PSEG NUCLEAR L.L.C.
SALEM/OPERATIONS

S2.OP-IO.ZZ-0006(Q) REV. 40

HOT STANDBY TO COLD SHUTDOWN

USE CATEGORY: **I**

- Biennial Review Performed: Yes ____ No ____ NA ✓
- DCP Packages and Affected Document Numbers incorporated into this revision: None
- The following OTSCs were incorporated into this revision: None

REVISION SUMMARY:

- The following changes are incorporated to provide additional clarification and guidance regarding the RCS draining process to ensure expected level response is obtained, and is in response to SAP Order 70090887, Unintended Reduction in RCS Inventory. Removed PZR level bands of 100 - 105% and 80 - 86% from the associated steps. The information is to be obtained using information previously reviewed and approved in Exhibit 1 of this procedure. **[70103122]**

  - Changed Step 5.1.60 CAUTION (second bullet), to read "The expected PZR COLD CAL level value in SPDS (U2LT0462S) in a water solid condition is <105%. An indicated level of ≥105% is highly suspect. Maintenance is to be notified to troubleshoot the apparent failure of the instrument whenever the indicated value is not as expected".

  - Changed Step 5.1.60.B to read; "ENSURE PZR COLD CAL Level in SPDS (U2LT0462S) is indicating <105% (Refer to EQACE 70090500).

  - Added Step 5.1.60.C "ENSURE PZR COLD CAL Level in SPDS (U2LT0462S) is indicating as expected. Refer to Exhibit 1, Pressurizer Level Channels, for channel behavior based on pressurizer water temperature."

  - Changed NOTE at Step 5.1.60.G to read; "Refer to Exhibit 1, Pressurizer Level Channels, for channel behavior based on pressurizer water temperature".

IMPLEMENTATION REQUIREMENTS **Effective Date: October 13, 2009**

None

HOT STANDBY TO COLD SHUTDOWN

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1.0 **PURPOSE**

1.1 To provide the instructions necessary to transition from Hot Standby (Mode 3) to Cold Shutdown (Mode 5).

2.0 **PREREQUISITES**

___ 2.1 IF the cooldown is required to comply with a TSAS,
THEN SM/CRS **REFER** to ECG for the appropriate event classification and reporting requirements.

___ 2.2 **NOTIFY** Chemistry of impending plant cooldown and the need to sample the RCS IAW SC.CH-TI.ZZ-0544(Q), Reactor Startup, Shutdown, and >15% Power Change Surveillance Requirement.

___ 2.3 IF cooldown to Mode 5 is anticipated,
THEN, as directed by Chemistry, **PLACE** the CVCS Cation Bed
OR standby CVCS Mixed Bed Demineralizer in service IAW S2.OP-SO.CVC-0012(Q), CVCS Demineralizer - Normal Operation, to begin delithiating the RCS.

___ 2.4 **ENSURE** all Shutdown and Control Rods are fully inserted.

___ 2.5 **ADJUST** RCS and Pressurizer boron concentrations as required to maintain adequate Shutdown Margin during the cooldown.
The RCS and Pressurizer boron concentrations are to be maintained above the minimum Shutdown Margin requirement during the cooldown.

___ 2.6 IF additional BAST volume is required to support RCS boration during cooldown,
THEN **ALIGN** Unit 1 BAST to Unit 2 BAST IAW S2.OP-SO.CVC-0005(Q), Boric Acid Solution Preparation And Transfer.

___ 2.7 **NOTIFY** Maintenance of the following:

___ ♦ S2.IC-FT.RCP-0070(Q), 2PT403 RCS Hot Leg Pressure Channel II and S2.IC-FT.RCP-0071(Q), 2PT405 RCS Hot Leg Pressure Channel I, will be required prior to placing POPS in service IAW T/S 4.4.10.3.1 and prior to RCS cooldown to ≤312°F

___ ♦ S2.IC-ST.RHR-0014(Q), RHR Interlock and Alarm Verification, will be required when RCS pressure is <375 psig and prior to placing RHR in service IAW T/S 4.5.2.i

___ 2.8 **NOTIFY** the Shift Operations Manager to provide direction for applicability of performing S2.OP-ST.SJ-0020(Q), Periodic Leakage Test - RCS Pressure Isolation Valves.

3.0 PRECAUTIONS AND LIMITATIONS

___ 3.1 This procedure does not duplicate or override any precautions and limitations referenced in approved operating procedures during the cooldown process. Steps are provided in this procedure to ensure conditions are satisfied prior to Mode changes IAW Administrative and Technical Specifications requirements.

___ 3.2 At least one Source Range Channel, OHA E-13, SR HI FLUX AT S/D, and the Audio Count Rate Channel should be OPERABLE anytime the reactor is shutdown.

___ 3.3 23 Charging Pump flow path shall be aligned to Unit 1 OR the pump shall be C/T when 21 or 22 Safety Injection Pump is capable of injection into the core with RCS temperature ≤312°F with the Reactor Vessel Head installed. **[C0565]**

___ 3.4 **1**CV462, CHARGING CROSS TIE MOV may spuriously open due to a hot short in its power cable or control circuit during a fire on Unit 1. The design basis for Unit 2 POPS may be challenged with the additional charging flow from Unit 1. For this reason, **1**CV464, CHARGING CROSS TIE ISOLATION VALVE is to be CLOSED when Unit 2 RCS temperature is ≤312°F.

___ 3.5 RCS dilutions are allowed IAW S2.OP-SO.CVC-0006(Q), Boron Concentration Control, provided:

- ♦ RCS is maintained above the Cold Shutdown Boron Concentration IAW S2.RE-RA.ZZ-0016(Q), Curve Book.
- ♦ CVCS Makeup Control System is returned to at least the Cold Shutdown boron concentration value IAW S2.RE-RA.ZZ-0016(Q), Curve Book.

___ 3.6 The following requirements are applicable to heatup or cooldown and plotted IAW S2.OP-TM.ZZ-0001(Q), RCS Pressure/Temperature Curves:

___ 3.6.1 Pressurizer Insurge/Outsurge (WCAP 14950):

___ ♦ During normal RCS heatup and cooldown evolutions, some plant operating practices induce pressurizer insurge and outsurge cycles. These cycles can introduce additional fatigue loading to the lower end of the pressurizer when the temperature difference between the RCS and PZR is significant. Existing plant instrumentation cannot be relied upon to detect the occurrence of this condition.

___ ♦ During Pressurizer cooldown evolutions, the Pressurizer Surge Line temperature should be monitored to ensure an outsurge and relatively stable temperature is maintained.

___ ♦ Pressurizer Surge Line temperature should trend with the saturation temperature in the Pressurizer. Pressurizer Surge Line temperature trending away from the saturation temperature and towards RCS Hot Leg temperature is an indication of an insurge.

___ ♦ To minimize Pressurizer insurge during RCS cooldown, Charging flow should be adjusted to offset the change in RCS volume while maintaining Pressurizer Level relatively constant. Another strategy would be to maximize Pressurizer Spray flow while maintaining Pressurizer Level relatively constant.

___ ♦ The pre-job brief should discuss factors that may have a significant impact on pressurizer insurge and outsurge cycles. Factors such as, Pressurizer Heater capacity, RCS heatup / cooldown rates and Charging / Letdown flow adjustments can all contribute to undesirable pressurizer insurge and outsurge cycles. The use of human performance reduction tools should also be discussed.

___ ♦ When a Pressurizer insurge that causes a >100°F step change in PZR surge line temperature is identified:

___ • Efforts should be made to allow the water to reach equilibrium temperature prior to initiating an outsurge.

___ • A Notification directed to Engineering is to be initiated for evaluation IAW WCAP 14950.

___ 3.6.2 T/S Surveillance 4.4.10.1.1: The Reactor Coolant System pressure and temperature (except the pressurizer) shall be determined to be within the limits at least once per 30 minutes during system heatup, cooldown, and inservice leak and hydrostatic testing operations with:

- ♦ A maximum heatup of 100°F in any one hour period.
- ♦ A maximum cooldown of 100°F in any one hour period.
- ♦ A maximum cooldown of 50°F in any one hour period when RCS temperature is <200°F.
- ♦ A maximum temperature change of ≤5°F in any one hour period during hydrostatic testing operations.

___ 3.6.3 T/S Surveillance 4.4.10.2: The pressurizer temperatures shall be determined to be within the limits at least once per 30 minutes during system heatup or cooldown. The spray water temperature differential shall be determined to be within the limit at least once per 12 hours during auxiliary spray operation with:

- ♦ A maximum heatup of 100°F in any one hour period.
- ♦ A maximum cooldown of 200°F in any one hour period.
- ♦ A maximum spray water temperature differential of 320°F.

___ 3.6.4 Cooldown step changes should be limited to <25°F/hour. A step change is considered a large temperature change within a few minutes followed by essentially constant temperature for the balance of the hour. This is considered good operating practice (DES-DEF-90-01584).

___ 3.6.5 RCS shrinkage will occur during RCS cooldown. Sufficient pressurizer inventory should be established prior to initiating RCS cooldown activities. At least 13,000 gallons of makeup water will be needed to cooldown from 547°F to 350°F and an additional 7,300 gallons will be needed to cooldown to 200°F. Additionally, the 45 gpm letdown orifice and RCS makeup source from the RWST may be used to maintain a relatively constant pressurizer level.

___ 3.6.6 During a Cooldown/Depressurization, Letdown flow will decrease as RCS Pressure drops. 23 Charging Pump linkage adjustment OR 2CV55 Low Flow control should be made ready prior to reaching this condition to preclude a rapidly increasing pressurizer level.

___ 3.6.7 As RCS cooldown progresses, the maximum cooldown rate provided by the Steam Dump System drops significantly as RCS temperature approaches 400°F.

___ 3.6.8 The cooldown rate provided by the Steam Dump System is affected by changes in Condenser backpressure. For example, starting a vacuum pump increases the steam flow through the system and increases the RCS cooldown rate.

___ 3.7 The automatic isolation time of <5 seconds for MSIVs pertains to the OPERABILITY of the MSIVs in Modes 1-3 per the requirements of T/S 3.7.1.5. S/R 4.7.1.5 states that each MSIV is demonstrated OPERABLE in Modes 1-3 by verifying full closure within 5 seconds when tested pursuant to T/S 4.0.5. Thus, the closure time pertains to main steam line isolation, not containment isolation.

T/S 3.6.3 pertains to OPERABILITY of the containment isolation valves in Modes 1-4. The main steam isolation valves (MSIVs) fulfill their containment isolation function as remote-manual containment isolation valves. The automatic closure of the MSIVs is NOT required for containment isolation due to having a closed system inside containment.

[80045103]

___ 3.8 When a MSIV is being relied upon as a remote-manual valve and either of the following conditions exist, the MSIV is inoperable IAW T/S 3.6.3:

- With secondary side steam pressure <118 psia (T_{avg} <340°F) AND the hydraulic actuator is NOT capable of closing the valve, or
- With secondary steam side pressure ≥118 psia (T_{avg} ≥340°F) and S2.OP-ST.MS-0003(Q) has NOT been performed within the last 92 days, AND the hydraulic actuator is NOT capable of closing the valve.

If either of the above conditions exist, the Mechanical Shaft Locking Device(s) is to be installed to secure the MSIV(s) in the closed position to comply with T/S 3.6.3.b.

___ 3.9 When a MSIV is being relied upon as a remote-manual valve and the valve hydraulic actuator is NOT capable of closing the valve, the MSIV is inoperable IAW T/S 3.6.3.

___ 3.10 The Post-Fire Safe Shutdown Equipment Administrative Controls, action level requirements are to be implemented should the MSIVs be closed in Step 5.1.35 or 5.1.36, IAW OP-SA-108-115-1001, Operability Assessment And Equipment Control Program [80067063].

___ 3.11 The preferred method for RCS cooldown is by using the **[CAPR 70010788]** Steam Dump System in the Main Steam Pressure Control Mode. Operations Manager approval is required to utilize the MS10, Atmospheric Steam Relief Valves for normal cooldown OR normal RCS temperature control. This requirement does NOT supersede the authority of a licensed operator to use the MS10 valves to control RCS temperature in abnormal situations where the preferred heat sink is NOT available or inadequate.

___ 3.12 RCS cooldown via 21-24MS10 requires close monitoring of steam pressures to preclude inadvertent SI from Steam Generator differential pressure.

___ 3.13 Chemistry is to be notified whenever steam is released from the Steam Generators to the atmosphere by way of any MS10, S/G Safety valve, or steam driven AFP exhaust. Chemistry will need to know the duration of the steam release as well as the affected Steam Generator(s). With this information, Chemistry can calculate the radioactive material concentration in the steam relative to that in the steam generator water IAW the ODCM section for Secondary Side Radioactive Gaseous Effluents and Dose Calculation. **[70028596]**

___ 3.14 The ability to reduce Reactor Coolant System or Steam Generator metal temperature is hindered when RCS water inventory is reduced. As a result of this, upcoming outage activities, such as the removal of S/G primary manway covers, should be reviewed prior to reducing RCS water inventory. **[70034006]**

___ 3.15 In Modes 1-3, 2/3 S/G Level Channels at ≤14% on any Steam Generator is considered an ESF Actuation regardless of AFW Pump status [70027485]. For this reason, 21-24 S/G narrow range levels are to be maintained ≥28% during the RCS cooldown. The RCS cooldown rate is to be reduced when any S/G is <28% narrow range level. The RCS cooldown is to be suspended when any S/G is ≤24% narrow range level. RCS cooldown may recommence when all S/G narrow range levels are >28%. **[70067944]**

___ 3.16 Cold Shutdown Testing (CST) requirements as described in ER-AA-321, Administrative Requirements for Inservice Testing [70039673]:

___ ♦ All due and overdue Cold Shutdown Testing procedures are required to be performed during a Refueling Outage prior to returning the plant to operation.

___ ♦ Cold Shutdown Testing is also required when the plant is placed in Mode 5 from Mode 4 (Mode 5 being the trigger) for reasons other than Refueling Outage. It is <u>NOT</u> the intent of the Inservice Testing Program to hold the plant in cold shutdown in order to complete Cold Shutdown Testing, however, it is the intent to complete as many tests as possible on a good-faith basis. The Station Planning Operations scheduler will schedule testing based on a Cold Shutdown, Refueling and Extended Outage testing list provided by the IST Program Engineer. Scheduled testing is to be started no later than 48 hours after reaching Mode 5 and is to continue until the plant is ready for Mode 4 entry at which time any in-progress 4.0.5V surveillances are completed without initiating others. In some cases Cold Shutdown Testing may be required to be performed in Mode 4 or Mode 3 depending on the overdue dates relative to testing already performed during Mode 5.

___ 3.17 S2.OP-AB.RHR-0001(Q), Loss Of RHR, is to be reviewed prior to opening any RCS Vent Path within 6 hours of reactor shutdown with the Containment Equipment Hatch open.

___ 3.18 When the RCS is vented to the Containment with either the Containment Equipment Hatch or a Containment Air Lock OPEN, the vent path established must be capable of being closed prior to the time to Core Boiling as determined by S2.OP-AB.RHR-0001(Q).
When the RCS is vented to the Containment, Salem's interpretation of NUMARC 91-06 requires that either the RCS is made intact prior to the time to core boiling should RHR be lost (applicable when the RCS loops are filled and two or more Steam Generators are available as a heat sink for Natural Circulation. Heat sink means the Steam Generators has a feed make-up source available, Secondary water level above the U-tubes, and a Steam Generator vent path), OR Containment Closure is established prior to time to core boiling should a Loss of RHR occur. (Containment Closure in this statement only applies to the Containment Equipment Hatch and the Containment Air Locks; Containment Closure of all other penetrations is required prior to Core Uncovery and is established IAW S2.OP-AB.CONT-0001(Q) [80082938].

___ 3.19 An alternate Pressurizer "Cold Scaled Level" indication for at least one of the three hot calibrated PZR Level Channels is to be provided whenever the PZR Liquid/Vapor temperature is ≤210°F. A "Cold Scaled Level" indication is simply a hot calibrated channel with a different meter scale. The scaling was developed utilizing the known relationship between the hot and cold calibrated channels at 140°F as depicted in Exhibit 1. It should be noted that the "Indicated Pressurizer Level (%)" displayed in Exhibit 1 graphs were developed using existing "Hot Calibrated" channel scaling and cannot be used with selected "Cold Scaled Level" indication(s). "Cold Scaled Level" indication(s) may be provided at anytime after Mode 4 is entered, however at least one indication is to be provided prior to lowering pressurizer level at Step 5.1.59. **[CAPR 70090887]**

4.0 EQUIPMENT/MATERIAL REQUIRED

- ♦ 3/64 Hex Key (Allen) wrench (for Maintenance to provide "Cold Scale Level" indications)

5.0 **PROCEDURE**

5.1 **Hot Standby To Cold Shutdown**

___ 5.1.1 IF this procedure was entered from the EOP network procedures, THEN:

___ A. IF the Automatic Safety Injection Block is established (2RP4), THEN:

1. **COMPLETE** one of the following:

___ ♦ **COMPLY** with T/S 3.0.3.
(SSPS Train A & B inoperable; T/S 3.3.2.1, Table 3.3-3, Functional Unit 1.b, Automatic Actuation Logic)

___ ♦ **RE-INSTATE** AUTO SI IAW S2.OP-SO.RPS-0008(Q), Establishing/Removing Auto SI Block.

Direct a second Operator to **PERFORM** Independent Verification of AUTO SI BLOCK removed (unblocked):

_____ _____
IV Signature Date

___ 2. **INITIATE** S2.OP-SO.SJ-0004(Q), Post Safety Injection System Restoration.

___ B. **REVIEW** Mode 3 T/S requirements to determine applicable action statements based on the evaluation of available instrumentation, Phase A and/or Phase B system alignments, electrical distribution system alignment, and other ECCS/ESF system alignments.

___ C. IF Main Steam Isolation signal is NOT present, THEN **OPEN** 21-24MS7, MN STM DRN valves.

___ D. **INITIATE** S2.OP-SO.CN-0002(Z), Steam Generator Feed Pump Operation, to complete SGFP shutdown sequence.

NOTE

Steps 5.1.2 through 5.1.13 may be performed in any order at discretion of the SM/CRS.

___ 5.1.2 **DIRECT** an Operator to CLOSE 2BF44, FW TO MSCDT.

___ 5.1.3 IF Containment inspection is required,
THEN **INITIATE** S2.OP-PT.CAN-0001(Q), Containment Walkdown.

___ 5.1.4 IF Main Turbine-Generator degas is required,
THEN **INITIATE** S2.OP-SO.GEN-0003(Z), Main Generator Gas System Operation.

___ 5.1.5 **ESTABLISH** Pressurizer Level between 25-53%: **[CAPR 70090887]**

___ A. **PLACE** Charging System Master Flow Controller in MANUAL.

___ B. **ADJUST** CHARGING FLOW as required to establish and maintain pressurizer level during cooldown.

___ 5.1.6 IF RCS is to be borated prior to start of cooldown to 350°F
OR is to be borated concurrently with cooldown,
THEN:

___ A. **ENSURE** Shutdown Margin IAW SC.RE-ST.ZZ-0002(Q), Figures.

___ B. **PERFORM** RCS boration IAW S2.OP-SO.CVC-0006(Q), Boron Concentration Control.

NOTE

To preclude delays during the next Unit startup, 23 AFW Pump, when available, should be placed in service to ensure any required maintenance is identified.

___ 5.1.7 IF 23 AFW Pump is available AND at the SM/CRS discretion,
THEN:

___ A. **PLACE** 23 AFW Pump in service IAW S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation, to verify proper operation.

___ B. **INITIATE** S2.OP-ST.AF-0007(Q), Inservice Testing - Auxiliary Feedwater Valves Mode 3.

___ C. When operation is verified, **SWAP** to motor driven AFW pumps AND **REMOVE** 23 AFW Pump from service IAW S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation.

___ 5.1.8 **COORDINATE** RCS Fission Gas Removal AND RCS Mechanical Degasification evolutions with Chemistry personnel IAW S2.OP-SO.CVC-0011(Q), RCS Degasification.

___ 5.1.9 **ENSURE** CVCS Makeup Control System is adjusted to at least the Cold Shutdown boron concentration value IAW S2.RE-RA.ZZ-0012(Q), Figures.

___ 5.1.10 IF Steamline Isolation and Response Time Testing is to be performed, THEN **INITIATE** S2.OP-ST.MS-0003(Q), Steamline Isolation and Response Time Testing Modes 2-3.

___ 5.1.11 IF the High Flux at Shutdown Alarm was NOT adjusted in S2.OP-IO.ZZ-0005(Q) at approximately 547°F, THEN **NOTIFY** Maintenance to adjust the High Flux at Shutdown Alarm IAW SC.IC-DC.NIS-0003(Q), Bistable Setpoint Adjustment N31 and N32 Source Range High Flux at Shutdown.

___ 5.1.12 IF any RCP(s) are to be stopped when RCS temperature is <500°F to support the current outage plan (Refer to Step 5.1.21), THEN:

___ A. IF Rod Control System is ENERGIZED, THEN **INITIATE** S2.OP-SO.RCS-0001(Q), Rod Control System Operation to align the system NOT capable of Rod withdrawal to comply with T/S 3.4.1.2.c.

___ B. **INITIATE** S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation. A minimum of one RCP is to remain in operation to comply with T/S 3.4.1.2.

___ C. **INITIATE** the performance of S2.OP-ST.RC-0005(Q), Reactor Coolant System RC/RHR Loop Status Modes 3-4.

___ 5.1.13 **PERFORM** the following (70016928):

___ A. IF Turbine Building Sump Pumps are aligned to the Non-Rad Waste Basin, THEN:

___ 1. **ENSURE** 2BD107, 2 TGA SUMP ISO VLV TO NON-RAD is OPEN.

___ 2. **ENSURE** 2BD109, 2TGA SUMP TO SKIMMER ISOL VLV is CLOSED.

___ 3. **ENSURE** the following breakers are OPEN:

___ ♦ S2230-2HY5TB1H, 2 FLOOD PUMP

___ ♦ S1230-1HY5TB1H, 1 FLOOD PUMP

___ B. IF Turbine Building Sump Pumps are aligned to #2 Skimmer Tank, THEN **PERFORM** the following:

___ ♦ **OPEN** the following breakers:

___ ● S1230-1HY5TB1H, 1 FLOOD PUMP

___ ● S1230-1HY5TB4G, 13 TURBINE AREA SUMP PUMP

___ ● S1230-1HY5TB5G, 14 TURBINE AREA SUMP PUMP

___ ● S2230-2HY5TB1H, 2 FLOOD PUMP

___ ● S2230-2HY5TB4G, 23 TURBINE AREA SUMP PUMP

___ ♦ **DIRECT** Site Services to install a temporary sump pump in 13 TGA Sump with the pump discharge directed to the Chemical Waste Hopper (100′ TGA, DM Plant).

___ ♦ **DIRECT** Chemistry to install a temporary sump pump in 23 TGA Sump IAW S2.CH-AB.BD-1149(Z), Redirecting Unit 2 Turbine Building Sump Discharge to the Chemical Waste Line.

___ ♦ **NOTIFY** Chemistry of 13 TGA Sump temporary sump pump status AND **DOCUMENT** in the Control Room Narrative Log.

NOTE

RCS and Pressurizer cooldown plots should be maintained IAW S2.OP-TM.ZZ-0001(Q), RCS Pressure/Temperature Curves.

___ 5.1.14 **INITIATE** the following:

___ ♦ SC.OP-DL.ZZ-0011(Q), Reactor Coolant System Heatup/Cooldown Log

___ ♦ SC.OP-DL.ZZ-0012(Q), Pressurizer Heatup/Cooldown Log

NOTES

- During normal RCS heatup and cooldown evolutions, some plant operating practices induce pressurizer insurge and outsurge cycles. These cycles can introduce additional fatigue loading to the lower end of the pressurizer when the temperature difference between the RCS and PZR is significant. Existing plant instrumentation cannot be relied upon to detect the occurrence of this condition.
- During Pressurizer cooldown evolutions, the Pressurizer Surge Line temperature should be monitored to ensure an outsurge and relatively stable temperature is maintained.
- Pressurizer Surge Line temperature should trend with the saturation temperature in the Pressurizer. Pressurizer Surge Line temperature trending away from the saturation temperature and towards RCS Hot Leg temperature is an indication of an insurge.
- To minimize Pressurizer insurge during RCS cooldown, Charging flow should be adjusted to offset the change in RCS volume while maintaining Pressurizer Level relatively constant. Another strategy would be to maximize Pressurizer Spray flow while maintaining Pressurizer Level relatively constant.
- The pre-job brief should discuss factors that may have a significant impact on pressurizer insurge and outsurge cycles. Factors such as, Pressurizer Heater capacity, RCS heatup / cooldown rates and Charging / Letdown flow adjustments can all contribute to undesirable pressurizer insurge and outsurge cycles. The use of human performance reduction tools should also be discussed.
- When a Pressurizer insurge that causes a >100°F step change in PZR surge line temperature is identified, efforts should be made to allow the water to reach equilibrium temperature prior to initiating an outsurge. A NOTF directed to Engineering is to be initiated for evaluation IAW WCAP 14950.

___ 5.1.15 **ESTABLISH** Pressurizer outsurge flow by placing the Pressurizer Control System in MANUAL IAW S2.OP-SO.PZR-0005(Q), Pressurizer Pressure Control System Operation.

___ 5.1.16 **ESTABLISH** Pressurizer Level between 25-53%: **[CAPR 70090887]**

___ A. **PLACE** Charging System Master Flow Controller in MANUAL.

___ B. **ADJUST** CHARGING FLOW as required to establish and maintain pressurizer level during cooldown.

___ 5.1.17 IF Steam Dump System is available,
THEN **INITIATE** RCS Cooldown IAW S2.OP-SO.MS-0002(Q),
Steam Dump System Operation.

___ 5.1.18 IF the Steam Dump System is NOT available,
AND 21-24MS10, Main Steam System Relief Valve use is authorized,
THEN **INITIATE** RCS Cooldown using 21-24MS10, Main Steam System Relief Valves, as necessary, to establish an RCS cooldown rate of <100°F/hour.
[Refer to Step 3.11]

___ 5.1.19 When RCS temperature reaches 543°F
AND LOW LOW T_{AVG} 2/4, TAVG LOW LOW (P-12 Permissive)
yellow status lamp is illuminated on 2RP4:

___ A. IF Steam Dump System is in service,
THEN **BYPASS** Steam Dump Low Low T_{AVG} Block (P-12 Permissive)
IAW S2.OP-SO.MS-0002(Q), Steam Dump System Operation.

___ B. **DEPRESS** the Safeguards Actuation, Train "A" Controls,
BLOCK HI STM LN FLO SI Bezel pushbutton. (Blocks Train "A"
High Steam Flow coincident with Low Steam Pressure or Low-Low T_{AVG} SI).

___ C. **DEPRESS** the Safeguards Actuation, Train "B" Controls,
BLOCK HI STM LN FLO SI Bezel pushbutton. (Blocks Train "B"
High Steam Flow coincident with Low Steam Pressure or Low-Low T_{AVG} SI).

___ D. **ENSURE** HI STM LN FLO SI BLKD blue status lamp illuminated on 2RP4.

___ E. **DIRECT** a second Operator to perform Independent Verification of Safeguards Actuation block status:

___ ♦ Train "A" Controls, BLOCK HI STM LN FLO SI Bezel pushbutton illuminated.

___ ♦ Train "B" Controls, BLOCK HI STM LN FLO SI Bezel pushbutton illuminated.

_____ _____
IV Signature Date

___ 5.1.20 **ADJUST** Pressurizer Pressure Control System controls to establish a desired Pressurizer cooldown rate while maintaining Pressurizer outsurge flow.

___ 5.1.21 IF RCS temperature is <500°F
AND RCP(s) are to be stopped to support the current outage plan,
THEN **INITIATE** RCP stop sequence as directed by the SM/CRS as follows:

___ A. **ENSURE** Rod Control System is de-energized to comply with T/S 3.4.1.2.c.

NOTE

Steam Generator steam flow will transfer to the RC Loop(s) with an operating RCP as the RCP(s) on the other RC Loops are stopped. This transfer of steam flow is more prevalent immediately after the third RCP is stopped. The NCO should be prepared to make significant AFW adjustments after each RCP is stopped.

___ B. **STOP** RCPs as directed by the SM/CRS IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation while maintaining a minimum of one in operation to comply with T/S 3.4.1.2.

NOTE

Pressurizer Pressure SI will automatically reset if pressure rises above 1915 psig.
SI signal may be reblocked when pressure is reduced to <1915 psig.

___ 5.1.22 When RCS is <1915 psig, AND PZR PRESS BELOW P-11 2/3,
P-11 green status lamp is illuminated on 2RP4:

___ A. **PRESS** Train "A" Controls, BLOCK LO PZR PRESS SI, 2CC1 Console Safeguards Actuation Bezel.

___ B. **PRESS** Train "B" Controls, BLOCK LO PZR PRESS SI, 2CC1 Console Safeguards Actuation Bezel.

___ C. **ENSURE** 2RP4, LO PZR PRESS SI BLOCK, blue status lamp illuminated.

___ D. **DIRECT** a second Operator to perform Independent Verification of Safeguards Actuation block status:

___ ♦ Train "A" Controls, BLOCK LO PZR PRESS SI Bezel pushbutton illuminated.

___ ♦ Train "B" Controls, BLOCK LO PZR PRESS SI Bezel pushbutton illuminated.

_____ _____
IV Signature Date

NOTE

Letdown flow should NOT exceed 130 gpm. Letdown pressures and temperatures are to be closely monitored to ensure flashing in the Letdown line does not occur.

___ 5.1.23 **PERFORM** the following:

___ A. **OPEN** 2CV3, 2CV4 and 2CV5 to maintain required letdown flow rates as required during RCS cooldown.

___ B. IF CVCS Letdown is to be maximized to support current plant evolutions, THEN **MAXIMIZE** Letdown Flow During Shutdown IAW S2.OP-SO.CVC-0001(Q), Charging, Letdown, And Seal Injection.

___ 5.1.24 During cooldown, **ADJUST** charging flow as needed to maintain Pressurizer level ≥25%. **[CAPR 70090887]**

___ 5.1.25 IF a Centrifugal Charging Pump is in service, THEN:

___ A. **PLACE** 2CA2015, CONTROL AIR SUPPLY TO CV55 BYPASS VALVE, in BYPASS.

___ B. **ADJUST** 2CV55 to obtain the desired flow.

___ C. **ENSURE** Seal Injection flow 6-12 gpm to each Reactor Coolant Pump not to exceed 40 gpm total Seal Injection flow.

___ 5.1.26 IF RCS makeup from the RWST is required to maintain VCT level during RCS cooldown, THEN **INITIATE** Attachment 1, RCS Makeup Source.

___ 5.1.27 IF Steam Generator level control is to be transferred to the Condensate System when S/G pressure is ≤550 psig, THEN **ESTABLISH** feeding the Steam Generators from the Condensate System IAW S2.OP-SO.CN-0001(Q), Condensate System Operation, at the discretion of the SM/CRS.

___ 5.1.28 IF S2.OP-ST.SJ-0020(Q), Periodic Leakage Test-RCS Pressure Isolation Valves, is to be performed (Refer to Step 2.8), THEN **MAINTAIN** RCS pressure ≥1000 psig while continuing with this procedure.

NOTE

Steps 5.1.29 to 5.1.36 may be performed in any order at discretion of the SM/CRS.

___ 5.1.29 SM/CRS to **EVALUATE** placing the Condensate System On Recirc and flush the condenser sparging steam header IAW S2.OP-SO.CN-0001(Q), Condensate System Operation. This is to identify potential system deficiencies and to facilitate repairs during the outage [80082196].

5.1.30 IF RCS temperature is to be stabilized between 350°F and 450°F for >12 hours, THEN when RCS is <450°F, **NOTIFY** Maintenance to adjust the High Flux at Shutdown Alarm IAW SC.IC-DC.NIS-0003(Q), Bistable Setpoint Adjustment N31 and N32 Source Range High Flux at Shutdown.

___ 5.1.31 When RCS pressure is <1000 psig:

___ A. **PLACE** 21-24SJ54 in VALVE OPERABLE on 2RP4.

___ B. Direct a second Operator to **PERFORM** Independent Verification that 21-24SJ54 are in VALVE OPERABLE on 2RP4.

_____ _____
IV Signature Date

___ C. **CLOSE** 21-24SJ54, Accumulator Outlet Valves.

___ D. Direct a second Operator to **PERFORM** Independent Verification that 21-24SJ54 are CLOSED.

_____ _____
IV Signature Date

___ E. **DIRECT** an Operator to OPEN 21-24SJ54 power supply breakers AND **UPDATE** WCM for 21-24SJ54 "Off-Normal" Status.

___ F. IF the repositioning of 2CV114, Seal Water Bypass, is required: THEN **REFER** to S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation, for 2CV114 valve position requirements AND **UPDATE** WCM for 2CV114 "Off-Normal" Status.

___ 5.1.32 IF Rod Control System is ENERGIZED, THEN **INITIATE** S2.OP-SO.RCS-0001(Q), Rod Control System Operation to align the system NOT capable of Rod withdrawal prior to Mode 4.

___ 5.1.33 IF RCS temperature is <400°F
AND any RCP is to be stopped to support current plant conditions,
THEN:

___ A. **ENSURE** Rod Control System is de-energized to comply with T/S 3.4.1.2.c.

___ B. **OPERATE** RCPs as required for current plant conditions IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation while maintaining a minimum of one in operation IAW T/S 3.4.1.2.

___ C. **INITIATE** the performance of S2.OP-ST.RC-0005(Q), Reactor Coolant System RC/RHR Loop Status Modes 3-4.

___ 5.1.34 IF RCS boration is required to establish Shutdown Margin boron concentration for ≤200°F,
THEN:

___ A. **REFER** to S2.RE-RA.ZZ-0016(Q), Curve Book, for required RCS boron concentration for ≤200°F.

___ B. **PERFORM** boration IAW S2.OP-SO.CVC-0006(Q), Boron Concentration Control.

NOTE

Operation of the 21-24MS10 valves may be required when the preferred heat sink is NOT available OR inadequate. Refer to Step 3.11 for management expectations for authorizing the use of the 21-24MS10 valves during RCS cooldown.

___ 5.1.35 IF the Steam Dump System is being used for plant cooldown,
AND 21-24MS18 valves are adequate to support RCS cooldown with the 21-24MS167 valves CLOSED,
THEN:

___ A. **OPEN** 21-24MS18, MN STM STOP BYPASS VLV, as necessary to support RCS cooldown.

___ B. **CLOSE** 21-24MS167 valves.

___ C. IF 21-24MS10, Main Steam System Relief Valves use is authorized,
THEN **OPERATE** 21-24MS10, as necessary to support RCS cooldown.

___ 5.1.36 IF the Steam Dump System is NOT being used for plant cooldown,
THEN **CLOSE** 21-24MS167 valves.

___ 5.1.37 IF 21-24MS167 valves are CLOSED,
THEN **INITIATE** Post-Fire Safe Shutdown Equipment Administrative Controls IAW OP-SA-108-115-1001, Operability Assessment And Equipment Control Program [80067063].

___ 5.1.38 When RCS temperature is <350°F and >312°F:

___ A. **RECORD** time Mode 4 is entered in Control Room Narrative Log.

___ B. **UPDATE** WCM to reflect Mode change.

___ C. IF S2.OP-ST.SJ-0020(Q), Periodic Leakage Test-RCS Pressure Isolation Valves, is to be performed (Refer to Step 2.8),
THEN **INITIATE** S2.OP-ST.SJ-0020(Q).

___ D. **PLACE** 2SJ135 in VALVE OPERABLE on 2RP4.

___ E. Direct a second Operator to **PERFORM** Independent Verification that 2SJ135 is in VALVE OPERABLE on 2RP4.

_____ _____
IV Signature Date

___ F. **CLOSE** 2SJ135, SI Discharge to Cold Legs Valve.

___ G. Direct a second Operator to **PERFORM** Independent Verification that 2SJ135 is CLOSED.

_____ _____
IV Signature Date

___ H. **CLOSE** 21 & 22SJ134, SI Pumps to Cold Legs Valves.

___ I. Direct a second Operator to **PERFORM** Independent Verification that 21 & 22SJ134 are CLOSED.

_____ _____
IV Signature Date

___ J. **DISARM** ECCS AUTOMATIC SWAPOVER by DEPRESSING the following CLOSE pushbuttons AND **ENSURE** the AUTO ARMED lights are DEENERGIZED for the associated valves:

___ ♦ 21SJ113, SI/Charging Pump X-Over

___ ♦ 22SJ113, SI/Charging Pump X-Over

___ ♦ 21CC16, 21 RHR Heat Exchanger Outlet

___ ♦ 22CC16, 22 RHR Heat Exchanger Outlet

(step continued on next page)

5.1.38 (continued)

NOTE

A maximum of one Centrifugal Charging Pump or one Safety Injection Pump shall be operable when RCS Cold Leg temperature ≤312°F IAW T/S 3.5.3

___ K. **C/T** 21 & 22 SI Pump power supplies for SM/CRS.

___ L. IF both Centrifugal Charging Pumps are OPERABLE,
THEN **C/T** OPEN the breaker to one Centrifugal Charging Pump
AND **RECORD** SI/CVC Pump breaker status in
S2.OP-DL.ZZ-0006(Q), Primary Plant Log.

___ M. **ENSURE** 2CV3, 2CV4 and 2CV5 are OPEN to maintain required letdown flow rates as required during RCS cooldown.

___ N. IF manual control of 2CV18 is required to maximize Letdown flow,
THEN:

___ 1. Using Regenerative Heat Exchanger outlet temperature (T0127A), Letdown pressure (2PI135B) and Steam Tables,
DETERMINE the minimum pressure required to maintain the outlet of the Regenerative Heat Exchanger at least 10°F subcooled.

___ 2. **PLACE** 2CV18 in MANUAL.

___ 3. Slowly **ADJUST** 2CV18 as required to obtain desired letdown flow while maintaining Regenerative Heat Exchanger outlet at least 10°F subcooled.

___ O. **CLOSE 1**CV464, CHARGING CROSS TIE ISOLATION VALVE.

___ P. **NOTIFY** the Unit 1 CRS that **1**CV464 is CLOSED
AND 13 Charging Pump is NOT required to provide
Post-Fire Shutdown capability for Unit 2.

___ Q. **NOTIFY** the Appendix R Safe Shutdown Program Engineer that 13 Charging Pump is NOT available to provide Post-Fire Safe Shutdown capability AND to initiate the appropriate compensatory measures for Unit 2.

(step continued on next page)

5.1.38 (continued)

___ R. **PLACE** 23 Charging Pump linkage in the low pressure position as follows:

___ 1. IF 23 Charging Pump is in service,
THEN **TRANSFER** to a Centrifugal Charging Pump
IAW S2.OP-SO.CVC-0002(Q), Charging Pump Operation.

___ 2. **PLACE** 23 Charging Pump linkage in the low pressure position.

___ 3. IF 23 Charging Pump is to be placed in service,
THEN **TRANSFER** to 23 Charging Pump
IAW S2.OP-SO.CVC-0002(Q), Charging Pump Operation.

CAUTION

Operation of RCPs, other than as specified, can result in uneven RCS temperatures and create conditions in Steam Generators causing inadvertent SI due to SG differential pressures.

___ S. IF high RCS flow rates for chemical additions are no longer required,
THEN **REDUCE** number of operating RCPs to two OR one
IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation.

___ T. **INITIATE** S2.OP-SO.RPS-0009(Q), Installation / Removal of
AFW Start Function, Section for defeating Aux Feed Pump Auto Start.

[C0569]

___ 5.1.39 IF RCS temperature is to be stabilized between 200°F and 350°F for >12 hours,
THEN **NOTIFY** Maintenance to adjust the High Flux at Shutdown Alarm
IAW SC.IC-DC.NIS-0003(Q), Bistable Setpoint Adjustment
N31 and N32 Source Range High Flux at Shutdown.

___ 5.1.40 When RCS pressure is <360 psig and temperature >312°F:

___ A. **ENSURE** Maintenance has completed POPS functional
IAW S2.IC-FT.RCP-0070(Q), 2PT403 Reactor Coolant System
Hot Leg Pressure Channel II AND S2.IC-FT.RCP-0071(Q),
2PT405 Reactor Coolant System Hot Leg Pressure Channel I.

___ B. **ARM** POPS IAW S2.OP-SO.PZR-0004(Q),
Pressurizer Overpressure Protection Operation.

___ C. IF RHR Loop boron concentration is less than the required
RCS boron concentration for 200°F
IAW S2.RE-RA.ZZ-0016(Q), Curve Book,
THEN **PLACE** the RHR System In Service For Sampling in Mode 4
IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 5.1.41 When RCS pressure is ≤340 psig,
PLACE the RHR System In Service For Shutdown Cooling in Mode 4
IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 5.1.42 When RCS temperature is <250°F,
PERFORM the following:

___ ♦ **OPERATE** 21-24MS10 Main Steam System Relief Valves as necessary to vent non condensable gasses.

___ ♦ **COORDINATE** RCS Chemical Degasification AND RCS crud solubilization evolutions with Chemistry personnel IAW S2.OP-SO.CVC-0011(Q), RCS Degasification.

___ 5.1.43 IF RCS temperature is <248°F
AND the second loop of RHR is to be placed in service,
THEN **INITIATE** placing the second loop of RHR in service
IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 5.1.44 IF plant maintenance requires RCS temperature <210°F,
THEN:

___ A. **MAINTAIN** RCS temperature <210°F until work is completed.

___ B. **RECORD** Admin Tag Number(s): _____

___ 5.1.45 IF more than two RCPs are in service,
THEN prior to reducing RCS temperature <200°F,
REDUCE the number of operating RCPs to two OR one
IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation.

___ 5.1.46 **INITIATE** S2.OP-DL.ZZ-0002(Q), Control Room Logs - Mode 5, 6, and Defueled.

NOTE

- RCS cooldown rate is limited to ≤50°F/hour IAW S2.OP-TM.ZZ-0001(Q), RCS Pressure/Temperature Curves.
- RCS pressure <100 psig eliminates the use of crediting the RCS to meet T/S 3.4.1.4. **[C0609]**

___ 5.1.47 When RCS temperature is <200°F:

___ A. **REDUCE** RCS cooldown rate to ≤50°F/hour.

___ B. **RECORD** time Mode 5 is entered in Control Room Narrative Log.

___ C. **UPDATE** WCM to reflect Mode change.

___ D. IF the second loop of RHR is NOT inservice,
THEN **INITIATE** placing second loop of RHR in service
IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ E. **INITIATE** IST valve surveillance procedures which are required to be performed in Mode 5.

___ F. **CONTINUE** RCS Cooldown while slowly raising Pressurizer level to 80% as indicated on the cold calibrated level channel.

___ G. **PERFORM** the following:

___ 1. **C/T** 21 and 22 Containment Spray Pumps for SM/CRS

___ 2. **CLOSE** AND **LOCK** the following:

___ ♦ 21CS20

___ ♦ 22CS20

___ 3. **UNLOCK** AND **CLOSE** the following:

___ ♦ 21CS6

___ ♦ 22CS6

___ 4. **SELECT** 2CS14 VALVE OPERABLE at 2RP4

___ 5. **CLOSE** 2CS14

___ 6. **UPDATE** WCM to reflect current component status.

(step continued on next page)

5.1.47 (continued)

___ H. IF the remaining Centrifugal Charging Pump is NOT required to support current plant operation, THEN **C/T** the remaining Centrifugal Charging Pump for the SM/CRS.

___ I. IF Condenser vacuum is NOT to be maintained, THEN **BREAK** Vacuum IAW S2.OP-SO.AR-0001(Z), Condenser Air Removal System Operation.

___ J. IF Steam Generators will be placed in Wet Layup, THEN **INITIATE** S2.OP-SO.SG-0002(Q), Maintaining Steam Generators in Wet Layup.

___ K. **ESTABLISH** Auto SI Block IAW S2.OP-SO.RPS-0008(Q), Establishing/Removing Auto SI Block.

___ L. **PLACE** Containment Evacuation horn block switch on 2RP2 in BLOCK position.

___ M. **NOTIFY** the Appendix R Safe Shutdown Program Engineer that Unit 2 RCS temperature is <200°F and the compensatory measures implemented for Unit 2 may be removed.

___ N. IF entry into Mode 5 is for Refueling Outage, THEN **NOTIFY** the Outage Execution Team Supervisor to have the Containment Sump Strainer Covers installed on all sump strainers.

___ 5.1.48 **NOTIFY** Maintenance to adjust the High Flux at Shutdown Alarm IAW SC.IC-DC.NIS-0003(Q), Bistable Setpoint Adjustment N31 and N32 Source Range High Flux at Shutdown.

___ 5.1.49 IF Pressurizer cooldown is required, THEN **INITIATE** monitoring of parameters listed in Attachment 2, Section 4.0 AND **CONTINUE** to monitor parameters until PZR fill and drain down evolutions have been completed.

NOTE

Performance of Step 5.1.50 will collapse the pressurizer steam bubble while maintaining at least one RCP in operation.

___ 5.1.50 IF Pressurizer Cooldown is required, THEN:

___ A. **ENSURE** Pressurizer Spray ΔT between the PZR and Auxiliary Spray fluid is <320°F AND recorded IAW S2.OP-DL.ZZ-0002(Q), Control Room Logs Mode 5, 6 and Defueled (T/S 4.4.10.1.1).

___ B. **ENSURE** SC.OP-DL.ZZ-0012(Q), Pressurizer Heatup/Cooldown Log is maintained during cooldown.

___ C. **STABILIZE** the following parameters:

___ ♦ RCS Temperature

___ ♦ RCS Pressure

CAUTION

Pressurizer Spray Flow should be maximized in order to maintain a continuous PZR outsurge flow that will minimize temperature transients in the PZR surge nozzle and portions of the PZR lower head during PZR fill evolutions. (WCAP-13588/14950)

___ D. **MAXIMIZE** Pressurizer Spray flow as follows:

___ 1. **PLACE** all available Pressurizer BACKUP AND CNTRL GRP HEATERS to ON.

___ 2. **ADJUST** SPRAY VALVE CONTROL to maintain the following parameters:

___ ♦ RCP Seal ΔP ≥200 psid

___ ♦ RCS Pressure ≤340 psig

(step continued on next page)

5.1.50 (continued)

CAUTION

- **RCP Seal ΔP of ≥200 psid is to be maintained during RCP operation.**
- **PZR pressure is limited to ≤340 psig when RHR is aligned to the RCS.**
- **A relatively constant PZR Surge Line temperature is an indication of continuous PZR outsurge flow.**
- **The Pressurizer cold calibrated level is calibrated for 68°F. At ≈430°F, the Pressurizer cold calibrated level will indicate ≈84% with actual level being 100%. At this point ≈528 gallons will be needed to take the pressurizer solid (SC-RC002-01) assuming a constant PZR water temperature. An additional ≈33 gallons is needed for each 1.0°F change in PZR water temperature. Previous performance has shown this value to be ≈1600 gallons. Expect to go water solid when indicated COLD CAL level is <100%.**

___ E. **FILL** the Pressurizer to 84% as indicated on both COLD CAL level indications, console (LI462) and SPDS (U2LT0462S).

___ F. When 84% Pressurizer cold calibrated level is achieved, **ADJUST** the PZR fill rate to ≤25 gpm.

NOTE

It may take several hours to fill the pressurizer and completely collapse the steam bubble. Steam bubble collapse is indicated by further opening of the spray valve(s) with little or no effect on pressure. Pressure control is then transferred from the spray valves to the charging flow control.

___ G. When the pressurizer is water solid (steam bubble collapsed), Slowly **ADJUST** Charging OR Letdown flowrate to stabilize RCP Seal ΔP ≥200 psid AND RCS Pressure ≤340 psig.

___ H. **PLACE** Pressurizer BACKUP AND CNTRL GRP HEATERS to OFF.

___ I. **ENSURE** 2CV79, Charging Line Stop Valve is CLOSED.

___ J. **OPEN** 2CV75, Pressurizer Auxiliary Spray Stop Valve.

___ K. **CLOSE** 2CV77, Charging Line Stop Valve.

___ L. IF RCS makeup from the RWST is required to maintain VCT level during RCS cooldown, THEN **INITIATE** Attachment 1, RCS Makeup Source.

___ 5.1.51 **ENSURE** PZR and RCS Boron Concentrations are above the concentration specified by S2.RE-RA.ZZ-0016(Q), Curve Book.

___ 5.1.52 **ENSURE** PZR and RCS Boron Concentrations are within 50 ppm of each other OR RCS is ≥2050 ppm and PZR is ≥2000 ppm.

___ 5.1.53 IF the BAST System cross-connect was aligned during RCS cooldown, THEN **ENSURE** Unit 1 BAST to Unit 2 BAST restoration is complete IAW S2.OP-SO.CVC-0005(Q), Boric Acid Solution Preparation and Transfer.

CAUTION

- **The Reactor Vessel Inlet Nozzles are the limiting components during cooldown with all RCPs secured. Because of this, the RHR HX Inlet temperature shall not be used to plot RCS cooldown rate.**
- **The RHR discharge piping injects into the RCS downstream of the RCS WR T_{cold} RTDs. Because of this, the RCS WR T_{cold} RTDs shall not be used to plot RCS cooldown rate with all RCPs secured.**
- **When the last RCP is secured, the RHR HX Outlet temperature should be used to plot RCS cooldown rate.**
- **RHR cooling will be reduced prior to securing the last RCP to ensure that the Operator has control of the RCS cooldown rate.**
- **When the last RCP is secured, the RCS Cold Leg temperature will trend towards the RHR HX Outlet temperature. This will change the RCS cooldown rate. To ensure that the next calculated hourly cooldown rate does not exceed the T/S 3.4.10.1 limit of 50°F/hour, the RHR HX Outlet temperature must be compared to the RCS cooldown rate for the previous 60 minutes.**

___ 5.1.54 **PERFORM** the following:

___ A. **ADJUST** RHR Cooling to provide a slight RCS Heatup Rate, AND **ENSURE** RHR HX Outlet temperature is within 50°F of the RCS WR T_{cold} RTD for the previous 60 minutes.

___ B. **TRANSITION** from the coldest RCS WR T_{cold} RTD to the RHR HX Outlet temperature for plotting RCS cooldown rate.

___ C. **NOTIFY** Chemistry AND **ENSURE** all evolutions requiring RCP operation (RCS boron/chemical additions, RCS Crud Burst, RCS Degas, RCS Cleanup, S/G cooldown and PZR cooldown) are completed.

(step continued on next page)

5.1.54 (continued)

___ D. IF Step 5.1.50 was performed, **[CAPR 70090887/70100702]**
THEN **ENSURE** PZR Liquid/Vapor Temperatures are ≤210°F prior to securing the last RCP.

___ E. **SECURE** remaining RCP(s) IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation.

___ F. **ADJUST** RHR cooling to establish a ≤50°F/hour RCS Cooldown Rate.

___ G. IF Step 5.1.50 was performed
AND the RCS is to be depressurized to support plant maintenance activities or refueling outage,
THEN:

___ 1. **ENSURE** all RCPs are secured.

CAUTION

The rate of RCS depressurization should be maintained at ≤25 psig / minute. Potential voiding of the reference leg for PZR level transmitter LT462 (COLD CAL) may occur at faster rates. [CAPR 70090887]

___ 2. Slowly **DEPRESSURIZE** the Reactor Coolant System at ≤25 psig / minute by adjusting Charging flow to less than Letdown flow.

___ 3. When RCS pressure is <100 psig,
PERFORM the following:

___ a. **CLOSE** 21-24CV104, RCP Seal Water Return Stop.

___ b. **ENSURE** 2CV114, Seal Water Bypass is CLOSED.

___ c. Direct a second Operator to **PERFORM** Independent Verification that 2CV114, Seal Water Bypass is CLOSED.

_____ _____
IV Signature Date

___ 4. When Pressurizer cooldown temperature is obtained:

___ a. **OPEN** 2CV77.

___ b. **CLOSE** 2CV75.

___ H. **DIRECT** Maintenance to initiate **[CAPR 70090887]**
SC.IC-GP.RC-0092(Q), Backfilling LT462 Cold Pressurizer Level Reference Leg.

___ 5.1.55 IF Step 5.1.50 is marked as N/A,
AND Pressurizer cooldown and depressurization is required to support plant maintenance activities or refueling outage,
THEN:

___ A. **ENSURE** all RCPs are secured.

___ B. **ENSURE** Pressurizer Spray ΔT between the PZR and Auxiliary Spray fluid <320°F AND is recorded IAW S2.OP-DL.ZZ-0002(Q), Control Room Logs Mode 5, 6 and Defueled (T/S 4.4.10.1.1).

___ C. **ENSURE** SC.OP-DL.ZZ-0012(Q), Pressurizer Heatup/Cooldown Log is maintained during cooldown.

___ D. **PLACE** all Pressurizer BACKUP AND CNTRL GRP HEATERS to OFF.

___ E. **ENSURE** 2CV79, Charging Line Stop Valve is CLOSED.

___ F. **OPEN** 2CV75, Pressurizer Auxiliary Spray Stop Valve.

___ G. **CLOSE** 2CV77, Charging Line Stop Valve.

___ H. When RCS pressure is reduced to <100 psig,
PERFORM the following:

___ 1. **CLOSE** 21-24CV104, RCP Seal Water Return Stop.

___ 2. **ENSURE** 2CV114, Seal Water Bypass is CLOSED.

___ 3. Direct a second Operator to **PERFORM** Independent Verification that 2CV114, Seal Water Bypass is CLOSED.

_____ _____
IV Signature Date

___ I. **RAISE** Pressurizer level by adjusting Charging and Letdown flow.

___ J. Prior to reducing RCS pressure <25 psig,
OPEN 2PR1 and 2PR2.

___ K. **CONTINUE** raising Pressurizer level by adjusting Charging flow until Pressurizer overflows and an increase in level is observed in PRT.

___ L. When Pressurizer cooldown temperature is obtained:

___ 1. **OPEN** 2CV77.

___ 2. **CLOSE** 2CV75.

___ 5.1.56 IF a vent path through the pressurizer safety drains is required (this vent path does NOT satisfy Technical Specification requirements), THEN:

___ A. **REFER** to P&L Step 3.17 prior to opening any RCS Vent Path.

___ B. **CONNECT** temporary hose from 2PR67 and 2PR68, LOOP SEAL DRAIN LINE to the Containment Bioshield annulus.

___ C. **CLOSE** 2PR1 and 2PR2 AND **PLACE** in AUTO.

___ D. IF required to remove hydrogen or gaseous activity atmosphere, THEN **INITIATE** S2.OP-SO.PZR-0001(Q), Purging the PRT; Section for Purging PRT of Hydrogen or Xenon.

___ E. **ENSURE** POPS is ARMED IAW S2.OP-SO.PZR-0004(Q), Pressurizer Overpressure Protection Operation.

___ F. **ADJUST** Charging flow as required to minimize pressure at 2PR67 and 2PR68, LOOP SEAL DRAIN LINE.

___ G. **CLOSE** 2PS22, PZR LIQUID SAMP V.

___ H. Slowly **OPEN** 2PR67 AND 2PR68, LOOP SEAL DRAIN LINE AND **MONITOR** for flow.

___ I. When PZR pressure is relieved through the hose, **CLOSE** 2PR67 AND 2PR68, LOOP SEAL DRAIN LINE.

___ J. **DISCONNECT** temporary hose from 2PR67 and 2PR68, LOOP SEAL DRAIN LINE.

___ K. **OPEN** 2PS22, PZR LIQUID SAMP V.

___ L. **OPEN** 2PS32 AND 2PS33, PZR SPRAY LINE VENT.

___ M. IF additional vent paths are required to support PZR draining, THEN **ESTABLISH** any of the following vent paths:

- **OPEN** 2PS21 AND 2PS7, PZR VENT
- **OPEN** 2PR19, PZR SPRAY V LOOP SEAL DR VENT AND 2PR69, LOOP SEAL DR LN DR VT ISO

NOTE

Gas Decay Tank (GDT) volume is always an issue during an outage since numerous VCT purges are required to degas the RCS. To conserve GDT volume, the RCDT Pumps may be aligned to the Waste Holdup System during RCDT/PRT purge evolutions.

___ 5.1.57 IF RCDT Pump discharge is to be aligned to the WHUT inlet header at the discretion of the SM/CRS,
THEN **INITIATE** S2.OP-SO.WL-0005(Q), Reactor Coolant Drain Tank Operation to align the RCDT pump discharge to WHUT.

___ 5.1.58 IF Pressurizer level is to be lowered after PRT purge is completed,
THEN:

___ A. IF required to remove hydrogen or gaseous activity atmosphere,
THEN **PERFORM** S2.OP-SO.PZR-0001(Q), Purging the PRT; Section for Purging PRT of Hydrogen or Xenon.

___ B. **DRAIN** PRT to 10% IAW S2.OP-SO.PZR-0003(Q), Pressurizer Relief Tank Operation.

___ C. **ESTABLISH** RCS vent path IAW S2.OP-SO.PZR-0006(Q), RCS Venting.

___ 5.1.59 IF PZR Liquid/Vapor temperature is ≤210°F, **[CAPR 70090887]**
THEN request Maintenance to **PROVIDE** COLD SCALED LEVEL indication for at least one of the three hot calibrated PZR Level Channels (Refer to Step 3.19).

CAUTION [CAPR 70090887]

- **Refer to Exhibit 1, Pressurizer Level Channels, for channel behavior based on pressurizer water temperature.**
- **The expected PZR COLD CAL level value in SPDS (U2LT0462S) [70090500] in a water solid condition is <105%. An indicated level of ≥105% is highly suspect. Maintenance is to be notified to troubleshoot the apparent failure of the instrument whenever the indicated value is not as expected.**
- **When ≈528 gallons has been drained from the RCS, the PZR COLD CAL level should indicate ≈95% (PZR at ≈200°F) (Actual level at 100%).**
- **When ≈2500 gallons has been drained from the RCS, the PZR COLD CAL level should indicate ≈82% (PZR at ≈200°F) (Actual level at ≈84%).**
- **At ≈60% COLD CAL level, PZR Level Channels I, II, & III should begin to come on scale at ≈98.8% (≈61.0% on COLD SCALED LEVEL indication).**
- **At ≈20% PZR Level Channels I, II, & III should approximate the COLD CAL Level, (crossover). PZR Level Channels I, II, & III are normally off scale low at ≈11.5% COLD CAL level.**
- **The PZR volume from a water solid condition to 25% level is ≈9,978 gallons. There is ≈12,600 gallons between the upper and lower level taps and ≈528 gallons from the upper level tap to a water solid condition.**
- **Maintain a positive nitrogen pressure in the PRT until venting is performed in Step 5.1.65.**

___ 5.1.60 **LOWER** Pressurizer level to on scale indication as follows:

___ A. **ENSURE** Maintenance has completed **[CAPR 70090887]** SC.IC-GP.RC-0092(Q), Backfilling LT462 Cold Pressurizer Level Reference Leg.

___ B. **ENSURE** PZR COLD CAL Level in SPDS (U2LT0462S) is **[70090500]** indicating <105% .

___ C. **ENSURE** PZR COLD CAL Level in SPDS (U2LT0462S) is indicating as expected. Refer to Exhibit 1, Pressurizer Level Channels, for channel behavior based on pressurizer water temperature.

___ D. **RECORD** the following in Attachment 2, Sections 2.0 and 3.0:

- Inservice CVC HUT Level (Initial)
- VCT Level (Initial)

(step continued on next page)

5.1.60 (continued)

NOTE

The expected response of the PZR COLD CAL level channel shall be confirmed after ≈2500 gallons has been drained from the RCS. The Charging / Letdown Flow mismatch and the change in CVC HUT level will be initially used to determine RCS volume drained. This change in RCS volume is compared to actual PZR COLD CAL level and other relevant parameters in Attachment 2, Section 4.0, to confirm the expected response.

___ E. **CALCULATE** the time to drain 2500 gallons from the RCS based on the desired Letdown / Charging Flow Mismatch Δ gpm (PZR drain down rate) in Attachment 2, Section 1.0.

___ F. **ADJUST** Charging and Letdown flow to obtain desired drain down rate.

___ G. **RECORD** the following in Attachment 2, Section 1.0:

- ♦ Time (Start)
- ♦ Letdown Flow (FI134)
- ♦ Charging Flow (FI128B)
- ♦ Mismatch (Δ gpm)

NOTE

Refer to Exhibit 1, Pressurizer Level Channels, for PZR Level Channel behavior based on pressurizer water temperature.

___ H. When ≈2500 gallons has been drained from the RCS based on the time (minutes) calculated in Attachment 2, Section 1.0, **PERFORM** the following to confirm the expected response of Pressurizer Level (COLD CAL) indication:

___ 1. **ADJUST** Charging and Letdown flow to stabilize PZR level.

___ 2. **COMPLETE** Attachment 2, Sections 1.0, 2.0, and 3.0.

___ I. **ADJUST** Charging and Letdown flow to obtain desired drain down rate.

___ J. When the PZR is at the desired level (≥25%, COLD CAL) as directed by SM/CRS, **STABILIZE** Pressurizer level by adjusting Charging and Letdown flow.

___ K. IF PZR level is to be lowered to <25% (COLD CAL), THEN **INITIATE** S2.OP-SO.RC-0005(Q), Draining the RCS Reactor Coolant System to ≥101 Ft Elevation. **[CAPR 70090887]**

___ 5.1.61 IF 2PS32 and 2PS33 were opened in Step 5.1.56L,
THEN:

___ A. **ENSURE** RCS vent path IAW S2.OP-SO.PZR-0006(Q), RCS Venting.

___ B. **CLOSE** 2PS32 AND 2PS33, PZR SPRAY LINE VENT.

___ 5.1.62 IF additional vent paths were required to support PZR draining,
THEN **ISOLATE** the following vent paths:

- **CLOSE** 2PS21 AND 2PS7, PZR VENT
- **CLOSE** 2PR19, PZR SPRAY V LOOP SEAL DR VENT
  AND 2PR69, LOOP SEAL DR LN DR VT ISO

___ 5.1.63 IF Pressurizer cooldown was performed,
THEN **DISCONTINUE** monitoring of parameters listed in Attachment 2, Section 4.0, at the discretion of the SM/CRS.

___ 5.1.64 IF required to remove hydrogen or gaseous activity atmosphere from RCDT,
THEN **INITIATE** PURGE of RCDT of Hydrogen IAW S2.OP-SO.WL-0005(Q), Reactor Coolant Drain Tank Operation.

___ 5.1.65 IF PRT is to be vented to the containment atmosphere,
THEN **PERFORM** venting IAW S2.OP-SO.PZR-0003(Q), PRT Operation.

___ 5.1.66 IF RCS temperature will be reduced to <145°F,
THEN **REMOVE** Reactor Shield Ventilation and Nozzle Support Fans from service IAW S2.OP-SO.CBV-0001(Q), Containment Ventilation Operation.

NOTE

The ability to reduce Reactor Coolant System or Steam Generator metal temperature is hindered when RCS water inventory is reduced. As a result of this, upcoming outage activities, such as the removal of S/G primary manway covers, should be reviewed prior to reducing RCS water inventory. **[70034006]**

___ 5.1.67 IF draining the RCS is required,
THEN **INITIATE** S2.OP-SO.RC-0005(Q), Draining the Reactor Coolant System to ≥101 Ft Elevation.

___ 5.1.68 IF shutdown is for refueling,
THEN **INITIATE** S2.OP-IO.ZZ-0007(Q), Cold Shutdown to Refueling.

5.2 **Completion And Review**

___ 5.2.1 **COMPLETE** Attachment 3, Sections 1.0 and 2.0,
AND **FORWARD** this procedure to the SM/CRS for review and approval.

___ 5.2.2 SM/CRS **PERFORM** the following:

___ A. **REVIEW** this procedure with Attachments 1-3 for completeness and accuracy.

___ B. **COMPLETE** Attachment 3, Section 3.0.

___ C. IF this procedure is terminated prior to completion,
THEN **NOTE** reason, date and time of termination on Attachment 3, Section 1.0.

___ D. IF this procedure is completed successfully,
THEN **FORWARD** completed procedure, including any terminated procedure, if applicable, to Operations Staff.

END OF PROCEDURE SECTION

6.0 RECORDS

6.1 Retain the following IAW RM-AA-101, Records Management Program:

Attachments 1-3
Completed Heatup/Cooldown Plots performed IAW S2.OP-TM.ZZ-0001(Q)

7.0 REFERENCES

7.1 Updated Final Safety Analysis Report

7.1.1 Section 4, Reactor
7.1.2 Section 5, Reactor Coolant System and Connected Systems
7.1.3 Section 7, Instrumentation and Controls
7.1.4 Section 8, Electrical Systems
7.1.5 Section 9, Auxiliary Systems
7.1.6 Section 15.1, Condition 1, Normal Operation and Operational Transients

7.2 Technical Specifications - Unit 2

7.2.1 3.1.1.2, Shutdown Margin - $T_{AVG} \leq 200°F$
7.2.2 3.3.1.1, Reactor Trip System Instrumentation

7.3 Drawings

7.3.1 205301, No. 2 Unit Reactor Coolant System
7.3.2 205340, No. 2 Unit Waste Disposal - Gas
7.3.3 205332, No. 2 Unit Residual Heat Removal
7.3.4 205334, No. 2 Unit Safety Injection System
7.3.5 205331, No. 2 Unit Component Cooling System
7.3.6 205328, No. 2 Unit Chemical and Volume Control System
7.3.7 205333, No. 2 Unit Spent Fuel Cooling

7.4 Others

7.4.1 ATS Item DES-DEF-90-01584, Cooldown Step Change Concerns
7.4.2 DCP 80029150, Unit CVCS Cross-Tie
7.4.3 INPO SOER 88-3, Losses of RHR With Reduced Reactor Vessel Water Level
7.4.4 LER 272/96-008, Failure to Meet Technical Specifications Requirements While in Mode 5 for Natural Circulation.
7.4.5 PSE&G VTD 304209, Westinghouse Precautions, Limitations, and Setpoints for Nuclear Steam Supply Systems
7.4.6 NRC INFO 87-23, Loss Of Decay Heat Removal Function At PWRs With Partially Drained Reactor Coolant Systems

(step continued next page)

7.4 (continued)

7.4.7 SC-R200-MSE-0738-1, Mid-Loop Operation, 10/10/88
7.4.8 WCAP-11916, 7-88, Loss Of RHR While The RCS Is Partially Filled
7.4.9 WCAP-13588, Operating Strategies Mitigating PZR Insurge / Outsurge Transients.
7.4.10 WCAP-14950, Mitigation / Evaluation of Pressurizer Insurge/Outsurge Transients.
7.4.11 Westinghouse Tech. Bulletin NSD-TB-92-02-R0, Recommended PZR hydrogen concentration limit during RCS oxygenation process.
7.4.12 Westinghouse Owners Group Abnormal Response Guideline WOG-ARG-1, Loss of RHR While Operating at Mid-Loop Conditions
7.4.13 PR980929096 - BPCA #19, Cooldown Flexibility with RCS Below 200°F
7.4.14 70011541, MSIV Operability in Mode 3
7.4.15 LRI-00-0439, Maintaining MS167 Valves Open During Plant Cooldown (11/09/00)
7.4.16 DCP 80065299, Restoration Of The Positive Displacement Pump As The Normal Charging Pump [Safety Evaluation S003-002]

7.5 **Cross-References**

7.5.1 Technical Specifications:
- 4.4.10.1.1, RCS Pressure\Temperature Limits Surveillance
- 4.4.10.2, Reactor Coolant System Pressurizer Surveillance
- 4.4.10.3.1, RCS Overpressure Protection Systems Surveillance
- 4.5.2.i, ECCS Subsystems - $T_{AVG} \geq 350°F$

7.5.2 Procedures:
- SC.IC-TI.CVC-0001(Q), CV55 Flow Adjustment
- SC.CH-AD.RC-0413(Q), Chemical Addition to Primary System
- SC.CH-TI.ZZ-0544(Q), Reactor Startup, Shutdown, and >15% Power Change Surveillance Requirement.
- S2.IC-FT.RCP-0070(Q), 2PT403 Reactor Coolant System Hot Leg Pressure Channel II
- S2.IC-FT.RCP-0071(Q), 2PT405 Reactor Coolant System Hot Leg Pressure Channel I
- S2.IC-ST.RHR-0014(Q), RHR Interlock and Alarm Verification
- S2.OP-DL.ZZ-0001(Q), Control Room Logs
- S2.OP-DL.ZZ-0002(Q), Control Room Logs Modes 5, 6 and Defueled
- S2.OP-DL.ZZ-0006(Q), Primary Plant Log
- S2.OP-DL.ZZ-0014(Q), Shift Routines
- S2.OP-IO.ZZ-0007(Q), Cold Shutdown to Refueling
- S2.OP-PT.CAN-0001(Q), Containment Walkdown

(continued on next page)

7.5.2 (continued)

- S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation
- S2.OP-SO.AR-0001(Z), Condenser Air Removal System Operation.
- S2.OP-SO.CBV-0001(Q), Containment Ventilation Operation
- S2.OP-SO.CN-0001(Q), Condensate System Operation
- S2.OP-SO.SG-0003(Q), Maintaining Steam Generators in Wet Layup
- S2.OP-SO.CVC-0002(Q), Charging Pump Operation
- S2.OP-SO.CVC-0005(Q), Boric Acid Solution Preparation And Transfer
- S2.OP-SO.CVC-0006(Q), Boron Concentration Control
- S2.OP-SO.CVC-0011(Q), RCS Degassification
- S2.OP-SO.GEN-0003(Z), Main Generator Gas System Operation
- S2.OP-SO.GS-0001(Q), Turbine Gland Sealing Steam System Operation
- S2.OP-SO.MS-0002(Q), Steam Dump System Operation
- S2.OP-ST.MS-0003(Q), Steamline Isolation and Response Time Testing
- S2.OP-SO.PZR-0001(Q), Purging the PRT
- S2.OP-SO.PZR-0003(Q), Pressurizer Relief Tank Operation
- S2.OP-SO.PZR-0004(Q), Pressurizer Overpressure Protection Operation
- S2.OP-SO.PZR-0005(Q), Pressurizer Pressure Control System Operation
- S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation
- S2.OP-SO.RC-0005(Q), Draining the RCS to ≥101 Feet Elevation
- S2.OP-SO.RCS-0001(Q), Rod Control System Operation
- S2.OP-SO.RHR-0001(Q), Initiating RHR
- S2.OP-SO.RPS-0008(Q), Establishing/Removing Auto SI Block
- S2.OP-SO.RPS-0009(Q), Installation / Removal of AFW Start Function
- S2.OP-SO.WL-0005(Q), Reactor Coolant Drain Tank Operation
- S2.OP-ST.SJ-0020(Q), Periodic Leakage-RCS Pressure Isolation Valves
- S2.OP-TM.ZZ-0001(Q), RCS Pressure/Temperature Curves
- S2.RE-RA.ZZ-0012(Q), Figures
- S2.RE-RA.ZZ-0016(Q), Curve Book

7.6 **Commitments**

7.6.1 C0326 - INPO OMR - 312
7.6.2 C0569 - NSO INCI 94-124
7.6.3 C0609 - NRC INFO 95-35
7.6.4 C0565 - PSLT NLR-N94229 and ASME Code Case N-514 via Reg Guide 1.147, Rev. 12, dated 5/99

ATTACHMENT 1
(Page 1 of 1) **Page ____ of ____**

RCS MAKEUP SOURCE

1.0 **Alignment**

CAUTION

- **T/S 3.1.2.6 minimum RWST level in Modes 1-4 is ≥40.5 ft (364,500 gallons). T/S 3.1.2.5 minimum RWST level in Modes 5-6 is ≥1.9 ft (37,000 gallons).**
- **A constant Pressurizer outsurge and relatively constant Pressurizer level should be maintained during makeup. Rapid makeup rates may cause a Pressurizer insurge. Refer to P&L Step 3.6.1.**
- **Limit the number of Motor Operated Valve (MOV) full valve cycles to 3 in any 1 hour period. A full valve cycle is defined as traveling from one position to the opposite position, then back to original position. [C0326]**

RWST SOURCE	VCT SOURCE
1. **OPEN** 2SJ1 OR 2SJ2.	1. **OPEN** 2CV40 AND 2CV41
2. **CLOSE** 2CV40 OR 2CV41.	2. **CLOSE** 2SJ1 AND 2SJ2
3. **COMPLETE** Section 2.0 of this Attachment.	3. **COMPLETE** Section 2.0 of this Attachment.
4. When desired VCT level is obtained (CV35 AUTO divert to CVC HUT at 77%), **ALIGN** to VCT Source.	4. When additional VCT makeup is desired (VCT AUTO makeup at 14%), **ALIGN** to RWST Source.

2.0 **Valve Position And Independent Verification**

Valve Position				Initials	Date/Time	IV Date/Time	
2CV40	2CV41	2SJ1	2SJ2				

ATTACHMENT 2 **[CAPR 70090887]**
(Page 1 of 2)

PRESSURIZER COLD CALIBRATED LEVEL INDICATION (LI-462)

1.0 **Letdown / Charging Flow Mismatch**

TIME TO DRAIN 2500 GALLONS				
2500 gallons	÷	Δ gpm	=	minutes
2500 gallons ÷ Desired Letdown / Charging Flow Mismatch (Δ gpm) = minutes				

Parameter		Flow	Time		Gallons (1)
			Start	Stop	
Letdown Flow	FI134				
Charging Flow	FI128B		Δ minutes		
Mismatch	Δ gpm				
(1) The combined change in CVCS HUT AND VCT volume should be within 500 gallons of the Letdown / Charging Flow Mismatch volume, otherwise Shift Manager's concurrence is required to continue with the pressurizer drain down.					

2.0 **CVCS HUT Level Change**

Parameter		Level	Gallons (2)
CVCS HUT Level	Initial	%	
	Final	%	
Level Change	Δ	%	%
(2) Obtain "gallons" using S2.OP-TM.ZZ-0002(Q), Tank Capacity Data.			

3.0 **Volume Control Tank (VCT) Level Change**

Parameter		Level	Gallons (3)
VCT Level	Initial	%	
	Final	%	
Level Change	Δ	%	%
(3) Obtain "gallons" using S2.OP-TM.ZZ-0002(Q), Tank Capacity Data.			

ATTACHMENT 2 **[CAPR 70090887]**
(Page 2 of 2)

PRESSURIZER COLD CALIBRATED LEVEL INDICATION (LI-462)

4.0 **Plant Indications**

Parameters	(1)	Control Room	Plant Computer	SPDS
Pressurizer Level COLD CAL	(2)(3)	LI462	N/A	U2LT0462S
Pressurizer Level Channel I		LI459	L0480A	U2LT0459S
Pressurizer Level Channel II		LI460	L0481A	U2LT0460S
Pressurizer Level Channel III		LI461	L0482A	U2LT0461S
VCT Level	(3)	LI112	L0112A	U2LT0112S
Letdown Flow		LI134	F0134A	U2LT0134S
Charging Flow		LI128B	F0128A	U2LT0128S
21 CVCS HUT		LA-4145	N/A	U2LT0167S
22 CVCS HUT				U2LT0168S
23 CVCS HUT				U2LT0170S
RVLIS Full Range - Train A	(3)(4)	LD-3375		U2LT1311S
RVLIS Full Range - Train B		LD-3367		U2LT1321S

(1) **ENSURE** all available plant indications / trends are responding as expected during all pressurizer fill and drain down evolutions.

(2) **REFER** to Exhibit 1, Pressurizer Level Channels, for channel behavior based on pressurizer water temperature.

(3) **PLACE** Plant Computer and SPDS points on trend prior to performing the associated evolution. At a minimum, all points are required to be trended with the following stipulations:

- ♦ Only one of the Hot Calibrated Pressurizer Level Channels (I, II, or III) is required.
- ♦ Only one of the RVLIS Full Range Trains (A or B) is required.
  Both RVLIS Trains may be excluded from trend with Shift Manager's concurrence.
- ♦ Only the "In Service" CVC HUT is required.

(4) **ENSURE** available RVLIS Full Range indications remain >100% during the entire draindown to ≥25% in the Pressurizer. **[CAPR 70090887]**

ATTACHMENT 3
(Page 1 of 2) **Page ____ of ____**

COMPLETION SIGN-OFF SHEET

5.0 **COMMENTS** (**INCLUDE** procedure deficiencies and corrective actions.)

ATTACHMENT 3
(Page 2 of 2)

COMPLETION SIGN-OFF SHEET

6.0 **SIGNATURES**

Print	Initials	Signature	Date

INDEPENDENT VERIFICATION

7.0 **SM/CRS FINAL REVIEW AND APPROVAL**

This procedure with Attachments 1-3 are reviewed for completeness and accuracy.
All deficiencies, including corrective actions, are clearly recorded in the COMMENTS Section.

Signature:_____ Date:_____
SM/CRS

EXHIBIT 1
(Page 1 of 4)

PRESSURIZER LEVEL CHANNELS
(COLD CALIBRATED CHANNEL)

[CAPR 70090887]

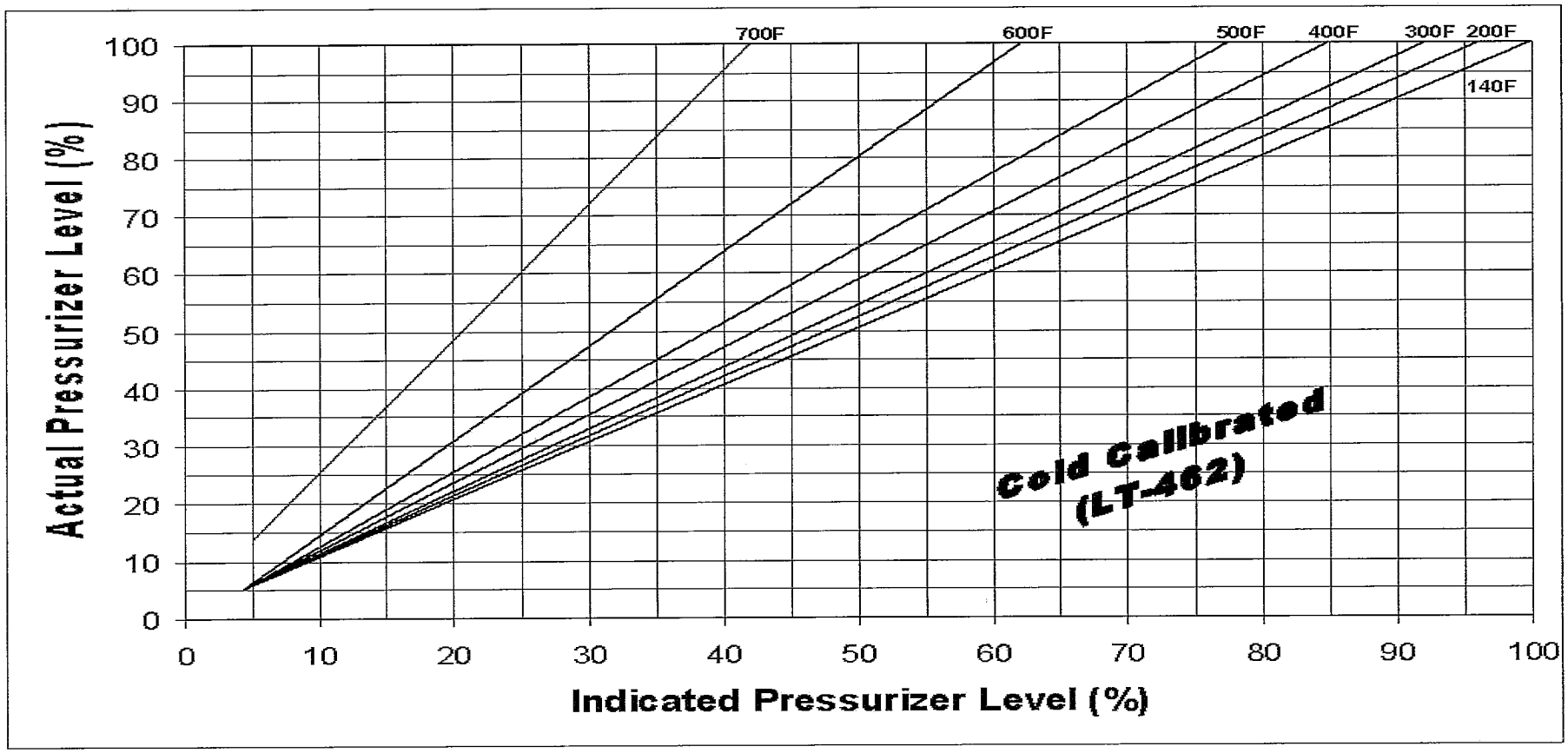


EXHIBIT 1
(Page 2 of 4)

PRESSURIZER LEVEL CHANNELS
(HOT CALIBRATED CHANNELS)

[CAPR 70090887]

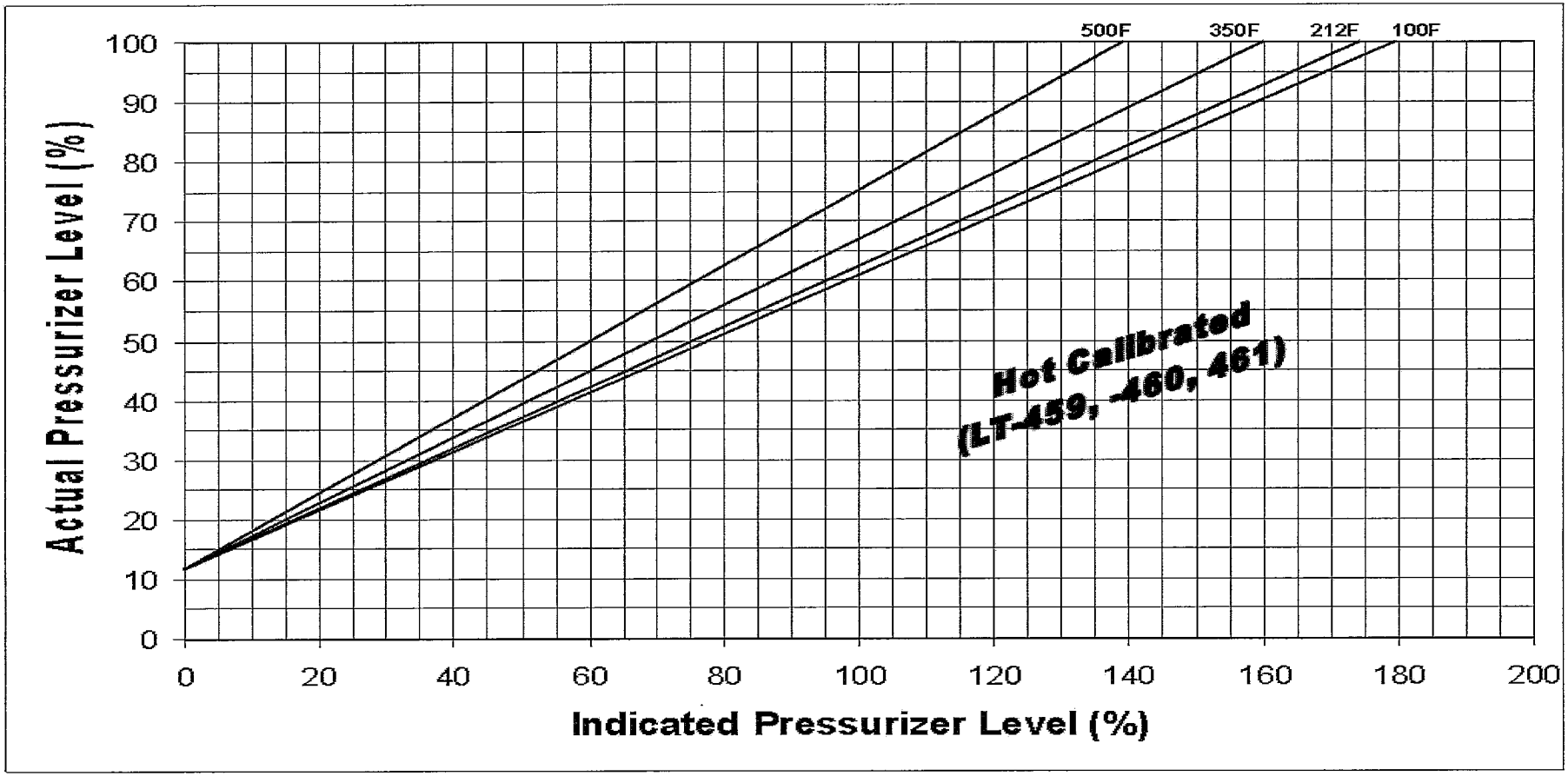


EXHIBIT 1
(Page 3 of 4)

PRESSURIZER LEVEL CHANNELS
(COLD AND HOT CALIBRATED CHANNELS FOR 140°F) **[CAPR 70090887]**

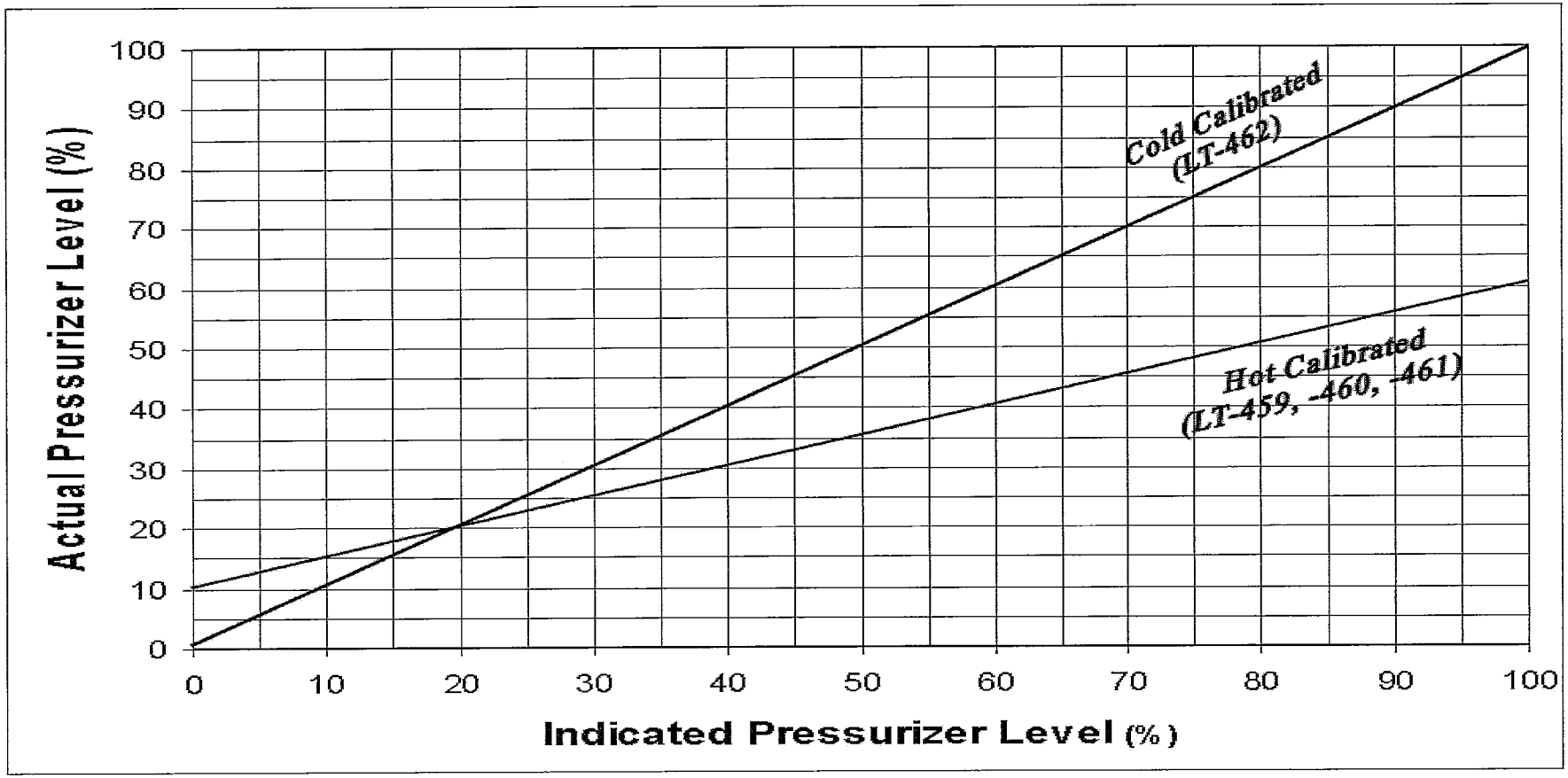
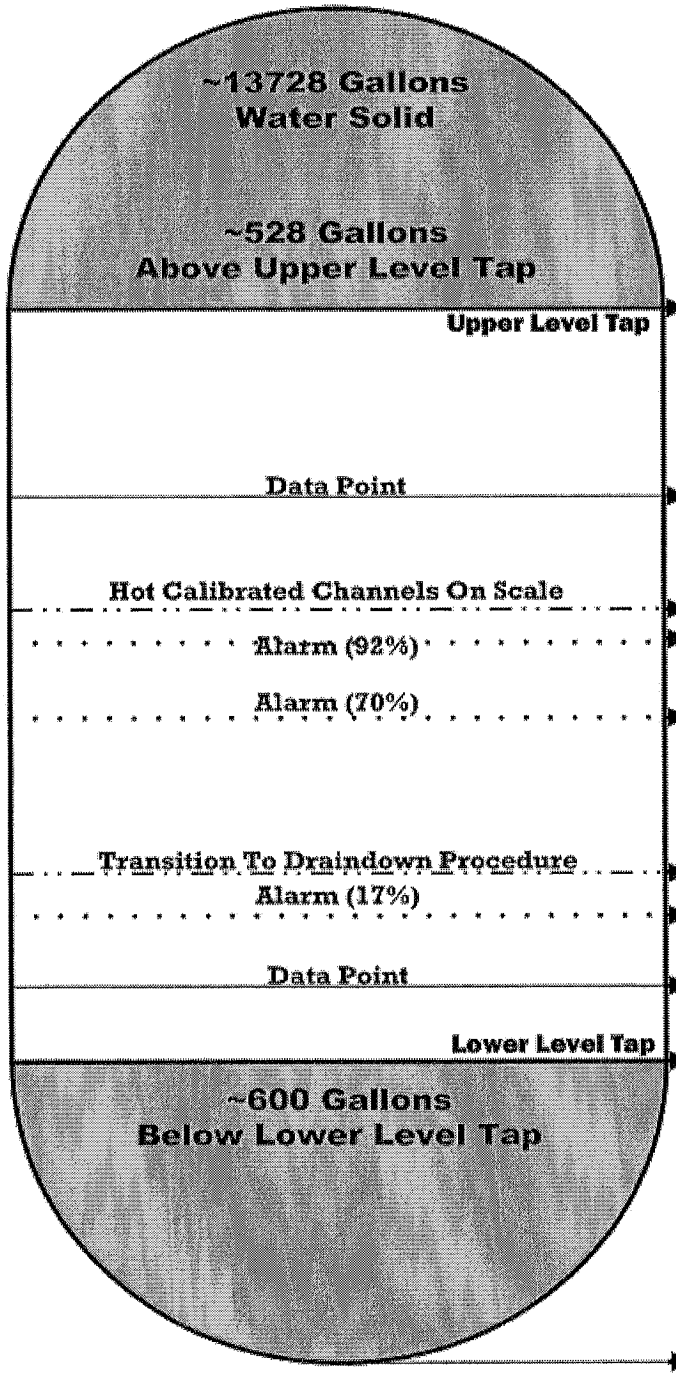


EXHIBIT 1
(Page 4 of 4)

PRESSURIZER LEVEL CHANNELS [CAPR 70090887]



PRESSURIZER LEVEL
COLD CONDITIONS – 100°F

	COLD CAL	Elevation	Channel I, II, III	Gallons
Upper Level Tap	100.0%	152.7ft	180.0%	13,200 gal.
Data Point	75.0%	141.8ft	129.3%	10,050 gal.
Hot Calibrated Channels On Scale	60.0%	135.2ft	98.8%	8,160 gal.
Alarm (92%)	56.7%	133.8ft	92.1%	7,744 gal.
Alarm (70%)	45.8%	129.0ft	70.0%	6,371 gal.
Transition To Draindown Procedure	25.0%	119.9ft	27.8%	3,750 gal.
Alarm (17%)	19.7%	117.6ft	17.0%	3,082 gal.
Data Point	10.0%	113.3ft	-2.7%	1,860 gal.
Lower Level Tap	0.0%	108.9ft	-23.0%	600 gal.
		104.34ft		