HOPE CREEK GENERATING STATION

HC.OP-IO.ZZ-0004(Q) - Rev. 82

SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN

USE CATEGORY: I

- Packages and Affected Document Numbers incorporated into this revision:
  CP No. _____ CP Rev. _____ AD No. _____ Rev No. _____ None ✓
- The following OPEX were incorporated into this revision: None
- The following OTSCs were incorporated into this revision: None

REVISION SUMMARY

- Changes the setpoint in Note 5.1.11.D to an allowable band of 4500 to 5100 gpm for the SCP. This was evaluated in DCP 80098725 and is editorial. (80098725-0210)
- Adds Step 5.1.29.C to ensure that the reactor cooldown is logged. This is the same as Step 5.2.4 and is editorial. (70105925-0010)
- Corrects a step numbering error on Attachment 12, Step 5.1.13.C. This is an editorial change.

IMPLEMENTATION REQUIREMENTS **Effective Date 1/15/10**

None

SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN

TABLE OF CONTENTS

ATTACHMENTS

SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN

START TIME	_____	DATE	_____	BY	_____
TERMINATION TIME	_____	DATE	_____	BY	_____
COMPLETION TIME	_____	DATE	_____	BY	_____

1.0 PURPOSE

This procedure provides guidelines for the shutdown of the plant from rated power to a Cold Shutdown condition.

2.0 PREREQUISITES

None

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Administrative

3.1.1. This procedure is to be used as a guideline for the shutdown of the plant from rated power to a Cold Shutdown condition. IF it is desired to shut down the plant from other than rated power using this procedure, the proper entry point should be determined by the SM/CRS. It is NOT required that each step be performed in precise sequence as long as the steps are performed in a timely manner in keeping with the intent of this procedure. Changes in sequence must be evaluated for potential reactivity challenges. Any deviations and/or limitations of this procedure shall be justified and documented on Attachment 11, Operational Limitations Comment Page. ____

3.1.2. The Flowcharts are to be used as an extension of the procedure. The procedure user should use a marker to record information directly on the Flowcharts, and the Flowcharts should be updated simultaneously with the body of the procedure. ____

3.1.3. This procedure may be used to perform a controlled shutdown where the Reactor is placed in a Hot Shutdown condition prior to reaching a low power level provided the sequence of Reactor operation has been evaluated as part of a “preplanned evolution”. ____

3.1.4. IF, while executing this procedure, conditions warrant placing the Reactor in Hot Shutdown without all preparatory actions completed OR this procedure is being used as part of a “preplanned evolution” to place the Reactor in a Hot Shutdown condition prior to reaching a low power level, THEN final mode change checks should be made in accordance with Step 5.1.29.B, and the Mode Switch may be placed in Shutdown in accordance with Step 5.1.29.D. Once the plant has been stabilized, all remaining steps in this procedure should be reviewed and completed as required. ____

3.1.5. Control rod insertion and cooldown of the Reactor Coolant System can be performed simultaneously.
WHEN this occurs, the cooldown rate
AND neutron flux should be closely monitored for any sudden changes. ____

3.1.6. IF control rod insertion is stopped prior to all rods being inserted, re-criticality must be anticipated due to cooldown. The Reactor Operator shall NOT be distracted for any reason until Rx power is stable, or all rods are fully inserted. ____

3.1.7. The following Abnormal Operating Procedures may be applicable during a plant Shut-down, and should be reviewed as applicable:

- HC.OP-AB.RPV-0001(Q), Reactor Power. ____
- HC.OP-AB.RPV-0003(Q), Recirculation System. ____
- HC.OP-AB.RPV-0004(Q), Reactor Level Control. ____
- HC.OP-AB.IC-0001(Q), Control Rod. ____
- HC.OP-AB.IC-0004(Q), Neutron Monitoring. ____

3.1.8. Values of Megawatts Electric (MWe), throughout this procedure are approximate. These values can be affected by Seasonal conditions and/or Plant conditions, such as Degraded Vacuum Operations. ____

3.2 **Technical Specification**

3.2.1. WHEN a thermal power change exceeding 15% of rated thermal power occurs within a one-hour period, the Chemistry Department shall be notified to obtain the required samples as specified in Technical Specification 3/4.4.5, and the Radiation Protection Department shall be notified to obtain the required samples as specified in ODCM Table 4.11.2.1.2-1. ____

3.2.2. The oxygen concentration limits of Technical Specification 3.6.6.2 shall be complied with. ____

3.2.3. Vessel metal temperatures above and below the water level and Reactor Coolant System Temperature/Pressure Data should be monitored to ensure the TS Cooldown limits are NOT exceeded while raising Reactor Vessel Level. ____

3.2.4. Technical Specification 4.6.1.3.c Primary Containment Air Lock operability requirements (and its associated note) shall be observed. ____

3.2.5. With NO Reactor Recirculation Pumps in service, AND the Reactor is "Critical"; the Mode Switch shall be LOCKED in "Shutdown". [**CD-354F**] ____

3.3 **Reactor**

3.3.1. The single rod scram test switches are intended for test purposes and should NOT be used to bypass the requirements for banked control rod movement below the RWM low power setpoints. These test switches are NOT to be used for power control or rapid power reduction purposes. [**CD-251C**] ____

3.3.2. Directions from Reactor Engineering should be adhered to when any steps which require the movement of control rods are performed. ALL power changes should be done with directions provided by Reactor Engineering or designated representative. [**CD-523B**] ____

3.3.3. IF immediate Reactor power reduction is required AND there is no dedicated reactivity plan THEN **IMPLEMENT** the Standard Power Reduction Instructions. [**CD-393B**] ____

3.3.4. IF the Crossflow Correction Factor is “Applied” / “Automatic” (Mode A) and is frozen, operation at Licensed Thermal Power Limit may continue for up to 24 hours with the frozen Correction Factor. Within 24 hours, one of the below actions must be completed.

- The problem causing the freeze is resolved and the Correction Factor is unfrozen (i.e. remain in Mode A). ____
- A manual Correction Factor is implemented (i.e. transition to Mode B). ____
- The Correction Factor is toggled to “Not Applied” (i.e. transition to Mode C). ____

IF plant conditions change significantly during this period, THEN the validity of the frozen Correction Factor should be evaluated. ____

3.3.5. When the OPRM’s are “Operable”, Operation within the OPRM Enable Region of the Power to Flow Map will allow a Reactor Scram due to OPRM input to RPS. ____

3.3.6. When the OPRM’s are “Inoperable” AND operating in or near Region 2 of the Power to Flow Map, nuclear instrumentation should be closely monitored for Reactor Core instability. **[CD-354F]** ____

3.3.7. Reactor operation shall be consistent with the Power to Flow Maps on Attachment 5. ____

3.3.8. WHEN repositioning IRM RANGE SELECT Switches, only one switch should be operated at a time. ____

3.3.9. All IRM RANGE SELECT Switches should be in RANGE 10 prior to IRM insertion. ____

3.3.10. WHEN reducing Thermal Power, the RWM Low Power Alarm Point (LPAP) should be reached by 17% power, but may be reached at a higher power level. The Low Power Set Point (LPSP) shall be reached by 8.6% power, but may be reached at a higher power level. ____

3.3.11. A rise in RPV Level could occur as the RPV depressurizes due to "flashing" in the Feedwater lines. This is caused when flow from the Feedwater system is no longer required to make up for steam loss from the RPV, which allows the Feedwater to cool at a slower rate than the RPV. As the RPV depressurizes, this higher temperature water expands as it changes phase, causing flow from the Feedwater system to the RPV.
If a Steam Bubble has formed in the Feedwater lines (as indicated by a sudden rise in RPV level), Feedwater Flow should not be initiated until the Bubble has condensed.
The recovery of RPV level, in the absence of water loss from steaming or letdown, would be an indication that the Bubble has condensed. ____

3.3.12. The IRM/APRM Recorders have dual scales (0 – 40 and 0 –125), but are only configured for the 0 – 125 scale.
During Startup, the IRM signals are sent to the recorder at either the 0 – 40 or the 0 – 125 scale, based on the position of the IRM Range Switch. At power, the APRM signals are sent to the recorders using the 0 – 125 scale only. The recorders do not change scale, therefore, the 0 – 40 scales, when using the IRMs, will not be accurate on the recorders. ____

3.4 **Balance of Plant**

3.4.1. During low flow conditions Feedwater flow to the Reactor should be maintained relatively constant to minimize thermal transients on the Reactor Vessel. Opening a bypass valve may be necessary to achieve steady Feedwater flow. **[CD-786D]** ____

3.4.2. To avoid thermal stress to the Feedwater Nozzles, maximum RWCU flow should be maintained, WHEN a low Feedwater flow condition exists. **[CD-786D]** ____

3.4.3. A 150°F/hr Cooldown rate on the Main Turbine first stage shell temperature is NOT to be exceeded. ____

3.4.4. The Mechanical Vacuum Pump(s) are NOT to be started OR operated if Reactor Thermal Power is above 5%. [**CD-015B**] ____

3.4.5. The Main Turbine should NOT be operated with exhaust pressure above the variable alarm setpoint. Under low-load conditions, exhaust pressure in excess of 4.0 Inches Hg Abs should be avoided. ____

3.4.6. This procedure does NOT require that the Reactor Building Sample Station Drains be diverted to CRW; however, if it is deemed necessary to do so, Condenser Vacuum should be monitored when repositioning 1-RC-V005. ____

3.4.7. At low loads, backpressure should be maintained ≥ 1.5" Hg Abs, (degraded vacuum) to mitigate shell and rotor distortion, which could result in a rub induced vibration condition. Degraded vacuum should be established gradually over a 2 Hour period, at approximately 25% Reactor Power. Vibration should be closely monitored when establishing degraded vacuum operation. ____

3.4.8. Extended low power operation with 3 or more Station Service Water pumps in service may result in overflowing the Cooling Tower Basin. WHEN operating in this mode, the Cooling Tower Blowdown Flow should be monitored for extended High Flow conditions (Ex: PNL 10C604, 0SP-RI-4168) AND the Cooling Tower Basin Level monitored locally. The SSW pump(s) should be secured as necessary. ___

3.5 **Cooldown**

3.5.1. During Rx depressurization, flashing may occur in the RWCU System piping, causing spurious Hi Delta Flow isolation signals or RWCU Pump trips on low flow to occur. ____

3.5.2. During plant Cooldown/Depressurization, similar Rx water level instrumentation should be monitored for significant deviation, indicating possible reference line de-gassing. Also, all maintenance activities which have the potential for draining the Rx Vessel should be terminated. ____

3.5.3. Excessive cooldown rates may be experienced with small amounts of decay heat present. Removal of loads from the Main Steam Header OR closing the MSIVs and using the Main Steam Line Equalizer Valve AB-HV-F020 will help to control cooldown rate. ____

3.5.4. During plant Cooldown the following guidance should be adhered to in order to minimize shutdown radiation levels from CRUD release and transport: [**PR 960508151**] ____

A. Recirculation Pumps should be maintained in operation as long as possible in order to assist in CRUD Burst Cleanup ____

B. RWCU Filter Demin flow should be maximized to remove CRUD released during the cooldown. (90 gpm Demin flow (single pump ops) may be the max flow while Depressurizing/Cooldown, due to suction venturi flashing causing inadvertent pump trips.) ____

C. Chemistry Department should be notified of changes in plant condition that may reduce CRUD removal. (i.e., RWCU flow changes) ____

3.5.5. Reactor Pressure and/or Level control may be significantly challenged following a Reactor Shutdown in which the Plant Heat Loads exceed the Decay Heat generation. Isolation of the MSIVs and cycling of the SRVs may be required to control Reactor Pressure. Consideration should be given to the implementation of a Post Scram Cooldown Strategy with low Decay Heat Load. ____

3.6 **Core Circulation**

3.6.1. During plant start up, run the Reactor Recirc Pumps at vessel head pressure for the minimal possible time. In addition, maintain pump speed as low as practical, avoiding speeds >30% and oscillations. If plant conditions will result in extended pump operation, greater than 24 hours, then consideration should be given to removing the pumps from service if a plant startup is not in progress. Plant Engineering should be consulted prior to exceeding this limit. **[CD-781A, PR 961227150]** ____

3.6.2. Operation of the Reactor Recirc Pump above 200 psig results in better seal operations. At approximately 200 psig the Reactor Recirc Pumps experience thrust changeover from lower thrust shoes to upper thrust shoes. As reactor pressure is decreased during shutdown, the plant should not be allowed to "hover" in this range. ____

NOTE

Effective Core Flow shall be the core flow that would result if both recirculation loop flows were assumed to be at the smaller value of the two loop flows.

3.6.3. Recirculation loop flow mismatch shall be maintained within: [**T/S 3.4.1.3**]

A. 5% of rated core flow with effective core flow $\geq$ 70% of rated core flow. ____

B. 10% of rated core flow with effective core flow $<$ 70% of rated core flow. ____

3.6.4. The time when neither the RHR System (operating in the Shutdown Cooling Mode) nor the Reactor Recirculation System is in operation should be minimized. ____

3.6.5. During the transition from normal Reactor Recirculation System operations to establishment of Shutdown Cooling, only the AP201 Reactor Recirc Pump may be left in operation until the BP202 (only) RHR Pump is operating satisfactorily, and then only until the required B RHR Loop flow of approximately 10,000 gpm is achieved. This limitation does NOT apply when Noble Metals Chemical Application is to be performed during plant shutdown. ____

3.6.6. The discharge valve of any Reactor Recirculation Pump, which is NOT in operation, should remain closed throughout Shutdown Cooling operations. IF it is required to stroke the discharge valve of an out-of-service Reactor Recirculation Pump, the pump's suction valve should be verified to be closed AND the suction valve's power supply breaker cleared and tagged open. ____

3.6.7. While the RHR System is operating in the Shutdown Cooling Mode of operation, any valve manipulations that would prevent ANY of the rated Shutdown Cooling Flow (approximately 10,000 gpm), from returning to the Reactor Vessel via the respective Recirculation System discharge piping and jet pumps are NOT to be performed. For example, recirculation suction and discharge valves being open simultaneously on the loop seeing shutdown cooling return flow would result in a portion of the return flow being diverted back through the Recirculation Loop in the reverse direction, rather than into the respective Jet Pumps where forced circulation through the core would occur. This limitation does NOT preclude intentionally reducing Shutdown Cooling flow to support Noble Metals Chemical Application. ____

3.6.8. While the RHR System is operating in the Shutdown Cooling Mode of operation, maintaining the rated shutdown cooling flow to the Reactor Vessel via the respective Recirculation System discharge piping and Jet Pumps is essential to assure that the RHR Heat Exchanger inlet temperature is representative of actual bulk coolant temperature. ____

3.6.9. WHEN the average Reactor coolant temperature is below 200°F, periods with the Reactor Vessel level ≤ 80 inches should be minimized, to ensure that natural circulation will be immediately available IF forced circulation is lost or terminated for any reason. ____

3.7 **Other**

3.7.1. Cold Shutdown IST Valve Testing should commence within 16 hours but must commence within 48 hours of achieving Cold Shutdown, and continue until testing is complete or the plant is ready to return to power. There is NO requirement to keep the plant in Cold Shutdown solely to complete Cold Shutdown Testing. For extended outages, testing need NOT begin in 48 hours, provided all valves required to be tested during Cold Shutdown will be re-tested before plant startup. ____

- IF an outage lasts beyond 92 days, then all Cold Shutdown Testing shall be completed. Additionally, Cold Shutdown Testing shall continue such that all applicable components have been tested within the last 92 days of the shutdown. ____

- WHEN an extended Cold Shutdown occurs which necessitates de-inerting the containment, then testing of valves that require this condition is discretionary. The length of the shutdown and the extent of other outage activities could be factored into a decision. ____

3.7.2. As part of Station Blackout considerations, valves AB-HV-F020 AND AB-HV-F021 will be tagged in their required position during power operations due to their inaccessibility (Main Steam Line valves). [**CD-675F**] ____

3.7.3. All initiating actions in EHC include a confirmation message. Initiating actions include valve testing, setpoint changes, resetting trips, etc. Specific direction to confirm the action is not included with each procedural step to perform an action. All terminating actions in EHC do not require confirmation. Terminating actions include stopping testing, terminating cooldown, adjusting with RAISE or LOWER pushbuttons, etc. ____

3.7.4. The blowdown rate from the Reactor Water Cleanup (RWCU) System should be limited to prevent RWCU Filter/Demineralizer inlet temperature from exceeding 130°F. ____

3.7.5. IF this procedure is being performed in preparation for Refueling activities, THEN consideration should be given to performing controlled flushes of systems which have the potential to affect Vessel Cavity clarity during refueling operations. (i.e., Shutdown Cooling Loops). ____

3.7.6. IF this procedure is being performed in preparation for Refueling activities AND the plant is in Mode 4, THEN consideration should be given to defeating the secondary containment air lock doors (Rx 102' & 145') in order to prevent damage to the doors, reduce the chance of injury and minimize transit times. [**T/S 3.6.5.1**] ____

3.7.7. IF CRIDS is lost during the plant shutdown THEN Field Operators shall take continuous rounds AND log keeping. Normal rounds and log keeping can resume WHEN the plant is in Hot Shutdown. [**CD-491Y**] ____

4.0 EQUIPMENT REQUIRED:

None

5.0 PROCEDURE

5.1 Load Reduction

NOTE

When lowering load IAW this procedure DO NOT exceed a rate of change of 1% per minute unless the change is due to a single control rod movement and positioning the control rod at an intermediate position is not recommended by Reactor Engineering.
[70004890, 80010404]

All power changes shall be done with directions provided by Reactor Engineering or a designated representative. Detailed directions from Reactor Engineering will be provided when performing any steps which require the movement of control rods. [**CD-523B**]

The Main Turbine should NOT be operated with exhaust pressure above the variable alarm setpoint. Operation at low or minimum load should be performed at the best attainable exhaust pressure. Under low-load conditions, exhaust pressure in excess of 4.0 Inches Hg Abs should be avoided.

5.1.1. **ENSURE** the following steps have been completed before commencing a shutdown:

A. System Operator notified of the shutdown. ____

B. Reactor Engineer notified of the shutdown. ____

C. Steam Lead Drain #4 (AC-HV-1018A) is in AUTO. ____

NOTE

- Recirculation loop flow mismatch shall be maintained within: [**T/S 3.4.1.3**]
  1. 5% of rated core flow with effective core flow ** greater than or equal to 70% of rated core flow.
  2. 10% of rated core flow with effective core flow** less than 70% of rated core flow.

  ** Effective core flow shall be the core flow that would result if both recirculation loop flows were assumed to be at the smaller value of the two loop flows.
- If immediate Reactor power reduction is required, and there is no dedicated reactivity plan, then implement the Standard Power Reduction Instructions. [**CD-393B**]

CAUTION

When the OPRMs are "Operable", Operation within the OPRM Enable Region of the Power to Flow Map will allow a Reactor Scram due to OPRM input to RPS. Time spent operating within this region should be minimized.

When the OPRMs are "Inoperable", AND operating in or near Region 2 of the Power to Flow Map, nuclear instrumentation should be closely monitored for Reactor Core instability. [CD-354F]

5.1.2. **LOWER** Reactor power by reducing Reactor Recirculation Pump A and B speed IAW HC.OP-SO.BB-0002(Q), REACTOR RECIRCULATION SYSTEM OPERATION. ____

5.1.3. **MAINTAIN** the Load Setpoint at 100 % OR as directed by CRS. ____

5.1.4. WHEN the #4 CONTROL VALVE is Full Closed, **ENSURE** the #4 STEAM LEAD DRAIN (HV-1018A) is OPEN. ____

5.1.5. WITH Feedwater flow < 15.27 Mlbm/hr ("Less Than 95% Flag" set) OR consistent with Reactor Engineering guidance, **TOGGLE** the Crossflow Correction Factor to "Not Applied" IAW HC.RE-RA.ZZ-0011(Q). ____

NOTE

Typically the first RFP removed from service for a planned maintenance outage has been designated for maintenance activities and may be removed from service IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. However, with this pump out of service (Tripped - yielding a 2 of 3 low control oil signal), any subsequent transient causing RPV level to reach Level 4 (30") will enforce an Intermediate Recirc Runback.

5.1.6. At approximately 70% power
PLACE the third RFP in Recirc. Operation
IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. ____

5.1.7. WHEN the Reactor Recirculation Pump speeds are between 45 and 50%, **ENSURE** the Reactor Recirculation Pumps are in Individual Manual Control IAW HC.OP-SO.BB-0002(Q), Reactor Recirculation System Operation. ____

5.1.8. At approximately 50% power, **ENSURE** H1CA –CA-HV-1991 is open to provide steam to the Steam Seal evaporator from Main Steam. ____

5.1.9. **CONTINUE** reducing Reactor power as follows:

A. IF needed, PRIOR to reducing power below 40% of rated (≈507 MWe) **ENSURE** the Throttle Pressure Set, Pressure Setpoint has been returned to normal (905 psig) as follows: ____

1. **SELECT** Control , Pressure Control ____

2. IF needed, **SELECT** Ramp Rate
AND **ENTER** desired rate. ____

3. IF needed, **SELECT** Setpoint
AND **ENTER** 905 psig. ____

4. **VERIFY** Throttle Pressure Set, "Pressure Reference" is equal to "Pressure Setpoint". ____

B. **LOWER** Reactor Recirculation Pump A AND B speed UNTIL minimum speed is reached ____

AND/OR

C. **INSERT** control rods IAW Reactor Engineering Guidance. ____

NOTE

At approximately 5000 gpm RFP flow to the vessel, flow oscillations could occur due to opening of RFP Minimum Flow Control Valves. This could cause RPV Level and Power perturbations.

Placing a second RFP in recirc before removing the first RFP placed in recirc from service (i.e., tripped - yielding a 2 of 3 low control oil signal) will ensure the Intermediate Recirc Runback circuit is not activated if the associated level transient causes RPV level to reach Level 4 (30").

Designating the RFP with the lowest discharge flow to the vessel as the 2nd RFP to be placed in Recirc operation reduces the amount of flow the last in-service RFP will have to assume to maintain a steady feed rate – this will minimize the level transient.

SCP Minimum Flow Valves will begin to open when total feed and condensate flow lowers to 13,500 gpm (the sum of RFP flow to the vessel and RFP minimum flow); this will occur at approximately 30% load (380 MWe). This step contains actions at an approximate power value and may be performed earlier if SCP Minimum Flow Valve performance is challenging level control. Based on RFP capacity, this step should be performed at less than or equal to 38% power (482 MWe).

5.1.10. At approximately 30% power, (≈386 MWe) WHEN the RFP with the lowest discharge flow (flow to the vessel) approaches 5,500 gpm, THEN, **PERFORM** the following:

A. **PLACE** the RFP operating with the lowest discharge flow to the vessel (the 2nd RFP) in Recirc operation IAW HC.OP-SO.AE-0001 (Q), Feedwater System Operation. ____

B. **STOP** one Secondary Condensate Pump A(B,C)P137 IAW HC.OP-SO.AD-0001(Q), Condensate System Operation (leaving two Secondary Condensate Pumps in service). ____

C. **STOP** one Primary Condensate Pump A (B, C) P102 IAW HC.OP-SO.AD-0001(Q), Condensate System Operation (leaving two Primary Condensate Pumps in service). ____

D. **ENSURE** one RFP previously placed in Recirc operation has been removed from service IAW HC.OP-SO.AE-0001 (Q), Feedwater System Operation. ____

E. **MAINTAIN** 1 RFP in service AND 1 RFP in Recirc operation IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. ____

(Continued on next page)

5.1.10 (Continued)

F. **VERIFY** that the "SINGLE ELEMENT CONTROL", block on the DFCS Main Screen #1 is illuminated yellow. ____

G. **INSTRUCT** I&C and Radiation Protection to restore the MSL Rad Monitor Trip and Alarm Setpoints to normal. ____

NOTE

When the TCV fast closure and MSV Trip Bypass Annunciator alarms, a scram may still be possible from the TCVs or MSVs. This alarm annunciates whenever any of the four channels monitoring first-stage turbine pressure drops below the setpoint. The CRIDS Digital Points (D3467 through D3470) which monitor continuity of the individual logic trains should be checked to determine when the scram function of the TCVs and MSVs is actually bypassed.

5.1.11. At approximately 30% Rated Power:

A. **VERIFY** the ROD BLOCK MONITOR, RBM A and B BYPASS light is ON. ____

B. To minimize the potential for RWCU pump trips on plant shutdown, **PERFORM** the following:

1. **CONTACT** Chemistry to reduce RWCU System flow to < 90 gpm with one Demineralizer in service while monitoring suction flow to prevent a trip on low flow. ____

2. **REMOVE** either A or B RWCU Pump from service. ____

C. IF not performed in the previous 92 days, **PERFORM** Main Turbine Lift Pump test IAW HC.OP-FT.AC-0003(Q). ____

NOTE

Secondary Condensate Pump (SCP) Min Flow Valves will cycle open and closed when any SCP flow lowers to an allowable band of 4500 to 5100 gpm. This occurs at approximately 22% power. In order to avoid Min Flow Valve cycling and corresponding Reactor Level swinging, RFP Min Flow Valves can be taken to MANUAL and opened to achieve a SCP flow value above 5500 gpm.

D. **PLACE** a RFP Min Flow Valve controller in MANUAL AND **ADJUST** Min Flow to achieve 3500 gpm (or as directed by the CRS).

CAUTION

At low loads, backpressure should be maintained ≥ 1.5" Hg Abs, (degraded vacuum) to mitigate shell and rotor distortion, which could result in a rub induced vibration condition. Degraded vacuum should be established gradually over a 2 hour period, at approximately 25% Turbine Load. Vibration should be closely monitored when establishing degraded vacuum operation.

5.1.12. At approximately 25% power (approx. 317 MWe), **GRADUALLY ESTABLISH** Condenser backpressure ≥ 1.5" Hg Abs, over a 2 Hour period using one or both of the following procedures:

- HC.OP-SO.CG-0001(R), Condenser Air Removal System Operation. ____
- HC.OP-SO.DA-0001(Z), Circulating Water System Operation ____

Continued Next Page

NOTE

Plant shutdown from >20% power will NOT support Turbine Testing per HC.OP-FT.AC-0004(Q), if it is required.

5.1.13. IF directed by the Operations Director to Lock the Mode Switch in Shutdown from between 30% and 20% power with the Main Turbine still on line, THEN **PERFORM** the following:

A. **DISPATCH** an operator for local observation, AND **CHECK** operation of the feedwater Startup Level Control Valves by performing the following steps to stroke the Startup Level Control Valves:

1. **PRESS** the "INS" pushbutton as necessary to select POSN DEMAND on STARTUP LEVEL CONTROLLER ____

2. **ENSURE** START UP LEVEL CONTROLLER is in "M" (manual). ____

3. **PRESS** LV1785 ON pushbutton. ____

4. Intermittently **PRESS** INCREASE ↑ pushbutton on STARTUP LEVEL CONTROLLER UNTIL POSN DEMAND indicator is at 100%.

5. **PRESS** LV-1785 CLOSE PB to close the Startup Level Control Valves in preparation for Shutdown. ____

B. **PLACE** Main Turbine Oil Pumps in service, **ADJUST** the lube oil temperature controller, AND **SECURE** the power system stabilizer IAW HC.OP-SO.AC-0001(Q) Section for shutting down the Main Turbine. ____

Continued Next Page

5.1.13 (continued)

C. **PERFORM** the following Steps at the current power level (all other intermediate steps should be N/A):

1. 5.1.22 for the EOC RPT system. ____

2. 5.1.27 for opening the FWH 1&2 vents. ____

3. 5.1.28 for Pressure Setpoint Adjustment. ____

4. 5.1.29 for performing a Manual Scram. ____

NOTE

If a power reduction event occurs so that reactor power is < 20 percent, Control rod motion (except for scram or other emergency condition) SHALL BE PROHIBITED UNTIL the MSL Rad Monitor Trip and Alarm Setpoints have been returned to normal.
[T/S 3.3.2 Table 3.3.2-1 Note ##]

5.1.14. **VERIFY** the MSL Rad Monitor Trip and Alarm Setpoints have been returned to normal PRIOR to decreasing core thermal power ≤ 20%. [**T/S-3.3.2**] ____

5.1.15. At approximately 17% Rated Power, (≈215 MWe) **PERFORM** the following:

A. **VERIFY** that the Low Power Alarm Point (LPAP) on the RWM is reached as follows: ____

1. **SELECT** the MAIN_1 display on the DFCS Console. ____

2. As indicated Steam Flow decreases to < 2.23 Mlb/hr on the DFCS Console
THEN **VERIFY** RWM Power Indication changes from "POWER:ABOVE LPAP" to "POWER:TRANSITION" at the RWM Display screen. ____

Continued Next Page

5.1.15 (continued)

NOTE

The following step is required to be performed within 8 hours PRIOR to RWM automatic initiation when reducing thermal power below the LPSP. [**T/S 4.1.4.1.a**]

If all the control rods in the currently latched step are at the initial or final positions for that step, then the RWM is at a boundary between adjacent steps. At a step boundary, a selection error is not generated when a control rod in either of the adjacent steps is selected. In such cases, a control rod must be selected from a step other than those adjacent ones.

RWM insert and withdraw blocks are indicated but are NOT enforced in the"transition" zone.

B. **SELECT** any control rod that is NOT in the currently latched step of the RWM (or an adjacent step if at a boundary) AND **PERFORM** the following: **[T/S 4.1.4.1.a]** ____

1. **VERIFY** the below selected indications at the RWM Operators Display:

   - "SR XX - YY : ZZ" where XX - YY is the selected rod and ZZ is its current position ____
   - "SE" which indicates a selection error ____
   - "IB" which indicates an insert block (not shown if at 00) ____
   - "WB" which indicates a withdraw block (not shown if at 48) ____

2. **RECORD** date and time. _____
   Date / Time

5.1.16. At 20% Rated Power (or less) and,
IF it is desired to continue Reactor Cooldown
AND Depressurization in preparation for Refueling activities,
THEN **DIRECT** Maintenance Department to commence Reactor Cavity Shield Plug Removal IAW HC.MD-FR.KE-0035(Q), Reactor Pressure Vessel Disassembly. ____

NOTE

The control rod pattern should be re-established PRIOR to reaching the low power setpoint on the RWM. Failure to do this may result in insert and/or withdraw blocks.

When reducing thermal power, RWM low power setpoint is nominally reached at 15% power (≈190 MWe).

PRIOR to load reduction below 8.6% power (≈109 MWe), automatic initiation of RWM shall be verified by performance of Step 5.1.17. These steps must be completed prior to any control rod movement after the RWM "POWER" indicates POWER: BELOW LPSP.
[CD-249E]

5.1.17. WHEN the low power setpoint (LPSP) on the RWM is reached **PERFORM** the following:

A. **OBSERVE** the RWM "POWER" indicates "POWER:BELOW LPSP" ____

OR

RWM "POWER" indication changes from "POWER:TRANSITION" to "POWER:BELOW LPSP". ____

Continued Next Page

5.1.17 (continued)

NOTE

The following step shall be performed within 1 hour AFTER RWM automatic initiation below the LPSP IAW T/S 4.1.4.1.c.

If all the control rods in the currently latched step are at the initial or final positions for that step, then the RWM is at a boundary between adjacent steps. At a step boundary, selection errors are not generated when control rods in either of the adjacent steps are selected. In such cases, a control rod must be selected from a step other than those adjacent ones.

B. **SELECT** any partially or fully inserted control rod that is NOT in the currently latched step of the RWM (or the adjacent step if on a boundary) AND **PERFORM** the following steps:

1. **VERIFY** the below selected indications at the RWM Operator's Display.

   - "SR XX - YY : ZZ" where XX - YY is the selected rod and ZZ is its current position ____
   - "SE" which indicates a selection error ____
   - "IB" which indicates an insert block (not shown if at 00) ____
   - "WB" which indicates a withdraw block ____

2. **ATTEMPT** to withdraw the control rod AND **VERIFY** that there is no control rod movement. **[T/S 4.1.4.1.c]** ____

3. **RECORD** date and time. _____
   Date / Time

5.1.18. At approximately 13% power (≈165 MWe), **PERFORM** the following:

NOTE

RFP Minimum Flow Valves begin to open at 5000 gpm total RFP flow for pump protection. To prevent Level / Power fluctuations caused by RFP Minimum Flow Valve operation, the in-service RFP Minimum Flow Valve is placed in MANUAL at 3500 gpm BEFORE the in-service RFP discharge flow to the vessel goes below 5000 gpm.

The RFP Woodward governor's calibrated lower control band is 650 rpm (1500 gpm equivalent). To prevent level fluctuations caused by RFP Woodward Governor performance, power should not be lowered in subsequent steps below that which would cause the in-service Feed Pump's discharge flow to the vessel to go below 2000 gpm WITH its associated minimum flow valve in manual at 3500 gpm.

Acceptable flow for Master Level Control (>2000 gpm feed flow to the Reactor) is expected to be maintained down to the following approximate indications of power:

- 13% as indicated on the APRMs, or
- 100 MWe Generator Load, or
- 2½ BPVs open

This is intended to maintain Master Level Control operation through removing the main turbine/generator from the grid for better overall level control.

A. WHEN Reactor Feed Pump A(B, C) Discharge Flow (flow to Vessel) reaches approximately 5500 gpm during shutdown, THEN, **PLACE** this Reactor Feed Pumps' Minimum Flow Valve in Manual to achieve 3,500 gpm minimum flow IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. ____

Continued Next Page

5.1.18 (continued)

B. **OPEN** the following:

1. AC-HV-1041/42/43 (A,B,C)CROSS AROUND (1 push button) ____

2. AF-HV-1373 A, B, C (FWH #3 SHELL SIDE)-EXTR LINE DRAINS (3 push buttons) ____

3. AF -HV-1388 A, B, C (FWH #3 SHELL SIDE)-EXTR LINE DRAINS (3 push buttons) ____

4. AF -HV-1355 A, B, C (FWH #4 SHELL SIDE)-EXTR LINE DRAINS (3 push buttons) ____

5. AF -HV-1377 A, B, C (FWH #4 SHELL SIDE)-EXTR LINE DRAINS (3 push buttons) ____

6. AF-HV-1387 A, B, C (FWH #5 SHELL SIDE)-X-AROUND STM LINE DRAIN (3 push buttons) ____

7. AF-HV-1359 A, B, (FWH #6 SHELL SIDE)-EXTR STM DRN VLVS (2 push buttons) ____

C. **VERIFY** the following valves auto open:

1. AB-HV-F033 CTMT INBD STM LNS/MN STM LINE AFT STOP V DRN HDR-DRN HDR OP DRN V. ____

2. AB-HV-F069 STEAM LINE BEFORE STOP VALVE DRAINS-DRN HDR OP DRN VLV. ____

5.1.19. **OPEN** the following valves:

A. AB-HV-1026 STM LEAD S/U (1 push button) ____

B. AC-HV-1013 A,B,C,D MN STM VLV BFR SEAT (1 push button) ____

C. AC-HV-1015 CONT VLV BFR SEAT (1 push button) ____

D. AC-HV-1017A/B STEAM LEAD 1&2 (1 push button) ____

E. Steam Lead Drain AC-HV-1018B Steam Lead 3 ____

5.1.20. **VERIFY** Steam Lead Drain AC-HV-1018A Steam Lead 4 is open. ____

5.1.21. **PERFORM** the appropriate sections of HC.OP-FT.AC-0004(Q); Main Turbine Functional Test – Refueling, as required:

A. IF required to implement Regular Maintenance Plan 14852, THEN **PERFORM** applicable sections of the procedure IAW Outage scheduling requirements. ____

B. IF required to **ENSURE** 24 month test frequency is NOT exceeded AND no maintenance work is scheduled to be performed on the Front Standard, THEN **PERFORM** POST and EOST Offline tests. ____

5.1.22. **ENSURE** the EOC Recirc Pump Trip System is BYPASSED as follows:

A. **PLACE** RECIRC PUMP TRIP DISABLE SYSTEM "A", Switch C71A-S12A, to BYP. (10C609) ____

B. **PLACE** RECIRC PUMP TRIP BYPASS DISABLE SYSTEM "B", Switch C71A-S12B, to BYP. (10C611) ____

NOTE

It is recommended to unload the Turbine-Generator from 15% to 5% of rated load (≈190 to 63 MWe OR lower) and trip the turbine within a total time of 45 minutes. This will maintain the required low pressure turbine temperature during shutdown and Turbine-Generator unloading.

5.1.23. **REMOVE** the Main Turbine/Generator from the grid IAW HC.OP-SO.AC-0001(Q), Main Turbine Operation. ____

NOTE

Acceptable flow for Master Level Control (>2000 gpm feed flow to the Reactor) is expected to be maintained down to the following approximate indications of power:

- 13% as indicated on the APRMs, or
- 100 MWe Generator Load, or
- 2½ BPVs open

This is intended to maintain Master Level Control operation through removing the main turbine/generator from the grid for better overall level control.

5.1.24. **TRANSFER** Feedwater Control from Master Level Control to Startup Valves IAW HC.OP-SO.AE-0001(Q). ____

5.1.25. **PERFORM** an IRM/APRM overlap at 10% power (average APRM reading) as follows: [**T/S 4.3.1.1-1 (Note b)**] ____

A. **PLACE** all IRM RANGE SELECT Switches to position 10. ____

NOTE

All IRM RANGE SELECT Switches should be in RANGE 10 prior to IRM insertion

B. **INSERT** the IRM Detectors to the full in position IAW HC.OP-SO.SE-0001(Q), Nuclear Instrumentation System Operation. ____

C. **DEMONSTRATE** that the IRM and APRM channels overlap for at least ½ decades by verifying the following: **[T/S 4.3.1.1-1 (Note b)]** ____

IRMs indicate ≤ 50 on range 10		**APRMs** ≥ 4% (Downscale Setpt).	
CHANNEL	INITIAL	CHANNEL	INITIAL
A		A	
B		B	
C		C	
D		D	
E		E	
F		F	
G			
H			

NOTE

GETARS will be re-booted and placed in "SENTINEL MODIFIED" using Work File 14 to allow for Data collection in SENTINEL while the Main Generator Output Breakers are open. This will allow for data collection following the manual Rx Scram later in this procedure. The Turbine Trip Limit Check (as sensed by Turbine Generator Output breaker position) is removed from Work File 14.

5.1.26. **PLACE** GETARS in "SENTINEL MODIFIED" using Work File 14. ____

5.1.27. **OPEN** AF-HV-1459 A,B,C HTRS 1 & 2/DC, S/U AND OPR VENTS ____

NOTE

IF Reactor Engineering will collect control rod scram time data during manual scram in Step 5.1.29.D, Reactor pressure will be required to be ≥ 950 psig prior to the manual scram.

5.1.28. IF necessary to support plant testing, THEN **RAISE** Throttle Pressure Set as follows:

A. **SELECT** [Control] , [Pressure Control] ____

B. **SELECT** Throttle Pressure Set [Ramp Rate] AND **ADJUST** as desired. ____

C. **SELECT** Throttle Pressure Set [Setpoint] AND **ENTER** desired setpoint OR **SELECT** Throttle Pressure Set, Manual Adj. [Raise] , [Lower] as needed. ____

NOTE

Step 5.1.29 is to be performed only if directed by the Operations Director; OTHERWISE Step 5.1.29 is to be N/A'd.

IF AB-HV-F020, AB-HV-F021, BG-HV-F034 and BG-HV-F035 will be required for Pressure and Level control, Step 5.1.29 should not be performed.

5.1.29. IF directed by the Operations Director to Lock the Mode Switch in Shutdown, THEN **PERFORM** the following:

A. IF control rod scram time data will be collected by Reactor Engineering, THEN **ENSURE** Reactor pressure is ≥ 950 psig. ____

B. **COMPLETE** Attachment 2 AND **REVIEW** Attachment 10 prior to locking the Mode Switch to Shutdown. ____ SM/CRS

C. IF it is desirable to continue reactor cooldown, **PLOT** Reactor Coolant System Cooldown rate, not to exceed 90° F/Hr, IAW Attachment 4 of this procedure and Attachment 3s of HC.OP-DL.ZZ-0026(Q), Surveillance Log. [**T/S 4.4.6.1.1**]. ____

(Continued on next page)

5.1.29 (continued)

NOTE

Following a “Manual Reactor Scam”, a Reactor water level 3 (12.5” RPV Lvl.) RPS signal is expected to occur.

D. **LOCK** the Mode Switch in Shutdown,
AND **ENTER** HC.OP-AB.ZZ-0000(Q). ____

E. IF adjusted for testing,
THEN **RE-ESTABLISH** Throttle Pressure Set to 905 as follows:

1. **SELECT** [Control] , [Pressure Control] ____

2. **SELECT** Throttle Pressure Set [Ramp Rate]
AND **ADJUST** as desired. ____

3. **SELECT** Throttle Pressure Set, [Setpoint]
AND **ENTER** 905 psig OR **SELECT** Throttle Pressure Set, Manual Adj [Raise] / [Lower] as needed. ____

F. IF it is desired to continue Reactor Cooldown
AND Depressurization in preparation for Refueling activities,
THEN **DIRECT** Maintenance Department to remove Reactor Cavity Shield Plugs IAW HC.MD-FR.KE-0001(Q), Refuel Floor Shield and Pool Plugs Removal and Replacement, OR HC.MD-FR.KE-0035(Q). ____

NOTE

Post Trip Review should be commenced as soon as possible after the plant is stabilized to prevent possible loss of Alarm Chronolog data.

G. **DIRECT** the STA to commence Post Trip Review IAW OP-HC-108-114-1001 and OP-AA-108-114. ____

H. **CONTINUE** in this procedure at Step 5.1.37. ____

NOTE

The RPS Mode Switch SHALL be placed in STARTUP & HOT STBY IAW Steps 5.1.30 through 5.1.37 prior to APRM indication decreasing to the Downscale setpoint (4%).

5.1.30. **CONTINUE** inserting control rods to reduce power to between 6 and 9%. ____

5.1.31. **ENSURE** all Operational Condition 2 surveillance items in HC.OP-DL.ZZ-0026(Q) have been initiated. ____

5.1.32. **PRESS** the RECORDER INPUT IRM A,B,C,D,E,F,G,H PB's to transfer the IRM/RBM/APRM Recorders to the IRM indication. ____

5.1.33. **ENSURE** IRM RANGE SELECT Switches are positioned so all IRM instruments read between 25 and 75 (on the 0 to 125 scale). ____

5.1.34. **ENSURE** the IRM drawers are NOT INOP, (At panels 10C635 and 10C636, **OBSERVE** each IRM drawer for NO IRM trip condition or INOP light) OR if they are INOP that they are BYPASSED. ____

5.1.35. **COMPLETE** Attachment 1 AND **REVIEW** Attachment 10 PRIOR to placing the Mode Switch to STARTUP & HOT STBY in the following step. ____

SM/CRS

NOTE

With the RPS mode switch in STARTUP & HOT STBY, an APRM rod block occurs at 11% AND an APRM scram occurs at 14%.

5.1.36. **PLACE** the RPS MODE SWITCH to STARTUP & HOT STBY. ____

5.1.37. **PERFORM** the following:

- **RELEASE** tagout on the Power Supply for AB-HV-F020 AND AB-HV-F021. ____

- **PREPARE** BG-HV-F031 RWCU FLOW ORIFICE BYPASS for blowdown operation as follows:

  1. **DIRECT** an Operator to TAG open breaker 52-264042 (BG-HV-F031) ____

  2. **REQUEST** Electrical Maintenance to perform Attachment 8. [**CD-407Y**] ____

  3. WHEN Notified by Electrical Maintenance, **DIRECT** an Operator to RELEASE breaker 52-264042. (BG-HV-F031) ____

5.1.38. IF a Hot Standby condition is to be maintained, THEN **REFER** to HC.OP-IO.ZZ-0007(Q). ____

CAUTION

The Reactor Coolant System temperature and pressure requirements of Technical Specification 3.4.6.1 shall be complied with. [CD-049X]

During low-flow conditions, Feedwater flow to the Reactor should be maintained relatively constant to minimize the thermal transients on the Reactor Vessel. Opening a bypass valve may be necessary to achieve a steady Feedwater flow.

Excessive Cool-down rates may be experienced with small amounts of decay heat present. Removal of loads from the Main Steam Header or closing the MSIVs and using the Main Steam Line Equalizer valve AB-HV-F020 will help to control cooldown rate.

During plant cooldown the following guidance should be adhered to in order to minimize shutdown radiation levels from CRUD release and transport. [PR 960508151]

- **Recirculation Pumps should be maintained in operation as long as possible in order to assist in CRUD Burst Cleanup.**
- **RWCU Filter Demin flow should be maximized to remove CRUD released during the cooldown. (90 gpm Demin flow (single pump ops) may be the max flow while Depressurizing/Cooldown, due to suction venturi flashing causing inadvertent pump trips.)**
- **Chemistry Department should be notified of changes in plant condition that may reduce CRUD removal. (i.e., RWCU flow changes)**

During Rx de-pressurization, flashing may occur in the RWCU System piping, causing spurious Hi Delta Flow isolation signals to occur.

5.2 Reactor Cooldown and Depressurization

NOTE

Control rod insertion and cooldown of the Reactor Coolant System can be performed simultaneously. When this occurs, the cooldown rate and neutron flux should be closely monitored for any sudden changes.

IF control rod insertion is stopped prior to all rods being inserted, re-criticality must be anticipated due to cooldown. The Reactor Operator shall NOT have any other concurrent duties during this evolution.

During plant Cooldown/Depressurization, similar Rx water level instrumentation should be monitored for significant deviation, indicating possible reference line de-gassing.
Also, all maintenance activities which have the potential for draining the Rx vessel should be terminated.

5.2.1. **CONTINUE** to reduce Reactor power by inserting control rods. ____

5.2.2. **MAINTAIN** the IRM flux between 25 and 75 (on the 0 to 125 scale) by repositioning the IRM RANGE SELECT Switches. ____

5.2.3. As required, **STOP** a Circulating Water Pump IAW HC.OP-SO.DA-0001 (Z), Circulating Water System Operation. ____

5.2.4. **PLOT** Reactor Coolant System Cooldown rate, not to exceed 90° F/Hr, IAW Attachment 4 of this procedure and Attachment 3s of HC.OP-DL.ZZ-0026(Q), Surveillance Log. [**T/S 4.4.6.1.1**]. ____

5.2.5. As Reactor power decreases, **MAINTAIN** the SRM count rate between 10^2 and 10^5 cps by inserting the SRM detectors IAW HC.OP-SO.SE-0001 (Q), Nuclear Instrumentation System Operation. ____

5.2.6. PRIOR to Locking the Mode Switch in Shutdown in the following step, **COMPLETE** Attachment 2 AND **REVIEW** Attachment 10. ____
SM/CRS

NOTE

The actions in Step 5.2.7 should be completed at that point in the plant shutdown where all control rods are fully inserted.

5.2.7. WHEN all control rods have been fully inserted, **PERFORM** the following:

NOTE

The RHR Shutdown Cooling operability requirements of T/S 3.4.9 shall be complied with.

The following step will result in a Reactor scram.

A. **LOCK** the RPS MODE SWITCH in SHUTDOWN. ____

B. Following the 10 second time delay, **RESET** the scram IAW HC.OP-SO.SB-0001(Q), Reactor Protection System Operation. ____

NOTE

Steam Loads, Decay Heat, and Feed will directly affect Cooldown / Depressurization. Impact of these variables, regardless of DEHC Control mode selected, MUST be continuously evaluated for impact on the cooldown.

At approximately 200 psig reactor pressure, the cooldown rate should be limited to approximately 30º F/hr to prevent excessive cavitation of the RWCU pump.

5.2.8. **CONTINUE / MAINTAIN** a cooldown rate of ≤ 90°F/hr using Rx Cooldown mode, Pressure Control mode
OR Bypass Valve Manual Jack as follows:

A. Establish **PRESSURE CONTROL** as follows:

1. **SELECT** [Control] , [Pressure Control] ____

2. **SELECT** Throttle Pressure Set [Ramp Rate]
AND **ENTER** desired rate. ____

3. **SELECT** Throttle Pressure Set, [Setpoint]
AND **ENTER** desired Pressure to match Throttle Press. ____

4. **VERIFY** expected valve response as Pressure Reference changes to match Pressure Setpoint. ____

5. IF desired to continue cooldown using Pressure Control mode, **ADJUST** Ramp Rate and Pressure Setpoint as desired. ____

Continued next page

5.2.8 (Continued)

NOTE

When Rx Cooldown mode is initiated with a bypass valve open, a minor Pressure Rise will occur. This pressure rise should be anticipated when placing Rx Cooldown controller in service.

Any cooldown that has occurred since the shutdown must be considered prior to establishing Rx Cooldown mode in determining initial cooldown so as NOT to exceed 90°F/hr.

Once Rx Cooldown mode is established, the INTENT is to remain on the Rx Cooldown controller for the duration of the Cooldown / Depressurization. An In-Progress Cooldown can be interrupted to support plant manipulations without exiting the Rx Cooldown mode by establishing the temperature Setpoint at the desired hold point on the Cooldown Controller.

B. IF desired, Establish **REACTOR COOLDOWN** as follows:

1. **SELECT** [Control] , [RX Cooldown] ____

2. **SELECT** [Ramp Rate]
AND **ENTER** desired rate not to exceed 90 deg F/hr. ____

3. **SELECT** [Temperature] AND **ENTER** desired temperature. ____

4. **SELECT** Reactor Cooldown [ON]
AND **VERIFY** Rx Cooldown Controlling indication is observed. ____

5. **MAINTAIN** Throttle Pressure Set, Pressure Setpoint approximately 50-100 psig above Throttle Pressure not to exceed 905 psig. ____

6. IF desired to Interrupt Cooldown,
THEN **SELECT** Cooldown [Temperature]
AND **ENTER** Temp Setpt to match indicated “Calc Rx” temperature. ____

7. WHEN desired to Re-establish Cooldown,
THEN **SELECT** Cooldown [Temperature]
AND **ENTER** desired Temp Setpt. ____

Continued next page

5.2.8 (Continued)

NOTE

Should it become necessary to transition from **Rx Cooldown** mode to **Pressure Control** mode with BPV's initially open, the following response should be anticipated:

- BPV's will immediately close due to the control logic resulting in a minor pressure rise.
- BPV's will then re-open to stabilize pressure after a short time delay.

Initially, when Rx Cooldown goes to off, "BPV Manual Jack in Control" will be displayed until "Throttle Pressure Ref Controlling" takes control.

C. IF NECESSARY to transition from **Reactor Cooldown** to **Pressure Control** Mode,
THEN Establish **Pressure Control** Mode as follows:

1. **SELECT** Cooldown [Temperature]
AND **ENTER** Temp Setpt to match indicated "Calc Rx" temperature
AND allow conditions to stabilize. ____

2. **SELECT** [Control] , [Pressure Control] ____

3. **SELECT** Throttle Pressure Set [Setpoint]
AND **ENTER** desired Pressure to match Throttle Pressure. ____

4. WHEN Pressure Reference is equal to Pressure Setpoint
THEN **SELECT** [Control] , [RX Cooldown] ____

5. **SELECT** Reactor Cooldown [OFF] ____

6. **SELECT** [Control] , [Pressure Control]
AND **OBSERVE** BPV Control Status indicates "Throttle Pressure Ref Controlling" after a short time delay. ____

Continued next page

5.2.8 (Continued)

D. IF desired, Establish **BYPASS VALVE MANUAL OPENING (Jack) CONTROL** as follows while maintaining Pressure Setpoint 50-100 psi above actual Throttle Pressure.

NOTE

Bypass Valve Manual Opening (Jack) Control, Manual Adj. Raise / Lower response is based on Ramp Rate selected. Approximate response as follows:

Ramp Rate %	10	20	30	40	50	60	70	80	90	100
BPV Jack Setpoint % Δ	0.2	0.3	0.5	0.7	0.8	1.0	1.1	1.3	1.5	1.7

1. **SELECT** Bypass Valve Manual Opening (Jack) Control Ramp Rate AND **ADJUST** as desired. ____

2. **SELECT** Bypass Valve Manual Opening (Jack) Control Setpoint
AND **ADJUST** as desired
OR **SELECT** Bypass Valve Manual Opening (Jack) Control Manual Adj. Raise / Lower as required. ____

3. **WHEN** Bypass Valve Jack is NO LONGER REQUIRED, **ENSURE** BPV Jack Setpoint is lowered to (minus) -0.5%. ____

5.2.9. IF it is desired to continue Reactor Cooldown AND Depressurization in preparation for Refueling activities, THEN **DIRECT** Maintenance Department to remove Reactor Cavity Shield Plugs IAW HC.MD-FR.KE-0001(Q), Refuel Floor Shield and Pool Plugs Removal and Replacement, OR HC.MD-FR.KE-0035(Q). ____

5.2.10. At approximately 500 psig, (approx 470°F) **PERFORM** the following:

A. **REMOVE** the remaining RFP's from service IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. ____

B. **STOP** the second Secondary Condensate Pump A(B,C)P137 IAW HC.OP-SO.AD-0001(Q), Condensate System Operation. ____

NOTE

The preparation of the RHR System for Shutdown Cooling Operation should be performed while the plant cooldown is continuing.

RHR Loop B is preferred for Shutdown Cooling due to its Radwaste connection.

C. **PREPARE** RHR Loop A or B for Shutdown Cooling Operation IAW HC.OP-SO.BC-0002(Q), Decay Heat Removal Operation. ____

D. **ALIGN** the RWCU system suction path to the Bottom Head Drain, IAW HC.OP-SO.BG-0001(Q), Section 5.13. ____

NOTE

Attachment 9 is to be performed when an increase in the cooldown rate of the Main Turbine Shell is desired, and used only during a "Controlled" shutdown (NOT following a scram), as a time-saving measure. The inferences to "Cooling/Cooldown", or "Warming", are dependent upon whether the direction is referring to the activity of cooling or the nomenclature on the instrumentation/indications.

5.2.11. IF desired, THEN **PERFORM** Cooldown of the HP Turbine Shell using Attachment 9 - Main Turbine Shell Cooldown. ____

5.2.12. **DIRECT** I&C to adjust the CRD flow controller H1BF -1BFFIC-R600-C11 per the ICD card. ____

5.2.13. **REMOVE** the HWCI System from service IAW HC.CH-SO.AX-0001 (Q). ____

5.2.14. Prior to reaching 300 psig, (approx 421°F) **PERFORM** the following:

A. **SHIFT** the SJAE Steam Supply from Main Steam to Auxiliary Steam IAW HC.OP-SO.CG-0001(R)
OR, **REMOVE** SJAE from service
AND **PLACE** MVPs in service
IAW HC.OP-SO.CG-0001(R). ____

B. IF the SJAE is to remain in service on Auxiliary Steam, **TRANSFER** the Recombiner Preheater Steam Supply from Main Steam to Auxiliary Steam
IAW HC.RW -SO.HA-0001(R), Gaseous Radwaste System Operation. ____

5.2.15. At approximately 200 psig, **REDUCE** cooldown rate to 30º F/hr or less to avoid cavitation of the RWCU pump

5.2.16. WHEN the PRESSURE is reduced to 150 psig, (approx 365°F) IF NOT required, **STOP** a Primary and Secondary Condensate Pump IAW HC.OP-SO.AD-0001(Q), Condensate System Operation. **[PR 981117261]** ____

5.2.17. At approximately 100 psig, (approx 328°F)
ENSURE the HPCI System isolates. ____

5.2.18. At approximately 80 psig, (approx 323°F)
PERFORM the following: **[CD-066X]**

A. **ENSURE** RHR Loop A OR B has been prepared to be prewarmed (for Shutdown Cooling operation)
IAW HC.OP-SO.BC-0002(Q), Decay Heat Removal Operation. ____

B. **PREWARM** RHR Loop A OR B for Shutdown Cooling Operation IAW HC.OP-SO.BC-0002(Q). ____

5.2.19. **ENSURE** that the RPS MODE SWITCH is Locked in SHUTDOWN. ____

5.2.20. IF Noble Metals Chemical Application (NMI) will be performed during plant shutdown,
THEN **PERFORM** the following IAW HC.DE-SP.ZZ-0001(Q), Noble Metals Chemical Addition-Infrequently Performed Evolution (IPTE): ____

A. **ADJUST** both Reactor Recirc Pumps speed, as required by the IPTE. ____

NOTE

RHR Loop B is the preferred loop to be placed in service. RHR Loop A may be placed in service if Loop B is unavailable OR if necessary to support outage scheduling.

B. **PLACE** RHR Loop B or A in Shutdown Cooling Operation, at the flowrate required by the IPTE, IAW HC.OP-SO.BC-0002(Q), Decay Heat Removal Operation. ____

C. GO TO Step 5.2.25. ____

NOTE

RCIC System isolates on a RPV Pressure of 64.5 psig after a 4 second TD.

RCIC Turbine trips on a Reactor level of 54".

If the RCIC System is still required for Level/Pressure Control then Steps 5.2.21 - 5.2.25 should be performed prior to reducing pressure below 65 psig.

Main Turbine Sealing Steam will automatically transfer from Main Steam to Auxiliary Steam at approximately 60 psig.

CAUTION

The time when NEITHER the RHR System (operating in the Shutdown Cooling Mode) NOR the Reactor Recirculation System is in operation should be minimized.

During the transition from normal Reactor Recirculation System operations to establishment of Shutdown Cooling, the AP201 (ONLY) Reactor Recirc Pump may be left in operation until the BP202 (ONLY) RHR Pump is operating satisfactorily, and then ONLY until the rated B RHR Loop flow of approximately 10,000 gpm is achieved.

The discharge valve of any Reactor Recirculation Pump which is NOT in operation should remain closed throughout Shutdown Cooling operations. If it is required to stroke the discharge valve of an out-of-service Reactor Recirculation Pump, the pump's suction valve should be verified to be closed and the suction valve's power supply breaker cleared and tagged open.

Level fluctuations will occur during performance of the following step.

5.2.21. **SHUT DOWN** the Reactor Recirculation System as follows:

A. IF RHR Loop A will be used for Shutdown Cooling, THEN **SECURE** both Reactor Recirc Pumps IAW HC.OP-SO.BB-0002(Q). ____

B. IF RHR Loop B will be used for Shutdown Cooling, AND it is NOT desired to maintain a Reactor Recirc Pump in service until rated Shutdown Cooling flow is established, THEN **SECURE** both Reactor Recirc Pumps IAW HC.OP-SO.BB-0002(Q). ____

C. IF RHR Loop B will be used for Shutdown Cooling, AND it is desired to maintain a Reactor Recirc Pump in service until rated Shutdown Cooling flow is established, THEN **SECURE** BP201 Reactor Recirc Pump IAW HC.OP-SO.BB-0002(Q), AND **MAINTAIN** AP201 running to provide forced core flow. ____

NOTE

Step 5.2.22 is to be performed only if Shutdown Cooling can NOT be placed in service AND Reactor Recirculation Pumps are NOT available; otherwise Step 5.2.22 is to be disregarded and performance continued with Step 5.2.23.

CAUTION

During performance of the following step, Vessel metal temperatures above and below the water level, and Rx Coolant System Temperature/Pressure Data should be monitored to ensure the Technical Specification Cooldown limits are not exceeded. In addition, Reactor Water Cleanup should be utilized in maximum cooling. [CD-178A, CD-693A, CD-973B]

5.2.22. IF Shutdown Cooling can NOT be placed in service
AND Reactor Recirc Pumps are NOT available,
THEN slowly **RAISE** Reactor Vessel level to ≥ 80 inches,
Reactor level shutdown range, using temperature-compensated indication, (Vessel Level Instrumentation Temperature Compensation Curves may be required), to allow for natural circulation, WHILE monitoring Reactor Coolant System Temperature/Pressure Data IAW Attachment 4 so as NOT to exceed cooldown rate. [**CD-178A, CD-693A, CD-973B**] ____

NOTE

If Shutdown Cooling becomes unavailable, the plant may be placed in Alternate decay heat removal IAW Attachment 6.

CAUTION

The Reactor Recirc Pump associated with the RHR Loop to be placed in Shutdown Cooling must be secured with its discharge valve shut. The discharge valve of any Reactor Recirculation Pump which is NOT in operation should remain closed throughout Shutdown Cooling operations. If it is required to stroke the discharge valve of an out-of-service Reactor Recirculation Pump, the pump's suction valve should be verified to be closed and the suction valve's power supply breaker cleared and tagged open.

5.2.23. Based on the decision made in Step 5.2.21,
PLACE RHR Loop A or B in Shutdown Cooling Operation to maintain a cooldown rate ≤ 90°F/hr
IAW HC.OP-SO.BC-0002(Q),
Decay Heat Removal Operation. **[CD-049X]** ____

5.2.24. WHEN RHR is in Shutdown Cooling at rated flow (approximately 10,000 gpm), IF the AP201 Reactor Recirc Pump is in service, THEN **SECURE** the AP201 Reactor Recirc Pump IAW HC.OP-SO.BB-0002(Q). ____

CAUTION

The RHR Heat Exchanger inlet temperature will NOT indicate properly if BC-HV-F003A (B) is NOT open. It may be necessary to secure SACS flow and open BC-HV-F003A (B) until stable or increasing temperature indicates the correct operational condition.

A RPV Level Rise could occur as the RPV depressurizes, due to "flashing" in the Feedwater lines. This is caused when flow from the Feedwater system is no longer required to make up for Steam loss from the RPV, which allows the Feedwater to cool at a slower rate than the RPV. As the RPV depressurizes, this higher temperature water expands as it changes phase, causing flow from the Feedwater system to the RPV. If a Steam Bubble has formed in the Feedwater lines (as indicated by a sudden rise in RPV level), Feedwater Flow should not be initiated until the Bubble has condensed. The recovery of RPV level, in the absence of water loss from steaming or letdown, would be an indication that the Bubble has condensed.

5.2.25. **CONTINUE** plotting cooldown using the appropriate RHR Heat Exchanger inlet temperature. ____

5.2.26. At approximately 64.5 psig, (approx 311°F) **ENSURE** the RCIC System isolates. ____

5.2.27. At approximately 50 psig , (approx 298°F)
AND when RHR cooling is established, **ENSURE** the following:

A. Reactor pressure setpoint matched to current throttle pressure. ____

B. Rx Cooldown Control [OFF] selected if utilized. ____

C. IF desired, Bypass Valve Manual (Jack) Control may be used to continue cooldown below 50 psig as follows:

1. **SELECT** Bypass Valve Manual Opening (Jack) Control [Ramp Rate] AND **ADJUST** as desired. ____

2. **SELECT** Bypass Valve Manual Opening (Jack) Control [Setpoint]
AND **ADJUST** as desired
OR **SELECT** Bypass Valve Manual Opening (Jack) Control Manual Adj. [Raise] / [Lower] required. ____

3. **WHEN** Bypass Valve Jack is NO LONGER REQUIRED, **ENSURE** BPV Jack Setpoint is lowered to (minus) -0.5%. ____

5.2.28. At approximately 25 psig, IF open, THEN **CLOSE** the Turbine Bypass Valves by **ADJUSTING** BPV Jack Setpoint to (minus) -0.5%. ____

NOTE

As the Reactor pressure approaches 0 psig, the RWCU System becomes susceptible to flashing and differential flow isolation and RWCU Pump trips. This condition can persist until reactor inventory becomes subcooled. Flashing can be prevented by reducing RWCU System flow, by slowly reducing Reactor pressure and by preventing the RPV from reaching vacuum conditions.

5.2.29. WHEN Reactor Pressure is in the range of 10 to 50 psig,
THEN **CLOSE** MSIVs IAW HC.OP-SO.AB-0001(Q),
Main Steam System Operation. ____

5.2.30. At approximately 5 psig
THEN **CLOSE** AB-HV-F016 CTMT INBD STM LINE DRAIN HDR ISLN INBOARD. ____

5.2.31. **STOP** HP Turbine Shell Cooldown using Attachment 9 - Main Turbine Shell Cooldown. ____

5.2.32. **RELEASE** tags AND **MAKE** breakers ready for the following valves per SM/CRS direction:

A. BB-HV-F001 Reactor Head Vent. ____

B. BB-HV-F002 Reactor Head Vent. ____

C. AE-HV-F011A, B Inboard Feedwater Isolation. [**CD-174E**] ____

5.2.33. WHEN the Reactor coolant temperature is < 212 °F, THEN **PERFORM** the following (10C651C):

A. **PLACE** the second RWCU Pump in service at approximately 90 gpm IAW HC.OP-SO.BG-0001(Q), Reactor Water Cleanup System Operation. ____

B. **DIRECT** Chemistry to place 2nd RWCU Demineralizer in service at approximately 90 gpm. ____

C. **ENSURE** the following (MAIN STEAM LINE DRAINS AND VENTS) valves are closed:

1. AB-HV-F019 CTMT INBD STM LINE DRAIN HDR ISLN OUTBOARD. ____

2. AB-HV-F016 CTMT INBD STM LINE DRAIN HDR ISLN INBOARD. ____

3. AB-HV-F021 CTMT INBD STM LNS/MN STM LINE AFT STOP V DRN HDR-DRN HDR S/U DRN V. ____

4. AB-HV-F033 CTMT INBD STM LNS/MN STM LINE AFT STOP V DRN HDR-DRN HDR OP DRN V. ____

5. AB-HV-F072 STEAM LINE BEFORE STOP VALVE DRAINS-DRN HDR S/U DRN V. ____

6. AB-HV-F069 STEAM LINE BEFORE STOP VALVE DRAINS-DRN HDR OP DRN V. ____

D. **ENSURE** AC-HV-1013 A/B/C/D TURBINE SEALING STEAM AND DRAINS STEAM LINE DRAINS-MN STM VLV BFR SEAT is closed. ____

Continued next page

5.2.33 (continued)

E. **REPOSITION** the following MAIN STEAM LINE DRAINS AND VENTS:

1. **CLOSE** BB-HV-F005 REACTOR HEAD VENT, STM LINE A. ____

2. **OPEN** BB-HV-F001 REACTOR HEAD VENT, CRW INBD ISLN. ____

3. **OPEN** BB-HV-F002 REACTOR HEAD VENT, CRW OTBD ISLN. ____

CAUTION

The blowdown rate from the Reactor Water Cleanup (RWCU) System should be limited to prevent the RWCU Filter/Demineralizer inlet temperature from exceeding 130°F.

F. IF necessary, **MAINTAIN** Reactor Vessel level with the RWCU System IAW HC.OP-SO.BG-0001(Q). ____

5.2.34. PRIOR to reaching a Reactor coolant temperature of 200°F, **ENSURE** all Operational Condition 4 surveillance items in HC.OP-DL.ZZ-0026(Q) are initiated. ____
SM/CRS

5.2.35. **COMPLETE** Attachment 3 AND **REVIEW** Attachment 10 PRIOR to reducing Reactor Coolant Temperature to < 200°F. ____
SM/CRS

NOTE

The unit will be in Cold Shutdown (OPERATIONAL CONDITION 4) WHEN Reactor Coolant temperature is < 200°F WITH the RPS MODE SWITCH in SHUTDOWN.

CAUTION

The RHR Heat Exchanger inlet temperature will NOT indicate properly if BC-HV-F003A (B) is NOT open. It may be necessary to secure SACS flow and open BC-HV-F003A (B) UNTIL stable or increasing temperature indicates the correct operational condition.

5.2.36. **CONTINUE** the cooldown to < 200 °F AND **RECORD** in Control Room Log(s) the time the unit enters Cold Shutdown. ____

NOTE

Completion of the following step will allow for natural circulation in the event that forced circulation is subsequently lost.

Main Steam Isolation Valves require closing at 90 inches.

Main Steam Line flooding occurs at 118 inches.

If a degraded Shutdown Cooling condition occurs or if there is indication that the RHR Heat Exchanger inlet temperature may NOT be representative of average Reactor Coolant temperature, HC.OP-AB.RPV-0009(Q), Shutdown Cooling, should be referred to.

During performance of the following step, Vessel metal temperatures above and below the water level and Reactor Coolant System Temperature/Pressure Data should be monitored to ensure the TS Cooldown limits are not exceeded.
[CD-178A, CD-693A, CD-973B]

5.2.37. **SLOWLY RAISE** Reactor Vessel level to ≥ 80 inches, Reactor level shutdown range, using temperature-compensated indication, (Vessel Level Instrumentation Temperature Compensation Curves may be required), WHILE continuing in this section. [**CD-178A, CD-693A, CD-973B**] ____

NOTE

RWCU Regen Hx Bypass can only be opened once Cold Shutdown has been attained.

5.2.38. At the discretion of the Shift Manager, **PLACE** the RWCU System in Regenerative Heat Exchanger bypass operation IAW HC.OP-SO.BG-0001(Q) Section 5.9, throttling 1-ED-V035 RWCU NRHX RACS RTN PLUG VLV as necessary to maintain RWCU Demineralizer inlet temp. < 120°F
AND RWCU System outlet temp. ≥ 79°F CRIDS Point A215). ____

5.2.39. IF the Containment (Drywell/Torus) is to be opened, THEN **PERFORM** the following:

NOTE

The purge alignment requirements of ODCM 3.11.2.8. shall be observed.

A. **ENSURE** that a Release Permit has been obtained from the RP Dept. AND the applicability of CPCS requirements reviewed. ____ SM/CRS

B. IF required, THEN **BEGIN** Containment Pre-purge Cleanup IAW HC.OP-SO.GS-0001(Q), Containment Atmosphere Control System Operation. **[CD-019Y]** ____

C. WHEN atmospheric radioactivity levels are within the limits specified by RP AND by radiological effluent Tech Specs, THEN **STOP** Containment Pre-purge Cleanup. [**CD-019Y**] ____

NOTE

The Primary Containment Air Lock operability requirements of T/S 4.6.1.3.c (and its associated note) shall be observed.

D. **DE-INERT** the Containment (Drywell/Torus) IAW HC.OP-SO.GS-0001(Q), Containment Atmosphere Control System Operation (**REFER TO** T/S 3.6.1.8). ____

5.2.40. WHEN Reactor coolant temperature reaches 150°F, **RAISE** RWCU System Demineralizer flow to 150 gpm per Demin Vessel. ____

NOTE

An administrative temperature range of 90°F - 110°F should be maintained. Other temperature(s) within Technical Specification limits may be used to support specific plant operations, as necessary.

The Reactor Vessel and Head Flange temperature limits of Technical Specification 3.4.6.1.d shall be complied with.

5.2.41. **CONTINUE** the cooldown UNTIL the desired final Reactor coolant temperature is reached. ____

5.2.42. AFTER ensuring that the temperature readings at the final desired temperature are to the right of limit line of Technical Specification Figure 3.4.6.1-2, **STOP** plotting the Reactor Coolant Cooldown rate. ____

5.2.43. **DIRECT** I&C to remove Reactor Vessel Level Purge from service IAW HC.IC-GP.ZZ-0119(0120, 0121, 0122)(Q), Filter Replacement and Flow Adjustment Procedure - Backfill Station - RPV Channel A(B, C, D), removing one channel at a time AND initialing for each channel.

- RPV Channel A ____
- RPV Channel B ____
- RPV Channel C ____
- RPV Channel D ____

CAUTION

If it is desired to break Main Condenser Vacuum in this step, then the removal and/or isolation of inputs to the Condensate Drain Tank in this step (RFP Shaft Seal Leak off, the SPE Loop Seal Drains, and the Turbine Bldg Sample Sink), should be verified/coordinated PRIOR to isolating the Condensate Drain Tank Level Control Valves and/or opening the vacuum breakers. The SPE Seal Drains are isolated IAW HC.OP-SO.CA-0001(Z), Main and RFP Turbine Sealing Steam System Operation. The Turbine Bldg Sample Sink is diverted to CRW. The removal of the Condensate System IAW HC.OP-SO.AD-0001(Q), Condensate System will remove the RFP Shaft Seal Water Supply, which is in service until the RFP comes off of the Turning Gear.

5.2.44. IF desired to break Main Condenser Vacuum, THEN **PERFORM** the following:

A. **PLACE** DIVISION 1 and 2 and 3 and 4 CONDENSER LOW VACUUM BYPASS Switches to BYP (Control Room Panels 10C609 and 10C611). ____

B. **NOTIFY** Chemistry that the Condensate Drain Tank is no longer available to receive drains, AND to align the drains from the Turbine Building Sample Station IAW HC.CH-SA.RC-0001. ____

(continued on next page)

5.2.44 (continued)

NOTE

Main Condenser vacuum should NOT be broken before Main Turbine speed decreases to less than 1200 rpm EXCEPT in emergency conditions such as high vibration, which require the Main Turbine to be slowed down as fast as possible.

C. **SHUT DOWN** the Condenser Air Removal System IAW HC.OP-SO.CG-0001(R), Condenser Air Removal System Operation. ____

D. **SHUT DOWN** the Gaseous Radwaste System IAW HC.RW-SO.HA-0001(R), Gaseous Radwaste System Operation. ____

E. **INFORM** Chemistry to shut down the Offgas Vial Sampling Panel 10C335 IAW HC.CH-SA.HA-0001(R). [**CD-448H**] ____

NOTE

To prevent pulling in cold air along the Turbine Rotor, there should be no vacuum prior to removing the Main Turbine Steam Seals. It may be desirable to open the Vacuum Breakers to assure this.

F. **REMOVE** the Main Turbine Steam Seals from service IAW HC.OP-SO.CA-0001(Z), Main and RFP Turbine Sealing Steam System Operation. ____

NOTE

The Condensate System should be left in service if needed for Reactor Pressure Vessel floodup in HC.OP-IO.ZZ-0005(Q).

G. **SECURE** from feeding the Reactor Vessel with the Condensate System IAW HC.OP-SO.AE-0001(Q), Feedwater System Operation. ____

H. **PLACE** Condensate Drain Tank Level Control in Manual AND lower output signal to 0 %. ____

I. **SHUT DOWN** the Condensate System IAW HC.OP-SO.AD-0001(Q), Condensate System Operation. ____

(Continued on next page)

5.2.44 (continued)

NOTE

The Main Turbine should remain on the turning gear if Turbine restart is expected soon OR until turbine metal temperatures are < 300 F. **[CD-953B]**

J. **REMOVE** the Main Turbine from Turning Gear operation IAW HC.OP-SO.AC-0001(Q),Main Turbine Operation. ____

K. **STOP** the remaining Circulating Water Pumps IAW HC.OP-SO.DA-0001(Z), Circulating Water System Operation. ____

6.0 RECORDS

6.1 **RETAIN** the entire procedure IAW RM-AA-101, Records Management Program.

7.0 REFERENCES

7.1 **Integrated Operating Procedures**

- HC.OP-IO.ZZ-0007(Q), Operations from Hot Standby

7.2 **System Operating Procedures:**

- HC.OP-SO.AB-0001(Q), Main Steam System Operation
- HC.OP-SO.AC-0001(Q), Main Turbine Operation
- HC.OP-SO.AD-0001(Q), Condensate System Operation
- HC.OP-SO.AE-0001(Q), Feedwater System Operation
- HC.OP-SO.BB-0002(Q), Reactor Recirculation System Operation
- HC.OP-SO.BC-0001(Q), Residual Heat Removal System Operation
- HC.OP-SO.BC-0002(Q), Decay Heat Removal Operation
- HC.OP-SO.BG-0001(Q), Reactor Water Cleanup System Operation
- HC.OP-SO.CA-0001(Z), Main and RFP Turbine Sealing Steam System Operation
- HC.OP-SO.CG-0001(R), Condenser Air Removal System Operation
- HC.OP-SO.DA-0001(Z), Circulating Water System Operation
- HC.OP-SO.GS-0001(Q), Containment Atmosphere Control System Operation
- HC.OP-SO.SB-0001(Q), Reactor Protection System Operation
- HC.OP-SO.SE-0001(Q), Nuclear Instrumentation System Operation

7.3 **Other**

- HC.RW-SO.HA-0001(R), Gaseous Radwaste System Operation
- HC.RE-RA.ZZ-0011(Q), Crossflow Operations
- CD-015B, GE SIL 254
- CD-019Y, FSAR 11.3.2.2.1
- CD-049X, FSAR 5.3.3.6
- CD-066X, FSAR 5.4.7.2.6
- CD-251C, INPO SE 85-83
- CD-393B, INPO SOER 84-02R03
- CD-523B, NRC IE INFO NOTICE 83-75
- CD-693A, INPO SOER 82-2
- CD-786D, GE AID 48-78
- CD-973B, GE SIL 357
- HC.OP-DL.ZZ-0027(Z), Temporary Reading Log, Rev. 0
- CD-953B
- CD-249E
- CD-101E
- CD-174E, Power Ascension Walk through Aug. 85
- CD-491Y, FSAR ACRS-1
- HC.OP-DL.ZZ-0026(Q)
- CD-354F NRC Bulletin 88-07
- CD-573F
- NRC GEN LTR 92-04
- NRC Bulletin 93-03
- CD-609G NHO LET 4EC3411
- Technical Specifications 3.6.6.2, 4.3.1.1, 4.3.6, 4.3.7.6, 4.9.2
- CD-454H PR 960326238, LER 354/95-033-05
- CD-448H PR 960326107, LER 96-012
- PR 960508151
- GE SIL 541, Rev 2
- Nuclear Fuels Memo NFS 96-416
- CD-781A (GE SIL 203 and 203 Supp. 1)
- CD-210E INPO SOER 85-4
- CR 981117261 Loss of Feedwater Flow During Plant Cooldown
- HC.MD-FR.KE-0035(Q), Reactor Pressure Vessel Disassembly
- HC.MD-FR.KE-0001(Q), Refuel Floor Shield and Pool Plugs Removal and Replacement
- 80048294, Electro Hydraulic Control (EHC) digital upgrade
- 80048295, Main Turbine Retrofit
- 80065875, OPRM trips to RPS.

ATTACHMENT 1
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 2)
(Page 1 of 2)

NOTE

The following checks may be performed in any order.

1.0 FINAL CHECKS

1.1 **REVIEW** OP-HC-108-115-1001 forms to ensure the equipment required to enter Condition 2 is available. Any shutdown LCO's which will not be exited prior to changing modes have been assessed IAW Tech Spec 3.0.4.b and OP-HC-108-115-1001.

_____ _____
SM/CRS Date/Time

1.2 **ENSURE** all current notifications are screened for operability prior to mode change. **[70021851]**

_____ _____
SM/CRS Date/Time

ATTACHMENT 1
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 2)
(Page 2 of 2)

1.3 PRIOR to taking the RPS MODE SWITCH to STARTUP & HOT STBY, **PERFORM** the following:

1.3.1. **CHANGE** WCM "Current Operating Mode" from 1 to 2, **USING** the Mode Dependent Tagging/Current Mode/Change function. ____

NOTE

The Components in the Off - Normal Position Report will indicate all components NOT in the required position for STARTUP.

1.3.2. **GENERATE** a Components In Off - Normal Position Report **USING** the WCM Reports/Off Normal Report function. ____

1.3.3. **POSITION** all components as required. ____

1.3.4. **UPDATE** WCM using the Mode Dependent Tag/Current Positions/Change Function. ____

1.3.5. The above items have been completed with all equipment required for going into STARTUP available.

_____ _____
SM/CRS Date/Time

1.4 System requirements and surveillances required for entering Operational Condition 2 are completed.

_____ _____
I&C Date/Time

_____ _____
Operations Date/Time

All department system requirements, above, for entering Operational Condition 2 are satisfied.

_____ _____
SM/CRS Date/Time

ATTACHMENT 2
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 3)
(Page 1 of 2)

NOTE

The following checks may be performed in any order.

1.0 FINAL CHECKS

1.1 **REVIEW** OP-HC-108-115-1001 forms to ensure the equipment required to enter Condition 3 is available. Any shutdown LCO's which will not be exited prior to changing modes have been assessed IAW Tech Spec 3.0.4.b and OP-HC-108-115-1001.

_____ _____
SM/CRS Date/Time

1.2 **ENSURE** all current notifications are screened for operability prior to mode change. **[70021851]**

_____ _____
SM/CRS Date/Time

ATTACHMENT 2
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 3)
(Page 2 of 2)

1.3 PRIOR to taking the RPS MODE SWITCH to SHUTDOWN, **PERFORM** the following: ____

1.3.1. **CHANGE** WCM "Current Operating Mode" to 3 using the Mode Dependent Tagging/Current Mode/Change function. ____

NOTE

The Components in the Off-Normal Position Report will indicate all components NOT in the required position for HOT SHUTDOWN.

1.3.2. **GENERATE** a **Components** In Off - Normal Position Report **USING** the WCM Reports/Off Normal Report function. ____

1.3.3. **POSITION** all components as required. ____

1.3.4. **UPDATE** WCM using the Mode Dependent Tag/Current Positions/Change Function. ____

1.3.5. The above items have been completed with all equipment required for going into HOT SHUTDOWN available.

_____ _____
SM/CRS Date/Time

1.4 System requirements and surveillances required for entering Operational Condition 3 are completed.

_____ _____
I&C Date/Time

_____ _____
Operations Date/Time

All department system requirements, above, for entering Operational Condition 3 are satisfied.

_____ _____
SM/CRS Date/Time

ATTACHMENT 3
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 4)
(Page 1 of 2)

NOTE

The following checks may be performed in any order

1.0 FINAL CHECKS

1.1 **REVIEW** OP-HC-108-115-1001 forms to ensure the equipment required to enter Condition 4 is available.

_____ _____
SM/CRS Date/Time

1.2 **ENSURE** all current notifications are screened for operability prior to mode change. **[70021851]**

_____ _____
SM/CRS Date/Time

ATTACHMENT 3
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
FINAL CHECKS
(ENTERING OPERATIONAL CONDITION 4)
(Page 2 of 2)

1.3 PRIOR to reaching a Reactor Coolant temperature of 200°F, **PERFORM** the following:

1.3.1. **CHANGE** WCM "Current Operating Mode" from 3 to 4 using the Mode Dependent Tagging/Current Mode/Change function. ____

NOTE

The Components in the Off - Normal Position Report will indicate all components NOT in the required position for HOT SHUTDOWN.

1.3.2. **GENERATE** a Components In Off - Normal Position Report **USING** the WCM Reports/Off Normal Report function. ____

1.3.3. **POSITION** all components as required. ____

1.3.4. **UPDATE** WCM using the Mode Dependent Tag/Current Positions/Change Function. ____

1.3.5. The above items have been completed with all equipment required for going into COLD SHUTDOWN available.

_____ _____
SM/CRS Date/Time

1.4 System requirements and surveillances required for entering Operational Condition 4 are completed.

_____ _____
Maintenance Date/Time

_____ _____
I&C Date/Time

_____ _____
Operations Date/Time

All department system requirements, above, for entering Operational Condition 4 are satisfied.

_____ _____
SM/CRS Date/Time

ATTACHMENT 4
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
REACTOR COOLANT SYSTEM TEMPERATURE/PRESSURE DATA
(Page 1 of 3)

CAUTION

The Reactor Coolant System temperature and pressure requirements of Technical Specification 3.4.6.1 shall be complied with.

1.0 **PLOT** Reactor Coolant System Temperature on this attachment every 30 minutes. ____

NOTE

Only points which have **flow** past the element should be used.

2.0 WHEN temperature is < 212 °F,
OBTAIN Reactor Coolant System Temperature as follows:

2.1 On TR-R650-B31 (10C650C)

- RECIRC PUMP SUCTION - LOOP A TEMP ____
- RECIRC PUMP SUCTION - LOOP B TEMP ____

2.2 Recirc Loop Temperature, using the following Computer Points:

- A221, RECIRC LOOP A INLET TEMP 1 ____
- A222, RECIRC LOOP A INLET TEMP 2 ____
- A223, RECIRC LOOP B INLET TEMP 1 ____
- A224, RECIRC LOOP B INLET TEMP 2 ____
- B2042, RECIRC LOOP A AVG INLET TEMP ____
- B2043, RECIRC LOOP B AVG INLET TEMP ____

2.3 RHR Hx Inlet Temperature using the following computer points:

- A2380, RHR A Hx Inlet Temperature ____
- A2382, RHR B Hx Inlet Temperature ____

2.4 RWCU Bottom Head Drain Temperature from Computer Point A2942. ____

ATTACHMENT 4
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
REACTOR COOLANT SYSTEM TEMPERATURE/PRESSURE DATA
(Page 2 of 3)

3.0 WHEN temperature is ≥ 212 °f, data can be obtained by converting Reactor Steam Dome pressure to saturated temperature using steam tables. ____

4.0 **CHECK** the cooldown rate is ≤ 90 °f/hr,
AND **RECORD** delta-t for the 30 minute interval below the Reactor Coolant System Temperature plot on the space provided. ____

5.0 **DETERMINE** the RCS temperature and pressure are to the right of the limit line of Technical Specification Figure 3.4.6.1-2 (if reactor is NOT critical) or Figure 3.4.6.1-3 (if reactor is critical), every 30 minutes,
AND **RECORD** on Attachment 3s of HC.OP-DL.ZZ-0026 (Q), Surveillance Log. ____

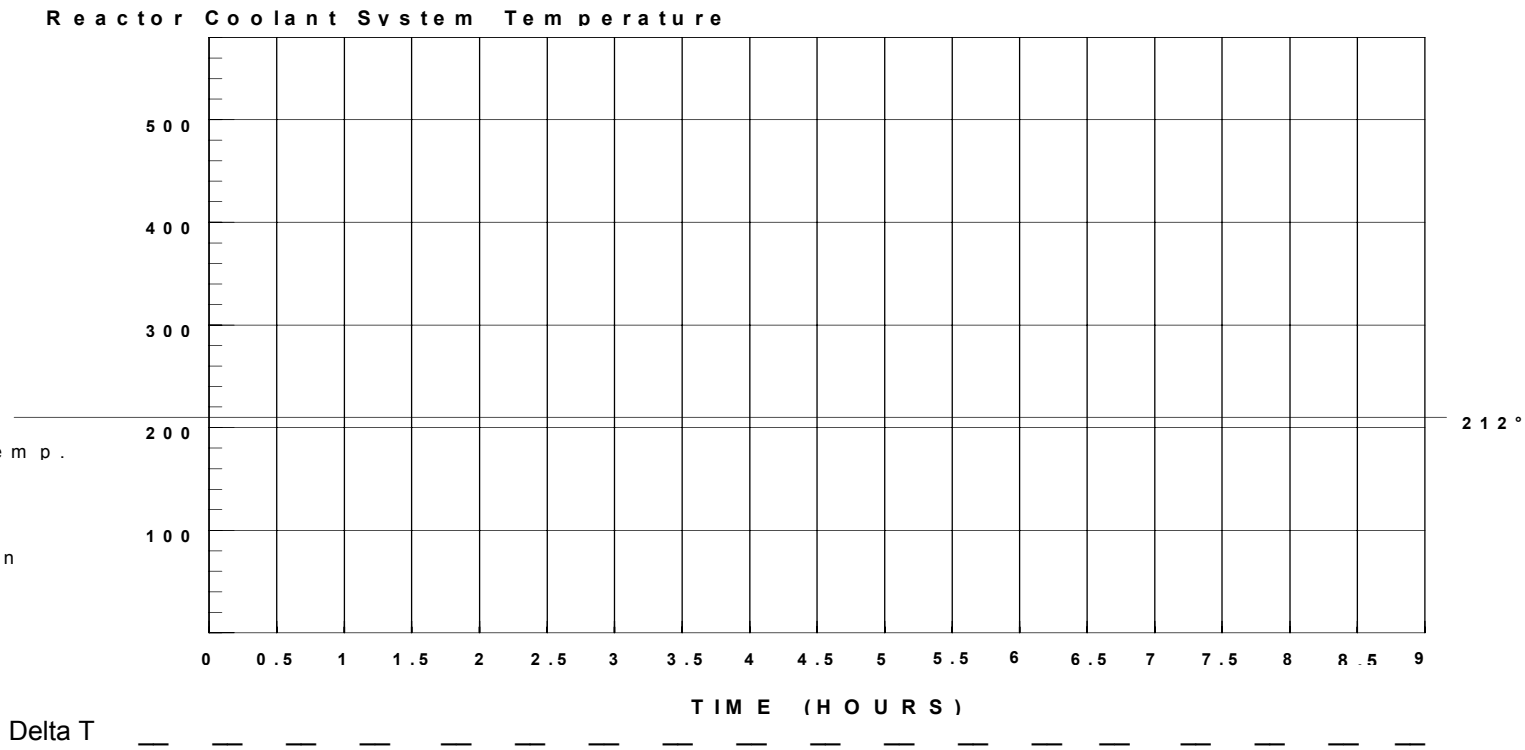
ATTACHMENT 4
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
REACTOR COOLANT SYSTEM TEMPERATURE/PRESSURE DATA
(Page 3 of 3)

DATE

Reactor Steam Dome Pressure converted to Saturated Temp.

RPV Press + 14.7 = PSIA

PSIA / Steam Table Saturation Temperature

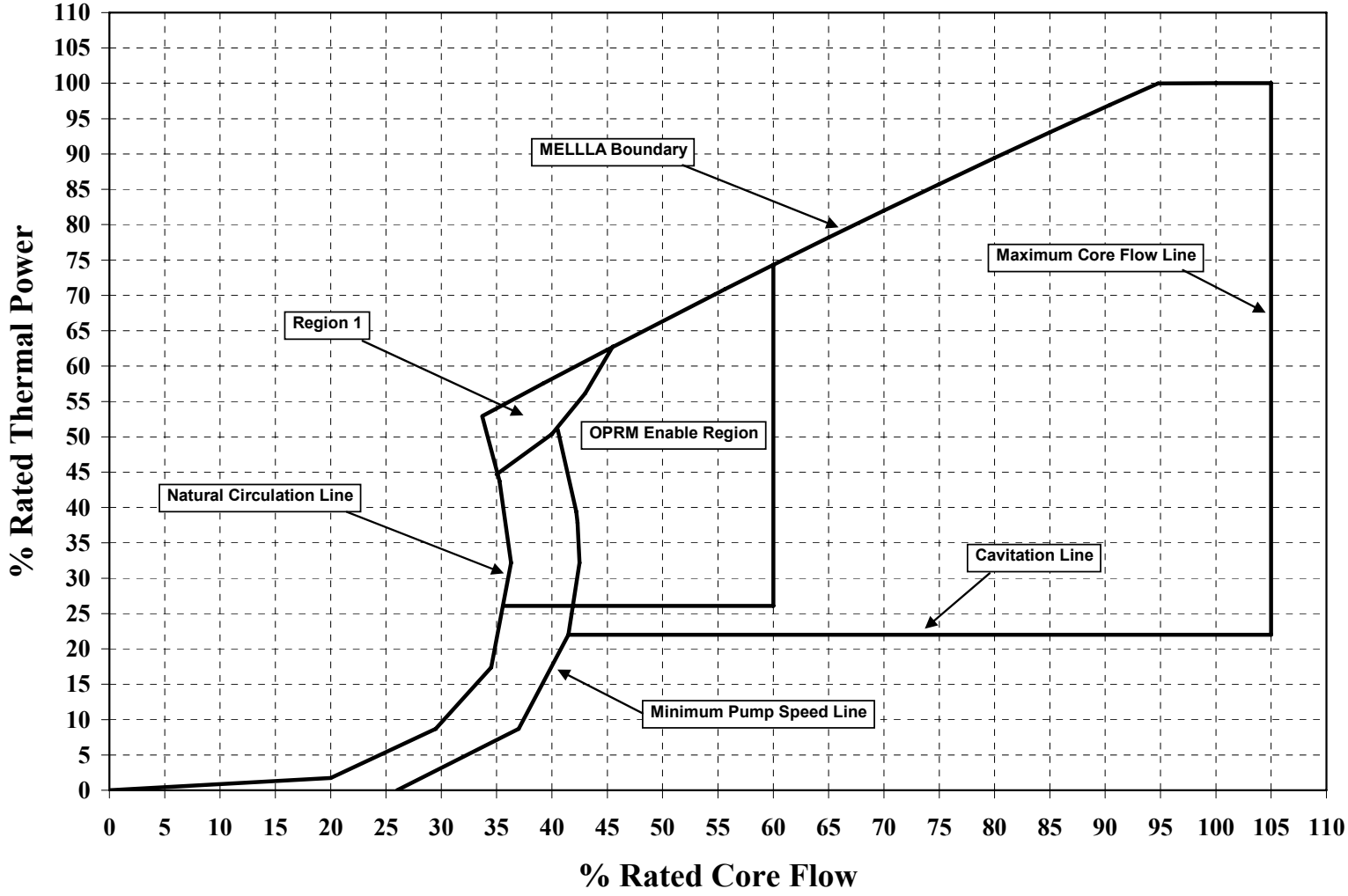


Highest Recirc Suction Temp.
or
RHR Hx Inlet
or
RWCU Bottom Head Drain

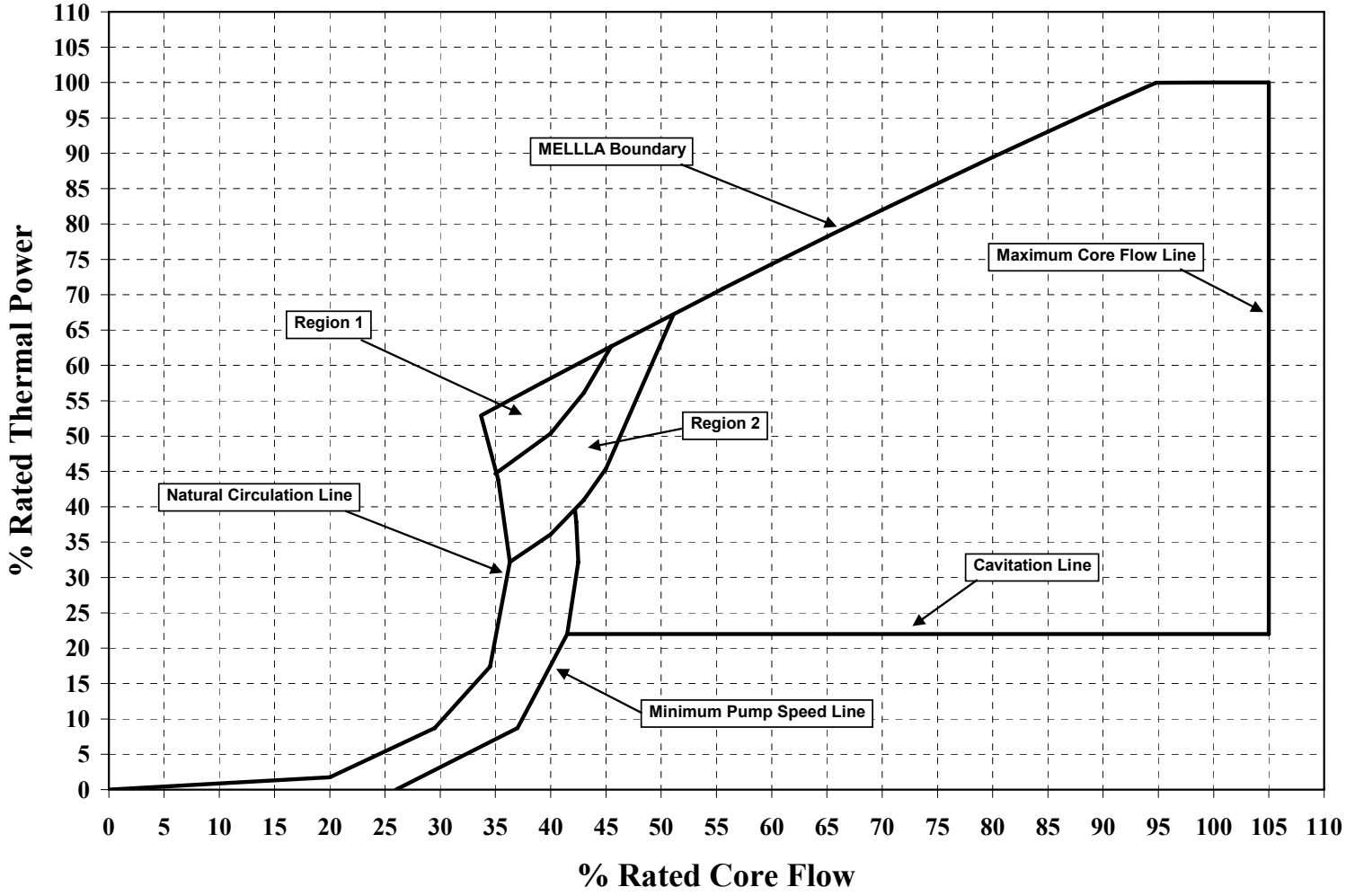
VI.2 Delta T

Note: 1. **RETAIN** completed Attachment 4 sheets with the on going procedure HC.OP-IO.ZZ-0004(Q).
2. **RECORD** temperatures in conjunction with HC.OP-DL.ZZ-0026(Q), Attachment 3s
AND **ENSURE** operation to the right of the applicable curve in Tech Spec 3.4.6.1 as well as HC.OP-DL.ZZ-0026(Q), Attachment 3s.
3. Below 212°F water temperature must be read directly. The points are listed in order of preference (highest Recirc suction temperature, RHR Hx Inlet, RWCU Bottom Head Drain).
4. There must be forced flow past the temperature element in order to obtain a valid temperature reading.
5. Above 212°F Reactor Steam Dome pressure should be used to obtain the saturation temperature from the Steam Tables. This temperature should then be plotted.

ATTACHMENT 5
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
POWER TO FLOW MAP
OPRM'S OPERABLE
(Page 1 of 2)



ATTACHMENT 5
SHUTDOWN FROM RATED POWER TO COLD SHUTDOWN
POWER TO FLOW MAP
OPRM'S INOPERABLE
(Page 2 of 2)



ATTACHMENT 6
PLACING THE PLANT IN ALTERNATE DECAY HEAT REMOVAL MODE OF OPERATION
(Page 1 of 2)

1.0 System Engineering has performed analysis to determine Alternate Decay Heat Removal method [**CD-210E**]:

CONSIDERATIONS DATA	
Time after shutdown at which the specified alternate heat removal configuration can be used.	
Max SACS and/or RACS temperature for which the specified alternate decay heat removal configuration is valid.	
Recirculation requirements (e.g., single Recirc Pp at minimum speed, RHR Pp in shutdown cooling lineup, natural circulation)	
Decay heat removal requirements (e.g., FPCC and RWCU, RWCU cooled by RACS, RWCU cooled by Chilled Water, other.)	

_____ _____
System Engineer Date/Time

2.0 The SM has been informed that the Alternate Decay Heat Removal method will adequately remove decay heat for the system lineup specified by system engineering, IAW Technical Specification 3/4.9.11.

_____ _____
SM Date/Time

3.0 **PLACE** RWCU in the Regenerative Heat Exchanger Bypass Mode of operation IAW HC.OP-SO.BG-0001(Q), if required.

_____ _____
SM/CRS/RO Date/Time

4.0 **PLACE** one, or both, Fuel Pool Cooling Heat Exchangers in service IAW HC.OP-SO.EC-0001(Q).

_____ _____
SM/CRS/RO Date/Time

ATTACHMENT 6
PLACING THE PLANT IN ALTERNATE DECAY HEAT REMOVAL MODE OF OPERATION
(Page 2 of 2)

5.0 **MAINTAIN** flow through the core WITH either one Recirculation Pump, (IAW HC.OP-SO.BB-0002(Q)), OR one RHR Pump aligned for shutdown cooling WITH the heat exchanger bypassed, IAW HC.OP-SO.BC-0002(Q).

_____ _____
SM/CRS/RO Date/Time

6.0 C RHR Pump has been placed in service for Alternate Decay Heat Removal IAW HC.OP-AB.RPV-0009(Q). [**CD-609G**]

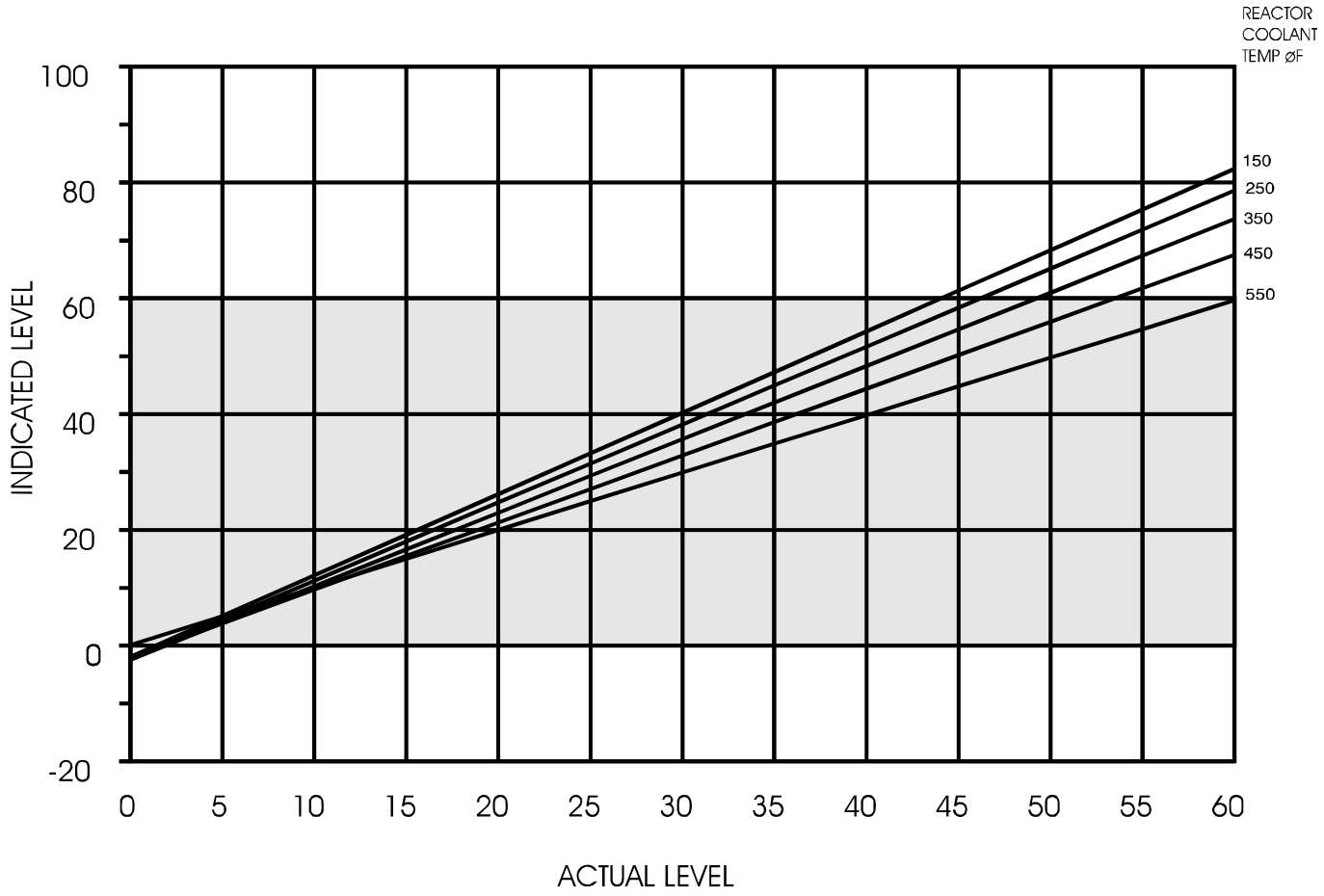
_____ _____
SM/CRS/RO Date/Time

7.0 D RHR Pump has been placed in service for Alternate Decay Heat Removal IAW HC.OP-AB.RPV-0009(Q). [**CD-609G**]

_____ _____
SM/CRS/RO Date/Time

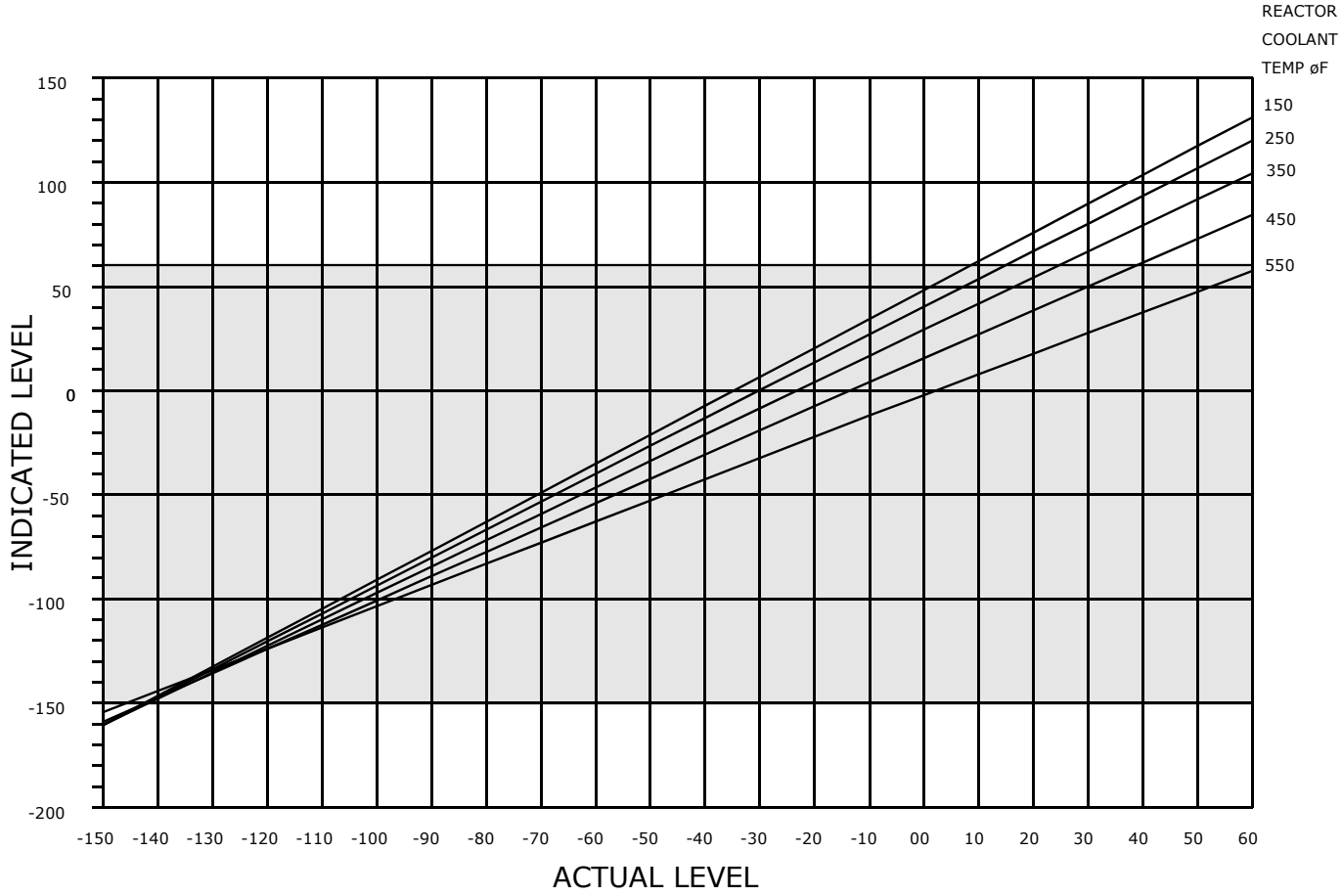
ATTACHMENT 7
(Page 1 of 4)
VESSEL LEVEL INSTRUMENTATION TEMPERATURE COMPENSATION CURVES

NARROW RANGE LEVEL
TEMPERATURE COMPENSATION
GRAY AREA - INDICATED LEVEL RANGE



ATTACHMENT 7
(Page 2 of 4)
VESSEL LEVEL INSTRUMENTATION TEMPERATURE COMPENSATION CURVES

WIDE RANGE LEVEL
TEMPERATURE COMPENSATION
GRAY AREA - INDICATED LEVEL RANGE

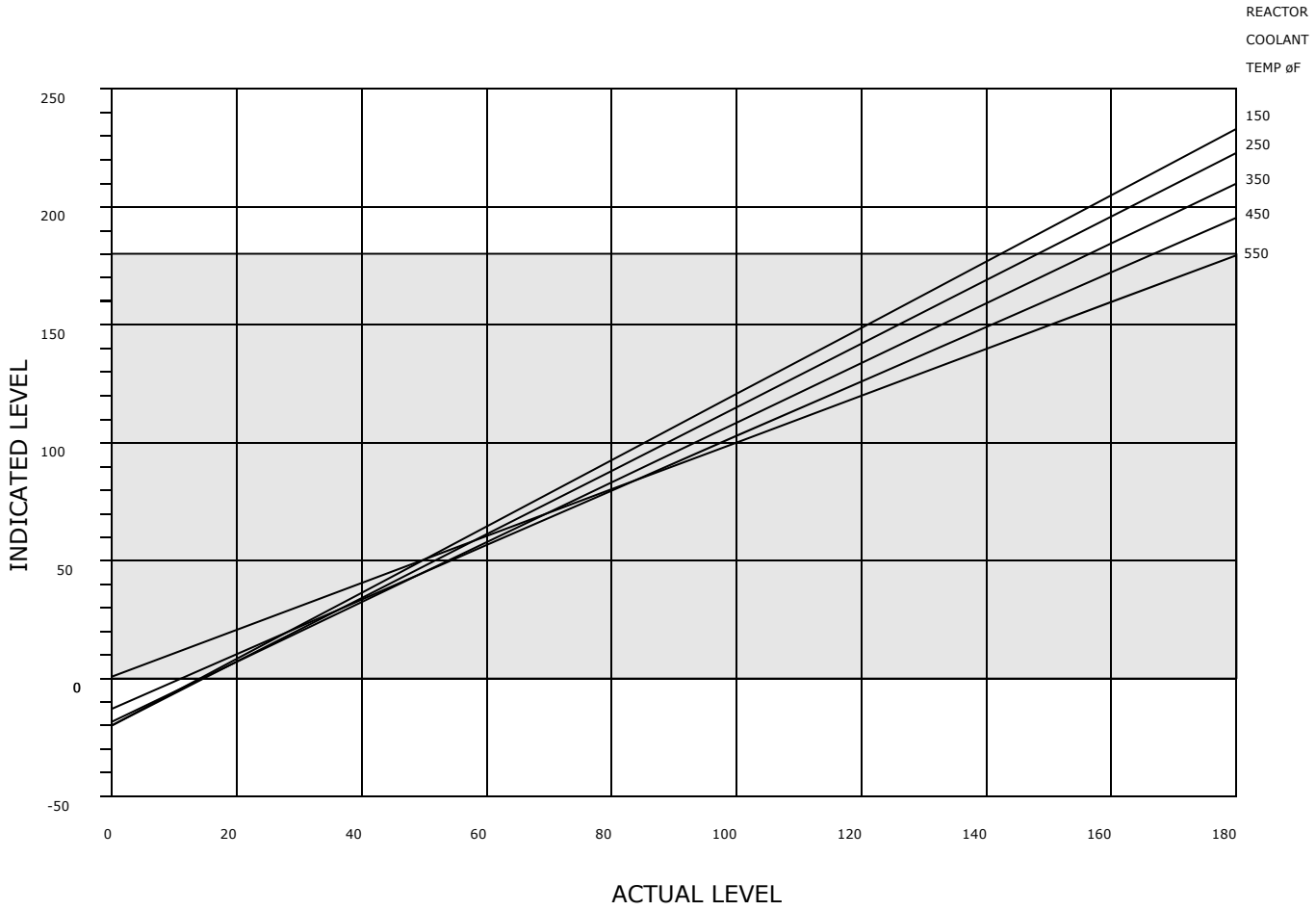


ATTACHMENT 7
(Page 3 of 4)
VESSEL LEVEL INSTRUMENTATION TEMPERATURE COMPENSATION CURVES

UPSET RANGE LEVEL

TEMPERATURE COMPENSATION

GRAY AREA - INDICATED LEVEL RANGE

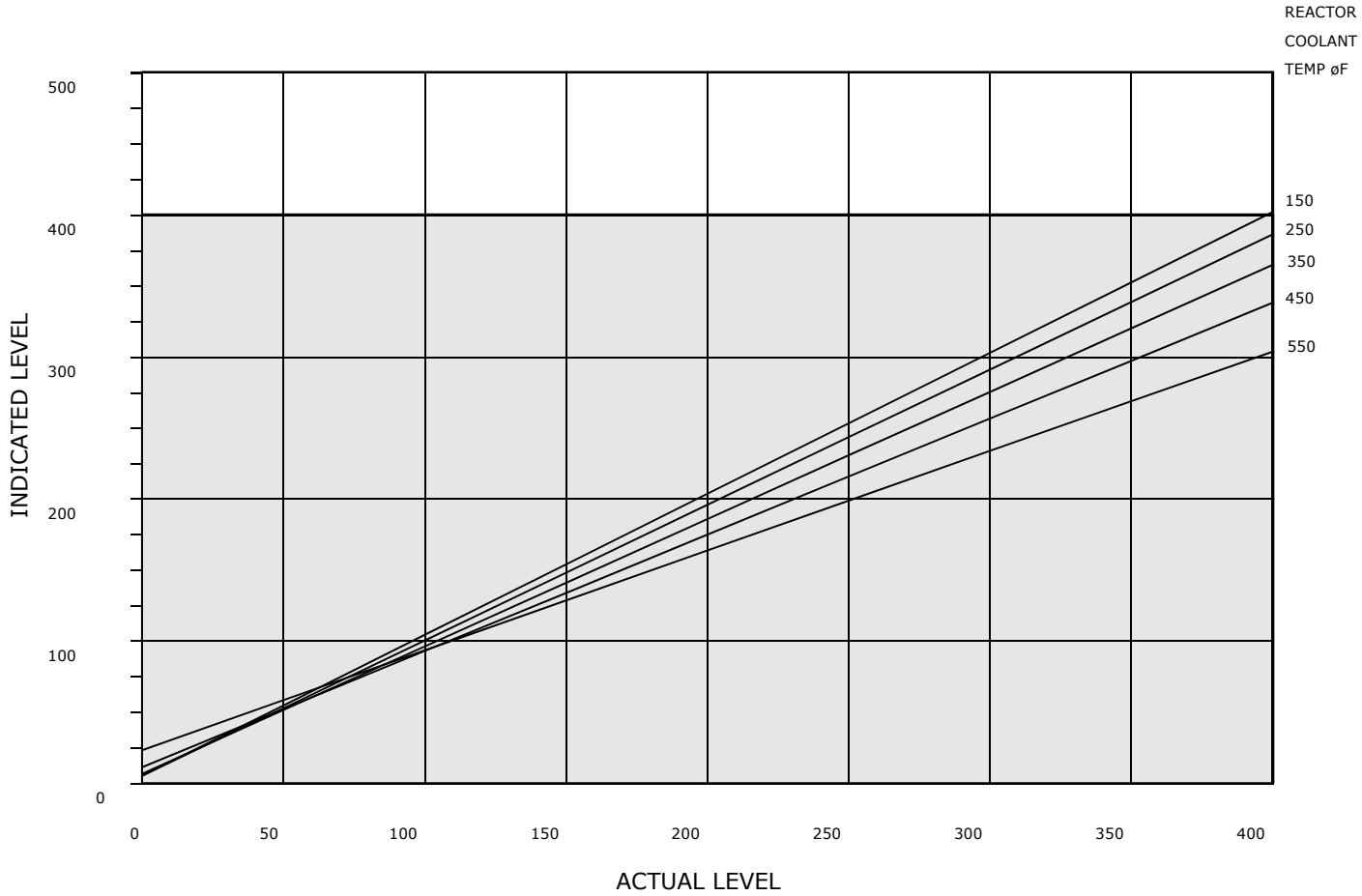


ATTACHMENT 7
(Page 4 of 4)
VESSEL LEVEL INSTRUMENTATION TEMPERATURE COMPENSATION CURVES

SHUTDOWN RANGE LEVEL

TEMPERATURE COMPENSATION

GRAY AREA - INDICATED LEVEL RANGE



ATTACHMENT 8
INSTALLATION OF BREAKER OVERLOADS FOR BKR 52-264042 (BG-HV-F031)
(Page 1 of 1)

NOTE

The following should be performed by Qualified Maintenance Personnel.

An independent verification shall be performed for the following steps.

1.0 Upon notification that 52-264042 (BG-HV-F031 RWCU FLOW ORIFICE BYPASS) is tagged open, **PERFORM** the following:

1.1 At Breaker 52-264042 **PERFORM** the following:

1.1.1. **VERIFY** Breaker 52-264042 BG-HV-F031 RWCU FLOW ORIFICE BYPASS is open. ____

1.1.2. **REMOVE** Job Information Tag for the Breaker Overloads. ____

1.1.3. **RE-INSTALL** the Breaker Overloads for Breaker 52-264042 BG-HV-F031 RWCU FLOW ORIFICE BYPASS (H1022 (LO)) ____

1.2 **NOTIFY** the Main Control room to release breaker 52-264042. ____

2.0 PERFORMER/VERIFIER

PRINT NAME	SIGNATURE	INITIALS	DATE/TIME

2.1 **NOTIFY** The Main Control Room that the Breaker Overloads have been installed. ____

ATTACHMENT 9
MAIN TURBINE SHELL COOLDOWN
(Page 1 of 5)

NOTE

Attachment 9 is to be performed when an increase in the cooldown rate of the Main Turbine Shell is desired, and used only during a "Controlled" shutdown (NOT following a scram), as a time-saving measure. The inferences to "Cooling/Cooldown", or "Warming", are dependent upon whether the direction is referring to the activity of cooling or the nomenclature on the instrumentation/indications.

This attachment cannot be used simultaneously with the cooldown controller. The cooldown controller is interlocked such that a Main Turbine trip signal must exist. Performing the turbine shell cooldown requires the turbine trip signal to be reset.

1.0 Start HP Turbine Shell Cooldown by performing the following steps:

1.1 **SELECT** [Diag Reset S1] , [Diag Reset P1] , [Master Reset P1] ____

1.2 **SELECT** [Control] , [Valve Limiters] ____

1.3 **OBSERVE** the following:

- Valve Position Limiter, VPL Setpoint: 100% ____
- Max Combined Flow Limit, Setpoint: 130% ____

1.4 **SELECT** [Control] , [Pre-Warming] ____

1.5 **OBSERVE** the following:

- Chest Warming: OFF ____
- Shell Warming: OFF ____

1.6 **SELECT** [Control] , [Speed – Load] ____

1.7 **OBSERVE** the following:

- Turbine Trip Status: Reset ____
- Turbine Control Status: Valves Closed Controlling ____
- Load Setpoint: 0% ____

1.8 **SELECT** Speed Control , Acceleration RPM/Min [Fast (180)] . ____

ATTACHMENT 9
MAIN TURBINE SHELL COOLDOWN
(Page 2 of 5)

CAUTION

The following valves will NOT fully Close IF the DECREASE push button is used. The only method to ensure complete valve closure is to use the CLOSE push button. The valve must be Open, OR at an intermediate position (both the Open and Close bezel lamps illuminated) for the CLOSE push button to function properly:

AC-HV-1015 AND AC-HV-1041/42/43/A/B/C.

1.9 **CLOSE** the following valves:

1.9.1. AC-HV-1013A, B, C and D STEAM LINE DRAINS - MN STM VLV BFR SEAT. ____

1.9.2. AC-HV-1015 STEAM LINE DRAINS - CONT VLV BFR SEAT. ____

1.9.3. AC-HV-1041/42/43/A/B/C STEAM LINE DRAINS – CROSS AROUND. ____

1.9.4. AC-HV-1018B STEAM LINE DRAINS - LEAD 3. ____

1.9.5. AC-HV-1360A, B and C FWH #5A, B and C SHELL SIDE MOIST SEP B DRN. ____

1.9.6. AC-HV-1361A, B and C FWH #5A, B and C SHELL SIDE MOIST SEP A DRN. ____

1.9.7. AC-HV-1362A,B and C FWH # 5A,B and C SHELL SIDE CROSS AROUND STM ISLN. ____

1.9.8. AC-HV-1751A, B and C RFPT A, B and C LO PRESS STM ISLN VLV. ____

ATTACHMENT 9
MAIN TURBINE SHELL COOLDOWN
(Page 3 of 5)

NOTE

While in Shell Cooldown, the temperature limits of Attachment 2 of HC.OP-SO.AC-0001(Q) should be referred to.

1.10 **SELECT** [Control] , [Pre-Warming] ____

1.11 **SELECT** Shell Warming , [ON]
AND **OBSERVE** the following:

1.11.1. All Control Valves open fully, after a time delay. ____

1.11.2. All Intermediate Stop Valves (ISV) go closed. ____

1.11.3. All Intercept Valves (IV) remain closed. ____

1.11.4. All Main Stop Valves (MSV) remain closed. ____

ATTACHMENT 9
MAIN TURBINE SHELL COOLDOWN
(Page 4 of 5)

NOTE

IF the turbine should roll off the turning gear, it may be necessary to remove lift pumps from service. Alternate lift pump operations should be performed by referring to Attachment 6 of HC.OP-SO.AC-0001(Q).

CAUTION

A 150°F/hr heatup or cooldown rate on the Main Turbine first stage metal temperature should NOT be exceeded. [CD-570X]

During HP Turbine shell warming/cooldown, a Reactor scram will result IF the HP Turbine first stage shell pressure exceeds 104.2 psig with the Turbine Stop Valves closed.

1.12 **PRESSURIZE** HP Turbine Shell to a pressure which will allow for a 50°F difference between steam temperature and 1st Stage Shell Lower Inner Surface temperature as follows:
(**REFER** to Steam Tables for initial desired pressure/temperature) ____

NOTE

Chest temperature changes should be observed as an indication of steam flow.

1.12.1. To establish cooldown steam,
SELECT Adjust MSV2 Position [Ramp Rate]
AND **ENTER** desired Ramp Rate. ____

1.12.2. Intermittently **SELECT** Adjust MSV2 Position , Manual Adj.
[Raise] UNTIL flow is established through MSV-2. ____

1.12.3. **THROTTLE** (STEAM LEAD DRAINS) - LEAD 1 & 2
AC-HV-1017A/B to maintain the 50°F temperature difference described in Step 1.12. ____

1.12.4. IF the turbine rolls off the turning gear,
THEN **SELECT** Shell Warming-[OFF] ____

ATTACHMENT 9
MAIN TURBINE SHELL COOLDOWN
(Page 5 of 5)

2.0 Stop HP Turbine Shell Cooldown by performing the following steps:

2.1 **PRESS** Adjust MSV2 Position , Manual Adj [Lower]
UNTIL Position indication is at zero PERCENT. ____

2.2 **OPEN** the following valves:

2.2.1. AC-HV-1013A, B, C and D STEAM LINE DRAINS - MN STM VLV BFR SEAT. ____

2.2.2. AC-HV-1015 STEAM LINE DRAINS - CONT VLV BFR SEAT. ____

2.2.3. AC-HV-1041/42/43/A/B/C STM LINE DRAINS - CROSS AROUND. ____

2.2.4. AC-HV-1018B STEAM LINE DRAINS - LEAD 3. ____

2.2.5. AC-HV-1360A, B and C FWH #5A, B and C SHELL SIDE MOIST SEP B DRN. ____

2.2.6. AC-HV-1361A, B and C FWH #5A, B and C SHELL SIDE MOIST SEP A DRN. ____

2.2.7. AC-HV-1362A, B and C FWH #5A, B and C SHELL SIDE CROSS AROUND STM ISOL. ____

2.2.8. AC-HV-1751A, B and C RFPT A, B and C LO PRESS STM ISLN VLV. ____

2.3 **OPEN** (STEAM LEAD DRAINS)-LEAD 1&2 AC-HV-1017A/B. ____

NOTE

Overhead alarm D3-D5 - EHC PANEL 10C363 TROUBLE will come in (CRIDS Point D2031 MN TRB FAST CLOSE INTRCPT VLVS in alarm), IF cross-around pressure is still above 43 psig when the Shell Warming-OFF is selected.

2.4 After Cross-around pressure drops below 43 psig,
SELECT Shell Warming [OFF] ____

2.5 **OBSERVE** all Control, Stop and Intercept Valves close. ____

CD-454H

ATTACHMENT 10
NUCLEAR INSTRUMENTATION SURVEILLANCE REQUIREMENTS
IN OPERATIONAL CONDITIONS 2, 3, 4, AND 5
(excluding those required specifically during core alterations)
(Page 1 of 4)

TRIP FUNCTION	TECHNICAL SPECIFICATION	APPLICABLE OPERATIONAL CONDITION(S)	SURVEILLANCE REQUIREMENT	SURVEILLANCE FREQUENCY	ACTIONS (See page 4 for details of Actions)
IRMS, Neutron Flux High	Table 4.3.1.1-1 Function 1.a	2,3,4,5 2,3,4,5 2,3,4,5	Channel Check Channel Functional Test Channel Calibration	Shiftly Weekly Refueling	OC 2: Action 1 OCs 3,4: Action 2 OC 5: Action 3
IRM's, Inoperative	Table 4.3.1.1-1 Function 1.b	2,3,4,5	Channel Functional Test	Weekly	OC 2: Action 1 OCs 3,4: Action 2 OC 5: Action 3
APRM's, Neutron Flux, Upscale, Setdown	Table 4.3.1.1-1 Function 2.a	2,3,4,5 2,3,4,5 2,3,4,5	Channel Check Channel Functional Test Channel Calibration	Shiftly Weekly Semi-annually	OC 2: Action 1 OCs 3,4: Action 2 OC 5: Action 3
APRM's, Inoperative	Table 4.3.1.1-1 Function 2.d	2,3,4,5	Channel Functional Test	Quarterly	OC 2: Action 1 OCs 3,4: Action 2 OC 5: Action 3
APRM's, Inoperative	Table 4.3.6.-1 Function 2.b	2,5	Channel Functional Test	Quarterly	OCs 2,5: Action 61
APRM's, Neutron Flux, Upscale, Startup	Table 4.3.6.-1 Function 2.d	2,5 2,5	Channel Functional Test Channel Calibration	Quarterly Semi-annually	OCs 2,5: Action 61

CD-454H

ATTACHMENT 10
NUCLEAR INSTRUMENTATION SURVEILLANCE REQUIREMENTS
IN OPERATIONAL CONDITIONS 2, 3, 4, AND 5
(Excluding those required specifically during core alterations)
(Page 2 of 4)

TRIP FUNCTION	TECHNICAL SPECIFICATION	APPLICABLE OPERATIONAL CONDITION(S)	SURVEILLANCE REQUIREMENT	SURVEILLANCE FREQUENCY	ACTIONS (See page 4 for details of Actions)
SRMs, Detector Not Full In	Table 4.3.6.-1 Function 3.a	2,5	Channel Functional Test	Weekly	OCs 2,5: Action 61
SRMs, Upscale	Table 4.3.6-1 Function 3.b	2,5 2,5	Channel Functional Test Channel Calibration	Weekly Refueling	OCs 2,5: Action 61
SRMs, Inoperative	Table 4.3.6-1 Function 3.c	2,5	Channel Functional Test	Weekly	OCs 2,5: Action 61
SRMs, Downscale	Table 4.3.6-1 Function 3.d	2,5 2,5	Channel Functional Test Channel Calibration	Weekly Refueling	OCs 2,5: Action 61
IRMs, Detector Not Full In	Table 4.3.6-1 Function 4.a	2,5	Channel Functional Test	Weekly	OCs 2,5: Action 61
IRMs, Upscale	Table 4.3.6-1 Function 4.b	2,5 2,5	Channel Functional Test Channel Calibration	Weekly Refueling	OCs 2,5: Action 61
IRMs, Inoperative	Table 4.3.6-1 Function 4.c	2,5	Channel Functional Test	Weekly	OCs 2,5: Action 61
IRMs, Downscale	Table 4.3.6-1 Function 4.d	2,5 2,5	Channel Functional Test Channel Calibration	Weekly Refueling	OCs 2,5: Action 61

CD-454H

ATTACHMENT 10
NUCLEAR INSTRUMENTATION SURVEILLANCE REQUIREMENTS
IN OPERATIONAL CONDITIONS 2, 3, 4, AND 5
(Excluding those required specifically during core alterations)
(Page 3 of 4)

TRIP FUNCTION	TECHNICAL SPECIFICATION	APPLICABLE OPERATIONAL CONDITION(S)	SURVEILLANCE REQUIREMENT	SURVEILLANCE FREQUENCY	ACTIONS (See page 4 for details of Actions)
SRMs	4.3.7.6.a.1.a	2	Channel Check	Shiftly	Action 3.3.7.6.a
SRMs	4.3.7.6.a.1.b	3,4	Channel Check	Daily	Action 3.3.7.6.b
SRMs	4.3.7.6.a.2	2,3,4	Channel Calibration	Refueling	OC 2: Action 3.3.7.6.a OCs 3,4: Action 3.3.7.6.b
SRMs	4.3.7.6.b	2,3,4	Channel Functional Test	Monthly	OC 2: Action 3.3.7.6.a OCs 3,4: Action 3.3.7.6.b
SRMs	4.9.2.a.1	5	Channel Check	Shiftly	Action 3.9.2
SRMs	4.9.2.a.2	5	Verification That Detectors are Fully Inserted	Shiftly	Action 3.9.2
SRMs	4.9.2.b	5	Channel Functional Test	Weekly	Action 3.9.2
SRMs	4.9.2.c.3	5	Verification That Channel Count Rate is ≥ 3 cps	Daily (1)	Action 3.9.2

(1) AND prior to control rod withdrawal OR Core Alterations

CD-454H ATTACHMENT 10

NUCLEAR INSTRUMENTATION SURVEILLANCE REQUIREMENTS IN OPERATIONAL CONDITIONS 2, 3, 4, AND 5 (excluding those required specifically during core alterations) (Page 4 of 4)

Actions Required if Technical Specification Surveillance Requirements Not Satisfied

3.3.1-1
Actions: 1: Be in at least Hot Shutdown within 12 hours

2: Verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the Shutdown position within one hour.

3: Suspend all operations involving CORE ALTERATIONS* and insert all insertable control rods within one hour.

*Except replacement of LPRM strings provided SRM instrumentation is OPERABLE per Specification 3.9.2.

3.3.6-1
Actions

61: With the number of Operable Channels:

a. One less than required by the Minimum Operable Channels per Trip Function requirement, restore the inoperable channel to Operable status within 7 days or place the inoperable channel in the tripped condition within the next hour.

b. Two or more less than required by the Minimum Operable Channels per Trip Function requirement, place at least one inoperable channel in the tripped condition within one hour.

3.3.7.6.a: In Operational condition 2 with one of the above required source range monitor channels inoperable, restore at least 3 source range monitor channels to an Operable status within 4 hours or be in at least Hot Shutdown within the next 12 hours.

3.3.7.6.b: In Operational condition 3 or 4 with one of the above required source range monitor channels inoperable, verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the Shutdown position within one hour.

3.9.2: With the requirements of the above specification not satisfied, immediately suspend all operations involving Core Alterations and insert all insertable control rods.

ATTACHMENT 11
OPERATIONAL LIMITATIONS COMMENT PAGE
Page 1 of 1

ATTACHMENT 12
SHUTDOWN FLOW CHART
Page 1 of 5

LOAD REDUCTION SECTION 1

ENSURE THE FOLLOWING 5.1.1

A. System Operator has been notified of the Shutdown.
B. Reactor Engineer has been notified of the Shutdown.
C. Steam Lead drain #4 is in AUTO. (AC-HV-1018A)

5.1.3 **MAINTAIN** Load Setpoint at 100%, OR as directed by CRS

5.1.2 **LOWER** Rx PWR W/ Recirc

5.1.5 **TOGGLE** Crossflow to Not Applied

5.1.4 WHEN the #4 CONTROL VALVE is Full Closed, **ENSURE** the #4 STEAM LEAD DRAIN (HV-1018A) is OPEN

Approx. 70% PWR (888 MWe)

5.1.7 **ENSURE** Recirc. Is in Indiv.Manual @ approx 45% - 50% speed

5.1.6 **PLACE** 3rd RFP in Recirc.

5.1.9.A **ENSURE** Throttle Pressure Set @ 905 psig

5.1.8 H1CA -CA-HV-1991 is open

Before 40% PWR (507 MWe)

5.1.9.C **INSERT** Rods

5.1.9.B **LOWER** Recirc to Minimum

Approx. 30% PWR (380 MWe)

5.1.10.A **PLACE** RFP with lowest discharge flow to vessel (2nd RFP) in Recirc IAW HC.OP-SO.AE-0001(Q)

5.1.10.B **STOP** one SCP A(B,C)P137 IAW HC.OP-SO.AD-0001(Q)

5.1.10.C **STOP** one PCP A(B,C)P102 IAW HC.OP-SO.AD-0001(Q)

5.1.10.D **ENSURE** one RFP previously placed in Recirc has been removed from svc IAW HC.OP-SO.AE-0001(Q)

5.1.10.E **MAINTAIN** 1 RFP in svc and 1 RFP in Recirc

5.1.10.F **REMOVE** the HWCI System from service

5.1.10.H **VERIFY** Single Element Control

5.1.10.H **INSTRUCT** I&C and Radiation Protection to restore MSL Rad Monitor Trip and Alarm Setpoints to normal

5.1.11.A **VERIFY** RBM Bypass On

5.1.11.B **MINIMIZE** potential for RWCU pump trips as follows:

- ❑ **CONTACT** Chemistry to reduce RWCU flow to . <90 gpm with one Demin in svc while monitoring suction flow.
- ❑ **REMOVE** A or B RWCU Pump from svc

5.1.11.C IF not performed in previous 92 days, **PERFORM** Main Turbine Lift Pump test

5.1.11.D **PLACE** RFP Min Flow Vlv controller in MAN AND **ADJUST** Min flow to achieve 3500 gpm.

Approx. 25% PWR (317 MWe)

5.1.12 **MAINTAIN** Condenser backpressure less than or equal to 1.5" Hg Abs., using one or both of the following procedures:

- ❑ HC.OP-SO.CG-0001(R), Condenser Air Removal System Operation
- ❑ HC.OP-SO.DA-0001(Z), Circulating Water System Operation.

5.1.13.A-B IF directed to lock Mode Switch in Shutdown between 30% & 20% power with Main Turbine on line, **PERFORM** the following:

- ❑ **DISPATCH** an Operator for local observation and **CHECK** Feedwater Startup Level Control Valves.
- ❑ **PLACE** Main Turbine Oil Pumps in svc, **ADJUST** lube oil temp. controller, **SECURE** power system stabilizer IAW HC.OP-SO.AC-0001(Q)

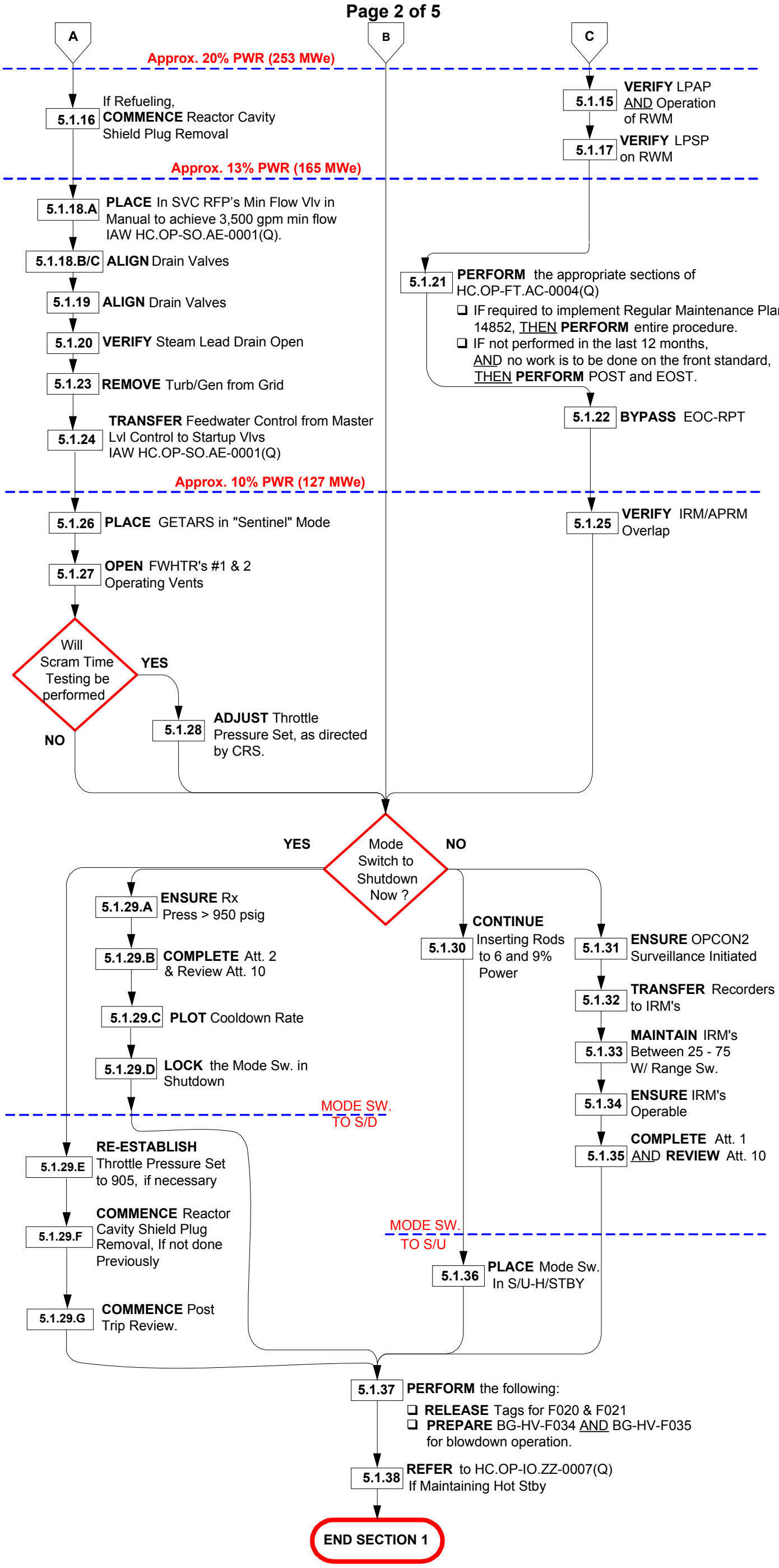
5.1.13.C **PERFORM** the following at current power level: (Intermediate Steps N/A)

5.1.22 for EOC RPT System
5.1.27 for opening the FWH 1&2 vents
5.1.28 for Pressure Setpoint Adjustment
5.1.29 for performing a Manual Scram

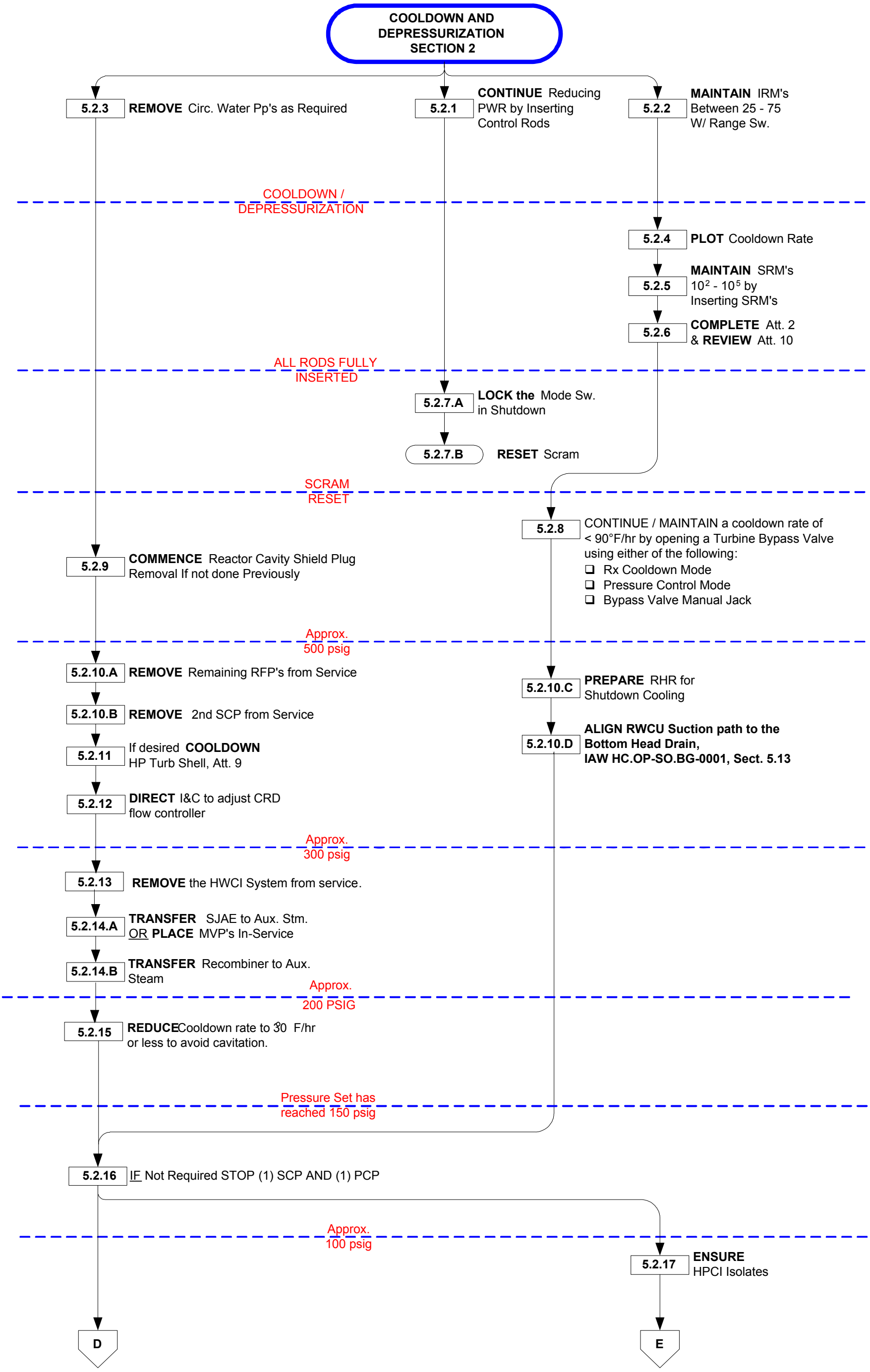
5.1.14 **VERIFY** MSLRM to Norm.

A B C

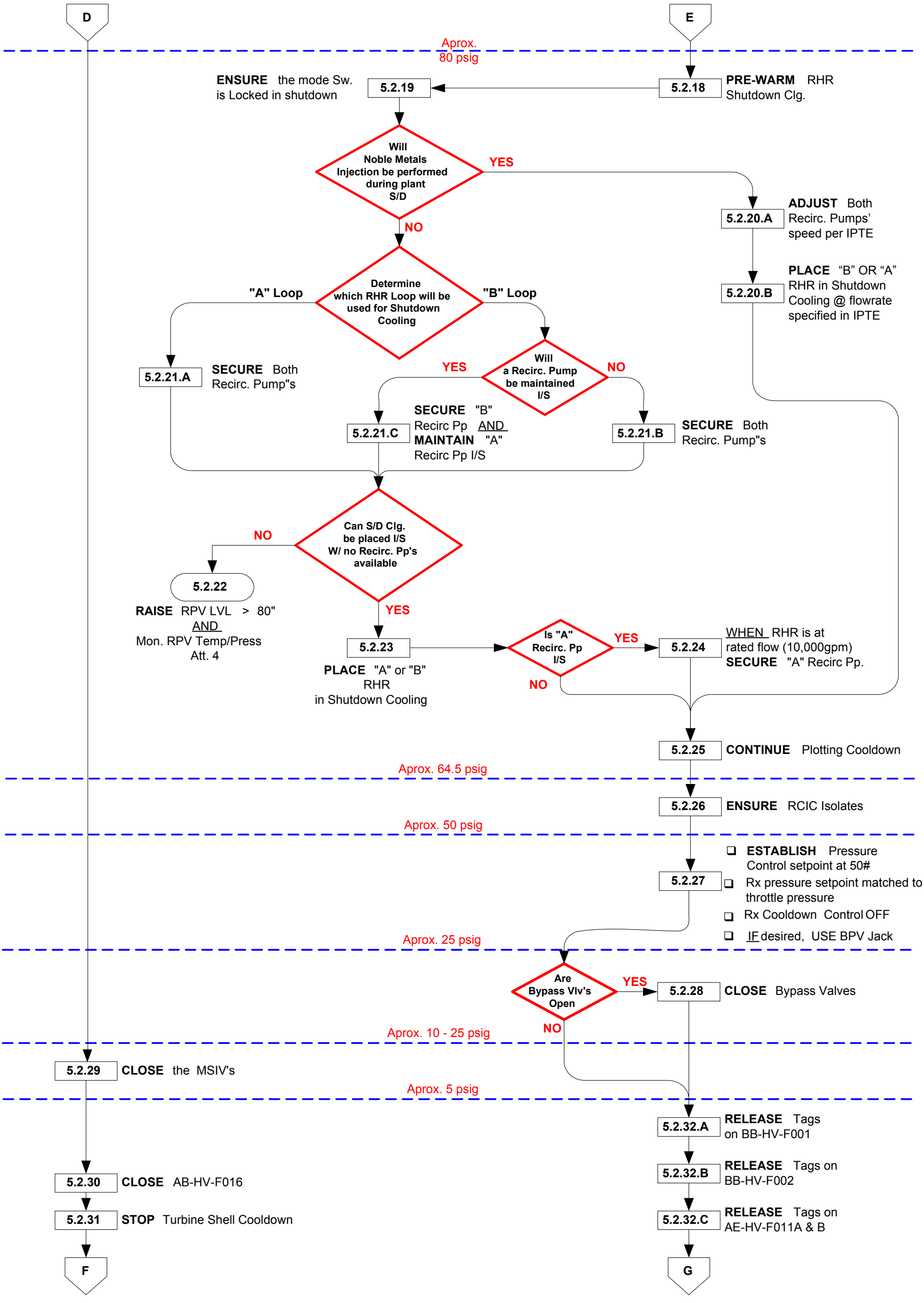
ATTACHMENT 12
SHUTDOWN FLOW CHART
Page 2 of 5



ATTACHMENT 12
SHUTDOWN FLOW CHART
Page 3 of 5



ATTACHMENT 12
SHUTDOWN FLOW CHART
Page 4 of 5



ATTACHMENT 12
SHUTDOWN FLOW CHART
Page 5 of 5

F

When RPV Temp. < 212° F

5.2.33.C **ENSURE** MSL Vents and Drain are Closed

5.2.33.D **ENSURE** Turb Sealing Stm Drains are Closed

5.2.33.E **REPOSITION** Stm. Line Drains

5.2.33.F IF necessary, **MAINTAIN** Reactor Vessel level with the RWCU System

200 ° F

Is the Containment going to be opened

NO

YES

5.2.39.A **ENSURE** Release Permit has been obtained

5.2.39.B If required **BEGIN** Containment Pre-Purge

5.2.39.C When Cont. Atm. Rad Levels are within Limits, **STOP** Pre-Purge

5.2.39.D **BEGIN** De-inerting the Containment

RPV Coolant Temp. 150° F

Will Breaking Condenser Vacuum be Required

NO

YES

5.2.44.A **PLACE** Main Cond. Low Vacuum Switches in Bypass

5.2.44.B **NOTIFY** Chemistry that the Condensate Drain Tk is no longer available, AND to **ALIGN** the Turbine Sample Sink drains IAW HC.CH-SA.RC-0001

5.2.44.C **SHUTDOWN** Condenser Air Removal Sys.

5.2.44.D **SHUTDOWN** Gaseous Rad Waste Sys.

5.2.44.E **INFORM** Chemistry to S/D Off Gas Vial Sampling

5.2.44.F **REMOVE** Sealing Steam Sys. from service

5.2.44.G **SECURE** Feeding the RPV from Condensate

5.2.44.H **PLACE** Cond. Drn. Tk. LVL Control in MAN. AND **LOWER** Output to 0%

5.2.44.I **SHUTDOWN** The Condensate Sys.

5.2.44.J **REMOVE** The Main Turbine from the Turning Gear

5.2.44.K **STOP** Remaining Circ. Water Pumps

G

5.2.33.A **PLACE** 2nd RWCU Pp I/S @ approx. 90 gpm.

5.2.33.B **DIRECT** Chemistry to Place 2nd RWCU F/D in-service

5.2.34 **ENSURE** Op Con 4 surveillance's Initiated

5.2.35 **COMPLETE** Att. 3 AND **REVIEW** Att. 10

5.2.36 **CONTINUE** Cooldown to < 200 ° F

5.2.37 Slowly **RAISE RPV** LVL ≥ 80"

5.2.38 At SM discretion **PLACE** RWCU RHX in Bypass Operation

5.2.40 **RAISE** RWCU Flow to 150 gpm/ Demin Vessel

5.2.41 **CONTINUE** Cooldown to Desired Temperature

5.2.42 AFTER Desired Temp. is Reached AND W/in T.S.Limit **STOP** Plotting Cooldown Rate

5.2.43 **DIRECT** I&C to Remove Vessel Level Purge from Service

END