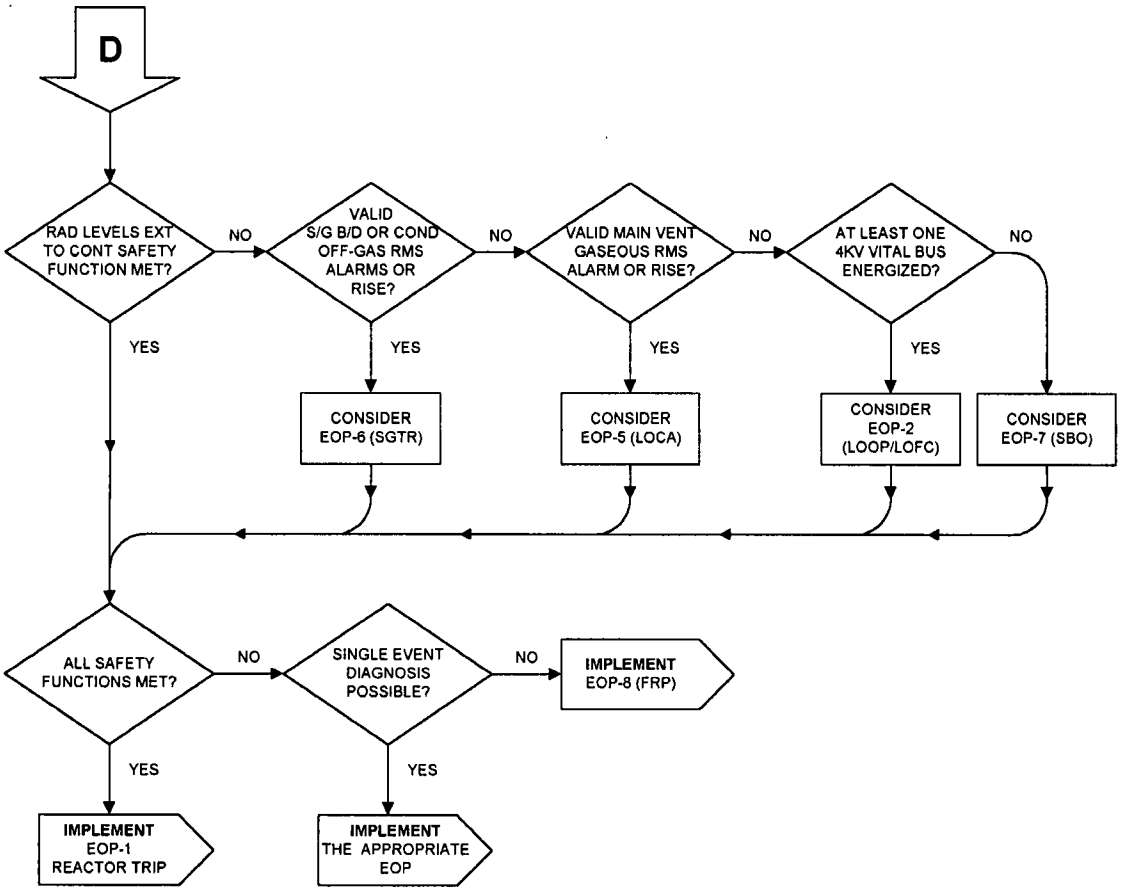
V. DIAGNOSTIC FLOWCHART



V. DIAGNOSTIC FLOWCHART



V. DIAGNOSTIC FLOWCHART



VI. SAFETY FUNCTION STATUS CHECK

A. The STA (or person designated by the CRS) will perform the safety function status checks on entry into this procedure.

B. Notify the Control Room Supervisor if any safety function acceptance criteria is not being satisfied, promptly upon full completion of the safety function status check.

	SAFETY PARAMETERS ACCEPTANCE CRITERIA	
REACTIVITY CONTROL PARAMETERS	**ACCEPTANCE CRITERIA**	**STATUS CHECK**
a. WRNI	lowering	_____
b. SUR	negative	_____
c. CEA status	**NO** more than ONE CEA **NOT** fully inserted	_____
OR		
Boration status	RCS boration in progress	_____

VI. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. 4KV vital buses 21 **OR** 24	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	_____
e. 2Y09 or 2Y10	at least ONE energized	_____

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. Pressurizer pressure	1850 PSIA to 2300 PSIA	_____
b. Pressurizer level	80 inches to 180 inches	_____
c. RCS subcooling	greater than 30°F	_____

VI. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. RCS T_{COLD}	525°F to 535°F	_____
b. T_{HOT} minus T_{COLD}	less than 10°F	_____
c. RCPs operating per loop	1 **OR** 2	_____
d. S/G level 21 **OR** 22	(-)170 inches to (+)30 inches	_____

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
a. Containment pressure	less than 0.7 PSIG	_____
b. Containment Temperature	less than 120°F	_____
c. Containment Radiation Monitors	alarm clear with **NO** unexplained rise	_____

VI. SAFETY FUNCTION STATUS CHECK

RADIATION LEVELS EXTERNAL TO CONTAINMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA	
	ACCEPTANCE CRITERIA	STATUS CHECK
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	_____
c. S/G B/D RMS (2-RI-4014)	alarm clear with **NO** unexplained rise	_____
d. Main Vent Gaseous RMS (2-RI-5415)	alarm clear with **NO** unexplained rise	_____

SAFETY FUNCTION STATUS KEEPER

STEP COMPLETE	FUNCTION	ALTERNATE ACTIONS PERFORMED	SAFETY FUNCTION CAN **NOT** BE MET
	A. REACTIVITY CONTROL SAFETY FUNCTION.		
	B. ENSURE TURBINE TRIP.		N/A
	C. VITAL AUXILIARIES SAFETY FUNCTION.		
	D. RCS PRESSURE AND INVENTORY SAFETY FUNCTION.		
	E. CORE AND RCS HEAT REMOVAL SAFETY FUNCTION.		
	F. CONTAINMENT ENVIRONMENT SAFETY FUNCTION.		
	G. RADIATION LEVELS EXTERNAL TO CONTAINMENT SAFETY FUNCTION.		

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-2

LOSS OF OFFSITE POWER / LOSS OF FORCED CIRCULATION

REVISION 14

Safety Related

Approval Authority: Kent Mills 11/25/03
signature/date

Effective Date: 5/3/2004

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-64	14

PLACEKEEPER PAGE NUMBERS	REVISION
1	13

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01401	48

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V.	SAFETY FUNCTION STATUS CHECK	58
	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed after a Loss Of Offsite Power (LOOP) or a Loss Of Forced Circulation (LOFC). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to safely establish plant conditions allowing implementation of hot standby, hot shutdown or cold shutdown. This procedure is designed to meet this objective, while maintaining adequate core cooling and 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:

1. A Loss Of Offsite Power has occurred, as indicated by **ANY** of the following conditions:

   - Momentary loss of Control Room lighting on **BOTH** Units
   - 500KV Red Bus and Black Bus power available lights are de-energized
   - Diesel Generators automatically start
   - 13KV Service Buses 12 and 22 power available lights are de-energized
   - **NO** RCPs are running on **EITHER** Unit
   - Reactor Trip occurs due to RCS low flow

2. Single phase natural circulation is to be utilized for RCS heat removal although at least ONE 13KV Service Bus is energized.

III. PRECAUTIONS

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

A. **WARNING**

None

B. **CAUTIONS**

1. 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.

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

3. 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.

4. There is a possibility for excessive 1B 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 1B DG load limit is 3300 KW, the 1A DG load limit is 5400 KW. The SMECO load limit is 240 AMPS Continuous.

5. 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.

6. 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).

7. 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. 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.

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine diagnosis of a Loss Of Offsite Power / Loss of Forced Circulation is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of Offsite Power / Loss of Forced Circulation is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS **PER** THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SALTWATER PP on the same header • At least ONE IA COMPR • 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 • Instrument Air Compressor **PER** OI-19, INSTRUMENT AIR • 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** 13 AFW PP starts **AND** 11 or 12 AFW PP is operating, **THEN** secure 13 AFW PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. **IF** COMPONENT COOLING FLOW HAS BEEN LOST, **THEN** RESTORE FLOW.	
1. Verify CC CNTMT SUPPLY valve, 1-CC-3832-CV, is shut. 2. Start a CC PP. 3. 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. 4. 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.** 5. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (continued) 6. **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: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Slowly open 1-CC-284 to restore component cooling flow.	
F. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.	
1. Shut **BOTH** MSIVs. 2. Shut the S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. ESTABLISH RCS HEAT SINK.	
1. Operate the TURB BYP valves to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F (continue)	1.1 Operate the ADVs to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F a. Shift the ADV controller to MANUAL. b. Operate the ADVs from the control room. c. **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. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued)	G.1.1.c (continued)
	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.
CAUTION **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.**	
2. Establish Main Feedwater flow to at least **ONE** S/G by performing the following actions: 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	2.1 Establish Auxiliary Feedwater flow to at least ONE S/G using 11 or 12 AFW PP as follows: a. Verify the S/G steam driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV
(continue)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2 (continued) 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. (5) **WHEN** S/G levels are at approximately 0 inches, **THEN** shift SG FW REG BYPASS controllers to Auto. d. **IF** 11 CST LVL drops to 5 feet, **THEN** establish Auxiliary Feedwater flow and secure Main Feedwater. (continue)	G.2.1 (continued) b. Open 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 c. Adjust and maintain turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (11 AFW PP SPEED CONTR) 1-HC-3987A **OR** • (12 AFW PP SPEED CONTR) 1-HC-3989A d. Place 13 AFW PP in PULL TO LOCK. e. Slowly raise and maintain S/G level between (-)24 and (+)30 inches by adjusting S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV f. Operate the AFW Room ventilation as necessary to maintain temperature less than 130° F. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2 (continued) (continue)	G.2 (continued) 2.2 **IF** Auxiliary Feedwater can **NOT** be established using 11 or 12 AFW PP, **THEN** establish Auxiliary Feedwater flow using 13 AFW PP: a. Verify the S/G motor driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV **CAUTION** **13 AFW PP flow limit is 575 GPM.** b. Start 13 AFW PP. c. Slowly raise and maintain S/G level between (-)24 and (+)30 inches, by adjusting S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 3. **IF** Main Feedwater is **NOT** available, **THEN** secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL COND BSTR PPs in PULL TO LOCK. c. Place ALL COND PPs in PULL TO LOCK. d. Place BOTH HTR DRN PPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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. g. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 4. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
H. MAINTAIN PRESSURIZER LEVEL BETWEEN 101 AND 180 INCHES.	
1. Operate Charging and Letdown to restore and maintain pressurizer level between 101 and 180 inches. (continue)	1.1 **IF** Letdown is **NOT** operating, **THEN** operate the selected CHG PP to maintain pressurizer level between 101 and 180 inches. 1.2 **WHEN** 1Y09 and 1Y10 are energized, **THEN** restore letdown by performing the following actions: a. Verify the following: • 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, 1-LIC-110X or 1-LIC-110Y, in Auto Remote. c. Place the L/D PRESS CONTR, 1-PIC-201, in MANUAL with a 20% output. d. Place the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. e. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.2 (continued) f. Open the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV g. Place L/D PRESS CONTR, 1-PIC-201 in service as follows: (1) Verify the setpoint on 1-PIC-201 is 460 PSIG. (2) Shift L/D PRESS CONTR, 1-PIC-201 to AUTO. h. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. i. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. j. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. k. Check pressurizer level is trending to 160 inches. l. **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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.2 (continued) m. **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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. ENSURE INSTRUMENT AIR IS AVAILABLE.	
1. Check Instrument Air header pressure greater than 90 PSIG.	1.1 **IF** Instrument Air header pressure is less than 90 PSIG, **THEN** attempt to restore Instrument Air header pressure concurrently **PER** AOP-7D, INSTRUMENT AIR MALFUNCTION.
J. MAINTAIN RCS SUBCOOLING BETWEEN 30 AND 140° F.	
1. Operate Pressurizer HTRs and SPRAY as necessary to maintain RCS subcooling between 30 and 140° F based on CET temperatures: a. 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). (a) Operate 11 or 13 BACKUP HTRs as follows: 1) Charge the closing spring using the manual lever at 480V breakers 52-1127 and 52-1427. 2) Push the PUSH-TO-CLOSE button on the breaker fronts. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1.a(1)(a) (continued)	
	CAUTION **The Pressurizer Heater Low Level cutout at 101 inches is inoperable when Heaters are operated at 1C43.**
3) **IF** 1Y10 is de-energized, **THEN** Tie 1Y10 to 1Y09: a) On 1Y10, open INSTRUMENT TRANSF-12 1X09 main feeder breaker 1. b) On 1Y10, close BUS TIE 208/120 BUS 11 Breaker 2. c) Place the 1Y09-1Y10 BUS TIE Switch 1SY09, located between 1Y09 and 1Y10, to ON.	3).1 **IF** 1Y10 can **NOT** be energized, **THEN** operate 11 and 13 BACKUP HTRs from 1C43, to maintain RCS pressure as required.
(2) Secure AUX SPRAY.	
(3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (continued) b. Lower subcooling by **ANY** of the following methods: (1) De-energize Pressurizer HTR(s). (2) Initiate AUX SPRAY: **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.** (a) Record the following information: • PRZR WTR TEMP (1-TI-101) • 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 flow: • 1-CVC-518-CV • 1-CVC-519-CV (d) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (e) Shut the PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV (f) Maintain the pressurizer cooldown rate at less than 200° F/hour. (3) Lower the RCS cooldown rate.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. ATTEMPT TO RESTORE POWER.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** 11 **OR** 14 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following: a. Verify 1A and 1B DGs running. (1) Verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.c (continued) (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify 0C DG OUT BKR, 152-0703 is closed. (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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 4. 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. 5. **IF** 500KV offsite power has been restored, **THEN PROCEED** to step S.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
CAUTION **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.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1.a (continued) (6) Turn the key in the clockwise direction. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (continued) **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 2. **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. 3. **IF** Letdown is secured, **THEN** restore Letdown **PER** step H.1.2.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.	
1. Verify the following emergency pumps are operating: • Turbine EMERG OIL PP • EMERG H_2 SEAL OIL PP • SGFP EMERG OIL PPs	
O. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ENERGIZE SUPPORT EQUIPMENT.	
CAUTION **SMECO load limit is 240 AMPS Continuous.** **CAUTION** **Operation of additional equipment NOT directed within this procedure may cause 1B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.** 1. Energize the following support equipment as necessary, while maintaining load within the power source 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 SRW Pump Room Ventilation **PER** OI-15, SERVICE WATER SYSTEM. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (continued) d. **IF** the "SFP TEMP HI" alarm is received, **THEN** start the SFP CLG PP(s) **PER** the appropriate OI-24 series procedure. 2. Restore power to MCC-101AT and MCC-101BT loads, while remaining within load limits, 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.2 (continued) 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. (7) Turn the key in the clockwise direction. (8) Close MCC-101AT Tie Breaker, 52-10120. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.2 (continued) 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.2 (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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	
1. **IF** SIAS actuates **AND** 1B DG loading exceeds 3600 KW, **THEN** perform rapid 1B DG load reduction as follows: a. Open the 14B BUS 480V FDR breaker, 52-1413. b. Stop 12 MAIN EXH FAN. c. Locally open MCC-101BT Main Feeder Breaker, 52-10141. d. Close the 14B BUS 480V FDR breaker, 52-1413.	
2. **IF** SIAS actuates **AND** 1B DG loading exceeds 3300 KW, **THEN** secure the following DG loads as necessary to lower 1B DG load below 3300 KW: a. Stop 12 MAIN EXH FAN. b. Locally open MCC-101BT Main Feeder Breaker, 52-10141	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.	
1. Align the GENERATOR CO_2 CHARGE AND GAS VENT ISOLATION VALVE, 1-G-01, to the VENT position. 2. Throttle open the GENERATOR GAS VENT LINE ISOLATION VALVE, 1-G-03. 3. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: a. Shut 1-G-03. b. Secure the EMERG H_2 SEAL OIL PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MAINTAIN VCT LEVEL BETWEEN 60 AND 100 INCHES.	
1. Maintain VCT level between 60 and 100 inches. 2. **WHEN** VCT makeup is required, **THEN** shift Charging Pump(s) suction to the RWT: 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 Charging Pump(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to the VCT as follows: (1) Open the VCT OUT valve, 1-CVC-501-MOV. (2) Shut the RWT CHG PP SUCT valve, 1-CVC-504-MOV.	
S. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MINIMIZE 250V DC BATTERY DISCHARGE.	
1. Close 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4 KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. EVALUATE RESTORING FORCED CIRCULATION.	
1. **WHEN** 500KV offsite power is restored, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using natural circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures	
2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step V.	
3. **IF** T_{COLD} is less than 369° F, **THEN** restart the RCPs **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS.	
CAUTION **If RCPs are restarted with a significant volume of unborated reactor coolant in a cold leg, the potential exists for a reactor restart accident.**	
4. **IF** RCPs initially tripped during a boron dilution, **THEN** verify at least **ONE** of the following: • natural circulation is in progress • RCS boron concentration is greater than or equal to the shutdown boron concentration **PER** the NEOPs. (continue)	4.1 **IF** natural circulation is **NOT** verified in progress **AND** RCS boron concentration is less than the shutdown boron concentration **PER** the NEOPs, **THEN PROCEED** to step V.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 5. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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. Raise Pressurizer level to between 155 and 180 inches. 9. Reduce T_{COLD} to less than 525° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

U. (continued)
 	
10. Verify RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
 	
• 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 30° 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>
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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** 11. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP BLEED-OFF ISOL valves are open: • 1-CVC-505-CV • 1-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 12. Operate Charging and Letdown to restore and maintain pressurizer level between 101 and 180 inches. 13. Monitor RCP seal parameters following pump restart. 14. Allow backflow to equalize temperatures in the opposite loop. 15. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS b. Start an RCP **PER** step U.11 above. c. Monitor RCP seal parameters following pump restart.	
V. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step Z. 3. **IF** RCS boration has **NOT** been conducted, **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. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs. 4. Record the time RCS boration was commenced: _____ 5. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 6. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 7. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 1-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV 8. Commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADVs, maintain RCS cooldown less than 100° F in any one hour. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 9. Commence logging RCS and PZR cooldown rates **PER** ATTACHMENT(14), RCS COOLDOWN DATA SHEET, and ATTACHMENT(15), PRESSURIZER COOLDOWN DATA SHEET. 10. 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. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 11. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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 (2) Lower RCS subcooling to as near 30° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown (3) Repeat steps W.1.c.(1) through W.1.c.(2) as necessary. (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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.1 (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.** 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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. 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** perform the following actions: 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.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) 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. COMMENCE SHUTDOWN COOLING.	
1. **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 30° F based on CET temperatures **THEN** initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING.	
Z. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	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 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11,12,13,14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	80 inches to 180 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	30°F to 140°F	___|___|___|___ ___|___|___|___	30°F to 140°F	_____
d. Reactor Vessel level	above the top of the hot leg	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. RCS T_{COLD}	less than 535°F	___|___|___|___ ___|___|___|___	less than 535°F	_____
b. T_{HOT} minus T_{COLD}				
natural circulation	less than 50°F	___|___|___|___ ___|___|___|___	less than 50°F	_____
OR				
forced circulation	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

V. 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 (1)	less than 150°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. 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) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-2 UNIT 1
LOSS OF OFFSITE POWER / LOSS OF FORCED CIRCULATION

IF POWER HAS BEEN LOST	PLANT STABILIZATION	RECOVERY	RESTORATION
• VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING • RESTORE COMPONENT COOLING FLOW • SHUT THE MSIVS AND BLOWDOWN VALVES	• ESTABLISH RCS HEAT SINK • MAINTAIN PRESSURIZER LEVEL • ENSURE INSTRUMENT AIR IS AVAILABLE • MAINTAIN RCS SUBCOOLING	• VERIFY NATURAL CIRCULATION • ATTEMPT TO RESTORE POWER • EVALUATE RESTORING FORCED CIRCULATION • EVALUATE THE NEED FOR PLANT COOLDOWN	• ESTABLISH LTOP CONTROLS • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.		9
	E. **IF** COMPONENT COOLING HAS BEEN LOST, **THEN** RESTORE FLOW.		10
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284.		
	F. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.		11
	G. ESTABLISH RCS HEAT SINK.	C	12
	• S/G pressure **850 - 920 PSIA**. • T_{COLD} **525 - 535°F**. • S/G level **(-)24 - (+)30 inches**		

START	FUNCTION	DONE	PAGE
	H. MAINTAIN PRESSURIZER LEVEL BETWEEN **101 AND 180 INCHES**.	C	17
	I. ENSURE INSTRUMENT AIR IS AVAILABLE.	C	20
	J. MAINTAIN RCS SUBCOOLING BETWEEN **30 AND 140°F**.	C	20
	K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	23
	• At least 30°F subcooling 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		
	L. ATTEMPT TO RESTORE POWER.	C	24
	M. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.		29
	• MCC-104 and 114 • 1Y09 and 1Y10		
	N. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.		33
	O. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ENERGIZE SUPPORT EQUIPMENT.		33
	P. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	C	38
	• **IF** 1B DG load exceeds 3600 KW, **THEN** perform rapid load reduction. • **IF** 1B DG load exceeds 3300 KW, **THEN** secure DG loads.		
	Q. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.		39

START	FUNCTION	DONE	PAGE
	R. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MAINTAIN VCT LEVEL BETWEEN **60 AND 100 INCHES**.	C	40
	S. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MINIMIZE 250V DC BATTERY DISCHARGE.		40
	T. ENSURE AUXILIARY SYSTEM OPERATION.	C	41
	U. EVALUATE RESTORING FORCED CIRCULATION.	C	42
	V. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	46
	W. CONTROL CORE AND RCS VOIDING.	C	50
	X. PERFORM LOW TEMPERATURE ACTIONS.		53
	• **WHEN** T_{COLD} is less than 385°F, **THEN** establish RCS low temperature conditions. • **WHEN** T_{COLD} is less than 369°F, **THEN** establish MPT protection.		
	Y. COMMENCE SHUTDOWN COOLING.	C	57
	Z. IMPLEMENT THE APPROPRIATE PROCEDURE.		57

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-2

LOSS OF OFFSITE POWER / LOSS OF FORCED CIRCULATION

REVISION 14

Safety Related

Approval Authority: Dave Holm 4/9/03
signature/date

Effective Date: 4/18/03

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
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PLACEKEEPER PAGE NUMBERS	REVISION
1	14

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01401	47

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III.	PRECAUTIONS	5
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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed after a Loss Of Offsite Power (LOOP) or a Loss Of Forced Circulation (LOFC). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to safely establish plant conditions allowing implementation of hot standby, hot shutdown or cold shutdown. This procedure is designed to meet this objective, while maintaining adequate core cooling and 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:

1. A Loss Of Offsite Power has occurred, as indicated by **ANY** of the following conditions:

   - Momentary loss of Control Room lighting on **BOTH** Units
   - 500KV Red Bus and Black Bus power available lights are de-energized
   - Diesel Generators automatically start
   - 13KV Service Buses 12 and 22 power available lights are de-energized
   - **NO** RCPs are running on **EITHER** Unit
   - Reactor Trip occurs due to RCS low flow

2. Single phase natural circulation is to be utilized for RCS heat removal although at least ONE 13KV Service Bus is energized.

III. PRECAUTIONS

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

A. **WARNING**

None

B. **CAUTIONS**

1. 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.

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

3. 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.

4. 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.

5. 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.

6. 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).

7. 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. 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.

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine diagnosis of a Loss Of Offsite Power / Loss of Forced Circulation is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of Offsite Power / Loss of Forced Circulation is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS **PER** THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SW PP on the same header • At least ONE IA COMPR • 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 • Instrument Air Compressor **PER** OI-19, INSTRUMENT AIR • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 3. **IF** 23 AFW PP starts **AND** 21 or 22 AFW PP is operating, **THEN** secure 23 AFW PP.	
E. **IF** COMPONENT COOLING FLOW HAS BEEN LOST, **THEN** RESTORE FLOW.	
1. Verify CC CNTMT SUPP valve, 2-CC-3832-CV, is shut. 2. Start a CC PP. 3. 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. 4. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. (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.** 5. **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. 6. **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: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open CC CNTMT SUPP valve, 2-CC-3832-CV. c. Slowly open 2-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.	
1. Shut **BOTH** MSIVs. 2. Shut the SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
G. ESTABLISH RCS HEAT SINK.	
1. Operate the TURB BYP valves to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F (continue)	1.1 Operate the ADVs to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F a. Shift the ADV controller to MANUAL. b. Operate the ADVs from the control room. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.1 (continued)	G.1.1 (continued) c. **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) **CAUTION** **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** 2. Establish Main Feedwater flow to at least **ONE** S/G by performing the following actions: 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. (continue)	2.1 Establish Auxiliary Feedwater flow to at least ONE S/G using 21 or 22 AFW PP as follows: a. Verify the S/G steam driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV b. Open 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 (continue)

IV. ACTIONS

RECOVERY ACTIONS

G.2 (continued)

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 SG FRV BYP RESET buttons.

(4) Adjust the SG FW REG BYPASS valves to establish S/G levels at approximately 0 inches.

(5) **WHEN** S/G levels are at approximately 0 inches,
THEN shift SG FW REG BYPASS controllers to Auto.

d. **IF** 21 CST LVL drops to 5 feet,
THEN establish Auxiliary Feedwater flow and secure Main Feedwater.

(continue)

ALTERNATE ACTIONS

G.2.1 (continued)

c. Adjust and maintain turbine driven discharge header pressure at least 100 PSI greater than S/G pressure:

- (21 AFW PP SPD CONTR) 2-HC-3987A

OR

- (22 AFW PP SPD CONTR) 2-HC-3989A

d. Place 23 AFW PP in PULL TO LOCK.

e. Slowly raise and maintain S/G level between (-)24 and (+)30 inches by adjusting S/G FLOW CONTR valves:

- (21 S/G) 2-AFW-4511-CV
- (22 S/G) 2-AFW-4512-CV

f. Operate the AFW Room ventilation as necessary to maintain temperature less than 130° F.

2.2 **IF** Auxiliary Feedwater can **NOT** be established using 21 or 22 AFW PP,
THEN establish Auxiliary Feedwater flow using 23 AFW PP:

a. Verify the S/G motor driven train SG AFW BLOCK valves are open with the handswitches in AUTO:

21 S/G
- 2-AFW-4522-CV
- 2-AFW-4523-CV

22 S/G
- 2-AFW-4532-CV
- 2-AFW-4533-CV

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2 (continued)	G.2.2 (continued) **CAUTION** **23 AFW PP flow limit is 300 GPM when power is supplied by a DG; otherwise the flow limit is 575 GPM.** b. Start 23 AFW PP. c. Slowly raise and maintain S/G level between (-)24 and (+)30 inches, by adjusting SG FLOW CONTR valves: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV
3. **IF** Main Feedwater is **NOT** available, **THEN** secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL CBPs in PULL TO LOCK. c. Place ALL COND PPs in PULL TO LOCK. d. Place BOTH HDT PPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.3 (continued) g. 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 4. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. MAINTAIN PRESSURIZER LEVEL BETWEEN 101 AND 180 INCHES.	
1. Operate Charging and Letdown to restore and maintain pressurizer level between 101 and 180 inches.	1.1 **IF** Letdown is **NOT** operating, **THEN** operate the selected CHG PP to maintain pressurizer level between 101 and 180 inches. 1.2 **WHEN** 2Y09 and 2Y10 are energized, **THEN** restore letdown by performing the following actions: a. Verify the following: • 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 the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. d. Place the IX BYP valve, 2-CVC-520-CV, in BYPASS. e. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. f. Open the L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV
(continue)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.2 (continued) g. Place Letdown Pressure Controller, 2-PIC-201 in service as follows: (1) Verify the setpoint on 2-PIC-201 is 460 PSIG. (2) Shift Letdown Pressure Controller, 2-PIC-201 to AUTO. h. Adjust the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. i. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. j. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. k. Check pressurizer level is trending to 160 inches. l. **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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued)	H.1.2 (continued) m. **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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. ENSURE INSTRUMENT AIR IS AVAILABLE.	
1. Check Instrument Air header pressure greater than 90 PSIG.	1.1 **IF** Instrument Air header pressure is less than 90 PSIG, **THEN** attempt to restore Instrument Air header pressure concurrently **PER** AOP-7D, INSTRUMENT AIR MALFUNCTION.
J. MAINTAIN RCS SUBCOOLING BETWEEN 30 AND 140° F.	
1. Operate Pressurizer HTRs and SPRAY as necessary to maintain RCS subcooling between 30 and 140° F based on CET temperatures: a. 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). (a) Operate 21 or 23 BACKUP HTRs as follows: 1) Charge the closing spring using the manual lever at 480V breakers 52-2127 and 52-2427. 2) Push the PUSH-TO-CLOSE button on the breaker fronts. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1.a(1)(a) (continued)	
	CAUTION **The Pressurizer Heater Low Level cutout at 101 inches is inoperable when Heaters are operated at 2C43.**
3) **IF** 2Y10 is de-energized, **THEN** Tie 2Y10 to 2Y09: a) On 2Y10, open INST. TRANSF. 22 2X09 main feeder breaker 77. b) On 2Y10, close BUS TIE 208/120V INST. BUS 21 Breaker 78. c) Place the 2Y09-2Y10 BUS TIE Switch 2SY09, located between 2Y09 and 2Y10, to ON.	3).1 **IF** 2Y10 can **NOT** be energized, **THEN** operate 21 and 23 Backup Heaters from 2C43, to maintain RCS pressure as required.
(2) Secure AUX SPRAY.	
(3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (continued) b. Lower subcooling by **ANY** of the following methods: (1) De-energize Pressurizer HTR(s). (2) Initiate AUX SPRAY: **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.** (a) Record the following information: • PZR WTR TEMP (2-TI-101) • CHG OUT TEMP (2-TI-229) (b) Open the AUX SPRAY valve, 2-CVC-517-CV. (c) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 2-CVC-518-CV • 2-CVC-519-CV (d) Shift the PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL. (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) Maintain the pressurizer cooldown rate at less than 200° F/hour. (3) Lower the RCS cooldown rate.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. ATTEMPT TO RESTORE POWER.	
CAUTION **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 1. **IF** 21 **OR** 24 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following: a. Verify 2A and 2B DGs running. (1) Verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.c (continued) (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify 0C DG OUT BKR, 152-0703 is closed. (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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 4. 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. 5. **IF** 500KV offsite power has been restored, **THEN PROCEED** to step S.	
M. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1.a (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1.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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 2. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.2 (continued) 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. 3. **IF** Letdown is secured, **THEN** restore Letdown **PER** step H.1.2.	
N. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.	
1. Verify the following emergency pumps are operating: • Turbine EMERGENCY BRG OIL PP • EMERGENCY AIR SIDE SEAL OIL PP • SGFP EMERGENCY OIL PPs	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ENERGIZE SUPPORT EQUIPMENT.	
CAUTION **SMECO load limit is 240 AMPS Continuous.** **CAUTION** **Operation of additional equipment NOT directed within this procedure may cause 2A or 2B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.** 1. Energize the following support equipment as necessary, while maintaining load within the power source 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 SRW Pump 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. (continued) 2. Restore power to MCC-201AT and MCC-201BT loads, while remaining within load limits, 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.2.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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	
1. **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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) 2. **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.	
Q. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.	
1. Throttle open the GENERATOR BOTTOM VENT TO ATMOSPHERE ISOLATION VALVE, 2-G-06. 2. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: a. Shut 2-G-06. b. Secure the EMERGENCY AIR SIDE SEAL OIL PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MAINTAIN VCT LEVEL BETWEEN 60 AND 100 INCHES.	
1. Maintain VCT level between 60 and 100 inches. 2. **WHEN** VCT makeup is required, **THEN** shift Charging Pump(s) suction to the RWT: 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 Charging Pump(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to the VCT as follows: (1) Open the VCT OUT valve, 2-CVC-501-MOV. (2) Shut the RWT CHG PP SUCT valve, 2-CVC-504-MOV.	
S. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MINIMIZE 250V DC BATTERY DISCHARGE.	
1. Close 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4 KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. EVALUATE RESTORING FORCED CIRCULATION.	
1. **WHEN** 500KV offsite power is restored, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using natural circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures	
2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step V.	
3. **IF** T_{COLD} is less than 306° F, **THEN** restart the RCPs **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS.	
CAUTION **If RCPs are restarted with a significant volume of unborated reactor coolant in a cold leg, the potential exists for a reactor restart accident.**	
4. **IF** RCPs initially tripped during a boron dilution, **THEN** verify at least **ONE** of the following: • natural circulation is in progress • RCS boron concentration is greater than or equal to the shutdown boron concentration **PER** the NEOPs. (continue)	4.1 **IF** natural circulation is **NOT** verified in progress **AND** RCS boron concentration is less than the shutdown boron concentration **PER** the NEOPs, **THEN PROCEED** to step V.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 5. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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. Raise Pressurizer level to between 155 and 180 inches. 9. Reduce T_{COLD} to less than 525° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

U. (continued)
 	
10. Verify RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-215 (ALL RCPs)
  • MCC-205 (21A/21B RCP)
 	
• 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 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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** 11. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP CBO ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 12. Operate Charging and Letdown to restore and maintain pressurizer level between 101 and 180 inches. 13. Monitor RCP seal parameters following pump restart. 14. Allow backflow to equalize temperatures in the opposite loop. 15. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start an RCP **PER** step U.11 above. c. Monitor RCP seal parameters following pump restart.	
V. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step Z. 3. **IF** RCS boration has **NOT** been conducted, **THEN** commence RCS boration: a. Shut the VCT M/U valve, 2-CVC-512-CV. b. Open the BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs. 4. Record the time RCS boration was commenced: _____ 5. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 6. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 7. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 2-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 2-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV 8. Commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADVs, maintain RCS cooldown less than 100° F in any one hour. (continue)	

01401

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 9. Commence logging RCS and PZR cooldown rates **PER** ATTACHMENT(14), RCS COOLDOWN DATA SHEET, and ATTACHMENT(15), PRESSURIZER COOLDOWN DATA SHEET. 10. 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. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 11. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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 (2) Lower RCS subcooling to as near 30° F as practical by **ANY** of the following methods: • De-energize the Pressurizer HTR(s) • Operate Pressurizer SPRAY • Secure RCS cooldown (3) Repeat steps W.1.c.(1) through W.1.c.(2) as necessary (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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.1 (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.** 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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	
X. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (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** perform the following actions: 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.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) 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. COMMENCE SHUTDOWN COOLING.	
1. **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 30° F based on CET temperatures **THEN** initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING.	
Z. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	80 inches to 180 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	30°F to 140°F	___|___|___|___ ___|___|___|___	30°F to 140°F	_____
d. Reactor Vessel level	above the top of the hot leg	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. RCS T_{COLD}	less than 535°F	___|___|___|___ ___|___|___|___	less than 535°F	_____
b. T_{HOT} minus T_{COLD}				
natural circulation	less than 50°F	___|___|___|___ ___|___|___|___	less than 50°F	_____
OR				
forced circulation	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

V. 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 (1)	less than 150°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. 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) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-2 UNIT 2
LOSS OF OFFSITE POWER / LOSS OF FORCED CIRCULATION

IF POWER HAS BEEN LOST	PLANT STABILIZATION	RECOVERY	RESTORATION
• VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING • RESTORE COMPONENT COOLING FLOW • SHUT THE MSIVS AND BLOWDOWN VALVES	• ESTABLISH RCS HEAT SINK • MAINTAIN PRESSURIZER LEVEL • ENSURE INSTRUMENT AIR IS AVAILABLE • MAINTAIN RCS SUBCOOLING	• VERIFY NATURAL CIRCULATION • ATTEMPT TO RESTORE POWER • EVALUATE RESTORING FORCED CIRCULATION • EVALUATE THE NEED FOR PLANT COOLDOWN	• ESTABLISH LTOP CONTROLS • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.		9
	E. **IF** COMPONENT COOLING HAS BEEN LOST, **THEN** RESTORE FLOW.		10
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284.		
	F. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.		12
	G. ESTABLISH RCS HEAT SINK.	C	12
	• S/G pressure **850 - 920 PSIA**. • T_{COLD} **525 - 535°F**. • S/G level **(-)24 - (+)30 inches**		

START	FUNCTION	DONE	PAGE
	H. MAINTAIN PRESSURIZER LEVEL BETWEEN **101 AND 180 INCHES.**	C	18
	I. ENSURE INSTRUMENT AIR IS AVAILABLE.	C	21
	J. MAINTAIN RCS SUBCOOLING BETWEEN **30 AND 140°F.**	C	21
	K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	24
	• At least 30°F subcooling 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		
	L. ATTEMPT TO RESTORE POWER.	C	25
	M. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.		29
	• MCC-204 and 214 • 2Y09 and 2Y10		
	N. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.		33
	O. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** ENERGIZE SUPPORT EQUIPMENT.		34
	P. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	C	37
	• **IF** 2A or 2B DG load exceeds 3600 KW, **THEN** perform rapid load reduction. • **IF** 2A or 2B DG load exceeds 3300 KW, **THEN** secure DG loads.		
	Q. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.		38

START	FUNCTION	DONE	PAGE
	R. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MAINTAIN VCT LEVEL BETWEEN **60 AND 100 INCHES.**	C	39
	S. **IF** 500KV OFFSITE POWER HAS BEEN LOST, **THEN** MINIMIZE 250V DC BATTERY DISCHARGE.		39
	T. ENSURE AUXILIARY SYSTEM OPERATION.	C	40
	U. EVALUATE RESTORING FORCED CIRCULATION.	C	41
	V. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	45
	W. CONTROL CORE AND RCS VOIDING.	C	49
	X. PERFORM LOW TEMPERATURE ACTIONS.		51
	• **WHEN** T_{COLD} is less than 325°F, **THEN** establish RCS low temperature conditions. • **WHEN** T_{COLD} is less than 306°F, **THEN** establish MPT protection.		
	Y. COMMENCE SHUTDOWN COOLING.	C	56
	Z. IMPLEMENT THE APPROPRIATE PROCEDURE.		56

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-3

LOSS OF ALL FEEDWATER

REVISION 18

Safety Related

Approval Authority: Kent Mills 4/20/05
signature/date

Effective Date: 5/10/05

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-91	18

PLACEKEEPER PAGE NUMBERS	REVISION
1	18

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01802	9

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Loss Of All Feedwater (LOAF). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a LOAF by restoring feedwater, or cooling down and depressurizing the RCS to establish a low pressure feedwater source, long term core cooling using Once-Through-Cooling or initiation of shutdown cooling. These actions are designed to maintain adequate core cooling 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 exists indicating a Loss Of All Feedwater:

- "11 SGFPT TRIP" and "12 SGFPT TRIP" alarms (C26 and C30)
- Low suction or discharge pressure for **EITHER** the Condensate, Condensate Booster, or S/G Feed Pumps
- Loss of Condenser Hotwell level
- Loss of Condensate Storage Tank inventory
- Low suction or discharge pressure for the AFW Pumps
- "MOTOR SYS NO FLOW" alarm (AFW STATUS PANEL)
- "TURB SYS NO FLOW" alarm (AFW STATUS PANEL)

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. 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} .

2. Solid water operation of the RCS should only be attempted in order to maintain a subcooled margin of 30° 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.

3. 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.

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

5. 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.

6. 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.

7. 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).

8. 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. 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.

2. 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.

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Loss Of All Feedwater is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of All Feedwater is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOOP, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. TRIP **ALL** RCPs.	
E. MINIMIZE S/G INVENTORY LOSS.	
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	
F. COMMENCE RCS BORATION.	
1. Commence RCS boration as follows: 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. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.1 (continued) e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs. 2. Record the time RCS boration was commenced: _____ 3. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ 4. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. COMMENCE NATURAL CIRCULATION RCS COOLDOWN TO T_{COLD} LESS THAN 465° F.	
1. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN** initiate Once-Through-Cooling concurrently **PER** step J.	
2. 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.	2.1 **IF** SGIS actuates as a result of the cooldown **AND** the Non-Vital 4KV buses are energized, **THEN** reset the SGIS as follows: a. Place the COND BSTR PPs in PULL TO LOCK. b. Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST. c. Block SGIS. d. Reset the SGIS signal. e. Open the MSIV(s). f. Open the SG FW ISOL valve(s): • 1-FW-4516-MOV • 1-FW-4517-MOV g. Start a COND BSTR PP.

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 3. Block SIAS as follows: • **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. 4. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. a. Shut **BOTH** MSIVs. **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.** 5. Conduct 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 30 and 140° F based on CET temperatures • Pressurizer level between 50 and 180 inches (continue)	5.1 **IF** subcooling exceeds 140° F, **THEN** 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) (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5 (continued)	G.5.1 (continued) d. Open the AUX SPRAY valve, 1-CVC-517-CV. e. Operate the LOOP CHG valves as necessary to adjust Auxiliary 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 h. Maintain the pressurizer cooldown rate less than 200° F/hour. 5.2 **IF** pressurizer level is **NOT** between 50 and 180 inches, **THEN** perform the following as necessary to restore pressurizer level between 50 and 180 inches: a. Adjust cooldown rate. b. Operate charging and letdown.
6. Verify adequate RCS heat removal via steam generators: • At least ONE S/G has wide range level greater than (-)350 inches • T_{COLD} is stable or lowering	6.1 **IF BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN PROCEED** to step J.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. ATTEMPT TO ESTABLISH AFW FLOW TO S/Gs.	
1. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN** initiate Once-Through-Cooling concurrently **PER** step J.	
2. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
3. Establish AFW flowpath by placing the handswitches for the 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	3.1 **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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (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. 4. Establish feedwater flow by **ANY** of the following methods: a. 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) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	a.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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.a (continued) (4) 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)	H.4.a.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. (5) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (6) 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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4 (continued) b. 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 (4) Open 11 and 12 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 (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 (continue)	b.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 (6) Verify open 11 **OR** 12 THROTTLE/STOP valve: • 1-MS-3986 • 1-MS-3988 (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.b (continued) (6) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (7) 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 (8) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	H.4.b.1 (continued) (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) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (10) 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 (11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4 (continued) c. 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. (c) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.c(3) (continued) (d) 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 5. **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 6. Adjust the TURB BYP valves **OR** the ADVs to establish RCS temperature control. 7. **IF** feed flow has been restored to at least ONE S/G, **THEN PROCEED** to step L.	
I. **IF** AFW CAN **NOT** FEED S/Gs, **THEN** LINE UP TO FEED S/Gs WITH A CONDENSATE BOOSTER PUMP.	
1. Check the Condensate system is available for feeding the S/Gs. (continue)	1.1 **IF** the Condensate system is **NOT** available, **THEN PROCEED** to step J.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. Shut the MAIN SG FW REG valves. 3. Shift the SG FW REG BYPASS controllers to Manual. 4. Depress the S/G FRV BYP RESET buttons. 5. Manually adjust the SG FW REG BYPASS valve controllers to 0%. 6. Open the SG FW ISOL valves: • (11 S/G) 1-FW-4516-MOV • (12 S/G) 1-FW-4517-MOV 7. Open the PRECOAT SYS BYP valve, 1-CD-5818-CV. 8. Open the COND DEMIN BYP valve, 1-CD-4439-MOV. 9. Verify at least ONE COND PP is running. 10. Verify ONE COND BSTR PP is running. 11. Place BOTH HTR DRN PP Handswitches in PULL TO LOCK. 12. **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 13. Manually adjust the SG FW REG BYPASS valve controllers to gradually restore S/G(s) levels to between (-)24 and (+)30 inches. **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. 14. Confirm feed flow has been restored by observing the following indications: • SG FW DIFF PRESS controller indicates greater than 0 PSID • S/G levels constant or rising 15. Adjust the TURB BYP valves **OR** the ADVs to establish RCS temperature control. 16. **IF** feed flow has been restored to at least ONE S/G, **THEN PROCEED** to step L.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. INITIATE ONCE-THROUGH-COOLING.	
CAUTION **After Once-Through-Cooling has been initiated, feed flow to S/Gs should be restored only as directed by step K.** 1. Continue efforts to restore feedwater capability concurrently **PER** steps H and I with Once-Through-Cooling. **NOTE** Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of J.2 may be performed, and in any order. **NOTE** Perform steps J.2 and J.3 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.** 2. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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.	
e. Start **ALL** THREE HPSI PPs.	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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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), HIGH PRESSURE SAFETY INJECTION FLOW • CET temperatures constant or lowering	i.1 **IF** HPSI flow is **NOT PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, **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), SIAS VERIFICATION CHECKLIST.
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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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 J.3, **AND IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE.
3. 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 • 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.3.a (continued) • **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 4. **IF** feedwater capability is restored, **THEN** concurrently perform step K. 5. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • CIS • SIAS 6. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15. 7. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

J. (continued)
 	
8. Override the CSAS signal to the COND BSTR PPs and the MAIN FW ISOL valves by taking the following keyswitches to OVERRIDE:
 	
• FW TRIP SGIS/CSAS OVERRIDE, 1-HS-4000
 	
• 11 S/G FW ISOL VLV SGIS/CSAS OVERRIDE, 1-HS-4516A
 	
• 12 S/G FW ISOL VLV SGIS/CSAS OVERRIDE, 1-HS-4517A
 	
9. **WHEN ALL** of the following conditions can be maintained:
 	
• At least 30° 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
 	
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 30 and 140° F based on CET temperatures
 	
• Pressurizer level greater than 101 inches {141}
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 10. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped. 11. Direct Chemistry to place the Hydrogen Monitors in service. 12. 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. 13. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. 14. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 15. **IF** Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, HYDROGEN PURGE SYSTEM, until the Plant Technical Support Center recommends its termination.	
K. **IF** FEEDWATER CAPABILITY IS RESTORED **AND** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** EVALUATE FEEDING A S/G.	
NOTE The decision to feed a S/G should be made based on the time until shutdown cooling entry conditions can be established, the adequacy of the cooldown on Once-Through-Cooling, the availability of condensate inventory, and the overall status of the plant. **CAUTION** **If ANY S/G has indicated level, then 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.** 1. **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 (continue)	1.1 **IF NEITHER** S/G is to be fed, **THEN** return to the step that was being performed, by referring to the placekeeper if necessary.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued) 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	
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 at 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's Manual Isolation Valve: • (11 S/G) 1-MS-101 • (12 S/G) 1-MS-104

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) **CAUTION** **If voids exist in the S/G tubes, a rapid RCS pressure reduction will occur when the voids collapse.** 2. Establish feed to the selected S/G. a. Verify the TURB BYP valves **AND** the ADVs are shut. b. **IF** AFW has been restored **PER** step H, **THEN** perform the following actions: (1) Adjust S/G FLOW CONTR valves for the S/G to be fed to approximately 150 GPM: 11 S/G • 1-AFW-4511-CV • 1-AFW-4525-CV 12 S/G • 1-AFW-4512-CV • 1-AFW-4535-CV (2) **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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (continued) **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.** c. **IF** Main Feedwater has been restored **PER** step I, **THEN** perform the following actions: (1) 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. (2) **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 d. **IF** 11 or 12 AFW PP is operating, **THEN** verify AFW Room normal **OR** emergency ventilation is operating to maintain temperature less than 130° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K..(continued) **CAUTION** **The RCS may be solid. Any action involving RCS cooldown or heatup should be closely monitored to prevent rapid pressure excursions.** 3. 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. 4. **WHEN ALL** of the following conditions can be maintained: • At least 30° 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 **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 30 and 140° F based on CET temperatures. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) 5. **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 30 and 140° F using CET temperatures. e. Adjust the ADV to establish RCS temperature control.	
L. **WHEN** BORATION HAS BEEN COMPLETED, **THEN** SHIFT CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** SIAS is 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. Shut the VCT OUT valve, 1-CVC-501-MOV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. 2. **IF** SIAS has **NOT** actuated **OR** has been reset, **THEN** perform **ONE** of the following: a. Lineup the Charging Pump Suction to the RWT as follows: (1) Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. (2) Shut the VCT OUT valve, 1-CVC-501-MOV. (3) Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. (4) Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV (5) Stop the BA PP(s). (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.2 (continued) b. Lineup the Charging Pump Suction to the VCT as follows: (1) Maintain VCT makeup blend sufficient to sustain required shutdown boron concentration **PER** the NEOPs. (2) Open the VCT OUT valve, 1-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. (5) Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** 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.
N. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** MONITOR FOR 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.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 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 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 PPs in operation. **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** f. **IF** TWO or THREE HPSI PPs are running **AND** total flow is greater than 1000 GPM, **THEN** throttle HPSI flow equally among the four headers to achieve a total flow of 1000 GPM. (continue)	f.1 **IF** ONE HPSI PP is running **AND** total flow is greater than 600 GPM, **THEN** throttle HPSI flow equally among the four headers to achieve a total flow of 600 GPM.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) g. **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), HIGH PRESSURE SAFETY INJECTION FLOW. (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. (c) Notify the Plant Technical Support Center. (d) **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE (continue)	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) h. 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. i. Place the ECCS PP RM EXH FILT in service. j. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) k. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** l. Ensure HPSI PP flow is at least 90 GPM during recirculation.	l.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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	
P. **IF** ONCE-THROUGH-COOLING HAS BEEN INITIATED, **THEN** RESTORE CONTAINMENT ENVIRONMENT.	
1. **IF** a CSAS has initiated containment spray **AND** 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) c. Verify **ALL** available CNTMT AIR CLRs are operating to reduce containment temperature. d. Restore the equipment listed in ATTACHMENT (3), CSAS VERIFICATION CHECKLIST. 2. **WHEN** containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions: **NOTE** 1B Diesel Generator non-essential trips are enabled when SIAS is reset. a. Verify the pressurizer pressure signals are blocked **AND** reset the SIAS signals. b. 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.** c. Secure ONE CS PP. d. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition. e. Evaluate the Charging Pump suction supply. 3. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** 11 **OR** 14 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** the following: a. Verify 1A and 1B DGs running. (1) Verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1.c (continued) (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 189-1406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued)	
4. 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.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.**	
5. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
CAUTION **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.5.a (continued) (2) Verify BORIC ACID PUMP 11 is available, **AND** open the BORIC ACID PUMP 12 breaker, 52-10406. (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. (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)	(2).1 **IF** BORIC ACID PUMP 11 is **NOT** available, **THEN** verify BORIC ACID PUMP 11 breaker, 52-11406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.5 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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.	
8. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Check **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. ENSURE AUXILIARY SYSTEM OPERATION	
1. Ensure proper operation of the following systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Compoment Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. **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, 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.	
T. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.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 the 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. 3. Restore Instrument Air to the Containment as follows: a. Verify the IA CNTMT ISOL valve, 1-IA-2080-MOV, is open. **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 the Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater will enable greater cooldown capability. 4. **IF** the ADVs are being used to control RCS temperature, **THEN** attempt to restore the TURB BYP valves to operation **PER** the appropriate procedure.	
U. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV c. Slowly open 1-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. ESTABLISH LTOP CONTROL.	
NOTE If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication. 1. **WHEN** T_{COLD} is less than 385° F, **THEN** establish RCS low temperature conditions as follows: a. **IF** the HPSI system is in operation, **THEN** reduce the HPSI flow as follows: (1) **IF** THREE HPSI PPs are operating, **THEN** secure ONE HPSI PP. (2) Throttle HPSI flow to maintain the following: • RCS temperature constant or lowering • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS pressure greater than 300 PSIA (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.1 (continued) b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	b.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate AUX SPRAY to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) **NOTE** MPT protection must be established even if Once-Through-Cooling is in progress. **CAUTION** **PORVs must be in MPT ENABLE before T_{COLD} is less than 365° F.** 2. **WHEN** T_{COLD} is less than 369° F, **AND** Once-Through-Cooling flow is **NOT** reduced due to restoration of a secondary heat sink, **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.2 (continued) e. **IF** Once-Through-Cooling is **NOT** in progress, **THEN** verify the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404 3. **IF** feedwater capability is restored **AND** restoration of feedwater is desired, **THEN PROCEED** to step K. 4. **IF** it is desired to continue the RCS cooldown using Once-Through-Cooling until shutdown cooling entry conditions are reached, **THEN PROCEED** to step AC.	
W. **IF** A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	
1. Ensure Once-Through-Cooling flow has been reduced **PER** step K.5. 2. Restore letdown **PER** step X. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 3. Secure Once-Through-Cooling as follows: a. Verify the HPSI throttle criteria are met. b. Secure the HPSI PPs. c. Shut the HPSI HDR valves. d. Place the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404 e. Adjust charging and letdown to maintain RCS subcooling between 30 and 140° F using CET temperatures. 4. Adjust the ADV to establish natural circulation, and maintain CET temperatures constant or lowering. 5. Verify **BOTH** PORV BLOCK valves are OPEN: • 1-RC-403-MOV • 1-RC-405-MOV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 6. Draw a bubble as follows: **NOTE** Pressurizer Backup Heater Banks 11 and 13 trip on U/V and SIAS. a. Energize the Pressurizer HTR(s). b. **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. c. **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. d. Operate Pressurizer HTRs and AUX SPRAY as necessary to maintain RCS subcooling between 30 and 140° F. 7. Restore and maintain the level of the S/G being fed between (-)24 and (+)30 inches. 8. **WHEN** a secondary heat sink has been restored **AND** RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 9. **IF** a plant cooldown is desired, **THEN** commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADV from the S/G with feed flow, maintain RCS cooldown less than 100° F in any one hour. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 10. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	9.1 **IF** a plant cooldown is **NOT** desired, **THEN** maintain stabilized plant conditions.
X. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step Y.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) 2. Verify the selected PZR 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 the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. 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) 7. Open the L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) **CAUTION** **The setpoint of 1-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.** 8. 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. 9. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. 11. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** Once-Through-Cooling is **NOT** in progress, **THEN** check pressurizer level is trending to 160 inches. (continue)	12.1 **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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.12 (continued)	X.12 (continued) 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 1-CVC-103 • 1-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 1-CVC-104 • 1-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 1-CVC-108 • 1-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 1-CVC-109 • 1-CVC-111 e. Place L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. Place BACKPRESS REG VLVS handswitch, 1-HS-201, in BOTH.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. RESTORE RCS SUBCOOLING AND PRESSURIZER LEVEL.	
1. Restore and maintain subcooling between 30 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.** a. 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) Raise RCS cooldown rate, while maintaing less than 100° F in any one hour, by using TURB BYP valves **OR** ADVs. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.1 (continued) b. 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** overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (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 AUX SPRAY valve, 1-CVC-517-CV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.1.b(5) (continued) (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 (h) Maintain pressurizer cooldown rate less than 200° F/hour. 2. Restore and maintain Pressurizer Level between 101 and 180 inches by operating charging and letdown.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	
AA. RESTORE FORCED CIRCULATION.	
1. Evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step AB. 3. **IF** T_{COLD} is less than 369° F, **THEN PROCEED** to step AB. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

AA. (continued)
 	
8. Verify RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
 	
• 12/22 SERV BUS VOLTS is less than 14.8 KV
 	
• 4KV Bus voltage is greater than 4100 volts
 	
• RCP Controlled Bleed-off temperatures are less than 200° F
 	
• RCS subcooling is greater than 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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** 9. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP BLEED-OFF ISOL valves are open: • 1-CVC-505-CV • 1-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 10. Operate Charging and Letdown or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS b. Start an RCP **PER** step AA.9 above. c. Monitor the RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 AB.1.c.(1) through AB.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. ESTABLISH RCS LOW TEMPERATURE CONDITIONS.	
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	
2. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than TWO RCPs are in operation.	
3. **IF** Once-Through-Cooling is in progress, **AND** RCS temperature is less than 300° F, **THEN** HPSI flow may be throttled to maintain the following: • RCS temperature constant or lowering • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. **IF** PLANT COOLDOWN IS BEING PERFORMED, **THEN** COMMENCE SHUTDOWN COOLING.	
1. **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 greater than 30° 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. Restore letdown **PER** step X. c. Operate HPSI and Charging and Letdown to maintain the following: • Pressurizer level above 101 inches • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS d. Initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.1 (continued) e. **WHEN** Shutdown Cooling has been established, **THEN** secure Once-Through-Cooling as follows: (1) Secure the HPSI PPs. (2) Place the PORV OVERRIDE handswitches in AUTO: • 1-HS-1402 • 1-HS-1404 (3) **IF** a pressurizer bubble is desired, **THEN** draw a pressurizer bubble **PER** step W.6.	
AE. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met. 2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals. 3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS. 4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager. END of Section IV	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	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 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches {90}	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) **(1)**	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) **(1)**	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	greater than 30°F greater than 30°F	_____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

(1) LPSI and Charging Pumps are **NOT** required post-RAS.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 50°F superheated	___|___|___|___ ___|___|___|___	less than 50°F superheated	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. S/G level (1)	(-)350 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
OR				
Once-Through-Cooling: (1)				
Pressurizer pressure	less than 1270 PSIA or lowering	___|___|___|___ ___|___|___|___	less than 1270 PSIA or lowering	_____
Core Flow	minimum equipment available **PER** Att. (17) and SIS injecting **PER** Att. (10)	___|___|___|___ ___|___|___|___	shutdown cooling initiated	_____

(1) The criteria for S/G level is not applicable during Once-Through-Cooling. The criteria for pressurizer pressure and core flow should be used after Once-Through-Cooling is initiated.

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	ALL available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 1Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

V. 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) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-3 UNIT 1
LOSS OF ALL FEEDWATER

INITIAL STABILIZATION	IF FEED FLOW IS NOT RESTORED	RECOVERY	RESTORATION

• TRIP **ALL** RCPS
• SECURE S/G BLOWDOWN
• COMMENCE NATURAL CIRC COOLDOWN TO LESS THAN 465°F
• ATTEMPT TO ESTABLISH FEED FLOW
	• INITIATE ONCE-THROUGH COOLING
	  • **BOTH** S/G levels less than (-)350 inches
	  • TCOLD rises uncontrollably 5°F or greater
	  • Prior to CETs reaching 560°F
	• MONITOR FOR RAS
	• RESTORE CONTAINMENT ENVIRONMENT
	• ATTEMPT TO ESTABLISH FEED FLOW
		• RESTORE FROM LOSS OF POWER
		• EVALUATE THE NEED FOR COOLDOWN
		• RESTORE SUBCOOLING AND PZR LEVEL
		• VERIFY NATURAL CIRCULATION
			• RESTORE FORCED CIRCULATION
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME.		8
	D. TRIP **ALL** RCPs.		8
	E. MINIMIZE S/G INVENTORY LOSS.		8
	F. COMMENCE RCS BORATION.		8
	G. COMMENCE NATURAL CIRCULATION RCS COOLDOWN TO TCOLD LESS THAN 465°F.	C	10
	• **IF,** at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** TCOLD rises uncontrollably 5°F or greater, **THEN** initiate Once-Through-Cooling • Block / Reset SGIS • Block SIAS • Rapid cooldown less than 100°F per hour • Maintain subcooling **30 - 140°F** • Maintain pressurizer level **50 - 180 inches**		
	H. ATTEMPT TO ESTABLISH AFW FLOW TO S/Gs.	C	13
	I. **IF** AFW CAN **NOT** BE ALIGNED TO FEED S/Gs, **THEN** LINE UP TO FEED S/Gs WITH A CONDENSATE BOOSTER PUMP.	C	19
	NOTE: Condensate Booster Pump head is approximately 500 PSIA.		
	J. INITIATE ONCE-THROUGH-COOLING.	C	22

	NOTE: Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of J.2 may be performed, and in any order.
	Perform S/G dryout step concurrently with initiation of Once-Through-Cooling.
	• **IF,** at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** TCOLD rises uncontrollably 5°F or greater, **THEN** initiate Once-Through-Cooling
	• **WHEN EACH** S/G level is less than (-)380 inches, **THEN** prevent S/G dryout
	• **IF** containment pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS
	• **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS
	• **WHEN** the following conditions can be maintained:
	  • At least 30°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
	THEN HPSI flow can be reduced		

START	FUNCTION	DONE	PAGE
	K. **IF** FEEDWATER CAPABILITY IS RESTORED **AND** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** EVALUATE FEEDING A S/G.	C	29
	• Restore and maintain S/G level **(-)170 - (+)30 inches** • Shift to TWO HPSI PPs and ONE CHG PP • Shut ONE PORV BLOCK valve		
	L. **WHEN** BORATION HAS BEEN COMPLETED, **THEN** SHIFT CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	C	34
	M. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** PREPARE FOR RAS ACTUATION.	C	37
	• RWT level drops to 4 feet.		
	N. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** MONITOR FOR RAS ACTUATION.	C	37
	O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.		42
	P. **IF** ONCE-THROUGH-COOLING HAS BEEN INITIATED, **THEN** RESTORE CONTAINMENT ENVIRONMENT.	C	42
	• **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP		
	Q. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.		44
	• MCC-104 and 114 • 1Y09 and 1Y10		
	R. ENSURE AUXILIARY SYSTEM OPERATION.	C	54
	S. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	C	55
	• Notify the Plant Technical Support Center to review ERPIP-611.		
	T. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.		55

START	FUNCTION	DONE	PAGE
	U. **IF** COMPONENT COOLING HAS BEEN SECURED TO CONTAINMENT, **THEN** RESTORE FLOW.	C	57
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284		
	V. ESTABLISH LTOP CONTROL.		59
	• **WHEN** TCOLD is less than 385°F, **THEN** establish RCS low temperature conditions • **WHEN** TCOLD is less than 369°F, **THEN** establish MPT protection		
	W. **IF** A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	C	62
	• RCS subcooling **30 - 140°F** • Draw a pressurizer bubble • S/G level **(-)24 - (+)30 inches**		
	X. RESTORE LETDOWN FLOW.	C	65
	Y. RESTORE RCS SUBCOOLING AND PRESSURIZER LEVEL.	C	69
	• RCS subcooling **30 - 140°F** • Pressurizer level **101 - 180 inches**		
	Z. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	72
	• At least 30°F subcooling based on CET temperatures • THOT minus TCOLD less than 50°F • TCOLD constant or lowering • THOT constant or lowering • CET temperatures trend consistent with THOT • Steaming rate affects RCS temperatures		
	AA. RESTORE FORCED CIRCULATION.	C	72
	AB. CONTROL CORE AND RCS VOIDING.	C	77
	AC. ESTABLISH RCS LOW TEMPERATURE CONDITIONS.	C	80
	AD. **IF** PLANT COOLDOWN IS BEING PERFORMED, **THEN** COMMENCE SHUTDOWN COOLING.	C	83
	AE. IMPLEMENT THE APPROPRIATE PROCEDURE.		84

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-3

LOSS OF ALL FEEDWATER

REVISION 17

Safety Related

Approval Authority: Kent Mills 4/20/05
signature/date

Effective Date: 5/10/05

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-92	17

PLACEKEEPER PAGE NUMBERS	REVISION
1	17

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01702	9

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Loss Of All Feedwater (LOAF). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a LOAF by restoring feedwater, or cooling down and depressurizing the RCS to establish a low pressure feedwater source, long term core cooling using Once-Through-Cooling or initiation of shutdown cooling. These actions are designed to maintain adequate core cooling 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 exists indicating a Loss Of All Feedwater:

- "21 SGFPT TRIP" and "22 SGFPT TRIP" alarms (C26 and C30)
- Low suction or discharge pressure for **EITHER** the Condensate, Condensate Booster, or S/G Feed Pumps
- Loss of Condenser Hotwell level
- Loss of Condensate Storage Tank inventory
- Low suction or discharge pressure for the AFW Pumps
- "MOTOR SYS NO FLOW" alarm (AFW STATUS PANEL)
- "TURB SYS NO FLOW" alarm (AFW STATUS PANEL)

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. 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} .

2. Solid water operation of the RCS should only be attempted in order to maintain a subcooled margin of 30° 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.

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

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

5. 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.

6. 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.

7. 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).

8. 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. 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.

2. 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.

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Loss Of All Feedwater is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of All Feedwater is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA SGTR or LOOP can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. TRIP **ALL** RCPs.	
E. MINIMIZE S/G INVENTORY LOSS.	
1. Verify the SG BD valves are shut: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	
F. COMMENCE RCS BORATION.	
1. Commence RCS boration as follows: a. Shut the VCT M/U valve, 2-CVC-512-CV. b. Open the BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.1 (continued) e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs. 2. Record the time RCS boration was commenced: _____ 3. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ 4. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. COMMENCE NATURAL CIRCULATION RCS COOLDOWN TO T_{COLD} LESS THAN 465° F.	
1. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN** initiate Once-Through-Cooling concurrently **PER** step J.	
2. 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.	2.1 **IF** SGIS actuates as a result of the cooldown **AND** the Non-Vital 4KV buses are energized, **THEN** reset the SGIS as follows: a. Place the CBPs in PULL TO LOCK. b. Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST. c. Block SGIS. d. Reset the SGIS signal. e. Open the MSIV(s). f. Open the SG FW ISOL valve(s): • 2-FW-4516-MOV • 2-FW-4517-MOV g. Start a CBP.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 3. Block SIAS as follows: • **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. 4. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. a. Shut **BOTH** MSIVs. **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.** 5. Conduct 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 30 and 140° F based on CET temperatures • Pressurizer level between 50 and 180 inches (continue)	5.1 **IF** subcooling exceeds 140° F, **THEN** 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. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5 (continued)	G.5.1 (continued) e. Operate the LOOP CHG valves as necessary to adjust Auxiliary 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 h. Maintain the pressurizer cooldown rate less than 200° F/hour. 5.2 **IF** pressurizer level is **NOT** between 50 and 180 inches, **THEN** perform the following as necessary to restore pressurizer level between 50 and 180 inches: a. Adjust cooldown rate. b. Operate charging and letdown.
6. Verify adequate RCS heat removal via steam generators: • At least ONE S/G has wide range level greater than (-)350 inches • T_{COLD} is stable or lowering	6.1 **IF BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN PROCEED** to step J.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. ATTEMPT TO ESTABLISH AFW FLOW TO S/Gs.	
1. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **THEN** initiate Once-Through-Cooling concurrently **PER** step J.	
2. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	
3. Establish AFW flowpath by placing the handswitches for the 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	3.1 **IF** SG AFW BLOCK valve(s) will **NOT** open from the control room, **THEN** locally open valve(s) using the Hand Transfer Station(s) on South wall of SRW Room.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (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. 4. Establish feedwater flow by **ANY** of the following methods: a. 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) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	a.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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.a (continued) (4) 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)	H.4.a.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. (5) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (6) 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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4 (continued) b. 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 (4) Open 21 and 22 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 (5) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A • (22 AFW PP SPD CONTR) 2-HC-3989A (6) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	b.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: 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 (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 (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.b (continued) (7) 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 (8) Operate AFW ventilation as necessary to maintain temperature less than 130° F. (continue)	H.4.b.1 (continued) (7) Open the AFW Steam Supply Bypass Valves: • 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) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (10) 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 (11) Operate AFW ventilation as necessary to maintain temperature less than 130° F.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4 (continued) c. 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 AFW 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. (c) **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.4.c(3) (continued) (d) 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 5. **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 6. Adjust the TURB BYP valves **OR** the ADVs to establish RCS temperature control. 7. **IF** feed flow has been restored to at least ONE S/G, **THEN PROCEED** to step L.	
I. **IF** AFW CAN **NOT** FEED S/Gs, **THEN** LINE UP TO FEED S/Gs WITH A CONDENSATE BOOSTER PUMP.	
1. Check the Condensate system is available for feeding the S/Gs. (continue)	1.1 **IF** the Condensate system is **NOT** available, **THEN PROCEED** to step J.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. Shut the MAIN SG FW REG valves. 3. Shift the SG FW REG BYPASS controllers to Manual. 4. Depress the SG FRV BYP RESET buttons. 5. Manually adjust the SG FW REG BYPASS valve controllers to 0%. 6. Open the SG FW ISOL valves: • (21 S/G) 2-FW-4516-MOV • (22 S/G) 2-FW-4517-MOV 7. Open the PRECOAT SYS BYP valve, 2-CD-5818-CV. 8. Open the COND DEMIN BYP valve, 2-CD-4439-MOV. 9. Verify at least ONE COND PP is running. 10. Verify ONE CBP is running. 11. Place BOTH HDT PP Handswitches in PULL TO LOCK. 12. **IF** Once-Through-Cooling is in progress, **THEN PROCEED** to step K. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 13. Manually adjust the SG FW REG BYPASS valve controllers to gradually restore S/G(s) levels to between (-)24 and (+)30 inches. **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. 14. Confirm feed flow has been restored by observing the following indications: • SG FW DIFF PRESS controller indicates greater than 0 PSID • S/G levels constant or rising 15. Adjust the TURB BYP valves **OR** the ADVs to establish RCS temperature control. 16. **IF** feed flow has been restored to at least ONE S/G, **THEN PROCEED** to step L.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. INITIATE ONCE-THROUGH-COOLING.	
CAUTION **After Once-Through-Cooling has been initiated, feed flow to S/Gs should be restored only as directed by step K.** 1. Continue efforts to restore feedwater capability concurrently **PER** steps H and I with Once-Through-Cooling. **NOTE** Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of J.2 may be performed, and in any order. **NOTE** Perform steps J.2 and J.3 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.** 2. **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** T_{COLD} rises uncontrollably 5° F or greater, **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (continued)	
f. Open the 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 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), HIGH PRESSURE SAFETY INJECTION FLOW • CET temperatures constant or lowering	i.1 **IF** HPSI flow is **NOT PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW, **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), SIAS VERIFICATION CHECKLIST.
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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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 J.3, **AND IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE.
3. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.3.a (continued) • **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 4. **IF** feedwater capability is restored, **THEN** concurrently perform step K. 5. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • CIS • SIAS 6. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15. 7. **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 8. Override the CSAS signal to the CBPs and the MAIN FW ISOL valves by taking the following keyswitches to OVERRIDE: • FW TRIP SGIS/CSAS OVERRIDE, 2-HS-4000 • 21 S/G FW ISOL MOV CSAS/SGIS OVERRIDE, 2-HS-4516A • 22 S/G FW ISOL MOV CSAS/SGIS OVERRIDE, 2-HS-4517A (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

J. (continued)
 	
9. **WHEN ALL** of the following conditions can be maintained:
 	
• At least 30° 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
 	
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 30 and 140° F based on CET temperatures
 	
• Pressurizer level greater than 101 inches {141}
 	
10. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
 	
11. Direct Chemistry to place the Hydrogen Monitors in service.
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 12. 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. 13. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. 14. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 15. **IF** Plant Technical Support Center recommends the use of the Hydrogen Purge System, **THEN** operate the Hydrogen Purge System **PER** OI-41B, HYDROGEN PURGE SYSTEM, until the Plant Technical Support Center recommends its termination.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. **IF** FEEDWATER CAPABILITY IS RESTORED **AND** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** EVALUATE FEEDING A S/G.	
NOTE The decision to feed a S/G should be made based on the time until shutdown cooling entry conditions can be established, the adequacy of the cooldown on Once-Through-Cooling, the availability of condensate inventory, and the overall status of the plant. **CAUTION** **If ANY S/G has indicated level, then 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.**	
1. **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 (continue)	1.1 **IF NEITHER** S/G is to be fed, **THEN** return to the step that was being performed, by referring to the placekeeper if necessary.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued) 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	
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 at 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 (continue)	c.1 **IF** the ADV will **NOT** shut from 2C43, **THEN** shut the affected ADV's Manual Isolation Valve: • (21 S/G) 2-MS-101 • (22 S/G) 2-MS-104

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) **CAUTION** **If voids exist in the S/G tubes, a rapid RCS pressure reduction will occur when the voids collapse.** 2. Establish feed to the selected S/G. a. Verify the TURB BYP valves **AND** the ADVs are shut. b. **IF** AFW has been restored **PER** step H, **THEN** perform the following actions: (1) Adjust SG FLOW CONTR valves for the S/G to be fed to approximately 150 GPM: 21 S/G • 2-AFW-4511-CV • 2-AFW-4525-CV 22 S/G • 2-AFW-4512-CV • 2-AFW-4535-CV (2) **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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (continued) **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.** c. **IF** Main Feedwater has been restored **PER** step I, **THEN** perform the following actions: (1) 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. (2) **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 d. **IF** 21 or 22 AFW PP is operating, **THEN** verify AFW Room normal **OR** emergency ventilation is operating to maintain temperature less than 130° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) **CAUTION** **The RCS may be solid. Any action involving RCS cooldown or heatup should be closely monitored to prevent rapid pressure excursions.** 3. 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. 4. **WHEN ALL** of the following conditions can be maintained: • At least 30° 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 **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 30 and 140° F based on CET temperatures. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) 5. **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 30 and 140° F using CET temperatures. e. Adjust the ADV to establish RCS temperature control.	
L. **WHEN** BORATION HAS BEEN COMPLETED, **THEN** SHIFT CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open the RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut the VCT OUT valve, 2-CVC-501-MOV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. 2. **IF** SIAS has **NOT** actuated **OR** has been reset, **THEN** perform **ONE** of the following: a. Lineup the Charging Pump Suction to the RWT as follows: (1) Open the RWT CHG PP SUCT valve, 2-CVC-504-MOV. (2) Shut the VCT OUT valve, 2-CVC-501-MOV. (3) Shut the BA DIRECT M/U valve, 2-CVC-514-MOV. (4) Shut the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV (5) Stop the BA PP(s). (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.2 (continued) b. Lineup the Charging Pump Suction to the VCT as follows: (1) Maintain VCT makeup blend sufficient to sustain required shutdown boron concentration **PER** the NEOPs. (2) Open the VCT OUT valve, 2-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut the BA DIRECT M/U valve, 2-CVC-514-MOV. (5) Shut the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** 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.
N. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** MONITOR FOR 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.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 RAS lineup **PER** ATTACHMENT (6), RAS VERIFICATION CHECKLIST. d. **IF** RAS lineup is verified, **THEN** shut the RWT OUT valves: • 2-SI-4142-MOV • 2-SI-4143-MOV 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.	
CAUTION **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.**	
f. **IF** TWO or THREE HPSI PPs are running **AND** total flow is greater than 1000 GPM, **THEN** throttle HPSI flow equally among the four headers to achieve a total flow of 1000 GPM. (continue)	f.1 **IF** ONE HPSI PP is running **AND** total flow is greater than 600 GPM, **THEN** throttle HPSI flow equally among the four headers to achieve a total flow of 600 GPM.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) g. **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), HIGH PRESSURE SAFETY INJECTION FLOW. (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. (c) Notify the Plant Technical Support Center. (d) **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE. (continue)	(b).1 **IF** HPSI PP performance is **NOT** acceptable, **THEN** stop the HPSI PP(s).

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) h. 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. i. Place the ECCS PP RM EXH FILT in service. j. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) k. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. **CAUTION** **Minimum HPSI Pump flow is 90 GPM to prevent pump damage.** l. Ensure HPSI PP flow is at least 90 GPM during recirculation.	l.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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	
P. **IF** ONCE-THROUGH-COOLING HAS BEEN INITIATED, **THEN** RESTORE CONTAINMENT ENVIRONMENT.	
1. **IF** a CSAS has initiated containment spray **AND** 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) 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. 2. **WHEN** containment pressure drops to less than 2.8 PSIG, **THEN** perform the following actions: **NOTE** Diesel Generator non-essential trips are enabled when SIAS is reset. a. Verify the pressurizer pressure signals are blocked **AND** reset the SIAS signals. b. 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.** c. Secure ONE CS PP. d. Restore the equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST **AND** ATTACHMENT (4), CIS VERIFICATION CHECKLIST to the desired condition. e. Evaluate the Charging Pump suction supply. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) 3. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 1. **IF** 21 **OR** 24 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** the following: a. Verify 2A and 2B DGs running. (1) Verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.1.c (continued) (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 189-2406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued) 4. 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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.5.a (continued) (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. **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q.5.b (continued) (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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 and 2B DGs will require a SRW and a SW Pump running on its associated supply header.	
8. **IF** 2A **OR** 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Check **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPP valve, 2-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. ENSURE AUXILIARY SYSTEM OPERATION	
1. Ensure proper operation of the following systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Compoment Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. **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 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.	
T. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1 (continued) d. Open the SRW HDR TURB BLDG ISOL valves: • 2-SRW-1600-CV • 2-SRW-1637-CV • 2-SRW-1638-CV • 2-SRW-1639-CV 2. Restore the 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. 3. Restore Instrument Air to the Containment as follows: a. Verify the IA CNTMT ISOL valve, 2-IA-2080-MOV, is open. **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 the Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater will enable greater cooldown capability. 4. **IF** the ADVs are being used to control RCS temperature, **THEN** attempt to restore the TURB BYP valves to operation **PER** the appropriate procedure.	
U. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV c. Slowly open 2-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. ESTABLISH LTOP CONTROL.	
NOTE If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication. 1. **WHEN** T_{COLD} is less than 325° F, **THEN** establish RCS low temperature conditions as follows: a. **IF** the HPSI system is in operation, **THEN** reduce the HPSI flow as follows: (1) **IF** THREE HPSI PPs are operating, **THEN** secure ONE HPSI PP. (2) Throttle HPSI flow to maintain the following: • RCS temperature constant or lowering • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS • RCS pressure greater than 300 PSIA (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.1 (continued) b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	b.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate AUX SPRAY to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) **NOTE** MPT protection must be established even if Once-Through-Cooling is in progress. **CAUTION** **PORVs must be in MPT ENABLE before T_{COLD} is less than 301° F.** 2. **WHEN** T_{COLD} is less than 306° F, **AND** Once-Through-Cooling flow is **NOT** reduced due to restoration of a secondary heat sink, **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 PORV MPT PROTECTION handswitches in VARIABLE MPT ENABLE: • 2-HS-1406 • 2-HS-1408 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.2 (continued) e. **IF** Once-Through-Cooling is **NOT** in progress, **THEN** verify the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404 3. **IF** feedwater capability is restored **AND** restoration of feedwater is desired, **THEN PROCEED** to step K. 4. **IF** it is desired to continue the RCS cooldown using Once-Through-Cooling until shutdown cooling entry conditions are reached, **THEN PROCEED** to step AC.	
W. **IF** A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	
1. Ensure Once-Through-Cooling flow has been reduced **PER** step K.5. 2. Restore letdown **PER** step X. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 3. Secure Once-Through-Cooling as follows: a. Verify the HPSI throttle criteria are met. b. Secure the HPSI PPs. c. Shut the HPSI HDR valves. d. Place the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404 e. Adjust charging and letdown to maintain RCS subcooling between 30 and 140° F using CET temperatures. 4. Adjust the ADV to establish natural circulation, and maintain CET temperatures constant or lowering. 5. Verify **BOTH** PORV BLOCK valves are OPEN: • 2-RC-403-MOV • 2-RC-405-MOV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 6. Draw a bubble as follows: **NOTE** Pressurizer Backup Heater Banks 21 and 23 trip on U/V and SIAS. a. Energize the Pressurizer HTR(s). b. **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. c. **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. d. Operate Pressurizer HTRs and AUX SPRAY as necessary to maintain RCS subcooling between 30 and 140° F. 7. Restore and maintain the level of the S/G being fed between (-)24 and (+)30 inches. 8. **WHEN** a secondary heat sink has been restored **AND** RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 9. **IF** a plant cooldown is desired, **THEN** commence RCS cooldown to less than 300° F using the TURB BYP valves **OR** the ADV from the S/G with feed flow, maintain RCS cooldown less than 100° F in any one hour. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 10. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	9.1 **IF** a plant cooldown is **NOT** desired, **THEN** maintain stabilized plant conditions.
X. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step Y.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) 2. Verify the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, in Auto Remote. 3. Place the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. 4. Place the IX BYP valve, 2-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. 6. **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) 7. Open the L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) **CAUTION** **The setpoint of 2-PIC-201 must be above the saturation pressure for the letdown outlet temperature of the Regenerative Heat Exchanger.** 8. Place Letdown Pressure Controller, 2-PIC-201 in service as follows: a. Adjust the setpoint on 2-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift Letdown Pressure Controller, 2-PIC-201 to AUTO. 9. Adjust the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. 11. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** Once-Through-Cooling is **NOT** in progress, **THEN** check pressurizer level is trending to 160 inches. (continue)	12.1 **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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.12 (continued)	X.12 (continued) 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 2-CVC-103 • 2-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 2-CVC-104 • 2-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 2-CVC-108 • 2-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 2-CVC-109 • 2-CVC-111 e. Place L/D CONTR VLVS handswitch, 2-HS-110-1, in BOTH. f. Place BACKPRESSURE REG VLVS handswitch, 2-HS-201, in BOTH.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. RESTORE RCS SUBCOOLING AND PRESSURIZER LEVEL.	
1. Restore and maintain subcooling between 30 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.** a. 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) Raise RCS cooldown rate, while maintaing less than 100° F in any one hour, by using TURB BYP valves **OR** ADVs. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.1 (continued) b. 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** overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (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 AUX SPRAY valve, 2-CVC-517-CV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.1.b(5) (continued) (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 (h) Maintain pressurizer cooldown rate less than 200° F/hour. 2. Restore and maintain Pressurizer Level between 101 and 180 inches by operating charging and letdown.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	
AA. RESTORE FORCED CIRCULATION.	
1. Evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step AB. 3. **IF** T_{COLD} is less than 306° F, **THEN PROCEED** to step AB. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 8. Verify RCP restart criteria are met by **ALL** of the following: • Verify electrical power is available to the RCPs • RCP BUS • MCC-215 (ALL RCPs) • MCC-205 (21A/21B RCP) • 22/12 SERV BUS VOLTS is less than 14.8 KV • 4KV Bus voltage is greater than 4100 volts • RCP Controlled Bleed-off temperatures are less than 200° F • RCS subcooling is greater than 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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** 9. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP CBO INBD and OUTBD ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 10. Operate Charging and Letdown or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS b. Start an RCP **PER** step AA.9 above. c. Monitor the RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 AB.1.c.(1) through AB.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. ESTABLISH RCS LOW TEMPERATURE CONDITIONS.	
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.	
3. **IF** Once-Through-Cooling is in progress, **AND** RCS temperature is less than 300° F, **THEN** HPSI flow may be throttled to maintain the following: • RCS temperature constant or lowering • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS	

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.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) 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. **IF** PLANT COOLDOWN IS BEING PERFORMED, **THEN** COMMENCE SHUTDOWN COOLING.	
1. **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 greater than 30° 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. Restore letdown **PER** step X. c. Operate HPSI and Charging and Letdown to maintain the following: • Pressurizer level above 101 inches • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS d. Initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.1 (continued) e. **WHEN** Shutdown Cooling has been established, **THEN** secure Once-Through-Cooling as follows: (1) Secure the HPSI PPs. (2) Place the PORV OVERRIDE handswitches in AUTO: • 2-HS-1402 • 2-HS-1404 (3) **IF** a pressurizer bubble is desired, **THEN** draw a pressurizer bubble **PER** step W.6.	
AE. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met. 2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals. 3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS. 4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager. END of Section IV	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches {90}	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) **(1)**	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) **(1)**	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	greater than 30°F greater than 30°F	_____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

(1) LPSI and Charging Pumps are **NOT** required post-RAS.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 50°F superheated	___|___|___|___ ___|___|___|___	less than 50°F superheated	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. S/G level (1)	(-)350 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
OR				
Once-Through-Cooling: (1)				
Pressurizer pressure	less than 1270 PSIA or lowering	___|___|___|___ ___|___|___|___	less than 1270 PSIA or lowering	_____
Core Flow	minimum equipment available **PER** Att. (17) and SIS injecting **PER** Att. (10)	___|___|___|___ ___|___|___|___	shutdown cooling initiated	_____

(1) The criteria for S/G level is not applicable during Once-Through-Cooling. The criteria for pressurizer pressure and core flow should be used after Once-Through-Cooling is initiated.

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	ALL available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 2Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

V. 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) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-3 UNIT 2
LOSS OF ALL FEEDWATER

INITIAL STABILIZATION	IF FEED FLOW IS NOT RESTORED	RECOVERY	RESTORATION

• TRIP **ALL** RCPS
• SECURE S/G BLOWDOWN
• COMMENCE NATURAL CIRC COOLDOWN TO LESS THAN 465°F
• ATTEMPT TO ESTABLISH FEED FLOW
	• INITIATE ONCE-THROUGH COOLING
	  • **BOTH** S/G levels less than (-)350 inches
	  • TCOLD rises uncontrollably 5°F or greater
	  • Prior to CETs reaching 560°F
	• MONITOR FOR RAS
	• RESTORE CONTAINMENT ENVIRONMENT
	• ATTEMPT TO ESTABLISH FEED FLOW
		• RESTORE FROM LOSS OF POWER
		• EVALUATE THE NEED FOR COOLDOWN
		• RESTORE SUBCOOLING AND PZR LEVEL
		• VERIFY NATURAL CIRCULATION
			• RESTORE FORCED CIRCULATION
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. TRIP **ALL** RCPs.		8
	E. MINIMIZE S/G INVENTORY LOSS.		8
	F. COMMENCE RCS BORATION.		8
	G. COMMENCE NATURAL CIRCULATION RCS COOLDOWN TO TCOLD LESS THAN 465°F.	C	10
	• **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** TCOLD rises uncontrollably 5°F or greater, **THEN** initiate Once-Through-Cooling • Block / Reset SGIS • Block SIAS • Rapid cooldown less than 100°F per hour • Maintain subcooling **30 - 140°F** • Maintain pressurizer level **50 - 180 inches**		
	H. ATTEMPT TO ESTABLISH AFW FLOW TO S/Gs.	C	13
	I. **IF** AFW CAN **NOT** BE ALIGNED TO FEED S/Gs, **THEN** LINE UP TO FEED S/Gs WITH A CONDENSATE BOOSTER PUMP.	C	19
	NOTE: Condensate Booster Pump head is approximately 500 PSIA.		
	J. INITIATE ONCE-THROUGH-COOLING.	C	22

	NOTE: Prior to meeting initiation criteria, with the exception of opening the PORVs, the substeps of J.2 may be performed, and in any order.
	Perform S/G dryout step concurrently with initiation of Once-Through-Cooling.
	• **IF**, at **ANY** time, **BOTH** S/G levels are less than (-)350 inches **OR** TCOLD rises uncontrollably 5°F or greater, **THEN** initiate Once-Through-Cooling
	• **WHEN EACH** S/G level is less than (-)380 inches, **THEN** prevent S/G dryout
	• **IF** containment pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS
	• **IF** containment pressure rises to 4.25 PSIG, **THEN** verify CSAS
	• **WHEN** the following conditions can be maintained:
	  • At least 30°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
	THEN HPSI flow can be reduced		

START	FUNCTION	DONE	PAGE
	K. **IF** FEEDWATER CAPABILITY IS RESTORED **AND** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** EVALUATE FEEDING A S/G.	C	29
	• Restore and maintain S/G level **(-)170 - (+)30 inches** • Shift to TWO HPSI PPs and ONE CHG PP • Shut ONE PORV BLOCK valve		
	L. **WHEN** BORATION HAS BEEN COMPLETED, **THEN** SHIFT CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	C	34
	M. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** PREPARE FOR RAS ACTUATION.	C	37
	• RWT level drops to 4 feet.		
	N. **IF** ONCE-THROUGH-COOLING IS IN PROGRESS, **THEN** MONITOR FOR RAS ACTUATION.	C	37
	O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.		42
	P. **IF** ONCE-THROUGH-COOLING HAS BEEN INITIATED, **THEN** RESTORE CONTAINMENT ENVIRONMENT.	C	42
	• **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP		
	Q. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.		45
	• MCC-204 and 214 • 2Y09 and 2Y10		
	R. ENSURE AUXILIARY SYSTEM OPERATION.	C	55
	S. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	C	56
	• Notify the Plant Technical Support Center to review ERPIP-611.		
	T. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.		56

START	FUNCTION	DONE	PAGE
	U. **IF** COMPONENT COOLING HAS BEEN SECURED TO CONTAINMENT, **THEN** RESTORE FLOW.	C	58
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284		
	V. ESTABLISH LTOP CONTROL.		60
	• **WHEN** TCOLD is less than 325°F, **THEN** establish RCS low temperature conditions • **WHEN** TCOLD is less than 306°F, **THEN** establish MPT protection		
	W. **IF** A SECONDARY HEAT SINK HAS BEEN ESTABLISHED, **THEN** SECURE ONCE-THROUGH-COOLING.	C	63
	• RCS subcooling **30 - 140°F** • Draw a pressurizer bubble • S/G level **(-)24 - (+)30 inches**		
	X. RESTORE LETDOWN FLOW.	C	66
	Y. RESTORE RCS SUBCOOLING AND PRESSURIZER LEVEL.	C	70
	• RCS subcooling **30 - 140°F** • Pressurizer level **101 - 180 inches**		
	Z. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	73
	• At least 30°F subcooling based on CET temperatures • THOT minus TCOLD less than 50°F • TCOLD constant or lowering • THOT constant or lowering • CET temperatures trend consistent with THOT • Steaming rate affects RCS temperatures		
	AA. RESTORE FORCED CIRCULATION.	C	73
	AB. CONTROL CORE AND RCS VOIDING.	C	78
	AC. ESTABLISH RCS LOW TEMPERATURE CONDITIONS.	C	81
	AD. **IF** PLANT COOLDOWN IS BEING PERFORMED, **THEN** COMMENCE SHUTDOWN COOLING.	C	84
	AE. IMPLEMENT THE APPROPRIATE PROCEDURE.		85

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-4

EXCESS STEAM DEMAND EVENT

REVISION 17

Safety Related

Approval Authority: Kent Mills 7/14/04
signature/date

Effective Date: 10/6/04

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-82	17

PLACEKEEPER PAGE NUMBERS	REVISION
1	17

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01701	19,64

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of an Excess Steam Demand Event (ESDE). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of an ESDE by isolating the break or establishing conditions which will allow the implementation of long term core cooling using the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating an Excess Steam Demand Event:

- Loud noise and poor visibility in the plant or open MSSV (location dependent)
- Unexplained drop in T_{COLD}
- Unexplained lowering of ONE or **BOTH** S/G pressures
- Reactor Trip on low S/G pressure
- Unexplained rise in containment pressure, temperature, humidity or sump level
- Reactor Trip on high containment pressure

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. At least ONE S/G should be available for heat removal at all times. If there is a conflict between isolating a S/G and maintaining adequate heat removal, then RCS heat removal must be maintained via the least affected S/G.

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

3. Maintaining subcooling of 30° 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.

4. 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.

5. 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.

6. 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.

7. 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).

8. Solid water operation of the pressurizer should be avoided unless 30° 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.

9. 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. 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.

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

3. 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.

4. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of an Excess Steam Demand Event is correct by verifying Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of an Excess Steam Demand Event is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR ESFAS ACTUATION.	
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 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 b. Start 11 and 13 HPSI PPs. c. Start **ALL** available CHG PPs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) 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** 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.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: • **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.
4. Verify **BOTH** MSIVs are shut.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. IF THE STEAM LEAK HAS BEEN ISOLATED.	
1. **IF** the steam leak has been isolated as indicated by the following: • S/G pressure stabilized • Uncontrolled RCS cooldown secured • S/G levels constant or rising **THEN** perform the following actions: a. Maintain T_{COLD} approximately constant by using the ADVs. b. **PROCEED** to step J.	
G. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	
1. Identify the affected S/G by observing the following: • S/G with the highest steam flow • S/G with the lowest pressure • RCS loop with the lowest T_{COLD} • S/G with the most rapid downward level trend (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued)	
2. Isolate the affected S/G.	
a. **IF** 11 S/G is the 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 SG FW ISOL valve 1-FW-4516-MOV, is shut.	
(3) Verify 11 MSIV BYP valve, 1-MS-4045-MOV, is shut.	
(4) Shut 11 S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV	
(5) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2.a (continued) (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 the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (8) Observe locally, the S/G Safety Valves are **NOT** leaking. b. **IF** 12 S/G is the 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: (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 SG FW ISOL valve 1-FW-4517-MOV, is shut. (continue)	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2.b (continued) (3) Verify 12 MSIV BYP valve, 1-MS-4052-MOV, is shut. (4) Shut 12 S/G B/D valves: • 1-BD-4012-CV • 1-BD-4013-CV (5) Shut 12 SG AFW STM SUPP & BYPASS valves, 1-MS-4071-CV and 1-MS-4071A-CV. (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 the MS UPSTREAM DRN ISOL VLVS by placing handswitch 1-HS-6622 in CLOSE. (8) Observe locally, the S/G Safety Valves are **NOT** leaking.	
3. Verify the most affected S/G was isolated by checking the following: • S/G pressure lower for the affected S/G • S/G level lowering for the affected S/G and stabilized for the unaffected S/G • RCS loop T_{COLD} lower in the affected loop	3.1 **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 G.2.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. MAINTAIN RCS TEMPERATURES.	
NOTE The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure. 1. **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.** 2. **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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 1-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 1-CVC-514-MOV, is open. c. BAST GRAVITY FD valves are open: • 1-CVC-508-MOV • 1-CVC-509-MOV d. **ALL** available BA PPs are running. e. VCT OUT valve, 1-CVC-501-MOV, is shut. f. **ALL** available CHG PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: 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. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ 4. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 5. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. 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 30° 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
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 30 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}	

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN THE UNAFFECTED S/G LEVEL(S).	
1. Establish AFW flow to the unaffected S/G(s) with 13 AFW PP as follows: a. Verify the unaffected S/G motor driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV **CAUTION** **13 AFW PP flow limit is 575 GPM.** b. Start 13 AFW PP. c. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV d. Shut the unaffected 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)	1.1 Establish AFW flow to the unaffected S/G(s) with 11 or 12 AFW PP as follows: a. Verify the unaffected S/G steam driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV b. Open the unaffected 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 c. Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than the unaffected S/G pressure: • (11 AFW PP SPEED CONTR) 1-HC-3987A • (12 AFW PP SPEED CONTR) 1-HC-3989A d. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued)	K.1.1 (continued) e. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.
2. Secure the Main Feedwater system: a. Trip BOTH SGFPs. b. Place ALL COND BSTR PPs in PULL TO LOCK. c. Place ONE COND PP in PULL TO LOCK. d. Place BOTH HTR DRN PPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (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 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. MAINTAIN RCS SUBCOOLING AND PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** restore and maintain subcooling between 30 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.** a. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) b. 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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.b(5) (continued) (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 (h) Maintain the pressurizer cooldown rate less than 200° F/hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF** the RCS is water solid, **THEN** restore and maintain subcooling between 30 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 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). **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 3. **IF** the blowdown is **NOT** complete **AND** HPSI throttle criteria can be met, **THEN** maintain pressurizer level between 101 inches {141} and 120 inches {190} by operating charging and HPSI during blowdown of the affected S/G. **NOTE** If the pressurizer is **NOT** saturated, lowering pressurizer level will cause a rapid drop in pressurizer pressure. **NOTE** If adequate pressure control has been established, the upper level limit may be exceeded to achieve boration requirements. 4. **WHEN** the blowdown has been completed, **THEN** restore and maintain pressurizer level to between 101 inches {141} and 180 inches {190} by operating charging and HPSI.	
M. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	
1. **IF** SIAS has **NOT** actuated, **THEN** perform the following: a. Start **ALL** available CNTMT AIR CLRs in HIGH. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (continued) 2. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 3. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 4. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15. 5. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (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.** 6. **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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.6 (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.** (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.6.b (continued)	M.6.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.
7. Direct Chemistry to place the Hydrogen Monitors in service.	
8. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (continued) 9. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. 10. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 11. **IF** 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.	
N. MAINTAIN THE CHARGING PUMP SUCTION SUPPLY.	
1. **IF** boration has been completed **AND** SIAS is 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. Shut the VCT OUT valve, 1-CVC-501-MOV. c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. (continued) 2. **IF** SIAS has **NOT** actuated **OR** has been reset, **AND EITHER** of the following conditions exist: • Boration has been completed • Boration was **NOT** required **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open the RWT CHG PP SUCT valve, 1-CVC-504-MOV. (2) Shut the VCT OUT valve, 1-CVC-501-MOV. (3) Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. (4) Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV (5) Stop the BA PP(s). (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.2 (continued) b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain VCT makeup blend sufficient to sustain required shutdown boron concentration **PER** the NEOPs. (2) Open the VCT OUT valve, 1-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. (5) Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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 • ATTACHMENT (7), SGIS VERIFICATION CHECKLIST	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** 11 **OR** 14 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following: a. Verify 1A and 1B DGs running. (1) Verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.c (continued) (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 189-1406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
4. 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.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.**	
5. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
CAUTION **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.a (continued) (2) Verify BORIC ACID PUMP 11 is available, **AND** open the BORIC ACID PUMP 12 breaker, 52-10406. (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. (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)	(2).1 **IF** BORIC ACID PUMP 11 is **NOT** available, **THEN** verify BORIC ACID PUMP 11 breaker, 52-11406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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.	
8. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Verify **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.
R. RESET ESFAS ACTUATIONS.	
1. **IF** CSAS has actuated **AND** containment pressure is less than 4.0 PSIG, **THEN** perform the following actions: a. Reset the CSAS signals. b. Verify **ALL** available CNTMT AIR CLRs are operating to reduce containment temperature. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1 (continued) c. Restore equipment listed in ATTACHMENT (3), CSAS VERIFICATION CHECKLIST, to the desired condition. 2. **IF** CIS has actuated **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions: a. Reset the CIS signals. b. Restore equipment listed in ATTACHMENT (4), CIS VERIFICATION CHECKLIST, to the desired condition. 3. **IF** SIAS has actuated **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions: **NOTE** 1B Diesel Generator non-essential trips are enabled when SIAS is reset. a. Block the pressurizer pressure signals **AND** reset the SIAS signals. b. Secure **BOTH** CS PPs. c. Restore equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST, to the desired condition. d. Evaluate the Charging Pump suction supply.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 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 the IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPR, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until temperature alarm clears: • (11 IA COMPR) 1-HS-2063 • (12 IA COMPR) 1-HS-2065 b. Start at least ONE IA COMPR. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. (continued) 3. Restore Instrument Air to the 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 Key #85 from the Control Room Key Locker. b. Open the Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN.	
T. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV c. Slowly open 1-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 2. Verify the selected PZR 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 the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step V.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 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) 7. Open the 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.** 8. 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. 9. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 11. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F.	
12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches.	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 1-CVC-103 • 1-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 1-CVC-104 • 1-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 1-CVC-108 • 1-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 1-CVC-109 • 1-CVC-111 e. Place L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. Place BACKPRESS REG VLVS handswitch, 1-HS-201, in BOTH.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. **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 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures	
2. **IF** at least ONE RCP is operating in each loop **OR** RCP operation is **NOT** desired, **THEN PROCEED** to step Y.	
3. **IF** T_{COLD} is less than 369° F, **THEN PROCEED** to step Y.	
4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors.	
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.**	
5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F.	
6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

W. (continued)
 	
7. Restore Pressurizer level to between 155 and 180 inches.
 	
8. Verify the RCP restart criteria are met by **ALL** of the following:
• Verify electrical power is available to the RCPs
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
• 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 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (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** 9. **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. Verify the RCP BLEED-OFF ISOL valves are open: • 1-CVC-505-CV • 1-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 10. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start RCP **PER** step W.9 above. c. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. 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 the unaffected S/G. **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. 2. **IF ALL** RCPs have been secured, **THEN** verify Natural Circulation by the following: • RCS subcooling is at least 30° 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	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step AC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 3. **IF** RCS boration has **NOT** been conducted, **THEN** perform RCS boration as follows: a. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: (1) VCT M/U valve, 1-CVC-512-CV, is shut. (2) BA DIRECT M/U valve, 1-CVC-514-MOV, is open. (3) BAST GRAVITY FD valves are open: • 1-CVC-508-MOV • 1-CVC-509-MOV (4) **ALL** available BA PPs are running. (5) VCT OUT valve, 1-CVC-501-MOV, is shut. (6) **ALL** available CHG PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.3 (continued) b. **IF** SIAS has **NOT** actuated **OR** has been reset, **THEN** commence RCS boration as follows: (1) Shut the VCT M/U valve, 1-CVC-512-CV. (2) Open the BA DIRECT M/U valve, 1-CVC-514-MOV. (3) Open the 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 the VCT OUT valve, 1-CVC-501-MOV. (7) Start **ALL** available CHG PPs. c. Record the time RCS boration was commenced: _____ d. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.3 (continued) e. Continue boration until **ONE** of the following conditions is met: (1) Shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 90 inches. 01701 (3) Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating 01701 • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 4. **IF** SIAS is **NOT** Blocked, **THEN** block SIAS as follows: • **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. 5. **IF** SGIS has **NOT** actuated, **THEN** perform the following actions: • **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 6. Commence RCS cooldown to less than 300° F using the ADV from the unaffected S/G, maintain RCS cooldown less than 100° F in any one hour. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 7. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 Z.1.c.(1) through Z.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. 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. **IF** the HPSI system is in operation, **THEN** perform the following: (1) Place **ALL** but ONE operating HPSI PP in PULL TO LOCK. (2) Place **ALL** HPSI HDR valves 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.2.a (continued) (3) Throttle ONE HPSI HDR valve to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (4) Shut **ALL** remaining HPSI HDR valves.	
b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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}.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	b.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate AUX SPRAY to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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 4. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than TWO RCPs are in operation. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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: • (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. COMMENCE SHUTDOWN COOLING.	
1. **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 30° 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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	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 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches {90} **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	101 inches to 180 inches 101 inches to 180 inches	_____ _____
c. RCS subcooling	less than 140°F **OR** Main or Aux Spray operating to reduce subcooling greater than 30°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	less than 140°F less than 140°F greater than 30°F greater than 30°F	_____ _____ _____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. Unaffected S/G level	(-)170 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
	trending to (-)24 inches to (+)30 inches	___|___|___|___ ___|___|___|___	N/A	N/A

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	ALL available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 1Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted for breaks outside containment or until Chemistry has been able to place hydrogen monitors in service for breaks inside containment.

V. 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) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-4 UNIT 1
EXCESS STEAM DEMAND EVENT

LEAK ISOLATION	LEAK NOT ISOLATED	PLANT STABILIZATION	RECOVERY / RESTORATION
• MONITOR ESFAS ACTUATION • IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G	• COOL UNAFFECTED S/G TO WITHIN 25°F OF CET TEMPERATURE USING THE UNAFFECTED S/G ADV • EVALUATE HPSI THROTTLING/TERMINATION	• MAINTAIN UNAFFECTED S/G LEVEL • MAINTAIN RCS SUBCOOLING AND PZR LEVEL • MAINTAIN CONTAINMENT ENVIRONMENT • RESTORE FROM LOSS OF POWER	• RESTORE CONTAINMENT ENVIRONMENT • RESTORE FORCED CIRCULATION • MAINTAIN RCS FLOW VERIFICATION • ESTABLISH LTOP CONTROLS • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. MONITOR ESFAS ACTUATION.	C	8
	• **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.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	11
	F. IF THE STEAM LEAK HAS BEEN ISOLATED.		12
	• **PROCEED** to step J.		
	G. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.		12
	• Identify the affected S/G: • S/G with the highest steam flow • S/G with the lowest pressure • RCS loop with the lowest T_{COLD} • S/G with most rapid downward level trend • Verify the most affected S/G is isolated: • S/G pressure lower for the affected S/G • S/G level lowering for the affected S/G and stabilized for the unaffected S/G • RCS loop T_{COLD} lower in the affected loop		
	H. MAINTAIN RCS TEMPERATURES.	C	16
	• **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. • **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		
	I. COMMENCE RCS BORATION.		17

START	FUNCTION	DONE	PAGE
	J. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	20
	• **IF ALL** of the following conditions can be maintained: • At least 30°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 **THEN** HPSI flow may be reduced.		
	K. MAINTAIN THE UNAFFECTED S/G LEVEL(S).	C	21
	• S/G level **(-)24 - (+)30 inches.**		
	L. MAINTAIN RCS SUBCOOLING AND PRESSURIZER LEVEL.	C	24
	• RCS subcooling **30 - 140°F.** • **IF** blowdown is **NOT** complete **AND** HPSI throttle criteria can be met, **THEN** maintain pressurizer level between **101 inches {141}** and **120 inches {190}** • **WHEN** the blowdown has been completed **THEN** restore and maintain pressurizer level between **101 inches {141}** and **180 inches {190}**		
	M. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	C	28
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS. • **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS. • **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.		
	N. MAINTAIN THE CHARGING PUMP SUCTION SUPPLY.	C	33
	O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.		36
	P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	C	37
	Q. ENSURE AUXILIARY SYSTEM OPERATION.	C	47

START	FUNCTION	DONE	PAGE
	R. RESET ESFAS ACTUATIONS.	C	47
	• **IF** CSAS has actuated **AND** pressure is less than 4.0 PSIG, **THEN** reset CSAS **AND** verify **ALL** available CNTMT AIR CLRs are operating. • **IF** SIAS or CIS has actuated **AND** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure **BOTH** CS PPs.		
	S. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.		49
	T. **IF** COMPONENT COOLING HAS BEEN SECURED TO CONTAINMENT, **THEN** RESTORE FLOW.		50
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284.		
	U. RESTORE LETDOWN FLOW.		52
	V. **IF** THE RCS IS WATER SOLID, **THEN** DRAW A BUBBLE IN THE RCS.	C	55
	W. RESTORE FORCED CIRCULATION.	C	56
	X. MAINTAIN RCS FLOW VERIFICATION.	C	60
	• **IF ANY** RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} is less than 10°F. • **IF** RCPs have been secured, **THEN** verify the following: • At least 30°F subcooling 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		
	Y. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	61
	Z. CONTROL CORE AND RCS VOIDING.	C	66
	AA. PERFORM LOW TEMPERATURE ACTIONS.	C	69
	• **WHEN** T_{COLD} is less than 385°F, **THEN** establish LTOP control. • **WHEN** T_{COLD} is less than 369°F, **THEN** establish MPT protection.		
	AB. COMMENCE SHUTDOWN COOLING.	C	74
	AC. IMPLEMENT THE APPROPRIATE PROCEDURE.		75

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-4

EXCESS STEAM DEMAND EVENT

REVISION 16

Safety Related

Approval Authority: Kent Mills 7/14/04
signature/date

Effective Date: 10/6/04

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-85	16

PLACEKEEPER PAGE NUMBERS	REVISION
1	16

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01601	19,66

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of an Excess Steam Demand Event (ESDE). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of an ESDE by isolating the break or establishing conditions which will allow the implementation of long term core cooling using the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating an Excess Steam Demand Event:

- Loud noise and poor visibility in the plant or open MSSV (location dependent)
- Unexplained drop in T_{COLD}
- Unexplained lowering of ONE or **BOTH** S/G pressures
- Reactor Trip on low S/G pressure
- Unexplained rise in containment pressure, temperature, humidity or sump level
- Reactor Trip on high containment pressure

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. At least ONE S/G should be available for heat removal at all times. If there is a conflict between isolating a S/G and maintaining adequate heat removal, then RCS heat removal must be maintained via the least affected S/G.

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

3. Maintaining subcooling of 30° 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.

4. 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.

5. 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.

6. 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.

7. 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).

8. Solid water operation of the pressurizer should be avoided unless 30° 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.

9. 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. 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.

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

3. 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.

4. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of an Excess Steam Demand Event is correct by verifying Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of an Excess Steam Demand Event is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR ESFAS ACTUATION.	
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 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 b. Start 21 and 23 HPSI PPs. c. Start **ALL** available CHG PPs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) 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** 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.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: • **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), SIAS VERIFICATION CHECKLIST.
4. Verify **BOTH** MSIVs are shut.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. IF THE STEAM LEAK HAS BEEN ISOLATED.	
1. **IF** the steam leak has been isolated as indicated by the following: • S/G pressure stabilized • Uncontrolled RCS cooldown secured • S/G levels constant or rising **THEN** perform the following actions: a. Maintain T_{COLD} approximately constant by using the ADVs. b. **PROCEED** to step J.	
G. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	
1. Identify the affected S/G by observing the following: • S/G with the highest steam flow • S/G with the lowest pressure • RCS loop with the lowest T_{COLD} • S/G with the most rapid downward level trend (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. Isolate the affected S/G. a. **IF** 21 S/G is the 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: (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 SG FW ISOL valve 2-FW-4516-MOV, is shut. (3) Verify 21 MSIV BYP valve, 2-MS-4045-MOV, is shut. (4) Shut 21 SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV (5) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (continue)	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2.a (continued) (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 the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (8) Observe locally, the S/G Safety Valves are **NOT** leaking. b. **IF** 22 S/G is the 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: (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 SG FW ISOL valve 2-FW-4517-MOV, is shut. (continue)	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.2.b (continued) (3) Verify 22 MSIV BYP valve, 2-MS-4052-MOV, is shut. (4) Shut 22 SG BD valves: • 2-BD-4012-CV • 2-BD-4013-CV (5) Shut 22 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4071-CV and 2-MS-4071A-CV. (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 the MAIN STM UPSTREAM DRN ISOL VLVS by placing handswitch 2-HS-6622 in CLOSE. (8) Observe locally, the S/G Safety Valves are **NOT** leaking.	
3. Verify the most affected S/G was isolated by checking the following: • S/G pressure lower for the affected S/G • S/G level lowering for the affected S/G and stabilized for the unaffected S/G • RCS loop T_{COLD} lower in the affected loop	3.1 **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 G.2.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. MAINTAIN RCS TEMPERATURES.	
NOTE The temperature of the unaffected S/G may be obtained by using the saturation temperature for existing S/G pressure. 1. **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.** 2. **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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 2-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 2-CVC-514-MOV, is open. c. BAST GRAVITY FD valves are open: • 2-CVC-508-MOV • 2-CVC-509-MOV d. **ALL** available BA PPs are running. e. VCT OUT valve, 2-CVC-501-MOV, is shut. f. **ALL** available CHG PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: a. Shut the VCT M/U valve, 2-CVC-512-CV. b. Open the BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ 4. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 5. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. 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 30° 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
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 30 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}
 	
2. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
 	
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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN THE UNAFFECTED S/G LEVEL(S).	
1. Establish AFW flow to the unaffected S/G(s) with 23 AFW PP as follows: a. Verify the unaffected S/G motor driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV **CAUTION** **23 AFW PP flow limit is 575 GPM.** b. Start 23 AFW PP. c. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV d. Shut the unaffected 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 (continue)	1.1 Establish AFW flow to the unaffected S/G(s) with 21 or 22 AFW PP as follows: a. Verify the unaffected S/G steam driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV b. Open the unaffected 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 c. Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than the unaffected S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A • (22 AFW PP SPD CONTR) 2-HC-3989A d. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued)	K.1.1 (continued) e. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.
2. Secure the Main Feedwater system: a. Trip BOTH SGFPs. b. Place ALL CBPs in PULL TO LOCK. c. Place ONE COND PP in PULL TO LOCK. d. Place BOTH HDPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (continued) 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 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. MAINTAIN RCS SUBCOOLING AND PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **IF** a bubble exists in the Pressurizer **OR** the Reactor Vessel Head, **THEN** restore and maintain subcooling between 30 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.** a. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) b. 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. (5) Initiate AUX SPRAY as follows: (a) Place the Instrument Air 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1.b(5) (continued) (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 (h) Maintain the pressurizer cooldown rate less than 200° F/hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF** the RCS is water solid, **THEN** restore and maintain subcooling between 30 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 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). **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 3. **IF** the blowdown is **NOT** complete **AND** HPSI throttle criteria can be met, **THEN** maintain pressurizer level between 101 inches {141} and 120 inches {190} by operating charging and HPSI during blowdown of the affected S/G. **NOTE** If the pressurizer is **NOT** saturated, lowering pressurizer level will cause a rapid drop in pressurizer pressure. **NOTE** If adequate pressure control has been established, the upper level limit may be exceeded to achieve boration requirements. 4. **WHEN** the blowdown has been completed, **THEN** restore and maintain pressurizer level to between 101 inches {141} and 180 inches {190} by operating charging and HPSI.	
M. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	
1. **IF** SIAS has **NOT** actuated, **THEN** perform the following: a. Start **ALL** available CACs in HIGH. b. Open the CAC EMERGENCY OUT valves for the operating CACs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (continued) 2. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 3. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 4. Verify SRW Pump Room Ventilation is in service **PER** the SRW Pump Room Ventilation section of OI-15. 5. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (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.** 6. **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. (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.6.a (continued)	M.6.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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.6 (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.** (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.6.b (continued)	M.6.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.
7. Direct Chemistry to place the Hydrogen Monitors in service.	
8. 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.	
9. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. (continued) 10. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 11. **IF** 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.	
N. MAINTAIN THE CHARGING PUMP SUCTION SUPPLY.	
1. **IF** boration has been completed **AND** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open the RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Shut the VCT OUT valve, 2-CVC-501-MOV. c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. (continued) 2. **IF** SIAS has **NOT** actuated **OR** has been reset, **AND EITHER** of the following conditions exist: • Boration has been completed • Boration was **NOT** required **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open the RWT CHG PP SUCT valve, 2-CVC-504-MOV. (2) Shut the VCT OUT valve, 2-CVC-501-MOV. (3) Ensure the BA DIRECT M/U valve, 2-CVC-514-MOV, is shut. (4) Ensure the BAST GRAVITY FD valves are shut: • 2-CVC-508-MOV • 2-CVC-509-MOV (5) Ensure the BA PP(s) are stopped. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.2 (continued) b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain VCT makeup blend sufficient to sustain required shutdown boron concentration **PER** the NEOPs. (2) Ensure the VCT OUT valve, 2-CVC-501-MOV, is open. (3) Ensure the BA PP(s) are stopped. (4) Ensure the BA DIRECT M/U valve, 2-CVC-514-MOV, is shut. (5) Ensure the BAST GRAVITY FD valves are open: • 2-CVC-508-MOV • 2-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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 • ATTACHMENT (7), SGIS VERIFICATION CHECKLIST	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 1. **IF** 21 **OR** 24 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** the following: a. Verify 2A and 2B DGs running. (1) Verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.c (continued) (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 189-2406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) 4. 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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.a (continued) (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. **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. (continue)	(3).1 **IF** BORIC ACID PUMP 22 is **NOT** available, **THEN** verify BORIC ACID PUMP 22 breaker, 52-20406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.b (continued) (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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 and 2B DGs will require a SRW and a SW Pump running on its associated supply header.	
8. **IF** 2A **OR** 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Check **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPP valve, 2-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.
R. RESET ESFAS ACTUATIONS.	
1. **IF** CSAS has actuated **AND** containment pressure is less than 4.0 PSIG, **THEN** perform the following actions: a. Reset the CSAS signals. b. Verify **ALL** available CACs are operating to reduce containment temperature. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1 (continued) c. Restore equipment listed in ATTACHMENT (3), CSAS VERIFICATION CHECKLIST, to the desired condition. 2. **IF** CIS has actuated **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions: a. Reset the CIS signals. b. Restore equipment listed in ATTACHMENT (4), CIS VERIFICATION CHECKLIST, to the desired condition. 3. **IF** SIAS has actuated **AND** containment pressure is less than 2.8 PSIG, **THEN** perform the following actions: **NOTE** Diesel Generator non-essential trips are enabled when SIAS is reset. a. Block the pressurizer pressure signals **AND** reset the SIAS signals. b. Secure **BOTH** CS PPs. c. Restore equipment listed in ATTACHMENT (2), SIAS VERIFICATION CHECKLIST, to the desired condition. d. Evaluate the Charging Pump suction supply.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 the SRW HDR TURB BLDG ISOL valves: • 2-SRW-1600-CV • 2-SRW-1637-CV • 2-SRW-1638-CV • 2-SRW-1639-CV 2. Restore the IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPR, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until temperature alarm clears: • (21 IA COMPR) 2-HS-2063 • (22 IA COMPR) 2-HS-2065 b. Start at least ONE IA COMPR. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. (continued) 3. Restore Instrument Air to the Containment as follows: a. Open the 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 the Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN.	
T. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV c. Slowly open 2-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 2. Verify the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, in Auto Remote. 3. Place the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. 4. Place the IX BYP valve, 2-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step V.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 6. **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) 7. Open the 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.** 8. Place Letdown Pressure Controller, 2-PIC-201 in service as follows: a. Adjust the setpoint on 2-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift Letdown Pressure Controller, 2-PIC-201 to AUTO. 9. Adjust the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (continued) 11. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches. (continue)	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 2-CVC-103 • 2-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 2-CVC-104 • 2-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 2-CVC-108 • 2-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 2-CVC-109 • 2-CVC-111 e. Place L/D CONTR VLVS handswitch, 2-HS-110-1, in BOTH. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U.12 (continued)	U.12.2 (continued) f. Place BACKPRESSURE REG VLVS handswitch, 2-HS-201, in BOTH.
V. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.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 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.	
W. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures 2. **IF** at least ONE RCP is operating in each loop **OR** RCP operation is **NOT** desired, **THEN PROCEED** to step Y. 3. **IF** T_{COLD} is less than 306° F, **THEN PROCEED** to step Y. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

W. (continued)
 	
8. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-215 (ALL RCPs)
  • MCC-205 (21A/21B RCP)
 	
• 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 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (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** 9. **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. Verify the RCP CBO INBD and OUTBD ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 10. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start RCP **PER** step W.9 above. c. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. 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 the unaffected S/G. **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. 2. **IF ALL** RCPs have been secured, **THEN** verify Natural Circulation by the following: • RCS subcooling is at least 30° 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	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN trip ALL** RCPs.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step AC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 3. **IF** RCS boration has **NOT** been conducted, **THEN** perform RCS boration as follows: a. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: (1) VCT M/U valve, 2-CVC-512-CV, is shut. (2) BA DIRECT M/U valve, 2-CVC-514-MOV, is open. (3) BAST GRAVITY FD valves are open: • 2-CVC-508-MOV • 2-CVC-509-MOV (4) **ALL** available BA PPs are running. (5) VCT OUT valve, 2-CVC-501-MOV, is shut. (6) **ALL** available CHG PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.3 (continued) b. **IF** SIAS has **NOT** actuated **OR** has been reset, **THEN** commence RCS boration as follows: (1) Shut the VCT M/U valve, 2-CVC-512-CV. (2) Open the BA DIRECT M/U valve, 2-CVC-514-MOV. (3) Open the 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 the VCT OUT valve, 2-CVC-501-MOV. (7) Start **ALL** available CHG PPs. c. Record the time RCS boration was commenced: _____ d. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y.3 (continued) e. Continue boration until **ONE** of the following conditions is met: (1) Shutdown margin requirement has been achieved **PER** the NEOPs. (2) BAST level has been lowered a total of 90 inches. (3) Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 4. **IF** SIAS is **NOT** Blocked, **THEN** block SIAS as follows: • **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. 5. **IF** SGIS has **NOT** actuated, **THEN** perform the following actions: • **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. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 6. Commence RCS cooldown to less than 300° F using the ADV from the unaffected S/G, maintain RCS cooldown less than 100° F in any one hour. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 7. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 Z.1.c.(1) through Z.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. 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.	
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. **IF** the HPSI system is in operation, **THEN** perform the following: (1) Place **ALL** but ONE operating HPSI PP in PULL TO LOCK.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.3.a (continued) (2) Place **ALL** HPSI HDR valves 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) Throttle ONE HPSI HDR valve to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (4) Shut **ALL** remaining HPSI HDR valves. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.3 (continued) b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	b.1 **IF** HPSI LTOP control can **NOT** be established, **THEN** operate AUX SPRAY to maintain the following: • RCS subcooling above 30° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. COMMENCE SHUTDOWN COOLING.	
1. **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 30° 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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches {90}	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	OR Main or Aux Spray operating to reduce subcooling	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F	___|___|___|___ ___|___|___|___	greater than 30°F	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	greater than 30°F	_____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. Unaffected S/G level	(-)170 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
	trending to (-)24 inches to (+)30 inches	___|___|___|___ ___|___|___|___	N/A	N/A

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR **ALL** available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 2Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted for breaks outside containment or until Chemistry has been able to place hydrogen monitors in service for breaks inside containment.

V. 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) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) **(1,2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-4 UNIT 2
EXCESS STEAM DEMAND EVENT

LEAK ISOLATION	LEAK NOT ISOLATED	PLANT STABILIZATION	RECOVERY / RESTORATION
• MONITOR ESFAS ACTUATION • IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G	• COOL UNAFFECTED S/G TO WITHIN 25°F OF CET TEMPERATURE USING THE UNAFFECTED S/G ADV • EVALUATE HPSI THROTTLING/TERMINATION	• MAINTAIN UNAFFECTED S/G LEVEL • MAINTAIN RCS SUBCOOLING AND PZR LEVEL • MAINTAIN CONTAINMENT ENVIRONMENT • RESTORE FROM LOSS OF POWER	• RESTORE CONTAINMENT ENVIRONMENT • RESTORE FORCED CIRCULATION • MAINTAIN RCS FLOW VERIFICATION • ESTABLISH LTOP CONTROLS • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A COMMENCE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME.		8
	D. MONITOR ESFAS ACTUATION.	C	8
	• **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.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	11
	F. IF THE STEAM LEAK HAS BEEN ISOLATED.		12
	• **PROCEED** to step J.		
	G. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.		12
	• Identify the affected S/G: • S/G with the highest steam flow • S/G with the lowest pressure • RCS loop with the lowest T_{COLD} • S/G with most rapid downward level trend • Verify the most affected S/G is isolated: • S/G pressure lower for the affected S/G • S/G level lowering for the affected S/G and stabilized for the unaffected S/G • RCS loop T_{COLD} lower in the affected loop		
	H. MAINTAIN RCS TEMPERATURES.	C	16
	• **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. • **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		
	I. COMMENCE RCS BORATION.		17

START	FUNCTION	DONE	PAGE
	J. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	20
	• **IF ALL** of the following conditions can be maintained: • At least 30°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 **THEN** HPSI flow may be reduced.		
	K. MAINTAIN THE UNAFFECTED S/G LEVEL(S).	C	21
	• S/G level **(-)24 - (+)30 inches.**		
	L. MAINTAIN RCS SUBCOOLING AND PRESSURIZER LEVEL.	C	24
	• RCS subcooling **30 - 140°F.** • **IF** blowdown is **NOT** complete **AND** HPSI throttle criteria can be met, **THEN** maintain pressurizer level between **101 inches {141}** and **120 inches {190}** • **WHEN** the blowdown has been completed **THEN** restore and maintain pressurizer level between **101 inches {141}** and **180 inches {190}**		
	M. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	C	28
	• **IF** pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS. • **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS. • **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.		
	N. MAINTAIN THE CHARGING PUMP SUCTION SUPPLY.	C	34
	O. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.		37
	P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	C	38
	Q. ENSURE AUXILIARY SYSTEM OPERATION.	C	48

START	FUNCTION	DONE	PAGE
	R. RESET ESFAS ACTUATIONS.	C	48
	• **IF** CSAS has actuated **AND** pressure is less than 4.0 PSIG, **THEN** reset CSAS **AND** verify **ALL** available CACs are operating. • **IF** SIAS or CIS has actuated **AND** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure **BOTH** CS PPs.		
	S. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.		50
	T. **IF** COMPONENT COOLING HAS BEEN SECURED TO CONTAINMENT, **THEN** RESTORE FLOW.		51
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284.		
	U. RESTORE LETDOWN FLOW.		53
	V. **IF** THE RCS IS WATER SOLID, **THEN** DRAW A BUBBLE IN THE RCS.	C	56
	W. RESTORE FORCED CIRCULATION.	C	57
	X. MAINTAIN RCS FLOW VERIFICATION.	C	62
	• **IF ANY** RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} is less than 10°F. • **IF** RCPs have been secured, **THEN** verify the following: • At least 30°F subcooling 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		
	Y. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	63
	Z. CONTROL CORE AND RCS VOIDING.	C	68
	AA. PERFORM LOW TEMPERATURE ACTIONS.	C	71
	• **WHEN** T_{COLD} is less than 325°F, **THEN** establish LTOP control. • **WHEN** T_{COLD} is less than 306°F, **THEN** establish MPT protection.		
	AB. COMMENCE SHUTDOWN COOLING.	C	77
	AC. IMPLEMENT THE APPROPRIATE PROCEDURE.		78

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-5

LOSS OF COOLANT ACCIDENT

REVISION 24

Safety Related

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

Effective Date: 9/3/09

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-98	24

PLACEKEEPER PAGE NUMBERS	REVISION
1	24

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
02400	46,47

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V.	SAFETY FUNCTION STATUS CHECK	93
	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Loss of Coolant Accident (LOCA). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a LOCA by isolating the break or establishing long term core cooling using the safety injection system or the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating a Loss Of Coolant Accident:

- Unexplained lowering in pressurizer level.
- Unexplained rise in pressurizer level.
- SIAS actuation.
- Unexplained rise in containment pressure, temperature, humidity or sump level.
- "CNTMT RAD LVL HI" alarm (J4).
- "QUENCH TK • TEMP • LVL • PRESS" alarm (E1).

III. PRECAUTIONS

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

A. **WARNING**

None

B. **CAUTIONS**

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

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

3. Solid water operation of the pressurizer should be avoided unless 30° 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.

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

5. 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.

6. When containment hydrogen concentration is greater than 4.0%, there is the possibility of hydrogen ignition. The use of equipment in the containment building should be minimized.

7. 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. 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.

2. 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.

3. During a LOCA, 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.

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

5. 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.

6. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Loss Of Coolant Accident is correct by verifying Safety Function Status Check Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of Coolant Accident is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOOP, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE 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.	
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR RCS DEPRESSURIZATION.	
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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 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. f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.	
F. ATTEMPT LEAK ISOLATION.	
1. Verify L/D CNTMT ISOL valves are shut: • 1-CVC-515-CV • 1-CVC-516-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 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 **PER** step J.	
4. Shut RCS SAMPLE ISOL valve, 1-PS-5464-CV.	
5. Shut RX VESS VENT valves: • 1-RC-103-SV • 1-RC-104-SV	
6. Shut PRZR VENT valves: • 1-RC-105-SV • 1-RC-106-SV	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 7. **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: a. Trip **ALL** RCPs. b. Shut the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 8. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 9. **IF** the leak has been isolated **AND** SIAS has **NOT** actuated, **THEN** perform the following actions: a. Stop the HPSI PPs **PER** step K. b. Restore from loss of power **PER** step T. c. Shut MAIN and AUX HPSI HDR valves. d. Start RCPs **PER** step AC. e. Verify the Safety Function Status Check Intermediate Acceptance Criteria of EOP-1, REACTOR TRIP are satisfied. f. **IMPLEMENT** EOP-1, REACTOR TRIP. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 10. **IF**, at **ANY** time, the leak has been isolated, **THEN** evaluate the need for plant cooldown. a. Evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN b. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: (1) Maintain stabilized plant conditions. (2) Perform the appropriate recovery actions **AND PROCEED** to step AH.	
G. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	
1. **IF** SIAS has **NOT** actuated, **THEN** perform the following: a. Start **ALL** available CNTMT AIR CLRs in HIGH. b. Open the CNTMT CLR EMER OUT valves for the operating CNTMT AIR CLRs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 3. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 4. Verify the SRW Pump Room Ventilation is in service **PER** SRW Pump Room Ventilation section of OI-15. 5. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (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.** 6. **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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6 (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6.b (continued)	G.6.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.
7. Direct Chemistry to place the Hydrogen Monitors in service.	
8. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 9. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. 10. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 11. **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.	
H. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 1-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 1-CVC-514-MOV, is open. c. BAST GRAVITY FD valves are open: • 1-CVC-508-MOV • 1-CVC-509-MOV d. **ALL** available BA PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.1 (continued) e. VCT OUT valve, 1-CVC-501-MOV, is shut. f. **ALL** available CHG PPs are running. 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: a. Shut VCT M/U valve, 1-CVC-512-CV. b. Open BA DIRECT M/U valve, 1-CVC-514-MOV. c. Open BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV d. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ 4. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (continued) **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** 5. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	
I. COMMENCE COOLDOWN.	
1. **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. 2. **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 3. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. 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 4. **IF** RCS temperature is greater than 300° F, **THEN** commence RCS cooldown to less than 300° F using TURB BYP valves **OR** ADVs, maintain RCS cooldown less than 100° F in any one hour. 5. **IF** S/G pressure is greater than RCS pressure, **THEN** commence S/G cooldown using TURB BYP valves **OR** ADVs. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 6. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **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 30 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1.a(5) (continued) (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 (h) Maintain the pressurizer cooldown rate less than 200° F/hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (continued) **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 2. **IF** the RCS is water solid, **THEN** maintain subcooling within the following limits: • Between 30 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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). 3. **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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. 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 30° 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
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 30 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}	

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. RESTORE S/G LEVEL.	
CAUTION **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.**	
1. Establish Main Feedwater flow to at least **ONE** S/G by performing the following actions: 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.	1.1 Establish Auxiliary Feedwater flow to at least **ONE** S/G by **ONE** of the following: a. Establish Auxiliary Feedwater flow using 11 or 12 AFW PP as follows: (1) Verify the S/G steam driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV
(continue)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) 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 maintain S/G levels between 0 and (+)38 inches. d. **IF** 11 CST LVL drops to 5 feet, **THEN** establish Auxiliary Feedwater flow. (continue)	L.1.1.a (continued) (2) Open 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 (3) Adjust and maintain turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (11 AFW PP SPEED CONTR) 1-HC-3987A **OR** • (12 AFW PP SPEED CONTR) 1-HC-3989A (4) Slowly raise and maintain S/G level between 0 and (+)38 inches by adjusting S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (5) Operate the AFW Room ventilation as necessary to maintain temperature less than 130° F. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) (continue)	L.1.1 (continued) b. Establish Auxiliary Feedwater flow using 13 AFW PP: (1) Verify the S/G motor driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV **CAUTION** **13 AFW PP flow limit is 575 GPM.** (2) Start 13 AFW PP. (3) Slowly raise and maintain S/G level between 0 and (+)38 inches, by adjusting S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF** Main Feedwater is **NOT** available, **THEN** secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL COND BSTR PPs in PULL TO LOCK. c. Place ONE COND PP in PULL TO LOCK. d. Place BOTH HTR DRN PPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.2 (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 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Evaluate CST inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 M.1.c.(1) through M.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. 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 the unaffected S/G.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.
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.	

2. **IF ALL** RCPs have been secured, **THEN** verify subcooled natural circulation by the following:
• RCS subcooling is at least 30° 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
	2.1 **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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** boration has been completed **AND** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Verify VCT OUT valve, 1-CVC-501-MOV, is shut. c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. (continued) 2. **IF** boration has been completed **AND** SIAS has **NOT** actuated **OR** has been reset, **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. (2) Shut VCT OUT valve, 1-CVC-501-MOV. (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 (5) Stop the BA PP(s). b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain the VCT makeup blend sufficient to sustain the required shutdown boron concentration **PER** the NEOPs. (2) Open VCT OUT valve, 1-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut BA DIRECT M/U valve, 1-CVC-514-MOV. (5) Shut BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. CHECK CONTAINMENT SUMP LEVEL RISING.	
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.
Q. 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. 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.
S. 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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) 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), RAS VERIFICATION CHECKLIST.	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 **CAUTION** **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)

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1.e (continued)	S.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. 02400
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, 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. (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
(continue)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1.f (continued)	S.1.f.2 (continued) (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. 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
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued)	
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
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).
(continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued)	
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), HIGH PRESSURE SAFETY INJECTION FLOW.	(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
(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.	
(d) **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) 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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) n. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK. **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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** 11 **OR** 14 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following: a. Verify 1A and 1B DGs running. (1) Verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1.c (continued) (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 189-1406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 4. 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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions: **CAUTION** **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. (continue)	(1).1 **IF** SALTWATER SYSTEM AIR COMPRESSOR 11 is **NOT** available, **THEN** verify SALTWATER SYSTEM AIR COMPRESSOR 11 breaker, 52-11404 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.5.a (continued) (2) Verify BORIC ACID PUMP 11 is available, **AND** open the BORIC ACID PUMP 12 breaker, 52-10406. (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. (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)	(2).1 **IF** BORIC ACID PUMP 11 is **NOT** available, **THEN** verify BORIC ACID PUMP 11 breaker, 52-11406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.5 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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.	
8. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Verify **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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	
W. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** RESTORE THE CONTAINMENT ENVIRONMENT.	
1. Verify the IODINE FILT FANs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (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 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. 3. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.3 (continued) 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. 4. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP.	
X. **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 make up 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 2. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 3. 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.	
Z. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV c. Slowly open 1-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. 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 2. Verify the selected PZR 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 the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step AD.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 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) 7. Open the 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.** 8. 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. 9. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 11. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches.	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 1-CVC-103 • 1-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 1-CVC-104 • 1-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 1-CVC-108 • 1-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 1-CVC-109 • 1-CVC-111 e. Place L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. Place BACKPRESS REG VLVS handswitch, 1-HS-201, in BOTH.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. **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 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures	
2. **IF** at least ONE RCP is operating in each loop **OR** RCP operation is **NOT** desired, **THEN PROCEED** to step AD.	
3. **IF** T_{COLD} is less than 369° F, **THEN PROCEED** to step AD.	
4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors.	
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.**	
5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F.	
6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

AC. (continued)
 	
7. Restore Pressurizer level to between 155 and 180 inches.
 	
8. Verify RCP restart criteria are met by **ALL** of the following:
• Verify electrical power is available to the RCPs
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
• 12/22 SERV BUS VOLTS is less than 14.8 KV
• 4KV Bus voltage is greater than 4100 volts
• RCP Controlled Bleed-off temperatures are less than 200° F
• RCS subcooling is greater than 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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** 9. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP BLEED-OFF ISOL valves are open: • 1-CVC-505-CV • 1-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (continued) 10. Operate Charging and Letdown or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start an RCP **PER** step AC.9 above. c. Monitor the RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. 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.	
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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.2 (continued) 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. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.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	

IV. ACTIONS

RECOVERY ACTIONS | **ALTERNATE ACTIONS**

AE. 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 30° 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.

   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

(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.

   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

(continue)

IV. ACTIONS

RECOVERY ACTIONS

AE.1 (continued)

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

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

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

(continue)

ALTERNATE ACTIONS

AE.1.1 (continued)

g. Start the selected LPSI PP.

h. Maintain a flowrate of at least 150 GPM.

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.

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.1.i (continued) (5) Verify 11 HPSI PP is running. (6) **IF** approximately 150 GPM is **NOT** indicated **THEN** initiate Hot Leg Injection. (continue)	AE.1.i.1 (continued) h. **IF** 13 HPSI PP is running, **THEN** open the HPSI HDR XCONN valve, 1-SI-653-MOV. 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), HIGH PRESSURE SAFETY INJECTION FLOW. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.1 (continued)	AE.1 (continued) 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 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.
(continue)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.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 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** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. c. Ensure CET temperatures remain constant or lowering.	AE.1.3 (continued) i. Ensure CET temperatures remain constant or lowering.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF. COMMENCE SHUTDOWN COOLING	
1. **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 30° 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. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF. (continued) 2. **IF** the following conditions exist: • CET temperatures are less than 300° F • Conditions for establishing shutdown cooling can **NOT** be met • RAS has actuated • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (continued) t. Open LPSI HDR valves: • 1-SI-615-MOV • 1-SI-625-MOV • 1-SI-645-MOV u. Verify 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 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.** x. Adjust the signal on 1-FIC-306 to raise flow to 3000 GPM, while maintaining cooldown rate within limits. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AG. SECURE CORE FLUSH FLOWPATH.	
1. **WHEN** 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AH. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or the Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	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 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level (1)	greater than 30 inches {90}	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) (2)	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) (2)	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	greater than 30°F greater than 30°F	_____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	core covered	_____

(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 LOCA.
(2) LPSI and Charging Pumps are **NOT** required post-RAS.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 50°F superheated	___|___|___|___ ___|___|___|___	less than 50°F superheated	_____
b. RCS T_{COLD} (1)	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. S/G level	(-)170 inches to (+)38 inches	___|___|___|___ ___|___|___|___	0 inches to (+)38 inches	_____
	trending to 0 inches to (+)38 inches	___|___|___|___ ___|___|___|___	N/A	N/A

(1) T_{COLD} indication may be influenced by charging or SI temperatures during a large break LOCA. If this occurs, T_{COLD} may be deleted from the check provided CET temperatures and S/G level meet their acceptance criteria.

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	ALL available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 1Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

V. 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	_____
b. Condenser Off-Gas RMS (1-RI-1752) **(1,2,3)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) **(1,2,3)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.
(3) Alarm clear **NOT** applicable if high background radiation levels exist.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-5 UNIT 1
LOSS OF COOLANT ACCIDENT

INITIAL RESPONSE	PLANT STABILIZATION	RECOVERY	RESTORATION
• PERFORM THE RCP TRIP STRATEGY • ATTEMPT LEAK ISOLATION • MAINTAIN CONTAINMENT ENVIRONMENT • COMMENCE COOLDOWN • COMMENCE RCS DEPRESSURIZATION	• MAINTAIN SUBCOOLING AND PZR LEVEL • RESTORE S/G WATER LEVEL • 0 - (+)38 inches • CONTROL CORE AND RCS VOIDING • MAINTAIN RCS FLOW VERIFICATION • CHECK CONTAINMENT SUMP LEVEL RISING • VERIFY RAS ACTUATION	• RESTORE FROM LOSS OF POWER • COMMENCE ESFAS VERIFICATION • RESTORE CONTAINMENT ENVIRONMENT • RESTORE FORCED CIRCULATION	• ESTABLISH LTOP CONTROLS • COMMENCE CORE FLUSH • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	8
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. MONITOR RCS DEPRESSURIZATION.	C	8
	• **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.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	11
	F. ATTEMPT LEAK ISOLATION.		11
	G. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	C	16

	• **IF** pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS.
	• **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS.
	• **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.		

	H. COMMENCE RCS BORATION.	C	21
	I. COMMENCE COOLDOWN.	C	23
	J. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	C	25

	• RCS subcooling as low as possible:
	  • Subcooling **30 - 140°F**
	  • RCP NPSH limits
	• Pressurizer level **101 - 180 inches {141 - 190 inches}**		

START	FUNCTION	DONE	PAGE
	K. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	31

	• **IF ALL** of the following conditions can be maintained:
	  • At least 30°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
	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.		

	L. RESTORE S/G LEVEL.	C	32
	• S/G level **0 - (+)38 inches.**		
	M. CONTROL CORE AND RCS VOIDING.	C	37
	N. MAINTAIN RCS FLOW VERIFICATION.	C	40

	• **IF ANY** RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} less than 10°F
	• **IF** RCPs have been secured, **THEN** verify the following:
	  • At least 30°F subcooling 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		

	O. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	C	41
	P. CHECK CONTAINMENT SUMP LEVEL RISING.	C	43
	Q. PROTECT ECCS PUMPS FROM OVERHEATING.		43
	R. PREPARE FOR RAS ACTUATION.	C	44
	• RWT level drops to 4 feet.		
	S. VERIFY RAS ACTUATION.	C	44

START	FUNCTION	DONE	PAGE
	T. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	C	52
	U. ENSURE AUXILIARY SYSTEM OPERATION.	C	62
	V. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	C	63
	W. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** RESTORE THE CONTAINMENT ENVIRONMENT.	C	63
	• **WHEN** pressure is less than 4.0 PSIG, **THEN** reset CSAS **AND** verify **ALL** available CNTMT AIR CLRs are operating. • **WHEN** pressure is less than 2.8 PSIG, **THEN** reset SIAS, CIS **AND** secure ONE CS PP.		
	X. **IF** RAS ACTUATED, **THEN** REFILL THE RWT.	C	65
	• Notify the Plant Technical Support Center to review ERPIP-611.		
	Y. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.		66
	Z **IF** COMPONENT COOLING HAS BEEN SECURED TO CONTAINMENT, **THEN** RESTORE FLOW.		67
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284.		
	AA. RESTORE LETDOWN FLOW.		69
	AB. **IF** THE RCS IS WATER SOLID, **THEN** DRAW A BUBBLE IN THE RCS.	C	72
	AC. RESTORE FORCED CIRCULATION.	C	73
	AD. PERFORM LOW TEMPERATURE ACTIONS.	C	77
	• **WHEN** T_{COLD} is less than 369°F, **THEN** establish MPT protection.		
	AE. COMMENCE CORE FLUSH.	C	80
	• **8 to 11 hours** after SIAS was actuated.		
	AF. COMMENCE SHUTDOWN COOLING.	C	85
	AG. SECURE CORE FLUSH FLOWPATH.		91
	• CET temperatures less than 200°F		
	AH. IMPLEMENT THE APPROPRIATE PROCEDURE.		92

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-5

LOSS OF COOLANT ACCIDENT

REVISION 22

Safety Related

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

Effective Date: 9/3/09

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-100	22

PLACEKEEPER PAGE NUMBERS	REVISION
1	22

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
02200	45,46,48

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Loss of Coolant Accident (LOCA). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a LOCA by isolating the break or establishing long term core cooling using the safety injection system or the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating a Loss Of Coolant Accident:

- Unexplained lowering in pressurizer level.
- Unexplained rise in pressurizer level.
- SIAS actuation.
- Unexplained rise in containment pressure, temperature, humidity or sump level.
- "CNTMT RAD LVL HI" alarm (J4).
- "QUENCH TK • TEMP • LVL • PRESS" alarm (E1).

III. PRECAUTIONS

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

A. **WARNING**

None

B. **CAUTIONS**

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

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

3. Solid water operation of the pressurizer should be avoided unless 30° 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.

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

5. 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.

6. When containment hydrogen concentration is greater than 4.0%, there is the possibility of hydrogen ignition. The use of equipment in the containment building should be minimized.

7. 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. 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.

2. 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.

3. During a LOCA, 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.

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

5. 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.

6. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Loss Of Coolant Accident is correct by verifying Safety Function Status Check Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Loss Of Coolant Accident is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOOP, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE 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.	
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR RCS DEPRESSURIZATION.	
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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 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. f. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D. (continued) 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), 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** 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), SIAS VERIFICATION CHECKLIST.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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.	
F. ATTEMPT LEAK ISOLATION.	
1. Verify L/D CNTMT ISOL valves are shut: • 2-CVC-515-CV • 2-CVC-516-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 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: • 2-RC-403-MOV • 2-RC-405-MOV b. Place the appropriate PORV OVERRIDE handswitches in the OVERRIDE TO CLOSE position: • 2-HS-1402 • 2-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 **PER** step J.	
4. Shut RCS SAMPLE ISOL valve, 2-PS-5464-CV.	
5. Shut RXV VENT valves: • 2-RC-103-SV • 2-RC-104-SV	
6. Shut PZR VENT valves: • 2-RC-105-SV • 2-RC-106-SV	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 7. **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: a. Trip **ALL** RCPs. b. Shut the CC CNTMT SUPP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 8. **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 MON 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 9. **IF** the leak has been isolated **AND** SIAS has **NOT** actuated, **THEN** perform the following actions: a. Stop the HPSI PPs **PER** step K. b. Restore from loss of power **PER** step T. c. Shut HPSI MAIN and AUX HDR valves. d. Start RCPs **PER** step AC. e. Verify the Safety Function Status Check Intermediate Acceptance Criteria of EOP-1, REACTOR TRIP are satisfied. f. **IMPLEMENT** EOP-1, REACTOR TRIP. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 10. **IF**, at **ANY** time, the leak has been isolated, **THEN** evaluate the need for plant cooldown. a. Evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN b. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: (1) Maintain stabilized plant conditions. (2) Perform the appropriate recovery actions **AND PROCEED** to step AH.	
G. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	
1. **IF** SIAS has **NOT** actuated, **THEN** perform the following: a. Start **ALL** available CACs in HIGH. b. Open the CAC EMERGENCY OUT valves for the operating CACs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** containment pressure rises to 2.8 PSIG, **THEN** verify ESFAS actuation of the following: • SIAS • CIS 3. **IF** CIS has actuated, **THEN** trip **ALL** RCPs. 4. Verify the SRW Pump Room Ventilation is in service **PER** SRW Pump Room Ventilation section of OI-15. 5. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (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.** 6. **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. (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6.a (continued)	G.6.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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6 (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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6.b (continued)	G.6.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.
7. Direct Chemistry to place the Hydrogen Monitors in service.	
8. 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.	
9. **IF** hydrogen concentration rises to 0.5%, **OR** hydrogen concentration can **NOT** be determined, **THEN** start the Hydrogen Recombiners **PER** OI-41A, HYDROGEN RECOMBINERS. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 10. **IF** hydrogen concentration rises to 4.0%, **THEN** consult with the Plant Technical Support Center for guidance to secure the Hydrogen Recombiners. 11. **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.	
H. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 2-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 2-CVC-514-MOV, is open. c. BAST GRAVITY FD valves are open: • 2-CVC-508-MOV • 2-CVC-509-MOV d. **ALL** available BA PPs are running. e. VCT OUT valve, 2-CVC-501-MOV, is shut. f. **ALL** available CHG PPs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (continued) 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: a. Shut VCT M/U valve, 2-CVC-512-CV. b. Open BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ 4. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (continued) **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** 5. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating	
I. COMENCE COOLDOWN.	
1. **WHEN** the "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. 2. **WHEN** the "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 3. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. 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 4. **IF** RCS temperature is greater than 300° F, **THEN** commence RCS cooldown to less than 300° F using TURB BYP valves **OR** ADVs, maintain RCS cooldown less than 100° F in any one hour. 5. **IF** S/G pressure is greater than RCS temperature, **THEN** commence S/G cooldown using TURB BYP valves **OR** ADVs. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 6. **IF** Auxiliary Feedwater is being used to feed the S/Gs, **OR** ADVs are being used, **THEN**, if desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **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 30 and 140° F based on CET temperatures • RCS pressure greater than the NPSH limits **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1.a(5) (continued) (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 (h) Maintain the pressurizer cooldown rate less than 200° F/hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.1 (continued) **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 2. **IF** the RCS is water solid, **THEN** maintain subcooling within the following limits: • Between 30 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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). 3. **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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. 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 30° 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
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 30 and 140° F based on CET temperatures
• Pressurizer level between 101 inches {141} and 180 inches {190}	

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. RESTORE S/G LEVEL.	
CAUTION **Severe waterhammer may result if Main Feedwater flow is restored after it has been stopped for greater than 80 minutes.** 1. Establish Main Feedwater flow to at least **ONE** S/G by performing the following actions: 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. (continue)	1.1 Establish Auxiliary Feedwater flow to at least **ONE** S/G by **ONE** of the following: a. Establish Auxiliary Feedwater flow using 21 or 22 AFW PP as follows: (1) Verify the S/G steam driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued) 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 SG FRV BYP RESET buttons. (4) Adjust the SG FW REG BYPASS valves to maintain S/G levels between 0 and (+)38 inches. d. **IF** 21 CST LVL drops to 5 feet, **THEN** establish Auxiliary Feedwater flow. (continue)	L.1.1.a (continued) (2) Open 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 (3) Adjust and maintain turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A **OR** • (22 AFW PP SPD CONTR) 2-HC-3989A (4) Slowly raise and maintain S/G level between 0 and (+)38 inches by adjusting SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (5) Operate the AFW Room ventilation as necessary to maintain temperature less than 130° F. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L.1 (continued)	L.1.1 (continued) b. Establish Auxiliary Feedwater flow using 23 AFW PP: (1) Verify the S/G motor driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV **CAUTION** **23 AFW PP flow limit is 575 GPM.** (2) Start 23 AFW PP. (3) Slowly raise and maintain S/G level between 0 and (+)38 inches, by adjusting SG FLOW CONTR valves: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF** Main Feedwater is **NOT** available, **THEN** secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL CBPs in PULL TO LOCK. c. Place ONE COND PP in PULL TO LOCK. d. Place BOTH HDT PPs in PULL TO LOCK. e. Shut the SG FW ISOL valves: • 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Evaluate CST inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN.	
M. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 M.1.c.(1) through M.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. 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 the unaffected S/G.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.
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.	

2. **IF ALL** RCPs have been secured, **THEN** verify subcooled natural circulation by the following:
• RCS subcooling is at least 30° 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
	2.1 **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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** boration has been completed **AND** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Verify VCT OUT valve, 2-CVC-501-MOV, is shut. c. Place the BA PPs in PULL TO LOCK. d. Ensure BAST levels are steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. (continued) 2. **IF** boration has been completed **AND** SIAS has **NOT** actuated **OR** has been reset, **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. (2) Shut VCT OUT valve, 2-CVC-501-MOV. (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 (5) Stop the BA PP(s). b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain the VCT makeup blend sufficient to sustain the required shutdown boron concentration **PER** the NEOPs. (2) Open VCT OUT valve, 2-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut BA DIRECT M/U valve, 2-CVC-514-MOV. (5) Shut BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. CHECK CONTAINMENT SUMP LEVEL RISING.	
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.
Q. 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. 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.
S. 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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) c. Verify the CNTMT SUMP DISCH valves open: • 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.	02200 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.** 02200 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)	(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1.e (continued)	S.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: • 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. 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.	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. (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
(continue)	(continue)

02200

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1.f (continued)	S.1.f.2 (continued) (4) Open SDC Hx Inlet X-Conn 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. 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
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued)	
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
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).
(continue)	

02200

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued)	
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), HIGH PRESSURE SAFETY INJECTION FLOW.	(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
(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.	
(d) **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) 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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.1 (continued) n. **IF** CHG PPs are aligned with suction from the RWT, **THEN** place the CHG PPs in PULL TO LOCK.	
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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 1. **IF** 21 **OR** 24 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** the following: a. Verify 2A and 2B DGs running. (1) Verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.1.c (continued) (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 189-2406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 4. 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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.5.a (continued) (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. **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. (continue)	(3).1 **IF** BORIC ACID PUMP 22 is **NOT** available, **THEN** verify BORIC ACID PUMP 22 breaker, 52-20406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.5.b (continued) (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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 and 2B DGs will require a SRW and a SW Pump running on its associated supply header.	
8. **IF** 2A **OR** 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Check **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPP valve, 2-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. COMMENCE THE ESFAS VERIFICATION CHECKLISTS.	
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.** 1. 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	
W. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** RESTORE THE CONTAINMENT ENVIRONMENT.	
1. Verify the IODINE FILT FANs are running. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. (continued) 2. **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. 3. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.3 (continued) 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. 4. **WHEN** the Plant Technical Support Center recommends securing Containment Spray, **THEN** secure the remaining CS PP.	
X. **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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. **IF** SIAS HAS ACTUATED **AND** HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 2. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 3. 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.	
Z. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV c. Slowly open 2-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. 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 2. Verify the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, in Auto Remote. 3. Place the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. 4. Place the IX BYP valve, 2-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step AD.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 6. **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) 7. Open the 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.** 8. Place Letdown Pressure Controller, 2-PIC-201 in service as follows: a. Adjust the setpoint on 2-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift Letdown Pressure Controller, 2-PIC-201 to AUTO. 9. Adjust the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 11. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches. (continue)	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 2-CVC-103 • 2-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 2-CVC-104 • 2-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 2-CVC-108 • 2-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 2-CVC-109 • 2-CVC-111 e. Place L/D CONTR VLVS handswitch, 2-HS-110-1, in BOTH. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.12 (continued)	AA.12.2 (continued) f. Place BACKPRESSURE REG VLVS handswitch, 2-HS-201, in BOTH.

AB. **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 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.

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.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 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.	
AC. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures 2. **IF** at least ONE RCP is operating in each loop **OR** RCP operation is **NOT** desired, **THEN PROCEED** to step AD. 3. **IF** T_{COLD} is less than 306° F, **THEN PROCEED** to step AD. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (continued) **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

AC. (continued)
 	
8. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-215 (ALL RCPs)
  • MCC-205 (21A/21B RCP)
 	
• 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 30° 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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** 9. **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. Verify the RCP CBO INBD and OUTBD ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (continued) 10. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start RCP **PER** step AC.9 above. c. Monitor RCP seal parameters following pump restart.	
AD. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (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 PORV MPT PROTECTION 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.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	

IV. ACTIONS

RECOVERY ACTIONS | **ALTERNATE ACTIONS**

AE. 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 30° 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.

   b. Open the SI TO CHG HDR valve, 2-CVC-269-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.

   d. Shut LOOP CHG valves:

      - 2-CVC-518-CV
      - 2-CVC-519-CV

   e. Shut the PZR SPRAY VLVs by adjusting the output of 2-HIC-100 to 0%:

      - 2-RC-100E-CV
      - 2-RC-100F-CV

(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.

   b. Verify the CNTMT SUMP DISCH valves are open:

      - 2-SI-4144-MOV
      - 2-SI-4145-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

   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

   f. Open SDC HDR RETURN ISOL valves:

      - 2-SI-651-MOV
      - 2-SI-652-MOV

(continue)

IV. ACTIONS

RECOVERY ACTIONS

AE.1 (continued)

f. Verify HPSI AUX HDR ISOL valve, 2-SI-656-MOV, is open.

g. Open AUX SPRAY valve, 2-CVC-517-CV.

h. **IF** 23 HPSI PP is available, **THEN** perform the following actions:

(1) Verify 23 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

AE.1.1 (continued)

g. Start the selected LPSI PP.

h. Maintain a flowrate of at least 150 GPM.

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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.1.i (continued) (5) Verify 21 HPSI PP is running. (6) **IF** approximately 150 GPM is **NOT** indicated **THEN** initiate Hot Leg Injection. (continue)	AE.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), HIGH PRESSURE SAFETY INJECTION FLOW. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.1 (continued)	AE.1 (continued) 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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE.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.	AE.1.3 (continued) i. Ensure CET temperatures remain constant or lowering.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF. COMMENCE SHUTDOWN COOLING	
1. **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 30° 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. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF. (continued) 2. **IF** the following conditions exist: • CET temperatures are less than 300° F • Conditions for establishing shutdown cooling can **NOT** be met • RAS has actuated • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (continued) t. Open LPSI HDR valves: • 2-SI-615-MOV • 2-SI-625-MOV • 2-SI-645-MOV u. Verify 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 SDC TEMP CONTR, 2-SI-657-CV, in AUTO. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AF.2 (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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AG. SECURE CORE FLUSH FLOWPATH.	
1. **WHEN** 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AH. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or the Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level (1)	greater than 30 inches {90}	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) (2)	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F	___|___|___|___ ___|___|___|___	greater than 30°F	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11) (2)	___|___|___|___ ___|___|___|___	greater than 30°F	_____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	core covered	_____

(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 LOCA.
(2) LPSI and Charging Pumps are **NOT** required post-RAS.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 50°F superheated	___|___|___|___ ___|___|___|___	less than 50°F superheated	_____
b. RCS T_{COLD} (1)	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. S/G level	(-)170 inches to (+)38 inches	___|___|___|___ ___|___|___|___	0 inches to (+)38 inches	_____
	trending to 0 inches to (+)38 inches	___|___|___|___ ___|___|___|___	N/A	N/A

(1) T_{COLD} indication may be influenced by charging or SI temperatures during a large break LOCA. If this occurs, T_{COLD} may be deleted from the check provided CET temperatures and S/G level meet their acceptance criteria.

V. SAFETY FUNCTION STATUS CHECK

CONTAINMENT ENVIRONMENT PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Containment Pressure	less than 50 PSIG	___|___|___|___ ___|___|___|___	less than 2.8 PSIG	_____
b. Containment Temperature (1)	N/A	N/A	less than 220°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____
d. Hydrogen Concentration (3)	less than 0.5%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	ALL available hydrogen recombiners energized with hydrogen concentration less than 4.0%	___|___|___|___ ___|___|___|___	less than 0.5%	_____
	OR			
	hydrogen purge operation per Tech. Support recommendation	___|___|___|___ ___|___|___|___	less than 0.5%	_____

(1) **NOT** available if 2Y10 is de-energized.
(2) **NOT** applicable if OOS due to loss of power.
(3) Hydrogen concentration acceptance criteria may be omitted until Chemistry has been able to place hydrogen monitors in service.

V. 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	_____
b. Condenser Off-Gas RMS (2-RI-1752) **(1,2,3)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) **(1,2,3)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) **(2)**	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
			alarm clear	_____

(1) If MSIVs are shut and S/G Blowdown isolated, request Chemistry to sample **BOTH** S/Gs for activity.
(2) **NOT** applicable if OOS due to loss of power.
(3) Alarm clear **NOT** applicable if high background radiation levels exist.

V. SAFETY FUNCTION STATUS CHECK

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

EOP-5 UNIT 2
LOSS OF COOLANT ACCIDENT

INITIAL RESPONSE	PLANT STABILIZATION	RECOVERY	RESTORATION
• PERFORM THE RCP TRIP STRATEGY • ATTEMPT LEAK ISOLATION • MAINTAIN CONTAINMENT ENVIRONMENT • COMMENCE COOLDOWN • COMMENCE RCS DEPRESSURIZATION	• MAINTAIN SUBCOOLING AND PZR LEVEL • RESTORE S/G WATER LEVEL • 0 - (+)38 inches • CONTROL CORE AND RCS VOIDING • MAINTAIN RCS FLOW VERIFICATION • CHECK CONTAINMENT SUMP LEVEL RISING • VERIFY RAS ACTUATION	• RESTORE FROM LOSS OF POWER • COMMENCE ESFAS VERIFICATION • RESTORE CONTAINMENT ENVIRONMENT • RESTORE FORCED CIRCULATION	• ESTABLISH LTOP CONTROLS • COMMENCE CORE FLUSH • COMMENCE SDC • IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	8
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. MONITOR RCS DEPRESSURIZATION.	C	8
	• **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.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	11
	F. ATTEMPT LEAK ISOLATION.		11
	G. **IF** THE LEAK IS INSIDE CONTAINMENT, **THEN** MAINTAIN THE CONTAINMENT ENVIRONMENT.	C	16

	• **IF** pressure rises to 2.8 PSIG, **THEN** verify CIS and SIAS.
	• **IF** pressure rises to 4.25 PSIG, **THEN** verify CSAS.
	• **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.		

	H. COMMENCE RCS BORATION.	C	22
	I. COMMENCE COOLDOWN.	C	24
	J. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	C	26

	• RCS subcooling as low as possible:
	  • Subcooling **30 - 140°F**
	  • RCP NPSH limits
	• Pressurizer level **101 - 180 inches {141 - 190 inches}**		

START	FUNCTION	DONE	PAGE
	K. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	32

	• **IF ALL** of the following conditions can be maintained:
	  • At least 30°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
	  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.		

	L. RESTORE S/G LEVEL.	C	33
	• S/G level **0 - (+)38 inches.**		
	M. CONTROL CORE AND RCS VOIDING.	C	37
	N. MAINTAIN RCS FLOW VERIFICATION.	C	40

	• **IF ANY** RCPs are running, **THEN** verify T_{HOT} minus T_{COLD} less than 10°F
	• **IF** RCPs have been secured, **THEN** verify the following:
	  • At least 30°F subcooling 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		

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-6

STEAM GENERATOR TUBE RUPTURE

REVISION 17

Safety Related

Approval Authority: E.D. Dean III 3/3/2007
signature/date

Effective Date: 3/29/2007

LIST OF EFFECTIVE PAGES

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I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Steam Generator Tube Rupture (SGTR). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a SGTR by cooling down and depressurizing the RCS and establishing long term core cooling using the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating a Steam Generator Tube Rupture:

- Rise in activity or alarm on "UNIT 1 CNDSR OFF-GAS" (1-RI-1752).
- Rise in activity or alarm on "UNIT 1 S/G B/D" (1-RI-4014).
- Rise in activity or alarm on "UNIT 1 MAIN VENT GASEOUS" (1-RI-5415).
- Rise in activity or alarm on "MAIN STM EFFL RAD MON" (1-RIC-5421 or 1-RIC-5422).
- Steam Generator level response mismatch.

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. At least ONE S/G should be available for heat removal at all times. If there is a conflict between isolating a S/G and maintaining adequate heat removal, then RCS heat removal must be maintained via the least affected S/G.

2. If the damaged S/G has been isolated and the cooldown is proceeding via Natural Circulation, an inverted temperature differential may be observed in the idle loop. This condition will have no effect on natural circulation flow in the loop with the intact S/G.

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

4. 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.

5. 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.

6. 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).

7. 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.

8. 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. 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.

2. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Steam Generator Tube Rupture is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Steam Generator Tube Rupture is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, LOOP or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR RCS DEPRESSURIZATION.	
1. **IF** pressurizer pressure is less than or equal to 1725 PSIA, **THEN** verify SIAS actuation. 2. **IF** pressurizer pressure is greater than 1725 PSIA, **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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), RCS PRESSURE TEMPERATURE LIMITS, **THEN** trip **ALL** RCPs.	
F. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 1-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 1-CVC-514-MOV, is open. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.1 (continued) c. BAST GRAVITY FD valves are open: • 1-CVC-508-MOV • 1-CVC-509-MOV d. **ALL** available BA PPs are running. e. RWT CHG PP SUCT valve, 1-CVC-504-MOV, is shut. f. VCT OUT valve, 1-CVC-501-MOV, is shut. g. **ALL** available CHG PPs are running. 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: a. Shut VCT M/U valve, 1-CVC-512-CV. b. Open BA DIRECT M/U valve, 1-CVC-514-MOV. c. Open BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV d. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Verify RWT CHG PP SUCT valve, 1-CVC-504-MOV, is shut. g. Shut VCT OUT valve, 1-CVC-501-MOV. h. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 4. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ 5. Continue boration until **ONE** of the following conditions is met: a. 116 percent of the shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 108 inches. c. 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	
G. COMMENCE RCS COOLDOWN.	
1. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. 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 3. **IF** SGIS actuates **AND** condenser vacuum is available, **THEN** reset SGIS as follows: a. Place the COND BSTR PPs in PULL TO LOCK. b. Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST. c. Block SGIS. d. Reset the SGIS signal. e. Open **BOTH** MSIVs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.** 4. Cooldown the RCS using the TURB BYP valves as follows: a. Ensure the ADVs are shut. **NOTE** When the cooldown has been commenced, the operator should proceed with remaining actions. b. Perform a rapid RCS cooldown to reach T_{HOT} less than 515° F using the TURB BYP valves, while maintaining less than 100° F in any one hour. (continue)	4.1 Cooldown the RCS using the ADVs as follows: a. Prior to isolating the affected S/G, record the ADV open and close times, for dose calculations. **NOTE** When the cooldown has been commenced, the operator should proceed with remaining actions. b. Perform a rapid RCS cooldown to reach T_{HOT} less than 515° F using the ADVs, while maintaining less than 100° F in any one hour.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 5. **IF ANY** of the following conditions exist: • SIAS has actuated • TURB BYP valves are **NOT** available • Main Feedwater is **NOT** in operation **THEN** perform the following actions: a. Establish AFW flow using 13 AFW PP as follows: (1) Place the handswitches for the S/G motor driven train S/G AFW BLOCK valves in OPEN: 11 S/G • 1-AFW-4522-CV • 1-AFW-4523-CV 12 S/G • 1-AFW-4532-CV • 1-AFW-4533-CV (continue)	a.1 **IF** 13 AFW PP is **NOT** available, **THEN** establish AFW flow using 11 or 12 AFW PP as follows: (1) Place the handswitches for the S/G steam driven train S/G AFW BLOCK valves in OPEN: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5.a (continued) **CAUTION** **The 13 AFW PP flow limit is 575 GPM.** (2) Start 13 AFW PP. (3) Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve: • (11 S/G) 1-AFW-4525-CV • (12 S/G) 1-AFW-4535-CV (continue)	G.5.a.1 (continued) (2) 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 (3) Prior to isolating the affected S/G, record the time **BOTH** SG AFW STM SUPP & BYPASS valves are open, for dose calculations. (4) 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 (5) Restore and maintain the S/G levels between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (6) Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5 (continued) b. Secure the Main Feedwater system: (1) Trip BOTH SGFPs. (2) Place ALL COND BSTR PPs in PULL TO LOCK. (3) Place ONE COND PP in PULL TO LOCK. (4) Place BOTH HTR DRN PPs in PULL TO LOCK. (5) Shut the SG FW ISOL valves: • 1-FW-4516-MOV • 1-FW-4517-MOV (6) Shut the Hotwell To CST Dump CV by shifting 1-LIC-4405 to MANUAL with 50% output. (7) **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer: (a) 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. (b) Shut the 11 B/D HX HDR ISOL valves: • 1-CD-410 • 1-CD-411 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 6. **IF ALL** of the following conditions exist: • SIAS has **NOT** actuated • TURB BYP valves are available • Main Feedwater is in operation **THEN** perform the following actions: 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6 (continued) 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 controller 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 button. (4) Adjust the SG FW REG BYPASS valves to establish S/G level at approximately 0 inches. (5) Adjust SGFP speed as necessary. (6) **WHEN** S/G level is approximately 0 inches, **THEN** shift the SG FW REG BYPASS controller to Auto. d. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 1-LIC-4405 to MANUAL with 50% output. 7. Dispatch an operator to standby in the Unit 1 45 ft Switchgear Room to shut the affected S/G ADV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. 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
• 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
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 and 180 inches
2. **IF** pressurizer pressure is greater than 200 PSIA and constant **OR** rising, **THEN** the operating LPSI PPs may be stopped.
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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **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 • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (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. (5) 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.** (a) Record the following information: • PRZR WTR TEMP (1-TI-101) • 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 flow: • 1-CVC-518-CV • 1-CVC-519-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.a(5) (continued) (d) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (e) Shut the PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV (f) Maintain the pressurizer cooldown rate less than 200° F/hour. (6) **IF** pressure can **NOT** be lowered using MAIN SPRAY or AUX SPRAY, **THEN** depressurize the RCS with the PRZR VENT valves **PER** the DEPRESSURIZING THE REACTOR COOLANT SYSTEM WITH THE PRESSURIZER VENT VALVES AFTER A SGTR section of OI-1G. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (continued) **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. **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 • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 3. **IF ALL** of the following conditions exist, • TWO RCPs are in operation in opposite loops • The RCP NPSH requirements prevent maintaining RCS pressure approximately equal to S/G pressure • It is desired to start a second RCP in the loop with the unaffected S/G, and secure the RCP in the opposite loop to lower the minimum RCS pressure requirements • T_{COLD} is greater than 369° F **THEN** perform the following: a. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. **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.** b. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. c. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.3 (continued) d. Verify the RCP restart criteria are met by **ALL** of the following: • Verify electrical power is available to the RCPs • RCP BUS • MCC-115 (ALL RCPs) • MCC-105 (11A/11B RCP) • 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 • 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)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.3 (continued) e. **WHEN** RCP restart is desired **AND** the RCP restart criteria are met, **THEN** start ONE RCP in the desired loop as follows: (1) Verify the "CCW FLOW LO" alarm is clear. (2) Start the associated OIL LIFT PP. (3) Verify the "OIL LIFT PP PRESS LO" alarm is cleared. (4) Operate the OIL LIFT PP for at least 60 seconds. (5) Insert the RCP sync stick. (6) Verify the synchroscope on panel 1C19 is **NOT** rotating. (7) Start the RCP. (8) Verify the RCP(s) are **NOT** cavitating by observing running current is steady. f. Secure the RCP in the opposite loop. g. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. h. Monitor RCP seal parameters following pump restart. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 4. **IF ALL** of the following conditions exist: • Backflow from the affected S/G to the RCS is anticipated • HPSI throttle criteria can be met • A bubble exists in the Pressurizer **THEN** maintain Pressurizer Level between 101 and 120 inches until the backflow is initiated. 5. **IF** a bubble exists in the Pressurizer **AND** HPSI flow has been secured, **THEN** restore and maintain Pressurizer Level between 101 and 180 inches by operating charging, and if available, letdown.	
J. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	
1. Identify the most affected S/G by considering **ALL** of the following: • S/G samples • MAIN STEAM EFFL RAD MONITOR trends (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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 2. **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: (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. (5) Shut 11 SG AFW STM SUPP & BYPASS valves, 1-MS-4070-CV and 1-MS-4070A-CV. (continue)	(1).1 **IF** 11 ADV will **NOT** shut from 1C43, **THEN** shut 11 ADV Manual Isolation Valve, 1-MS-101.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2.a (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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: (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. (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 (continue)	(1).1 **IF** 12 ADV will **NOT** shut from 1C43, **THEN** shut 12 ADV Manual Isolation Valve, 1-MS-104.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2.b (continued) (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. 3. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.3 (continued) 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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. 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) • S/G level trends	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 J.2.
K. RESTORE THE UNAFFECTED S/G LEVEL.	
1. **IF** Main Feedwater is in operation, **THEN** perform the following actions for the unaffected S/G: a. Restore S/G level to between (-)24 and (+)30 inches and maintain RCS cooldown less than 100° F in any one hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued) b. **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 controller 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 button. (4) Adjust the SG FW REG BYPASS valves to establish S/G level at approximately 0 inches. (5) Adjust SGFP speed as necessary. (6) **WHEN** S/G level is approximately 0 inches, **THEN** shift the SG FW REG BYPASS controller to Auto. c. Ensure Auxiliary Feedwater flow to the unaffected S/G is secured. (continue)	

IV. ACTIONS

RECOVERY ACTIONS

K. (continued)

2. **IF** Main Feedwater is **NOT** in operation, **AND** 13 AFW PP is operating, **THEN** establish AFW flow to the unaffected S/G as follows:

   a. Verify the unaffected S/G motor driven train S/G AFW BLOCK valves are open with the handswitches in OPEN:

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

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

CAUTION
13 AFW PP flow limit is 575 GPM.

   b. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve:

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

   c. Shut the unaffected 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)

ALTERNATE ACTIONS

2.1 **IF** Main Feedwater is **NOT** in operation, **AND** 11 or 12 AFW PP is operating, **THEN** establish AFW flow to the unaffected S/G as follows:

   a. Verify the unaffected S/G steam driven train S/G AFW BLOCK valves are open with the handswitches in OPEN:

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

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

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

   b. 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

   c. Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than the unaffected S/G pressure:

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

(continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (continued)	K.2.1 (continued) d. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valve: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV e. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Evaluate CST inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN.	
L. CONTINUE THE RCS COOLDOWN.	
1. **IF ANY** RCPs are operating, **THEN** continue the RCS cooldown to less than 300° F, maintain RCS cooldown less than 100° F in any one hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF ALL** RCPs are secured, **THEN** continue the RCS cooldown to less than 300° F by performing the following actions: a. 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 S/G. b. Verify flow in the affected loop by the following indications: • Affected loop T_{COLD} trend consistent with the unaffected loop T_{COLD} • T_{COLD} greater than T_{HOT}	**NOTE** The maximum cooldown rate to prevent flow stagnation in the affected loop may be less than 35° F per hour, depending on decay heat level. b.1 **IF** flow can **NOT** be verified in the affected loop, **THEN** reduce the cooldown rate until flow is established. b.2 **IF** the cooldown rate can **NOT** be reduced sufficiently to establish flow in the affected loop, **THEN** control RCS pressure to minimize backflow from the S/G.
c. **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 d. **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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. MONITOR BORON CONCENTRATION AND RADIATION LEVELS.	
1. 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 2. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs.	
N. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** boration has been completed **AND** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. b. Verify VCT OUT valve, 1-CVC-501-MOV, is shut. c. Place the BA PPs in PULL TO LOCK. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) d. Ensure BAST levels are steady. 2. **IF** boration has been completed **AND** SIAS has **NOT** actuated **OR** has been reset, **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open RWT CHG PP SUCT valve, 1-CVC-504-MOV. (2) Shut VCT OUT valve, 1-CVC-501-MOV. (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 (5) Stop the BA PP(s). b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain the VCT makeup blend sufficient to sustain 116 percent of the required shutdown boron concentration **PER** the NEOPs. (2) Open VCT OUT valve, 1-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut BA DIRECT M/U valve, 1-CVC-514-MOV. (5) Shut BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. MAINTAIN THE AFFECTED S/G LEVEL.	
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. 1. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.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 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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. (8) Verify shut B/D Recovery DISCH TO MWS, 1-BD-4097-CV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.c (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.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: (a) Record the ADV open and close times, for dose calculations. (b) Direct the adjustment of the ADV from 1C43 as necessary. 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.	(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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **IF** 11 **OR** 14 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following: a. Verify 1A and 1B DGs running. (1) Verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.c (continued) (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 189-1406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
4. 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.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.**	
5. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
CAUTION **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.a (continued) (2) Verify BORIC ACID PUMP 11 is available, **AND** open the BORIC ACID PUMP 12 breaker, 52-10406. (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. (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)	(2).1 **IF** BORIC ACID PUMP 11 is **NOT** available, **THEN** verify BORIC ACID PUMP 11 breaker, 52-11406 is open.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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.	
8. **IF** 1B DG is running, **THEN** verify SRW/SW cooling is supplied to 1B DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Verify **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.
R. 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. RESET SIAS.	
1. **IF** SIAS has actuated, **THEN** reset SIAS as follows: **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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 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 the IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPR, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until temperature alarm clears: • (11 IA COMPR) 1-HS-2063 • (12 IA COMPR) 1-HS-2065 b. Start at least ONE IA COMPR. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 3. Restore Instrument Air to the 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 Key #85 from the Control Room Key Locker. b. Open the Containment Instrument Air Supply Valve, 1-IA-2085-CV, by momentarily placing 1-HS-2085 in OPEN.	
U. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUPPLY and RETURN valves: • 1-CC-3832-CV • 1-CC-3833-CV c. Slowly open 1-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 2. Verify the selected PZR 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 the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step Y.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 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) 7. Open the 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.** 8. 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. 9. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 11. Operate L/D HX TEMP CONTR, 1-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches.	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 1-CVC-103 • 1-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 1-CVC-104 • 1-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 1-CVC-108 • 1-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 1-CVC-109 • 1-CVC-111 e. Place L/D CONTR VLVS handswitch, 1-HS-110-1, in BOTH. f. Place BACKPRESS REG VLVS handswitch, 1-HS-201, in BOTH.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. **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 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures • 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 Y. 3. **IF** T_{COLD} is less than 369° F, **THEN PROCEED** to step Y. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

X. (continued)
 	
8. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
 	
• 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), RCS PRESSURE TEMPERATURE LIMITS, for the pumps to be started
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (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** 9. **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** 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. f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.9 (continued) 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. 10. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the opposite loop: a. 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), RCS PRESSURE TEMPERATURE LIMITS. c. Start RCP **PER** step X.9 above. d. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. 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 the unaffected S/G.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.
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.	

2. **IF ALL** RCPs have been secured, **THEN** verify subcooled natural circulation 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
	2.1 **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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.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 Z.1.c.(1) through Z.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 unaffected 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1 (continued) e. **IF** voiding is suspected in the affected S/G tubes, **THEN** cool the affected S/G **PER** step AB. f. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. 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. 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 following valves shut: • CONDENSER DUMP TO CIRCULATING WATER ISOLATION VALVE, 1-CD-239 • CONDENSATE DUMP TO CIRCULATING WATER BYPASS VALVE, 1-CD-455 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.1 (continued) 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 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 Condensate Demin and Turbine Plant sample sinks. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 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. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.2 (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, 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.** c. **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. 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. 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, DEARATOR 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, REACTOR COOLANT WASTE EVAPORATOR OPERATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.2 (continued) g. Ensure Plant Heating is aligned to Unit 2 Reheat Steam or the Auxiliary Boilers **PER** OI-40, PLANT HEATING SYSTEM.	
AB. COOL AND DEPRESSURIZE THE AFFECTED S/G AS NECESSARY.	
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. 1. Cool and depressurize the affected S/G 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 AB.2. (3) Ensure RCS Boron concentration at least 116 percent of the shutdown margin requirement **PER** the NEOPs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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 AB.1.a.(1) through AB.1.a.(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. (8) Operate the MS UPSTREAM DRN ISOL VLVS using 1-HS-6622 as necessary. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.b (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.** (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 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 AB.2. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (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. (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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (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 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 AB.2. (14) Repeat steps AB.1.c.(12) and AB.1.c.(13) as necessary. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1 (continued) 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 AB.2. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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 AB.2. (17) Repeat steps AB.1.d.(15) and AB.1.d.(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: (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 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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) **CAUTION** **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.** 2. **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 by placing the handswitches in OPEN: 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 (continue)	2.1 **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 by placing the handswitches in OPEN: 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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.2.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	AB.2.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. 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. **IF** the HPSI system is in operation, **THEN** perform the following: (1) Place **ALL** but ONE operating HPSI PP in PULL TO LOCK. (2) Place **ALL** HPSI HDR valves 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.2.a (continued) (3) Throttle ONE HPSI HDR valve to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (4) Shut **ALL** remaining HPSI HDR valves.	
b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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	b.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
CAUTION **Only ONE HPSI Pump shall be operable prior to cooldown to less than 365° F T_{COLD}.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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 4. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than TWO RCPs are in operation. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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: • (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. COMMENCE SHUTDOWN COOLING.	
1. **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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	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 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 25°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	greater than 25°F	_____
		___|___|___|___ ___|___|___|___	greater than 25°F	_____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. Unaffected S/G level	(-)170 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
	trending to (-)24 inches to (+)30 inches	___|___|___|___ ___|___|___|___	N/A	N/A

V. 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 (1)	less than 150°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Containment Sump Level	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____

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

V. 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)	N/A	N/A	alarm clear	_____
b. Condenser Off-Gas RMS (1-RI-1752) (1)	N/A	N/A	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) (1)	N/A	N/A	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) (1)	N/A	N/A	alarm clear	_____
e. Affected S/G pressure	less than 920 PSIA	___|___|___|___ ___|___|___|___	less than 920 PSIA	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-6 UNIT 1
STEAM GENERATOR TUBE RUPTURE

INITIAL RESPONSE	PLANT STABILIZATION	RECOVERY	RESTORATION

• MONITOR DEPRESSURIZATION
• COMMENCE COOLDOWN TO LESS THAN 515°F THOT
• COMMENCE RCS DEPRESSURIZATION
• IDENTIFY ISOLATE AND CONFIRM THE AFFECTED S/G
	• DEPRESSURIZE THE RCS TO MAINTAIN:
	  • RCS pressure approximately equal to affected S/G pressure
	  • At least 25°F subcooling
	  • RCP NPSH limits
	• RESTORE THE UNAFFECTED S/G LEVEL
	• MAINTAIN THE AFFECTED S/G LEVEL
		• RESTORE FROM LOSS OF POWER
		• RESTORE FORCED CIRCULATION
		• VERIFY NATURAL CIRCULATION
		• CONTROL SECONDARY SYSTEM CONTAMINATION
			• DEPRESSURIZE THE AFFECTED S/G
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. MONITOR RCS DEPRESSURIZATION.	C	8
	• **IF** RCS pressure is less than 1725 PSIA, **THEN** verify SIAS actuation. **OR** • Align HPSI injection and block SIAS.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	10
	F. COMMENCE RCS BORATION.		10
	G. COMMENCE RCS COOLDOWN.		12
	• Block / Reset SGIS. • Rapid cooldown to less than 515°F THOT. • Cooldown less than 100°F per hour. • Dispatch operator to 45 ft Switchgear room to shut affected S/G ADV.		
	H. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	20

	• **IF ALL** of the following conditions can be maintained:
	  • At least 25°F subcooling based on CET temperatures
	  • Pressurizer level greater than 101 inches
	  • At least ONE S/G available for heat removal
	  • Reactor Vessel level is above the top of the hot leg
	  THEN HPSI flow may be reduced.		

	I. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	C	21

	• RCS subcooling as low as possible:
	  • Subcooling **25 - 140°F**
	  • RCP NPSH limits
	  • RCS pressure less than **900 PSIA**
	  • RCS pressure approximately equal to affected S/G pressure
	• Pressurizer level **101 - 180 inches** (if backflow is anticipated **101 - 120 inches**)		

START	FUNCTION	DONE	PAGE
	J. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	C	30

	• Identify the most affected S/G by considering **ALL** of the following:
	  • S/G samples
	  • MAIN STM EFFL RAD MON 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
	• Maintain affected S/G pressure less than **920 PSIA**
	• Verify the most affected S/G is isolated:
	  • S/G sample activity higher in affected S/G
	  • RMS trends
	  • S/G level trends		

	K. RESTORE THE UNAFFECTED S/G LEVEL.	C	36
	• S/G level **(-)24 - (+)30 inches.**		
	L. CONTINUE THE RCS COOLDOWN.	C	39

	• **IF ANY** RCPs are operating, **THEN** continue RCS cooldown to less than 300°F, maintain cooldown less than **100°F in any one hour.**
	• **IF ALL** RCPs are secured, **THEN** continue the RCS cooldown to less than 300°F, by performing the following:
	  • Reduce the RCS cooldown rate to approximately **35°F per hour**
	  • Verify flow in the affected loop
	  • Disable RCPs in the affected loop		

	M. MONITOR BORON CONCENTRATION AND RADIATION LEVELS.	C	41
	• Ensure boron concentration remains above 116% of the required shutdown margin.		
	N. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	C	41
	O. MAINTAIN THE AFFECTED S/G LEVEL.	C	43

	• Maintain S/G level between **0 and (+)50 inches** by **ANY** of the following:
	  a. Controlling RCS pressure with backflow to the RCS.
	  b. Blowdown to MWS.
	  c. Blowdown to the Condenser.
	  d. Steaming to the Condenser.
	  e. Steaming to atmosphere.
	  f. Allow the S/G to fill to the MSIV.		

	P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	C	50
	Q. ENSURE AUXILIARY SYSTEM OPERATION.	C	60

START	FUNCTION	DONE	PAGE
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	• **IF ANY** RCPs are running, **THEN** verify THOT minus TCOLD less than 10°F
	• **IF** RCPs have been secured, **THEN** verify the following:
	  • At least 25°F subcooling based on CET temperatures
	  • THOT minus TCOLD less than 50°F
	  • TCOLD constant or lowering
	  • THOT constant or lowering
	  • CET temperatures trend consistent with THOT
	  • Steaming rate affects RCS temperatures		

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	  d. Feeding with blowdown to the Condenser.
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NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-6

STEAM GENERATOR TUBE RUPTURE

REVISION 17

Safety Related

Approval Authority: E.D. Dean III 3/3/2007
signature/date

Effective Date: 3/29/2007

LIST OF EFFECTIVE PAGES

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I. PURPOSE

This procedure provides the operator actions which must be completed in the event of a Steam Generator Tube Rupture (SGTR). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goal of this procedure is to mitigate the effects of a SGTR by cooling down and depressurizing the RCS and establishing long term core cooling using the shutdown cooling system. These actions are designed to maintain adequate core cooling 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 indicating a Steam Generator Tube Rupture:

- Rise in activity or alarm on "UNIT 2 CNDSR OFF-GAS" (2-RI-1752).
- Rise in activity or alarm on "UNIT 2 S/G B/D" (2-RI-4014).
- Rise in activity or alarm on "UNIT 2 MAIN VENT GASEOUS" (2-RI-5415).
- Rise in activity or alarm on "MAIN STM EFFL RAD MON" (2-RIC-5421 or 2-RIC-5422).
- Steam Generator level response mismatch.

III. PRECAUTIONS

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

A. WARNINGS

None

B. CAUTIONS

1. At least ONE S/G should be available for heat removal at all times. If there is a conflict between isolating a S/G and maintaining adequate heat removal, then RCS heat removal must be maintained via the least affected S/G.

2. If the damaged S/G has been isolated and the cooldown is proceeding via Natural Circulation, an inverted temperature differential may be observed in the idle loop. This condition will have no effect on natural circulation flow in the loop with the intact S/G.

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

4. 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.

5. 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.

6. 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).

7. 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.

8. 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. 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.

2. 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.

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Steam Generator Tube Rupture is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Steam Generator Tube Rupture is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, LOOP or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. MONITOR RCS DEPRESSURIZATION.	
1. **IF** pressurizer pressure is less than or equal to 1725 PSIA, **THEN** verify SIAS actuation. 2. **IF** pressurizer pressure is greater than 1725 PSIA, **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
D.2 (continued) e. **WHEN** the "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B. 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 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** 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), SIAS VERIFICATION CHECKLIST.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. 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.	
F. COMMENCE RCS BORATION.	
1. **IF** SIAS has actuated, **THEN** verify boration is in progress as follows: a. VCT M/U valve, 2-CVC-512-CV, is shut. b. BA DIRECT M/U valve, 2-CVC-514-MOV, is open. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.1 (continued) c. BAST GRAVITY FD valves are open: • 2-CVC-508-MOV • 2-CVC-509-MOV d. **ALL** available BA PPs are running. e. RWT CHG PP SUCT, 2-CVC-504-MOV, is shut. f. VCT OUT valve, 2-CVC-501-MOV, is shut. g. **ALL** available CHG PPs are running. 2. **IF** SIAS has **NOT** actuated, **THEN** commence RCS boration as follows: a. Shut VCT M/U valve, 2-CVC-512-CV. b. Open BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Verify RWT CHG PP SUCT, 2-CVC-504-MOV, is shut. g. Shut VCT OUT valve, 2-CVC-501-MOV. h. Start **ALL** available CHG PPs. 3. Record the time RCS boration was commenced: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 4. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ 5. Continue boration until **ONE** of the following conditions is met: a. 116 percent shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 108 inches. c. 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	
G. COMMENCE RCS COOLDOWN.	
1. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 2. **IF** 500KV offsite power has been lost, **THEN** protect the condenser from overpressure. 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 3. **IF** SGIS actuates **AND** condenser vacuum is available, **THEN** reset SGIS as follows: a. Place the CBPs in PULL TO LOCK. b. Match handswitch positions **PER** ATTACHMENT (7), SGIS VERIFICATION CHECKLIST. c. Block SGIS. d. Reset the SGIS signal. e. Open **BOTH** MSIVs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) **CAUTION** **RCS temperature must be closely monitored to avoid a cooldown greater than Technical Specification Limits.** 4. Cooldown the RCS using the TURB BYP valves as follows: a. Ensure the ADVs are shut. **NOTE** When the cooldown has been commenced, the operator should proceed with remaining actions. b. Perform a rapid RCS cooldown to reach T_{HOT} less than 515° F using the TURB BYP valves, while maintaining less than 100° F in any one hour. (continue)	4.1 Cooldown the RCS using the ADVs as follows: a. Prior to isolating the affected S/G, record the ADV open and close times, for dose calculations. **NOTE** When the cooldown has been commenced, the operator should proceed with remaining actions. b. Perform a rapid RCS cooldown to reach T_{HOT} less than 515° F using the ADVs, while maintaining less than 100° F in any one hour.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 5. **IF ANY** of the following conditions exist: • SIAS has actuated • TURB BYP valves are **NOT** available • Main Feedwater is **NOT** in operation **THEN** perform the following actions: a. Establish AFW flow using 23 AFW PP as follows: (1) Place the handswitches for the S/G motor driven train SG AFW BLOCK valves in OPEN: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV (continue)	a.1 **IF** 23 AFW PP is **NOT** available, **THEN** establish AFW flow using 21 or 22 AFW PP as follows: (1) Place the handswitches for the S/G steam driven train SG AFW BLOCK valves in OPEN: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5.a (continued) **CAUTION** **The 23 AFW PP flow limit is 575 GPM.** (2) Start 23 AFW PP. (3) Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV (continue)	G.5.a.1 (continued) (2) Open the 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 (3) Prior to isolating the affected S/G, record the time **BOTH** SG AFW MAIN STM SUPP & BYP valves are open, for dose calculations. (4) Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A • (22 AFW PP SPD CONTR) 2-HC-3989A (5) Restore and maintain the S/G levels between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (6) Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.5 (continued) b. Secure the Main Feedwater system: (1) Trip BOTH SGFPs. (2) Place ALL CBPs in PULL TO LOCK. (3) Place ONE COND PP in PULL TO LOCK. (4) Place BOTH HDT PPs in PULL TO LOCK. (5) Shut the SG FW ISOL valves: • 2-FW-4516-MOV • 2-FW-4517-MOV (6) Shut the Hotwell To CST Dump CV by shifting 2-LIC-4405 to MANUAL with 50% output. (7) **IF NO** COND PPs are operating, **THEN** protect against blowdown related waterhammer: (a) 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. (b) Shut the 21 B/D RECV HX valves: • 2-CD-333 • 2-CD-334 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. (continued) 6. **IF ALL** of the following conditions exist: • SIAS has **NOT** actuated • TURB BYP valves are available • Main Feedwater is in operation **THEN** perform the following actions: 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G.6 (continued) 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 controller to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the SG FRV BYP RESET button. (4) Adjust the SG FW REG BYPASS valves to establish S/G level at approximately 0 inches. (5) Adjust SGFP speed as necessary. (6) **WHEN** S/G level is approximately 0 inches, **THEN** shift the SG FW REG BYPASS controller to Auto. d. Shut the CNDSR HOTWELL M/U & DUMP CONTR CV by shifting 2-LIC-4405 to MANUAL with 50% output. 7. Dispatch an operator to standby in the Unit 2 45 ft Switchgear Room to shut the affected S/G ADV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. 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
• 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
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 and 180 inches	

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	
NOTE If rapid pressure excursions due to RCS inventory or temperature changes have occurred, consider the RCS water solid. 1. **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 • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (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. (5) 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.** (a) Record the following information: • PZR WTR TEMP (2-TI-101) • CHG OUT TEMP (2-TI-229) (b) Open the AUX SPRAY valve, 2-CVC-517-CV. (c) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 2-CVC-518-CV • 2-CVC-519-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.a(5) (continued) (d) Shift the PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL. (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) Maintain the pressurizer cooldown rate less than 200° F/hour. (6) **IF** pressure can **NOT** be lowered using Main Spray or AUX SPRAY, **THEN** depressurize the RCS with the PZR VENT valves **PER** the DEPRESSURIZING THE REACTOR COOLANT SYSTEM WITH THE PRESSURIZER VENT VALVES AFTER A SGTR section of OI-1G. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (continued) **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 2. **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 • RCS pressure less than 900 PSIA • RCS pressure approximately equal to affected S/G pressure 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.2 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 3. **IF ALL** of the following conditions exist, • TWO RCPs are in operation in opposite loops • The RCP NPSH requirements prevent maintaining RCS pressure approximately equal to S/G pressure • It is desired to start a second RCP in the loop with the unaffected S/G, and secure the RCP in the opposite loop to lower the minimum RCS pressure requirements • T_{COLD} is greater than 306° F **THEN** perform the following: a. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors.	
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.** b. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. c. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.3 (continued) d. Verify the RCP restart criteria are met by **ALL** of the following: • Verify electrical power is available to the RCPs • RCP BUS • MCC-215 (ALL RCPs) • MCC-205 (21A/21B RCP) • 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 • 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)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.3 (continued) e. **WHEN** RCP restart is desired **AND** the RCP restart criteria are met, **THEN** start ONE RCP in the desired loop as follows: (1) Verify the "CCW FLOW LO" alarm is clear. (2) Start the associated OIL LIFT PP. (3) Verify the "OIL LIFT PP PRESS LO" alarm is cleared. (4) Operate the OIL LIFT PP for at least 60 seconds. (5) Insert the RCP sync stick. (6) Verify the synchroscope on panel 1C19 is **NOT** rotating. (7) Start the RCP. (8) Verify the RCP(s) are **NOT** cavitating by observing running current is steady. f. Secure the RCP in the opposite loop. g. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. h. Monitor RCP seal parameters following pump restart. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 4. **IF ALL** of the following conditions exist: • Backflow from the affected S/G to the RCS is anticipated • HPSI throttle criteria can be met • A bubble exists in the Pressurizer **THEN** maintain Pressurizer Level between 101 and 120 inches until the backflow is initiated. 5. **IF** a bubble exists in the Pressurizer **AND** HPSI flow has been secured, **THEN** restore and maintain Pressurizer Level between 101 and 180 inches by operating charging, and if available, letdown.	
J. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	
1. Identify the most affected S/G by considering **ALL** of the following: • S/G samples • MAIN STM EFFL RAD MON trends (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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 2. **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: (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. (5) Shut 21 SG AFW MAIN STM SUPP & BYP valves, 2-MS-4070-CV and 2-MS-4070A-CV. (continue)	(1).1 **IF** 21 ADV will **NOT** shut from 2C43, **THEN** shut 21 ADV Manual Isolation Valve, 2-MS-101.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2.a (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2 (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: (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. (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 (continue)	(1).1 **IF** 22 ADV will **NOT** shut from 2C43, **THEN** shut 22 ADV Manual Isolation Valve, 2-MS-104.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.2.b (continued) (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. 3. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.3 (continued) 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: (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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. 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) • S/G level trends	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 J.2.
K. RESTORE THE UNAFFECTED S/G LEVEL.	
1. **IF** Main Feedwater is in operation, **THEN** perform the following actions for the unaffected S/G: a. Restore S/G level to between (-)24 and (+)30 inches and maintain RCS cooldown less than 100° F in any one hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.1 (continued) b. **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 controller to Manual. (2) Verify the operating SGFPT SPD BIAS ADJ is less than or equal to 5.0. (3) Depress the SG FRV BYP RESET button. (4) Adjust the SG FW REG BYPASS valves to establish S/G level at approximately 0 inches. (5) Adjust SGFP speed as necessary. (6) **WHEN** S/G level is approximately 0 inches, **THEN** shift the SG FW REG BYPASS controller to Auto. c. Ensure Auxiliary Feedwater flow to the unaffected S/G is secured. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. (continued) 2. **IF** Main Feedwater is **NOT** in operation, **AND** 23 AFW PP is operating, **THEN** establish AFW flow to the unaffected S/G as follows: a. Verify the unaffected S/G motor driven train SG AFW BLOCK valves are open with the handswitches in OPEN: 21 S/G • 2-AFW-4522-CV • 2-AFW-4523-CV 22 S/G • 2-AFW-4532-CV • 2-AFW-4533-CV **CAUTION** **23 AFW PP flow limit is 575 GPM.** b. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4525-CV • (22 S/G) 2-AFW-4535-CV c. Shut the unaffected 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 (continue)	2.1 **IF** Main Feedwater is **NOT** in operation, **AND** 21 or 22 AFW PP is operating, **THEN** establish AFW flow to the unaffected S/G as follows: a. Verify the unaffected S/G steam driven train SG AFW BLOCK valves are open with the handswitches in OPEN: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV **CAUTION** **An unmonitored radiation release could occur if the SG AFW MAIN STM SUPP & BYP valves from the affected S/G are open.** b. 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 c. Adjust and maintain the turbine driven discharge header pressure at least 100 PSI greater than the unaffected S/G pressure: • (21 AFW PP SPD CONTR) 2-HC-3987A • (22 AFW PP SPD CONTR) 2-HC-3989A (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K.2 (continued)	K.2.1 (continued) d. Restore and maintain the unaffected S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valve: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV e. Verify AFW Room normal or emergency ventilation is operating to maintain room temperature less than 130° F.
3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Evaluate CST inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN.	
L. CONTINUE THE RCS COOLDOWN.	
1. **IF ANY** RCPs are operating, **THEN** continue the RCS cooldown to less than 300° F, maintain RCS cooldown less than 100° F in any one hour. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. (continued) 2. **IF ALL** RCPs are secured, **THEN** continue the RCS cooldown to less than 300° F by performing the following actions: a. 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 S/G. b. Verify flow in the affected loop by the following indications: • Affected loop T_{COLD} trend consistent with the unaffected loop T_{COLD} • T_{COLD} greater than T_{HOT}	**NOTE** The maximum cooldown rate to prevent flow stagnation in the affected loop may be less than 35° F per hour, depending on decay heat level. b.1 **IF** flow can **NOT** be verified in the affected loop, **THEN** reduce the cooldown rate until flow is established. b.2 **IF** the cooldown rate can **NOT** be reduced sufficiently to establish flow in the affected loop, **THEN** control RCS pressure to minimize backflow from the S/G.
c. **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 d. **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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
M. MONITOR BORON CONCENTRATION AND RADIATION LEVELS.	
1. 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 2. Ensure boron concentration remains above 116 percent of the required shutdown margin **PER** the NEOPs.	
N. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	
1. **IF** boration has been completed **AND** SIAS is actuated, **THEN** switch the Charging Pump Suction to the RWT as follows: a. Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. b. Verify VCT OUT valve, 2-CVC-501-MOV, is shut. c. Place the BA PPs in PULL TO LOCK. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N.1 (continued) d. Ensure BAST levels are steady. 2. **IF** boration has been completed **AND** SIAS has **NOT** actuated **OR** has been reset, **THEN** line up the Charging Pump Suction by **ONE** of the following methods: a. Line up the Charging Pump Suction to the RWT as follows: (1) Open RWT CHG PP SUCT valve, 2-CVC-504-MOV. (2) Shut VCT OUT valve, 2-CVC-501-MOV. (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 (5) Stop the BA PP(s). b. Line up the Charging Pump Suction to the VCT as follows: (1) Maintain the VCT makeup blend sufficient to sustain 116 percent of the required shutdown boron concentration **PER** the NEOPs. (2) Open VCT OUT valve, 2-CVC-501-MOV. (3) Stop the BA PP(s). (4) Shut BA DIRECT M/U valve, 2-CVC-514-MOV. (5) Shut BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O. MAINTAIN THE AFFECTED S/G LEVEL.	
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. 1. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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. (8) Verify shut B/D Recovery DISCH TO MWS, 2-BD-4097-CV. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.c (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
O.1.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. 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.	(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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	
CAUTION **Attempts should NOT be made to reenergize a bus if a fault is suspected.** 1. **IF** 21 **OR** 24 4KV Bus is **NOT** energized, **AND** 500KV offsite power is **NOT** available, **THEN** perform **ANY** the following: a. Verify 2A and 2B DGs running. (1) Verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. b. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.b (continued) (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 **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.1.c (continued) (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 189-2406 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 d. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) 4. 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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 5. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.a (continued) (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. **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.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P.5.b (continued) (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. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
7. **IF** power has been lost to a 4KV Vital Bus, **THEN** 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	7.1 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 and 2B DGs will require a SRW and a SW Pump running on its associated supply header.	
8. **IF** 2A **OR** 2B DG is running, **THEN** verify SRW/SW cooling is supplied to the running DG.	8.1 **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.
9. **IF** SIAS has **NOT** actuated, **THEN** check at least ONE IA COMPR is running.	9.1 **IF NO** IA COMPRs are running **AND** SIAS has **NOT** actuated, **THEN** restart an IA COMPR **PER** OI-19, INSTRUMENT AIR.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued)	
10. Check at least ONE CC PP is operating.	10.1 **IF NO** CC PPs are operating, **THEN** perform the following actions: **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. Perform **ONE** of the following: (1) Check **ALL** RCP LOWER SEAL temperatures are less than 280° F. (2) Shut the CC CNTMT SUPP valve, 2-CC-3832-CV. c. Start a CC PP.
11. Verify the CC HX in service is being supplied from an operating Saltwater Header.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.
R. 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. RESET SIAS.	
1. **IF** SIAS has actuated, **THEN** reset SIAS as follows: **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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. **IF** SIAS HAS ACTUATED AND HAS BEEN RESET, **THEN** RESTORE AUXILIARIES.	
1. 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 the SRW HDR TURB BLDG ISOL valves: • 2-SRW-1600-CV • 2-SRW-1637-CV • 2-SRW-1638-CV • 2-SRW-1639-CV 2. Restore the IA COMPR to service as follows: a. **IF** a high temperature alarm exists on the IA COMPR, **THEN** open the service water isolation valves by placing their override handswitches in OPEN until temperature alarm clears: • (21 IA COMPR) 2-HS-2063 • (22 IA COMPR) 2-HS-2065 b. Start at least ONE IA COMPR. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 3. Restore Instrument Air to the Containment as follows: a. Open the 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 the Containment Instrument Air Supply Valve, 2-IA-2085-CV, by momentarily placing 2-HS-2085 in OPEN.	
U. **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. 1. 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 2. Verify CIS is reset. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. (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.** 3. **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 4. **IF ANY** RCP LOWER SEAL temperature is greater than 280° F, **THEN** restore Component Cooling Flow to Containment as follows: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open the CC CNTMT SUP and RTN valves: • 2-CC-3832-CV • 2-CC-3833-CV c. Slowly open 2-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. RESTORE LETDOWN FLOW.	
WARNING **High radiation levels in the auxiliary building may result if letdown is initiated with high activity levels in the RCS.** 1. Verify **ALL** of the following conditions: • 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 2. Verify the selected PZR LVL CONTR, 2-LIC-110X or 2-LIC-110Y, in Auto Remote. 3. Place the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. 4. Place the IX BYP valve, 2-CVC-520-CV, in BYPASS. 5. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. (continue)	1.1 **IF ANY** condition can **NOT** be maintained, **THEN PROCEED** to step Y.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 6. **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) 7. Open the 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.** 8. Place Letdown Pressure Controller, 2-PIC-201 in service as follows: a. Adjust the setpoint on 2-PIC-201 to a value less than RCS pressure but greater than the expected saturation pressure for letdown temperature. b. Shift Letdown Pressure Controller, 2-PIC-201 to AUTO. 9. Adjust the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. 10. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to AUTOMATIC. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. (continued) 11. Operate L/D HX TEMP CONTR, 2-TIC-223, to maintain Letdown Heat Exchanger letdown outlet temperature less than 120° F. 12. **IF** a bubble exists in the pressurizer, **THEN** check that pressurizer level is trending to 160 inches. (continue)	12.1 **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. 12.2 **IF** pressurizer pressure is less than 1000 PSIA, **THEN** place **BOTH** Backpressure Regulating valves and Letdown Control Valves in service. a. Open **BOTH** Letdown Control Valve Inlet valves: • 2-CVC-103 • 2-CVC-105 b. Check open **BOTH** Letdown Control Valve Outlet valves: • 2-CVC-104 • 2-CVC-106 c. Open **BOTH** Backpressure Regulating Inlet valves: • 2-CVC-108 • 2-CVC-110 d. Check open **BOTH** Backpressure Regulating Outlet valves: • 2-CVC-109 • 2-CVC-111 e. Place L/D CONTR VLVS handswitch, 2-HS-110-1, in BOTH. (continue)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V.12 (continued)	V.12.2 (continued) f. Place BACKPRESSURE REG VLVS handswitch, 2-HS-201, in BOTH.
W. **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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W.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 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.	
X. RESTORE FORCED CIRCULATION.	
1. **IF** the RCPs are **NOT** operating, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using Natural Circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures • 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 Y. 3. **IF** T_{COLD} is less than 306° F, **THEN PROCEED** to step Y. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering the RCP motors. **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. 6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering. 7. Restore Pressurizer level to between 155 and 180 inches. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

X. (continued)
 	
8. Verify the RCP restart criteria are met by **ALL** of the following:
 	
• Verify electrical power is available to the RCPs
 	
  • RCP BUS
  • MCC-215 (ALL RCPs)
  • MCC-205 (21A/21B RCP)
 	
• 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (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** 9. **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** 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. f. Operate the OIL LIFT PP for at least 60 seconds. g. Insert the RCP sync stick. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.9 (continued) 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. 10. Operate Charging and Letdown, or HPSI to restore and maintain pressurizer level between 101 and 180 inches. 11. Monitor RCP seal parameters following pump restart. 12. Allow backflow to equalize temperatures in the opposite loop. 13. Start a second RCP in the opposite loop: a. 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), RCS PRESSURE TEMPERATURE LIMITS. c. Start RCP **PER** step X.9 above. d. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. 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 the unaffected S/G.	1.1 **IF** T_{HOT} minus T_{COLD} is greater than 10° F in the loop(s) with the unaffected S/G, **THEN** trip **ALL** RCPs.
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.	

2. **IF ALL** RCPs have been secured, **THEN** verify subcooled natural circulation 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
	2.1 **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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.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 Z.1.c.(1) through Z.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 unaffected 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Z.1 (continued) e. **IF** voiding is suspected in the affected S/G tubes, **THEN** cool the affected S/G **PER** step AB. f. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. CONTROL SECONDARY SYSTEM CONTAMINATION.	
1. Minimize the spread of contamination by performing the following: a. Ensure the Unit 2 Turbine Building Sump Pumps are in STOP. b. 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 c. 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 d. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.1 (continued) e. 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 f. Verify shut SERVICE WATER HEAD TANK MAKEUP VALVE, 2-CD-144. g. Verify shut COMPONENT COOLING HEAD TANK MAKEUP VALVE, 2-CD-145. h. Notify Plant Chemistry to secure the Hotwell sample pumps and isolate the Condensate Demin and Turbine Plant sample sinks. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. (continued) 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. b. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.2 (continued) **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, 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.** c. **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. d. **IF** Auxiliary Feedwater is being used to feed the unaffected S/G, **THEN** isolate Condensate Makeup from 21 CST by performing the following: (1) Shut the Hotwell Makeup CV by shifting 2-LIC-4405 to MANUAL with 100% output. (2) Verify CONDENSER HOTWELL MAKEUP CV-4406 BYPASS VALVE, 2-CD-238, is shut. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.2 (continued) e. Ensure the Auxiliary Boiler Condensate returns are aligned to Unit 1 by verifying the following: (1) 0-AHB-210, DEAERATOR OVERFLOW TO 11 CONDENSER ISOLATION VALVE, is open. (2) 0-AHB-211, DEARATOR OVERFLOW TO 21 CONDENSER ISOLATION VALVE, is shut. f. Ensure the RC Waste Evaporators are aligned to Unit 1 or the Auxiliary Boilers **PER** OI-17E, REACTOR COOLANT WASTE EVAPORATOR OPERATION. g. Ensure Plant Heating is aligned to Unit 1 Reheat Steam or the Auxiliary Boilers **PER** OI-40, PLANT HEATING SYSTEM.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. COOL AND DEPRESSURIZE THE AFFECTED S/G AS NECESSARY.	
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. 1. Cool and depressurize the affected S/G 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 AB.2. (3) Ensure RCS Boron concentration at least 116 percent of the shutdown margin requirement **PER** the NEOPs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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 AB.1.a.(1) through AB.1.a.(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. (8) Operate the MAIN STM UPSTREAM DRN ISOL VLVS using 2-HS-6622 as necessary. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.b (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.** (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 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 AB.2. (2) **IF** AFAS has actuated, **THEN** reset the AFAS START signals **PER** ATTACHMENT(19), RESET AFAS START SIGNALS AT THE ACTUATION CABINETS. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (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. (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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.c (continued) (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 AB.2. (14) Repeat steps AB.1.c.(12) and AB.1.c.(13) as necessary. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1 (continued) 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 AB.2. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.1.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 AB.2. (17) Repeat steps AB.1.d.(15) and AB.1.d.(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 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 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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) **CAUTION** **If feedwater is supplied to the affected S/G during the backflow evolution, adequate shutdown margin can NOT be assured.** 2. **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 by placing the handswitches in OPEN: 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 (continue)	2.1 **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 by placing the handswitches in OPEN: 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)

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB.2.b (continued) (2) Start 23 AFW PP. **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	AB.2.b.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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. 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.	
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. **IF** the HPSI system is in operation, **THEN** perform the following: (1) Place **ALL** but ONE operating HPSI PP in PULL TO LOCK.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.3.a (continued) (2) Place **ALL** HPSI HDR valves 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) Throttle ONE HPSI HDR valve to maintain the following: • RCS subcooling above 25° F based on CET temperatures • RCS pressure **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS (4) Shut **ALL** remaining HPSI HDR valves. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.3 (continued) b. **IF** the HPSI system is **NOT** in operation, **THEN** perform the following: (1) Place **ALL** HPSI PPs in PULL TO LOCK. (2) 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.** (3) Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	b.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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. COMMENCE SHUTDOWN COOLING.	
1. **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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery as necessary until Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Plant Technical Support Center or Shift Manager.	
END of Section IV	

V. 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	_____

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	at least ONE energized	___|___|___|___ ___|___|___|___	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level	greater than 30 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
	OR At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 25°F **OR** At least ONE Charging Pump operating and SIS injecting **PER** Atts. (10) and (11)	___|___|___|___ ___|___|___|___	greater than 25°F	_____
		___|___|___|___ ___|___|___|___	greater than 25°F	_____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
c. Unaffected S/G level	(-)170 inches to (+)30 inches	___|___|___|___ ___|___|___|___	(-)24 inches to (+)30 inches	_____
	trending to (-)24 inches to (+)30 inches	___|___|___|___ ___|___|___|___	N/A	N/A

V. 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 (1)	less than 150°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Containment Sump Level	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____

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

V. 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)	N/A	N/A	alarm clear	_____
b. Condenser Off-Gas RMS (2-RI-1752) (1)	N/A	N/A	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) (1)	N/A	N/A	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) (1)	N/A	N/A	alarm clear	_____
e. Affected S/G pressure	less than 920 PSIA	___|___|___|___ ___|___|___|___	less than 920 PSIA	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-6 UNIT 2
STEAM GENERATOR TUBE RUPTURE

INITIAL RESPONSE	PLANT STABILIZATION	RECOVERY	RESTORATION

• MONITOR DEPRESSURIZATION
• COMMENCE COOLDOWN TO LESS THAN 515°F THOT
• COMMENCE RCS DEPRESSURIZATION
• IDENTIFY ISOLATE AND CONFIRM THE AFFECTED S/G
	• DEPRESSURIZE THE RCS TO MAINTAIN:
	  • RCS pressure approximately equal to affected S/G pressure
	  • At least 25°F subcooling
	  • RCP NPSH limits
	• RESTORE THE UNAFFECTED S/G LEVEL
	• MAINTAIN THE AFFECTED S/G LEVEL
		• RESTORE FROM LOSS OF POWER
		• RESTORE FORCED CIRCULATION
		• VERIFY NATURAL CIRCULATION
		• CONTROL SECONDARY SYSTEM CONTAMINATION
			• DEPRESSURIZE THE AFFECTED S/G
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. ————		8
	D. MONITOR RCS DEPRESSURIZATION.	C	8
	• **IF** RCS pressure is less than 1725 PSIA, **THEN** verify SIAS actuation. **OR** • Align HPSI injection and block SIAS.		
	E. PERFORM THE RCP TRIP STRATEGY.	C	10
	F. COMMENCE RCS BORATION.		10
	G. COMMENCE RCS COOLDOWN.		12
	• Block / Reset SGIS. • Rapid cooldown to less than 515°F THOT. • Cooldown less than 100°F per hour. • Dispatch operator to 45 ft Switchgear room to shut affected S/G ADV.		
	H. EVALUATE THE NEED FOR HPSI OR LPSI THROTTLING/TERMINATION.	C	20

	• **IF ALL** of the following conditions can be maintained:
	  • At least 25°F subcooling based on CET temperatures
	  • Pressurizer level greater than 101 inches
	  • At least ONE S/G available for heat removal
	  • Reactor Vessel level is above the top of the hot leg
	  THEN HPSI flow may be reduced.		

	I. DEPRESSURIZE THE RCS TO REDUCE SUBCOOLING AND MAINTAIN PRESSURIZER LEVEL.	C	21

	• RCS subcooling as low as possible:
	  • Subcooling **25 - 140°F**
	  • RCP NPSH limits
	  • RCS pressure less than **900 PSIA**
	  • RCS pressure approximately equal to affected S/G pressure
	• Pressurizer level **101 - 180 inches**(if backflow is anticipated **101 - 120 inches**)		

START	FUNCTION	DONE	PAGE
	J. IDENTIFY, ISOLATE AND CONFIRM THE AFFECTED S/G.	C	30

	• Identify the most affected S/G by considering **ALL** of the following:
	  • S/G samples
	  • MAIN STM EFFL RAD MON 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
	• Maintain affected S/G pressure less than **920 PSIA**
	• Verify the most affected S/G is isolated:
	  • S/G sample activity higher in affected S/G
	  • RMS trends
	  • S/G level trends		

	K. RESTORE THE UNAFFECTED S/G LEVEL.	C	36
	• S/G level **(-)24 - (+)30 inches.**		
	L. CONTINUE THE RCS COOLDOWN.	C	39

	• **IF ANY** RCPs are operating, **THEN** continue RCS cooldown to less than 300°F, maintain cooldown less than **100°F in any one hour.**
	• **IF ALL** RCPs are secured, **THEN** continue the RCS cooldown to less than 300°F, by performing the following:
	  • Reduce the RCS cooldown rate to approximately **35°F per hour**
	  • Verify flow in the affected loop
	  • Disable RCPs in the affected loop		

	M. MONITOR BORON CONCENTRATION AND RADIATION LEVELS.	C	41
	• Ensure boron concentration remains above 116% of the required shutdown margin.		
	N. SHIFT THE CHARGING PUMP SUCTION SUPPLY TO A LOWER BORIC ACID CONCENTRATION SOURCE.	C	41
	O. MAINTAIN THE AFFECTED S/G LEVEL.	C	43

	• Maintain S/G level between **0 and (+)50 inches** by **ANY** of the following:
	  a. Controlling RCS pressure with backflow to the RCS.
	  b. Blowdown to MWS.
	  c. Blowdown to the Condenser.
	  d. Steaming to the Condenser.
	  e. Steaming to atmosphere.
	  f. Allow the S/G to fill to the MSIV.		

	P. **IF** AN ELECTRICAL BUS HAS BEEN LOST, **THEN** RESTORE FROM LOSS OF POWER.	C	50
	Q. ENSURE AUXILIARY SYSTEM OPERATION.	C	60

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	• **IF ANY** RCPs are running, **THEN** verify THOT minus TCOLD less than 10°F
	• **IF** RCPs have been secured, **THEN** verify the following:
	  • At least 25°F subcooling based on CET temperatures
	  • THOT minus TCOLD less than 50°F
	  • TCOLD constant or lowering
	  • THOT constant or lowering
	  • CET temperatures trend consistent with THOT
	  • Steaming rate affects RCS temperatures		

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	  d. Feeding with blowdown to the Condenser.
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NOTE: Continuously applicable steps are designated with a "C" in the DONE column.

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT ONE

EOP-7

STATION BLACKOUT

REVISION 16

Safety Related

Approval Authority: E.D. Dean III 2/14/2006
signature/date

Effective Date: 3/15/2006

LIST OF EFFECTIVE PAGES

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I. PURPOSE

This procedure provides the operator actions which must be completed after a Station Blackout (SBO). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goals of this procedure are to restore the availability of a full complement of vital components and to safely establish plant conditions allowing implementation of hot standby, hot shutdown, shutdown cooling or a procedure provided by the Plant Technical Support Center. This procedure is designed to meet this objective, while maintaining adequate core cooling and 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 indicating a Station Blackout:

- Loss of Control Room lighting on **BOTH** Units.
- 500KV Red Bus and Black Bus power available lights de-energized.
- Diesel Generators **NOT** loaded.
- **NO** RCPs running on **EITHER** Unit.
- **ALL** 4KV Unit bus power available lights de-energized.

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 prior to the establishment of subcritical multiplication.

2. 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.

3. There is a possibility of RCS voiding throughout this procedure. Steps to eliminate voiding should be taken any time heat removal or inventory control is threatened. Corrective action should be started soon enough to ensure heat removal and inventory control are **NOT** lost.

4. 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 shutdow boron concentration to prevent any dilution of RCS boron concentration.

5. There is a possibility for excessive 1B 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 1B DG load limit is 3300 KW, the 1A DG load limit is 5400 KW. The SMECO load limit is 240 AMPS Continuous.

6. 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.

7. 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).

8. 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. 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.

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

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Station Blackout is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Station Blackout is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.	
1. Shut **BOTH** MSIVs. 2. Shut S/G B/D valves: • 1-BD-4010-CV • 1-BD-4011-CV • 1-BD-4012-CV • 1-BD-4013-CV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. MINIMIZE RCS INVENTORY LOSS.	
1. Shut L/D CNTMT ISOL valves: • 1-CVC-515-CV • 1-CVC-516-CV 2. Maintain an RCP Bleedoff flowpath: a. Verify RCP BLEED-OFF RELIEF ISOL, 1-CVC-507-CV, is open. b. Shut RCP BLEED-OFF ISOL valves: • 1-CVC-505-CV • 1-CVC-506-CV c. Open 11 RCDT DRN TO CNTMT FLOOR valve, 1-RCW-4258-SV. 3. Shut RCS SAMPLE ISOL valve, 1-PS-5464-CV. 4. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. ESTABLISH RCS HEAT SINK.	
1. Establish S/G heat removal: **NOTE** The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut. a. Locally operate the ADVs from the 45ft level of the Aux Building to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 2. Establish Auxiliary Feedwater flow to at least ONE S/G using 11 or 12 AFW PP as follows: a. Verify the S/G steam driven train S/G AFW BLOCK valves are open with the handswitches in AUTO: 11 S/G • 1-AFW-4520-CV • 1-AFW-4521-CV 12 S/G • 1-AFW-4530-CV • 1-AFW-4531-CV	
b. Open 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	b.1 **IF** the SG AFW STM SUPP & BYPASS valves will **NOT** open, **THEN** open the AFW Steam Supply Bypass Valves: • 1-MS-102 • 1-MS-105
WARNING **The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.** c. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.2 (continued) d. Assign an operator to control AFW discharge pressure locally as follows: (1) Establish communications between the operator and the control room. (2) 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 (3) Adjust 11 or 12 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure. e. Place 13 AFW PP in PULL TO LOCK. **CAUTION** **Total AFW PP flow limit is 600 GPM to prevent pump cavitation.** f. Restore and maintain S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting S/G FLOW CONTR valves: • (11 S/G) 1-AFW-4511-CV • (12 S/G) 1-AFW-4512-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL COND BSTR PPs in PULL TO LOCK. c. Place ALL COND PPs in PULL TO LOCK. d. Place BOTH HTR DRN PPs in PULL TO LOCK. e. Place the handswitches for the SG FW ISOL valves in CLOSE: • 1-FW-4516-MOV • 1-FW-4517-MOV f. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. VERIFY THE EMERGENCY DC PUMPS ARE OPERATING.	
1. Verify the following emergency pumps are operating: • Turbine EMERG OIL PP • EMERG H_2 SEAL OIL PP • SGFP EMERG OIL PPs	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	
1. Open the following 13KV breakers: • 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. Open the following 4KV breakers: • 14 4KV BUS NORMAL FDR, 152-1414 • 14 4KV BUS ALT FDR, 152-1401 • 11 4KV BUS NORMAL FDR, 152-1115 • 11 4KV BUS ALT FDR, 152-1101 • SWYD 4KV SERV XFMR FDR, 152-1113 • 12 4KV BUS NORMAL FDR, 152-1201 • 12 4KV BUS ALT FDR, 152-1209 • 13 4KV BUS NORMAL FDR, 152-1311 • 13 4KV BUS ALT FDR, 152-1301 • 15 4KV BUS FDR, 152-1501 • 16 4KV BUS FDR, 152-1604 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (continued) 3. Verify the following 4KV Vital Bus load breakers are open: **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** 11 4KV Vital Bus • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.3 (continued) **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** 14 4KV Vital Bus • 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 4. Place the 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitches for 11 and 14 4KV Buses in ON. 5. Shut CC CNTMT SUPPLY valve, 1-CC-3832-CV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. ATTEMPT TO RESTORE POWER TO AT LEAST ONE 4KV BUS.	
1. **IF** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following actions: **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** a. Attempt to start a DG as follows: • Start 1A DG **PER** the Restart Of 1A DG With An Automatic Start Signal Present Section of OI-21A, 1A DIESEL GENERATOR. • Start 1B DG **PER** the Restart Of 1B DG With An Automatic Start Signal Present section of OI-21B, 1B DIESEL GENERATOR. b. **IF EITHER** DG starts, **THEN** verify the associated DG OUT BKR closed. • 11 Bus - 152-1703 • 14 Bus - 152-1403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 0C DG 11 4KV BUS FDR, 152-1106 in PULL TO LOCK. (4) Verify 1A DG OUT BKR, 152-1703 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.c (continued) (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 **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 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 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.d (continued) (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify 0C DG OUT BKR, 152-0703 is closed. (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 e. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 4. 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. 5. **IF** NONE of the 4KV Buses have been re-energized, **THEN** perform the following actions: a. Concurrently perform actions **PER** steps K through O. b. Continue efforts to energize a 4KV bus. c. Check 125V DC Bus steady state amps are less than the following: • (11 Bus) 230 AMPS • (12 Bus) 290 AMPS • (12 Bus after 1Y05A shed) 100 AMPS • (21 Bus) 230 AMPS • (22 Bus) 310 AMPS • (22 Bus after 2Y05A shed) 120 AMPS	c.1 **IF** 125V DC Bus steady state amps are excessive, **THEN** notify the Technical Support Center it may be necessary to shed loads from the affected bus to reduce the battery discharge rate.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING.	
1. Open the Control Room panel bench board lower front covers. 2. Remove the front and back covers of the Control Room DG Control Consoles. **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. 3. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. **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: a. Depress the Shift key and type "@@A". b. Observe the message and the "ENTER YOUR OWNERNAME:" prompt. c. Type "GUEST1" and depress the Return key. d. Observe the "ENTER KEY" response. e. Depress the Return key. f. Observe the message (8 lines) and the "TSM>" prompt. g. Type "KILLER" and depress the Return key. h. Observe the messages (several pages) and the "TSM>" prompt. i. Type "X" and depress the Return key. j. Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". k. Depress the Shift key and type "@@P". l. Observe the "//" prompt. m. Type "HALT" and depress the Return key. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.4 (continued) **NOTE** "NNNNNNNN" in the following response may be any number. n. Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". 5. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. **IF** RCS SUBCOOLING DROPS TO 30° F, **THEN** COOL DOWN RCS TO MAINTAIN SUBCOOLING.	

1. Cooldown the RCS to restore and maintain subcooling between 30 and 50° F using ADVs, while maintaining the following:
• 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%$\Delta\rho$ SHUTDOWN vs. BURNUP
	1.1 **IF** 30° F subcooling can **NOT** be maintained, **THEN** continue RCS heat removal using two-phase natural circulation and ensure the following:
	• 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

M. BLOCK SGIS AND SIAS.	
1. Block SGIS and SIAS: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. ENSURE CONTAINMENT INTEGRITY.	
1. 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	1.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 1.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 1-HP-6901-MOV.
O. LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.	
1. Align the GENERATOR CO_2 CHARGE AND GAS VENT ISOLATION VALVE, 1-G-01, to the VENT position. 2. Throttle open the GENERATOR GAS VENT LINE ISOLATION VALVE, 1-G-03. 3. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: a. Shut 1-G-03. b. Secure the EMERG H_2 SEAL OIL PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.	
NOTE Do **NOT** continue until at least ONE 4KV bus has been re-energized. Steps P through AF are to be performed when at least ONE 4KV bus is re-energized.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SALTWATER PP on the same header • At least ONE IA COMPR • 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 • Instrument Air Compressor **PER** OI-19, INSTRUMENT AIR • 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
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) **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. 3. 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.	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.
Q. RESTORE COMPONENT COOLING FLOW.	
1. Notify the Technical Support Center to start-up the Plant Computer. 2. Verify CC CNTMT SUPPLY valve, 1-CC-3832-CV, is shut. 3. Start a CC PP. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued) 4. 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. 5. 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.** 6. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued) 7. **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: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 1-CC-284, located in the 5 ft East Penetration Room. b. Open CC CNTMT SUPPLY valve, 1-CC-3832-CV. c. Slowly open 1-CC-284 to restore component cooling flow.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.**	
1. **IF** MCC-104R or MCC-114R is de-energized, **THEN** perform the following actions:	
CAUTION **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.	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1.a (continued) (6) Turn the key in the clockwise direction. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1 (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R. (continued) **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 2. **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.	
S. ENSURE ADEQUATE SHUTDOWN MARGIN.	
1. Ensure adequate shutdown margin is met **PER** the NEOPs. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S. (continued) 2. **IF** RCS boration is needed to meet the requirements of the NEOPs, **THEN** borate the RCS as follows: a. Open LOOP CHG valves: • 1-CVC-518-CV • 1-CVC-519-CV b. Shut AUX SPRAY valve, 1-CVC-517-CV. c. Shut VCT M/U valve, 1-CVC-512-CV. d. Open BA DIRECT M/U valve, 1-CVC-514-MOV. e. Open BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV f. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. g. Start **ALL** available BA PPs. h. Shut VCT OUT valve, 1-CVC-501-MOV. i. Start **ALL** available CHG PPS. 3. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 1-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. MAINTAIN PRESSURIZER LEVEL BETWEEN 101 AND 180 INCHES.	
1. Operate CHG PPs to restore and maintain pressurizer level between 101 and 180 inches.	1.1 **IF** pressurizer level is less than 101 inches **AND** can **NOT** be restored with CHG PPs, **THEN** initiate HPSI injection as follows: a. **IF** 11 4KV Vital Bus is energized, **THEN** perform the following actions: (1) Open AUX HPSI HDR valves: • 1-SI-617-MOV • 1-SI-627-MOV • 1-SI-637-MOV • 1-SI-647-MOV (2) Start 11 HPSI PP. b. **IF** 14 4KV Vital Bus is energized, **THEN** perform the following actions: (1) Open MAIN HPSI HDR valves: • 1-SI-616-MOV • 1-SI-626-MOV • 1-SI-636-MOV • 1-SI-646-MOV (2) Start 13 HPSI PP. c. Ensure **ALL** available CHG PPs are in operation. d. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

T. (continued)
 	
2. **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained:
 	
• At least 30° F subcooling based on CET temperatures
 	
• Pressurizer level greater than 101 inches
 	
• 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
 	
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 30 and 140° F based on CET temperatures
 	
• Pressurizer level between 101 and 180 inches
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 3. **WHEN** 1Y09 and 1Y10 are energized, **THEN** restore letdown by performing the following actions: a. Verify the following: • 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, 1-LIC-110X or 1-LIC-110Y, in Auto Remote. c. Place the L/D PRESS CONTR, 1-PIC-201, in MANUAL with a 20% output. d. Place the IX BYPASS valve, 1-CVC-520-CV, in BYPASS. e. Shift the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to MANUAL and adjust to 20%. 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) (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.3 (continued) g. Open the 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 L/D PRESS CONTR, 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 L/D PRESS CONTR, 1-PIC-201 to AUTO. i. Adjust the LETDOWN THROTTLE VLV CONTROLLER, 1-HIC-110, to slowly restore letdown flow. j. Shift the 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. Check 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.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. 4. Restore RCP Bleed-off flowpath to 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U. MAINTAIN RCS SUBCOOLING BETWEEN 30 AND 140° F.	
1. Restore and maintain RCS subcooling between 30 and 140° F based on CET temperatures as follows: a. Raise subcooling by **ANY** of the following methods: (1) Energize the Pressurizer HTR(s). (a) Charge the closing spring for 11 or 13 BACKUP HTRs using the manual lever at 480V breakers 52-1127 **OR** 52-1427. (b) Push the PUSH-TO-CLOSE button on the breaker's front. (2) Secure AUX SPRAY. (3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using ADVs. (4) **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U.1 (continued) b. Lower subcooling by **ANY** of the following methods: (1) De-energize Pressurizer HTR(s). (2) Lower the RCS cooldown rate. (3) **IF** overpressurization is due to HPSI/Charging flow **AND** the HPSI throttle criteria are met, **THEN** throttle or secure flow to restore subcooling. (4) 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.** (a) Record the following information: • PRZR WTR TEMP (1-TI-101) • 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 flow: • 1-CVC-518-CV • 1-CVC-519-CV (d) Shift the PRESSURIZER SPRAY VLV CONTROLLER, 1-HIC-100, to MANUAL. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U.1.b(4) (continued) (e) Shut the PRZR SPRAY VLVs by adjusting the output of 1-HIC-100 to 0%: • 1-RC-100E-CV • 1-RC-100F-CV (f) Maintain the pressurizer cooldown rate less than 200° F/hour.	
V. MAINTAIN VCT LEVEL BETWEEN 60 AND 100 INCHES.	
1. Maintain VCT level between 60 and 100 inches. 2. **WHEN** VCT makeup is required, **THEN** shift Charging Pump(s) suction to the RWT: 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 Charging Pump(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to the VCT as follows: (1) Open the VCT OUT valve, 1-CVC-501-MOV. (2) Shut the RWT CHG PP SUCT valve, 1-CVC-504-MOV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4 KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. ENERGIZE SUPPORT EQUIPMENT.	
CAUTION **SMECO load limit is 240 AMPS Continuous.** **CAUTION** **Operation of additional equipment NOT directed within this procedure may cause 1B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.** 1. Energize the following support equipment as necessary, while maintaining load within the power source 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 SRW Pump 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) 2. Restore power to MCC-101AT and MCC-101BT loads, while remaining within load limits, 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.2.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.2 (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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	
1. **IF** SIAS actuates **AND** 1B DG loading exceeds 3600 KW, **THEN** perform rapid 1B DG load reduction as follows: a. Open the 14B BUS 480V FDR breaker, 52-1413. b. Stop 12 MAIN EXH FAN. c. Locally open MCC-101BT Main Feeder Breaker, 52-10141. d. Close the 14B BUS 480V FDR breaker, 52-1413. 2. **IF** SIAS actuates **AND** 1B DG loading exceeds 3300 KW, **THEN** secure the following DG loads as necessary to lower 1B DG load below 3300 KW: a. Stop 12 MAIN EXH FAN. b. Locally open MCC-101BT Main Feeder Breaker, 52-10141	
Z. MINIMIZE 250V DC BATTERY DISCHARGE.	
1. Close 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. EVALUATE RESTORING FORCED CIRCULATION.	
1. **WHEN** 500KV offsite power is restored, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using natural circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures 2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step AB. 3. **IF** T_{COLD} is less than 369° F, **THEN** restart the RCPs **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

AA. (continued)
 	
6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering.
 	
7. Raise Pressurizer level to between 155 and 180 inches.
 	
8. Reduce T_{COLD} to less than 525° F.
 	
9. Verify RCP restart criteria are met by **ALL** of the following:
• Verify electrical power is available to the RCPs
  • RCP BUS
  • MCC-115 (ALL RCPs)
  • MCC-105 (11A/11B RCP)
• 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 30° 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
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.9 (continued) • 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 **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** 10. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP BLEED-OFF ISOL valves are open: • 1-CVC-505-CV • 1-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.10 (continued) h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown 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. 14. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start an RCP **PER** step AA.10 above. c. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step AF. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 3. **IF** RCS boration has **NOT** been conducted, **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. Verify the M/U MODE SEL SW, 1-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 1-CVC-501-MOV. g. Start **ALL** available CHG PPs. 4. Record the time RCS boration was commenced: _____ 5. Record BAST levels: • 11 BAST: _____ • 12 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 6. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 7. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 1-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 1-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 1-CVC-508-MOV • 1-CVC-509-MOV 8. Commence RCS cooldown to less than 300° F using the ADVs, maintain RCS cooldown less than 100° F in any one hour. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 9. Commence logging RCS and PZR cooldown rates **PER** ATTACHMENT(14), RCS COOLDOWN DATA SHEET, and ATTACHMENT(15), PRESSURIZER COOLDOWN DATA SHEET. 10. 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. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 11. If desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 AC.1.c.(1) through AC.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. PERFORM LOW TEMPERATURE ACTIONS.	
NOTE If a T_{COLD} mismatch exists between loops, actions should be performed based on the lowest operating loop indication. 1. **WHEN** T_{COLD} is less than 385° F, **THEN** perform the following actions: 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 **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (continued) **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. **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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.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) 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE. COMMENCE SHUTDOWN COOLING.	
1. **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 30° F based on CET temperatures **THEN** initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING.	
AF. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.	
END of Section IV	

V. 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 (1)	**NO** more than ONE CEA **NOT** fully inserted	___|___|___|___ ___|___|___|___	**NO** more than ONE CEA **NOT** fully inserted	_____
OR				
Boration status (1)	greater than or equal to 40 GPM	___|___|___|___ ___|___|___|___	greater than 2300 ppm	_____

(1) **NOT** applicable while vital AC buses are de-energized.

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 11 or 14	N/A	N/A	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 11, 12, 13, 14	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 1Y09 or 1Y10	N/A	N/A	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level (1)	30 inches to 180 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F **OR** CET Temperatures less than 50°F superheated	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	greater than 30°F CET Temperatures less than 50°F superheated	_____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

(1) **NOT** applicable while vital AC buses are de-energized.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
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

V. 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 (1)	less than 185°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. 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) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
b. Condenser Off-Gas RMS (1-RI-1752) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (1-RI-4014) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (1-RI-5415) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-7 UNIT 1
STATION BLACKOUT

PLANT STABILIZATION	COPING WITH SBO	RECOVERY	RESTORATION

• SHUT THE MSIVS AND BLOWDOWN VALVES
• MINIMIZE RCS INVENTORY LOSS
• ESTABLISH RCS HEAT SINK
  • Locally operate ADVs to maintain S/G pressure between 850 and 920 PSIA.
  • Locally operate 11 OR 12 AFW PP to maintain S/G level between (-)24 and (+)30 inches
	• ATTEMPT TO RESTORE AT LEAST ONE 4KV BUS
	• PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING
	• VERIFY NATURAL CIRCULATION
	• COOLDOWN TO MAINTAIN SUBCOOLING 30 - 50°F
	• BLOCK SGIS AND SIAS
	• ENSURE CONTAINMENT INTEGRITY
		• VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING
		• ENSURE ADEQUATE SHUTDOWN MARGIN
		• EVALUATE RESTORING FORCED CIRCULATION
		• EVALUATE THE NEED FOR PLANT COOLDOWN
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.		8
	E. MINIMIZE RCS INVENTORY LOSS.	C	9
	F. ESTABLISH RCS HEAT SINK.	C	10
	• Station an operator to manually operate ADVs • S/G pressure **850 - 920 PSIA** • T_{COLD} **525 - 535°F** • Locally operate 11 or 12 AFW PP to maintain S/G level **(-)24 - (+)30 inches**		
	G. VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.		14
	H. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		15
	I. ATTEMPT TO RESTORE POWER TO AT LEAST ONE 4KV BUS.	C	18

	• Check 125V DC Bus steady state amps are less than the following:
	  • (11 Bus) 230 AMPS
	  • (12 Bus) 290/100 AMPS
	  • (21 Bus) 230 AMPS
	  • (22 Bus) 310/120 AMPS		

	J. PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING.		23
	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.		

START	FUNCTION	DONE	PAGE
	K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	26
	• At least 30°F subcooling 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		
	L. **IF** RCS SUBCOOLING DROPS TO 30°F, **THEN** COOL DOWN RCS TO MAINTAIN SUBCOOLING.	C	27

	• Cooldown the RCS to restore and maintain subcooling **30 - 50°F** using ADVs, while maintaining the following:
	  • 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		

	M. BLOCK SGIS AND SIAS.		27
	N. ENSURE CONTAINMENT INTEGRITY.		28
	O. LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.		28
	NOTE: Do **NOT** continue until at least ONE 4KV bus has been re-energized. Steps P through AF are to be performed when at least ONE 4KV bus is re-energized.		
	P. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.		29
	Q. RESTORE COMPONENT COOLING FLOW.	C	30
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 1-CC-284.		

START	FUNCTION	DONE	PAGE
	R. RESTORE REACTOR MCCS AND INSTRUMENT BUSES.	C	33
	• MCC-104 and 114 • 1Y09 and 1Y10		
	S. ENSURE ADEQUATE SHUTDOWN MARGIN	C	36
	T. MAINTAIN PRESSURIZER LEVEL BETWEEN **101 AND 180 INCHES.**	C	38
	U. MAINTAIN RCS SUBCOOLING BETWEEN **30 AND 140°F.**	C	43
	V. MAINTAIN VCT LEVEL BETWEEN **60 AND 100 INCHES.**	C	45
	W. ENSURE AUXILIARY SYSTEM OPERATION.	C	46
	X. ENERGIZE SUPPORT EQUIPMENT.		47
	Y. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	C	51
	• **IF** 1B DG load exceeds 3600 KW, **THEN** perform rapid load reduction. • **IF** 1B DG load exceeds 3300 KW, **THEN** secure DG loads.		
	Z. MINIMIZE 250V DC BATTERY DISCHARGE.		51
	AA. EVALUATE RESTORING FORCED CIRCULATION.	C	52
	AB. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	56
	AC. CONTROL CORE AND RCS VOIDING.	C	60
	AD. PERFORM LOW TEMPERATURE ACTIONS.	C	63
	• **WHEN** T_{COLD} is less than 385°F, **THEN** establish RCS low temperature conditions. • **WHEN** T_{COLD} is less than 369°F, **THEN** establish MPT protection.		
	AE. COMMENCE SHUTDOWN COOLING.	C	67
	AF. IMPLEMENT THE APPROPRIATE PROCEDURE.		67

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

CALVERT CLIFFS NUCLEAR POWER PLANT
TECHNICAL PROCEDURE

UNIT TWO

EOP-7

STATION BLACKOUT

REVISION 16

Safety Related

Approval Authority: Kent Mills 7/1/03
signature/date

Effective Date: 7/29/03

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	REVISION
1-75	16

PLACEKEEPER PAGE NUMBERS	REVISION
1	16

PROCEDURE ALTERATIONS

REVISION/CHANGE	PAGE NUMBERS
01602	59

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	PLACEKEEPER	

I. PURPOSE

This procedure provides the operator actions which must be completed after a Station Blackout (SBO). The actions in this procedure are necessary to ensure the plant is placed in a stable, safe condition. The goals of this procedure are to restore the availability of a full complement of vital components and to safely establish plant conditions allowing implementation of hot standby, hot shutdown, shutdown cooling or a procedure provided by the Plant Technical Support Center. This procedure is designed to meet this objective, while maintaining adequate core cooling and 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 indicating a Station Blackout:

- Loss of Control Room lighting on **BOTH** Units.
- 500KV Red Bus and Black Bus power available lights de-energized.
- Diesel Generators **NOT** loaded.
- **NO** RCPs running on **EITHER** Unit.
- **ALL** 4KV Unit bus power available lights de-energized.

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 prior to the establishment of subcritical multiplication.

2. 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.

3. There is a possibility of RCS voiding throughout this procedure. Steps to eliminate voiding should be taken any time heat removal or inventory control is threatened. Corrective action should be started soon enough to ensure heat removal and inventory control are **NOT** lost.

4. 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.

5. 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.

6. 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.

7. 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).

8. 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. 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.

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

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

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	
1. Determine the diagnosis of a Station Blackout is correct by verifying the Safety Function Status Checks Intermediate Acceptance Criteria are satisfied.	1.1 **IF ANY** parameter does **NOT** satisfy the Intermediate Acceptance Criteria and can **NOT** be readily returned to within the Acceptance Criteria, **OR** the diagnosis of a Station Blackout is **NOT** correct, **THEN** perform **EITHER** of the following: • **IMPLEMENT** EOP-8, FUNCTIONAL RECOVERY PROCEDURE **OR** • Perform the following: a. Rediagnose the event using EOP-0, POST-TRIP IMMEDIATE ACTIONS, V., DIAGNOSTIC FLOWCHART. b. **IF** a single event, such as a LOCA, SGTR or LOAF, can be identified, **THEN** verify the Intermediate Safety Function Status Check for the Optimal Recovery Procedure is met. c. **IMPLEMENT** the appropriate procedure.
B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
C. OBTAIN PLACEKEEPER **AND** RECORD TIME.	
D. PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.	
1. Shut **BOTH** MSIVs. 2. Shut SG BD valves: • 2-BD-4010-CV • 2-BD-4011-CV • 2-BD-4012-CV • 2-BD-4013-CV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
E. MINIMIZE RCS INVENTORY LOSS.	
1. Shut L/D CNTMT ISOL valves: • 2-CVC-515-CV • 2-CVC-516-CV 2. Maintain an RCP Bleedoff flowpath: a. Verify RCP CBO RELIEF ISOL, 2-CVC-507-CV, is open. b. Shut RCP CBO INBD and OUTBD ISOL valves: • 2-CVC-505-CV • 2-CVC-506-CV c. Open 21 RCDT DRN TO CNTMT FLR valve, 2-RCW-4258-SV. 3. Shut RCS SAMPLE ISOL valve, 2-PS-5464-CV. 4. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. ESTABLISH RCS HEAT SINK.	
1. Establish S/G heat removal: **NOTE** The ADVs are reverse acting, i.e., clockwise to open and counterclockwise to shut. a. Locally operate the ADVs from the 45ft level of the Aux Building to maintain the following: • S/G pressures between 850 and 920 PSIA • T_{COLD} between 525 and 535° F (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 2. Establish Auxiliary Feedwater flow to at least ONE S/G using 21 or 22 AFW PP as follows: a. Verify the S/G steam driven train SG AFW BLOCK valves are open with the handswitches in AUTO: 21 S/G • 2-AFW-4520-CV • 2-AFW-4521-CV 22 S/G • 2-AFW-4530-CV • 2-AFW-4531-CV	
b. Open 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	b.1 **IF** the SG AFW MAIN STM SUPP & BYP valves will **NOT** open, **THEN** open the AFW Steam Supply Bypass Valves: • 2-MS-102 • 2-MS-105
WARNING **The use of N_2 to operate AFW may result in the depletion of oxygen levels in some rooms due to system venting.** c. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F.2 (continued) d. Assign an operator to control AFW discharge pressure locally as follows: (1) Establish communications between the operator and the control room. (2) 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 (3) Adjust 21 or 22 AFW PP governor control knob to maintain discharge pressure at least 100 PSI greater than S/G pressure. e. Place 23 AFW PP in PULL TO LOCK. **CAUTION** **Total AFW PP flow limit is 600 GPM to prevent pump cavitation.** f. Restore and maintain S/G level between (-)24 and (+)30 inches, maintain RCS cooldown less than 100° F in any one hour, by adjusting SG FLOW CONTR valves: • (21 S/G) 2-AFW-4511-CV • (22 S/G) 2-AFW-4512-CV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
F. (continued) 3. Maintain AFW PP suction supply **AND** CST inventory **PER** ATTACHMENT (8), MAINTAIN AFW PUMP SUCTION SUPPLY AND CST INVENTORY. 4. Secure the Main Feedwater System as follows: a. Trip BOTH SGFPs. b. Place ALL CBPs in PULL TO LOCK. c. Place ALL COND PPs in PULL TO LOCK. d. Place BOTH HDT PPs in PULL TO LOCK. e. Place the handswitches for the SG FW ISOL valves in CLOSE: • 2-FW-4516-MOV • 2-FW-4517-MOV f. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
G. VERIFY THE EMERGENCY DC PUMPS ARE OPERATING.	
1. Verify the following emergency pumps are operating: • Turbine EMERGENCY BRG OIL PP • EMERGENCY AIR SIDE SEAL OIL PP • SGFP EMERGENCY OIL PPs	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.	
1. Open the following 13KV breakers: • 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. Open the following 4KV breakers: • 24 4KV BUS NORMAL FDR, 152-2401 • 24 4KV BUS ALT FDR, 152-2414 • 21 4KV BUS NORMAL FDR, 152-2101 • 21 4KV BUS ALT FDR, 152-2115 • SWYD SERV XFMR 4KV FDR, 152-2113 • 22 4KV BUS NORMAL FDR, 152-2201 • 22 4KV BUS ALT FDR, 152-2209 • 23 4KV BUS NORMAL FDR, 152-2311 • 23 4KV BUS ALT FDR, 152-2301 • 25 4KV BUS FDR, 152-2501 • 26 4KV BUS FDR, 152-2604 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H. (continued) 3. Verify the following 4KV Vital Bus load breakers are open: **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** 21 4KV Vital Bus • 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
H.3 (continued) **CAUTION** **Handswitches should NOT be placed in PULL TO LOCK while performing breaker position verification.** 24 4KV Vital Bus • 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 Pump No. 23, 152-2415 4. Place the 4KV BUS LOCI/SD SEQUENCER MANUAL INITIATE keyswitches for 21 and 24 4KV Buses in ON. 5. Shut CC CNTMT SUPP valve, 2-CC-3832-CV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. ATTEMPT TO RESTORE POWER TO AT LEAST ONE 4KV BUS.	
1. **IF** 500KV offsite power is **NOT** available, **THEN** perform **ANY** of the following actions: **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** a. Attempt to start a DG as follows: • Start 2A DG **PER** the Restart Of 2A DG With An Automatic Start Signal Present Section of OI-21A, 2A DIESEL GENERATOR. • Start 2B DG **PER** the Restart Of 2B DG With An Automatic Start Signal Present section of OI-21B, 2B DIESEL GENERATOR. b. **IF EITHER** DG starts, **THEN** verify the associated DG OUT BKR closed. • 21 Bus - 152-2103 • 24 Bus - 152-2403 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1 (continued) **NOTE** Align the 0C DG to the unit with redundant safety related equipment out of service. c. **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 0C DG 21 4KV BUS FDR, 152-2106 in PULL TO LOCK. (4) Verify 2A DG OUT BKR, 152-2103 in PULL TO LOCK. (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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.c (continued) (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 **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 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 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 DG 24 4KV BUS DISC, 189-2406. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I.1.d (continued) (6) **WHEN** the 0C DG is up to rated speed and voltage, **THEN** verify 0C DG OUT BKR, 152-0703 is closed. (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 e. Align the SMECO tie **PER** the ENERGIZING ENGINEERED SAFETY FEATURES BUSES FROM THE SMECO POWER SUPPLY SYSTEM section of OI-27E. 2. **IF** 500KV offsite power has been lost, **THEN** call the SO-TSO to determine when power is expected. 3. **WHEN** 500KV offsite power is available, **THEN** attempt to restore 500KV offsite power **PER** ATTACHMENT(16), 500KV OFFSITE POWER RESTORATION. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
I. (continued) 4. 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. 5. **IF** NONE of the 4KV Buses have been re-energized, **THEN** perform the following actions: a. Concurrently perform actions **PER** steps K through O. b. Continue efforts to energize a 4KV bus. c. Check 125V DC Bus steady state amps are less than the following: • (11 Bus) 230 AMPS • (12 Bus) 290 AMPS • (12 Bus after 1Y05A shed) 100 AMPS • (21 Bus) 230 AMPS • (22 Bus) 310 AMPS • (22 Bus after 2Y05A shed) 120 AMPS	c.1 **IF** 125V DC Bus steady state amps are excessive, **THEN** notify the Technical Support Center it may be necessary to shed loads from the affected bus to reduce the battery discharge rate.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING.	
1. Open the Control Room panel bench board lower front covers. 2. Remove the front and back covers of the Control Room DG Control Consoles. **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. 3. 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 (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J. (continued) 4. **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: a. Depress the Shift key and type "@@A". b. Observe the message and the "ENTER YOUR OWNERNAME:" prompt. c. Type "GUEST1" and depress the Return key. d. Observe the "ENTER KEY" response. e. Depress the Return key. f. Observe the message (8 lines) and the "TSM>" prompt. g. Type "KILLER" and depress the Return key. h. Observe the messages (several pages) and the "TSM>" prompt. i. Type "X" and depress the Return key. j. Observe two lines of statistics followed by a third line "RING IN FOR SERVICE". k. Depress the Shift key and type "@@P". l. Observe the "//" prompt. m. Type "HALT" and depress the Return key. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
J.4 (continued) **NOTE** "NNNNNNNN" in the following response may be any number. n. Observe "PSW NNNNNNNN ISNT NNNNNNNN HALT", followed by "//". 5. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	
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. 1. Verify Natural Circulation in at least ONE loop by the following: • RCS subcooling is at least 30° 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
L. **IF** RCS SUBCOOLING DROPS TO 30° F, **THEN** COOL DOWN RCS TO MAINTAIN SUBCOOLING.	

1. Cooldown the RCS to restore and maintain subcooling between 30 and 50° F using ADVs, while maintaining the following:
• 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%$\Delta\rho$ SHUTDOWN vs. BURNUP
	1.1 **IF** 30° F subcooling can **NOT** be maintained, **THEN** continue RCS heat removal using two-phase natural circulation and ensure the following:
	• 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

M. BLOCK SGIS AND SIAS.	
1. Block SGIS and SIAS: • **WHEN** "SGIS A BLOCK PERMITTED" alarm is received, **THEN** block SGIS A. • **WHEN** "SGIS B BLOCK PERMITTED" alarm is received, **THEN** block SGIS B. • **WHEN** "PZR PRESS BLOCK A PERMITTED" alarm is received, **THEN** block SIAS A. • **WHEN** "PZR PRESS BLOCK B PERMITTED" alarm is received, **THEN** block SIAS B.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
N. ENSURE CONTAINMENT INTEGRITY.	
1. 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	1.1 **IF** Containment Normal Sump Drain valves can **NOT** be verified shut from the control room, **THEN** locally check shut the valves. 1.2 **IF** H_2 Purge Valves can **NOT** be verified shut from the control room, **THEN** locally check shut 2-HP-6901-MOV.
O. LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.	
1. Throttle open the GENERATOR BOTTOM VENT TO ATMOSPHERE ISOLATION VALVE, 2-G-06. 2. **WHEN** Main Generator hydrogen pressure is vented to 2 PSIG, **THEN** perform the following actions: a. Shut 2-G-06. b. Secure the EMERGENCY AIR SIDE SEAL OIL PP.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.	
NOTE Do **NOT** continue until at least ONE 4KV bus has been re-energized. Steps P through AF are to be performed when at least ONE 4KV bus is re-energized.	
1. Check the following Shutdown Sequencer Loads are operating: • At least ONE SRW PP **AND** at least ONE SW PP on the same header • At least ONE IA COMPR • 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 • Instrument Air Compressor **PER** OI-19, INSTRUMENT AIR • 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
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
P. (continued) **NOTE** 2A and 2B DGs 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.
3. 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.	
Q. RESTORE COMPONENT COOLING FLOW.	
1. Notify the Technical Support Center to start-up the Plant Computer. 2. Verify CC CNTMT SUPP valve, 2-CC-3832-CV, is shut. 3. Start a CC PP. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued) 4. 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. 5. 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 **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.** 6. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Q. (continued) 7. **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: a. Shut CONTAINMENT SUPPLY HEADER ISOLATION valve, 2-CC-284, located in the 5 ft East Penetration Room. b. Open CC CNTMT SUPP valve, 2-CC-3832-CV. c. Slowly open 2-CC-284 to restore component cooling flow.	
R. RESTORE REACTOR MCCs AND INSTRUMENT BUSES.	
CAUTION **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 1. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1.a (continued) (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1 (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.1.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. **CAUTION** **Attempts should NOT be made to re-energize a bus if a fault is suspected.** 2. **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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
R.2 (continued) 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.	
S. ENSURE ADEQUATE SHUTDOWN MARGIN.	
1. Ensure adequate shutdown margin is met **PER** the NEOPs. 2. **IF** RCS boration is needed to meet the requirements of the NEOPs, **THEN** borate the RCS as follows: a. Open LOOP CHG valves: • 2-CVC-518-CV • 2-CVC-519-CV b. Shut AUX SPRAY valve, 2-CVC-517-CV. c. Shut VCT M/U valve, 2-CVC-512-CV. d. Open BA DIRECT M/U valve, 2-CVC-514-MOV. e. Open BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
S.2 (continued) f. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. g. Start **ALL** available BA PPs. h. Shut VCT OUT valve, 2-CVC-501-MOV. i. Start **ALL** available CHG PPS. 3. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 2-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 2-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. MAINTAIN PRESSURIZER LEVEL BETWEEN 101 AND 180 INCHES.	
1. Operate CHG PPs to restore and maintain pressurizer level between 101 and 180 inches.	1.1 **IF** pressurizer level is less than 101 inches **AND** can **NOT** be restored with CHG PPs, **THEN** initiate HPSI injection as follows: a. **IF** 21 4KV Vital Bus is energized, **THEN** perform the following actions: (1) Open HPSI AUX HDR valves: • 2-SI-617-MOV • 2-SI-627-MOV • 2-SI-637-MOV • 2-SI-647-MOV (2) Start 21 HPSI PP. b. **IF** 24 4KV Vital Bus is energized, **THEN** perform the following actions: (1) Open HPSI MAIN HDR valves: • 2-SI-616-MOV • 2-SI-626-MOV • 2-SI-636-MOV • 2-SI-646-MOV (2) Start 23 HPSI PP. c. Ensure **ALL** available CHG PPs are in operation. d. **WHEN** pressure is below 1270 PSIA, **THEN** verify appropriate HPSI flow **PER** ATTACHMENT(10), HIGH PRESSURE SAFETY INJECTION FLOW.
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

T. (continued)
 	
2. **IF** HPSI PPs are operating **AND ALL** of the following conditions can be maintained:
 	
• At least 30° F subcooling based on CET temperatures
 	
• Pressurizer level greater than 101 inches
 	
• 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
 	
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 30 and 140° F based on CET temperatures
 	
• Pressurizer level between 101 and 180 inches
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 3. **WHEN** 2Y09 and 2Y10 are energized, **THEN** restore letdown by performing the following actions: a. Verify the following: • 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 the L/D PRESS CONTR, 2-PIC-201, in MANUAL with a 20% output. d. Place the IX BYPASS valve, 2-CVC-520-CV, in BYPASS. e. Shift the LETDOWN VALVE CONTROLLER, 2-HIC-110, to MANUAL and adjust to 20%. 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) (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.3 (continued) g. Open the 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 the LETDOWN VALVE CONTROLLER, 2-HIC-110, to slowly restore letdown flow. j. Shift the 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. Check 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T.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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
T. (continued) 4. Restore RCP Bleed-off flowpath to 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 FLR valve, 2-RCW-4258-SV.	
U. MAINTAIN RCS SUBCOOLING BETWEEN 30 AND 140° F.	
1. Restore and maintain RCS subcooling between 30 and 140° F based on CET temperatures as follows: a. Raise subcooling by **ANY** of the following methods: (1) Energize the Pressurizer HTR(s). (a) Charge the closing spring for 21 or 23 BACKUP HTRs using the manual lever at 480V breakers 52-2127 **OR** 52-2427. (b) Push the PUSH-TO-CLOSE button on the breaker's front. (2) Secure AUX SPRAY. (3) Raise RCS cooldown rate, while **NOT** exceeding 100° F in any one hour, by using ADVs. (continue)	

IV. ACTIONS

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

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
U.1.b (continued) (4) 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.** (a) Record the following information: • PZR WTR TEMP (2-TI-101) • CHG OUT TEMP (2-TI-229) (b) Open the AUX SPRAY valve, 2-CVC-517-CV. (c) Operate the LOOP CHG valves as necessary to adjust AUX SPRAY flow: • 2-CVC-518-CV • 2-CVC-519-CV (d) Shift the PZR SPRAY VLV CONTR, 2-HIC-100, to MANUAL. (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) Maintain the pressurizer cooldown rate less than 200° F/hour.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
V. MAINTAIN VCT LEVEL BETWEEN 60 AND 100 INCHES.	
1. Maintain VCT level between 60 and 100 inches. 2. **WHEN** VCT makeup is required, **THEN** shift Charging Pump(s) suction to the RWT: 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 Charging Pump(s) current is steady. e. **WHEN** VCT level rises to 100 inches, **THEN** return Charging Pump suction to the VCT as follows: (1) Open the VCT OUT valve, 2-CVC-501-MOV. (2) Shut the RWT CHG PP SUCT valve, 2-CVC-504-MOV.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
W. ENSURE AUXILIARY SYSTEM OPERATION.	
1. Ensure proper operation of the following auxiliary systems: • Electrical systems • Saltwater system • Service Water system • Component Cooling system • Instrument Air system	1.1 Concurrently restore the appropriate system as follows: • 120V Vital AC **PER** AOP-7J, LOSS OF 120 VOLT VITAL AC OR 125 VOLT VITAL DC POWER. • 4KV, 480 Volt or non-vital 120V AC **PER** AOP-7I, LOSS OF 4 KV, 480 VOLT OR 208/120 VOLT INSTRUMENT BUS POWER. • Saltwater system **PER** AOP-7A, LOSS OF SALTWATER COOLING. • Service Water system **PER** AOP-7B, LOSS OF SERVICE WATER. • Component Cooling system **PER** AOP-7C, LOSS OF COMPONENT COOLING WATER. • Instrument Air system **PER** AOP-7D, LOSS OF INSTRUMENT AIR.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. ENERGIZE SUPPORT EQUIPMENT.	
CAUTION **SMECO load limit is 240 AMPS Continuous.** **CAUTION** **Operation of additional equipment NOT directed within this procedure may cause 2A or 2B DG loading to exceed 3600 KW if the LOCI Sequencer actuates.** 1. Energize the following support equipment as necessary, while maintaining load within the power source 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 SRW Pump 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X. (continued) 2. Restore power to MCC-201AT and MCC-201BT loads, while remaining within load limits, 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
X.2.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. 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	
1. **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. 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. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
Y. (continued) 2. **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.	
Z. MINIMIZE 250V DC BATTERY DISCHARGE.	
1. Close 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.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA. EVALUATE RESTORING FORCED CIRCULATION.	
1. **WHEN** 500KV offsite power is restored, **THEN** evaluate the need and desirability of restarting RCPs based on the following: • Adequacy of RCS and Core Heat Removal using natural circulation • Existing RCS pressure and temperatures • RCP Controlled Bleed-off temperatures 2. **IF** RCP operation is **NOT** desired, **THEN PROCEED** to step AB. 3. **IF** T_{COLD} is less than 306° F, **THEN** restart the RCPs **PER** OI-1A, REACTOR COOLANT SYSTEM AND PUMP OPERATIONS. 4. **IF** RCPs have been exposed to excessive moisture, **THEN** consider meggering RCP motors. **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.** 5. Check Controlled Bleed-off temperatures for the RCPs to be restarted have **NOT** exceeded 250° F. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS

AA. (continued)
 	
6. Verify RCP Controlled Bleed-off temperatures are less than 200° F or are lowering.
 	
7. Raise Pressurizer level to between 155 and 180 inches.
 	
8. Reduce T_{COLD} to less than 525° F.
 	
9. Verify RCP restart criteria are met by **ALL** of the following:
• Verify electrical power is available to the RCPs
  • RCP BUS
  • MCC-215 (ALL RCPs)
  • MCC-205 (21A/21B RCP)
• 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 30° 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
 	
(continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.9 (continued) • 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 **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** 10. **WHEN** RCP restart is desired **AND** RCP restart criteria are met, **THEN** start ONE RCP in a loop with an operating S/G as follows: a. Verify the RCP CBO ISOL valves are open: • 2-CVC-505-CV • 2-CVC-506-CV b. Verify the "CCW FLOW LO" alarm is clear. c. Start the associated OIL LIFT PP. d. Verify the "OIL LIFT PP PRESS LO" alarm is cleared. e. Operate the OIL LIFT PP for at least 60 seconds. f. Insert the RCP sync stick. g. Verify the synchroscope on panel 1C19 is **NOT** rotating. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AA.10 (continued) h. Start the RCP. i. Verify the RCP(s) are **NOT** cavitating by observing running current is steady. 11. Operate Charging and Letdown 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. 14. Start a second RCP in the same loop: a. Ensure RCP NPSH requirements are maintained **PER** ATTACHMENT (1), RCS PRESSURE TEMPERATURE LIMITS. b. Start an RCP **PER** step AA.10 above. c. Monitor RCP seal parameters following pump restart.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. EVALUATE THE NEED FOR PLANT COOLDOWN.	
1. **WHEN** the RCS parameters have been stabilized, **THEN** evaluate the need for a plant cooldown based on: • Plant Status • Auxiliary systems availability • Condensate inventory **PER** ATTACHMENT (9), MAKEUP WATER REQUIRED FOR RCS COOLDOWN 2. **IF** a plant cooldown is **NOT** desired, **THEN** perform the following: a. Maintain stabilized plant conditions. b. **PROCEED** to step AF. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 3. **IF** RCS boration has **NOT** been conducted, **THEN** commence RCS boration: a. Shut the VCT M/U valve, 2-CVC-512-CV. b. Open the BA DIRECT M/U valve, 2-CVC-514-MOV. c. Open the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV d. Verify the M/U MODE SEL SW, 2-HS-210, is in MANUAL. e. Start **ALL** available BA PPs. f. Shut the VCT OUT valve, 2-CVC-501-MOV. g. Start **ALL** available CHG PPs. 4. Record the time RCS boration was commenced: _____ 5. Record BAST levels: • 21 BAST: _____ • 22 BAST: _____ (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 6. Continue boration until **ONE** of the following conditions is met: a. Shutdown margin requirement has been achieved **PER** the NEOPs. b. BAST level has been lowered a total of 90 inches. c. Boration has been in progress as follows: • For 44 minutes if THREE CHG PPs are operating • For 66 minutes if TWO CHG PPs are operating • For 132 minutes if ONE CHG PP is operating 7. **WHEN** boration is complete, **THEN** secure boration as follows: a. Open the VCT OUT valve, 2-CVC-501-MOV. b. Stop the BA PP(s). c. Shut the BA DIRECT M/U valve, 2-CVC-514-MOV. d. Shut the BAST GRAVITY FD valves: • 2-CVC-508-MOV • 2-CVC-509-MOV 8. Commence RCS cooldown to less than 300° F using the ADVs, maintain RCS cooldown less than 100° F in any one hour. (continue)	

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IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AB. (continued) 9. Commence logging RCS and PZR cooldown rates **PER** ATTACHMENT(14), RCS COOLDOWN DATA SHEET, and ATTACHMENT(15), PRESSURIZER COOLDOWN DATA SHEET. 10. 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. **NOTE** Using the TURB BYP valves with Condensate/Main Feedwater in service, will enable greater cooldown capability and reduce the required amount of condensate inventory. 11. If desired, attempt to restore the TURB BYP valves, **AND** Condensate/Main Feedwater to operation **PER** the appropriate procedure.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC. 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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.1 (continued) **CAUTION** **The potential exists for pressurized thermal shock from an excessive cooldown rate followed by a repressurization.** c. Cycle RCS subcooling between 30 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.

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AC.1.c (continued) (2) Lower RCS subcooling to as near 30° 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 AC.1.c.(1) through AC.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 e. Monitor Pressurizer level and Reactor Vessel level for inventory trends.	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. PERFORM LOW TEMPERATURE ACTIONS.	
1. **WHEN** RCS temperature is less than 350° F, **THEN** verify that **NO** more than TWO RCPs are in operation. **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 325° F, **THEN** perform the following actions: 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.** c. Rack out the breakers for the TWO HPSI PPs **NOT** required. (continue)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD. (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)	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AD.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) 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	

IV. ACTIONS

RECOVERY ACTIONS	ALTERNATE ACTIONS
AE. COMMENCE SHUTDOWN COOLING.	
1. **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 30° F based on CET temperatures **THEN** initiate Shutdown Cooling **PER** OI-3B, SHUTDOWN COOLING.	
AF. IMPLEMENT THE APPROPRIATE PROCEDURE.	
1. Ensure the Safety Function Status Check Final Acceptance Criteria are met.	1.1 **IF** the Final Safety Function Status Check Acceptance Criteria are **NOT** met, **THEN** continue recovery actions as necessary until the Final Acceptance Criteria are met.
2. **IF ANY** safety signals have initiated, **AND** are no longer needed, **THEN** reset the appropriate signals.	
3. Commence ATTACHMENT(13), ADMINISTRATIVE POST-TRIP ACTIONS.	
4. **IMPLEMENT** the appropriate procedure as directed by the Shift Manager or the Plant Technical Support Center.	
END of Section IV	

V. 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 (1)	**NO** more than ONE CEA **NOT** fully inserted	___|___|___|___ ___|___|___|___	**NO** more than ONE CEA **NOT** fully inserted	_____
OR				
Boration status (1)	greater than or equal to 40 GPM	___|___|___|___ ___|___|___|___	greater than 2300 ppm	_____

(1) **NOT** applicable while vital AC buses are de-energized.

V. SAFETY FUNCTION STATUS CHECK

VITAL AUXILIARIES PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. 4KV vital buses 21 or 24	N/A	N/A	at least ONE energized	_____
b. 125V DC buses 11, 12 21 and 22	**ALL** greater than 105 volts	___|___|___|___ ___|___|___|___	**ALL** greater than 105 volts	_____
c. 120V AC vital buses 21, 22, 23, 24	at least THREE energized	___|___|___|___ ___|___|___|___	at least THREE energized	_____
d. 2Y09 or 2Y10	N/A	N/A	at least ONE energized	_____

V. SAFETY FUNCTION STATUS CHECK

RCS PRESSURE AND INVENTORY PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. Pressurizer pressure	less than the upper limits of Att. (1)	___|___|___|___ ___|___|___|___	less than the upper limits of Att. (1)	_____
b. Pressurizer level (1)	30 inches to 180 inches	___|___|___|___ ___|___|___|___	101 inches to 180 inches	_____
c. RCS subcooling	less than 140°F	___|___|___|___ ___|___|___|___	less than 140°F	_____
	greater than 30°F **OR** CET Temperatures less than 50°F superheated	___|___|___|___ ___|___|___|___ ___|___|___|___ ___|___|___|___	greater than 30°F CET Temperatures less than 50°F superheated	_____ _____
d. Reactor Vessel level	core covered	___|___|___|___ ___|___|___|___	above the top of the hot leg	_____

(1) **NOT** applicable while vital AC buses are de-energized.

V. SAFETY FUNCTION STATUS CHECK

CORE AND RCS HEAT REMOVAL PARAMETERS	SAFETY FUNCTION ACCEPTANCE CRITERIA			
	CRITERIA	INTERMEDIATE CHECK	CRITERIA	FINAL CHECK
a. CET Temperatures	less than 600°F	___|___|___|___ ___|___|___|___	less than 600°F	_____
b. RCS T_{COLD}	constant or lowering	___|___|___|___ ___|___|___|___	constant or lowering	_____
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

V. 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 (1)	less than 185°F	___|___|___|___ ___|___|___|___	less than 120°F	_____
c. Containment Radiation Monitor (2)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. 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) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
b. Condenser Off-Gas RMS (2-RI-1752) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
c. S/G B/D RMS (2-RI-4014) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____
d. Main Vent Gaseous RMS (2-RI-5415) (1)	**NO** unexplained rise	___|___|___|___ ___|___|___|___	**NO** unexplained rise	_____
	alarm clear	___|___|___|___ ___|___|___|___	alarm clear	_____

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

V. SAFETY FUNCTION STATUS CHECK

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

EOP-7 UNIT 2
STATION BLACKOUT

PLANT STABILIZATION	COPING WITH SBO	RECOVERY	RESTORATION

• SHUT THE MSIVS AND BLOWDOWN VALVES
• MINIMIZE RCS INVENTORY LOSS
• ESTABLISH RCS HEAT SINK
  • Locally operate ADVs to maintain S/G pressure between 850 and 920 PSIA.
  • Locally operate 21 OR 22 AFW PP to maintain S/G level between (-)24 and (+)30 inches
	• ATTEMPT TO RESTORE AT LEAST ONE 4KV BUS
	• PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING
	• VERIFY NATURAL CIRCULATION
	• COOLDOWN TO MAINTAIN SUBCOOLING 30 - 50°F
	• BLOCK SGIS AND SIAS
	• ENSURE CONTAINMENT INTEGRITY
		• VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING
		• ENSURE ADEQUATE SHUTDOWN MARGIN
		• EVALUATE RESTORING FORCED CIRCULATION
		• EVALUATE THE NEED FOR PLANT COOLDOWN
			• ESTABLISH LTOP CONTROLS
			• COMMENCE SDC
			• IMPLEMENT APPROPRIATE PROCEDURE

START	FUNCTION	DONE	PAGE
	A. COMMENCE THE INTERMEDIATE SAFETY FUNCTION STATUS CHECKS.	C	7
	B. DETERMINE APPROPRIATE EMERGENCY RESPONSE ACTIONS PER THE ERPIP.	C	7
	C. OBTAIN PLACEKEEPER **AND** RECORD TIME. _____		8
	D. PROTECT THE CONDENSER FROM OVERPRESSURE AND MINIMIZE S/G INVENTORY LOSS.		8
	E. MINIMIZE RCS INVENTORY LOSS.	C	9
	F. ESTABLISH RCS HEAT SINK.	C	10
	• Station an operator to manually operate ADVs • S/G pressure **850 - 920 PSIA** • TCOLD **525 - 535°F** • Locally operate 21 or 22 AFW PP to Maintain S/G level **(-)24 - (+)30 inches**		
	G. VERIFY THE EMERGENCY DC PUMP(s) ARE OPERATING.		14
	H. ALIGN THE ELECTRICAL SYSTEM FOR POWER RESTORATION.		15
	I. ATTEMPT TO RESTORE POWER TO AT LEAST ONE 4KV BUS.	C	18

	• Check 125V DC Bus steady state amps are less than the following:
	  • (11 Bus) 230 AMPS
	  • (12 Bus) 290/100 AMPS
	  • (21 Bus) 230 AMPS
	  • (22 Bus) 310/120 AMPS		

	J. PROTECT ELECTRONIC EQUIPMENT FROM OVERHEATING.		23
	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.		

START	FUNCTION	DONE	PAGE
	K. MAINTAIN NATURAL CIRCULATION FLOW VERIFICATION.	C	26
	• At least 30°F subcooling based on CET temperatures • THOT minus TCOLD less than 50°F • TCOLD constant or lowering • THOT constant or lowering • CET temperatures trend consistent with THOT • Steaming rate affects RCS temperatures		
	L. **IF** RCS SUBCOOLING DROPS TO 30°F, **THEN** COOL DOWN RCS TO MAINTAIN SUBCOOLING.	C	27

	• Cooldown the RCS to restore and maintain subcooling **30 - 50°F** using ADVs, while maintaining the following:
	  • 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}**
	  • TCOLD greater than NEOP-23 curve		

	M. BLOCK SGIS AND SIAS.		27
	N. ENSURE CONTAINMENT INTEGRITY.		28
	O. LOWER MAIN GENERATOR HYDROGEN PRESSURE TO 2 PSIG.		28
	NOTE: Do **NOT** continue until at least ONE 4KV bus has been re-energized. Steps P through AF are to be performed when at least ONE 4KV bus is re-energized.		
	P. VERIFY THE SHUTDOWN SEQUENCER LOADS ARE OPERATING.		29
	Q. RESTORE COMPONENT COOLING FLOW.	C	30
	• **IF ANY** RCP lower seal temperature is greater than 280°F, **THEN** restore Component Cooling by throttling 2-CC-284.		

START	FUNCTION	DONE	PAGE
	R. RESTORE REACTOR MCCS AND INSTRUMENT BUSES.	C	32
	• MCC-204 and 214 • 2Y09 and 2Y10		
	S. ENSURE ADEQUATE SHUTDOWN MARGIN	C	36
	T. MAINTAIN PRESSURIZER LEVEL BETWEEN **101 AND 180 INCHES.**	C	38
	U. MAINTAIN RCS SUBCOOLING BETWEEN **30 AND 140°F.**	C	43
	V. MAINTAIN VCT LEVEL BETWEEN **60 AND 100 INCHES.**	C	46
	W. ENSURE AUXILIARY SYSTEM OPERATION.	C	47
	X. ENERGIZE SUPPORT EQUIPMENT.		48
	Y. **IF** SIAS ACTUATES, **THEN** CHECK DG LOADING.	C	51
	• **IF** 2A or 2B DG load exceeds 3600 KW, **THEN** perform rapid load reduction. • **IF** 2A or 2B DG load exceeds 3300 KW, **THEN** secure DG loads.		
	Z. MINIMIZE 250V DC BATTERY DISCHARGE.		52
	AA. EVALUATE RESTORING FORCED CIRCULATION.	C	53
	AB. EVALUATE THE NEED FOR PLANT COOLDOWN.	C	57
	AC. CONTROL CORE AND RCS VOIDING.	C	61
	AD. PERFORM LOW TEMPERATURE ACTIONS.	C	64
	• **WHEN** TCOLD is less than 325°F, **THEN** establish RCS low temperature conditions. • **WHEN** TCOLD is less than 306°F, **THEN** establish MPT protection.		
	AE. COMMENCE SHUTDOWN COOLING.	C	68
	AF. IMPLEMENT THE APPROPRIATE PROCEDURE.		68

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