**ATTACHMENT 9**
**Procedures on Shutdown Cooling Isolation**

Contents

1. CPS 3002.01, "Heatup and Pressurization," Rev 32f
2. CPS 3312.03, "RHR – Shutdown Cooling (SDC) & Fuel Pool Cooling and Assist (FPC&A)," Rev 11d
3. CPS 4001.02, "Automatic Isolation," Rev 17f
4. CPS 4001.01, "Reactor Coolant Leakage," Rev 12b
5. CPS 4006.01, "Loss of Shutdown Cooling," Rev 5c
6. CPS 4200.01, "Loss of AC Power," Rev 26

# HEATUP AND PRESSURIZATION

***SCOPE OF REVISION:***

- Incorporated revisions 31 - 31e, revisions marked not saved.
- IR 2410659-11 incorporated NER-recommendations.
- 2385159-03, required use of the PPC heatup/cooldown screen with 15, 30 and 60 minute averages once established.
- Specific Rev. 32 [Helton] IR 2530316-67 (EC 619218) - Added a new radio button on the Reactor Moderator Heatup Trends screen and on the Fixed Trends screen. (Pages 6 & 18)

❶ Specific Rev. 32a [J. Delaney] - 3987232-02 (EC 378612) - Replaced 1TIC-VP009, which was abandoned in place, with 1TIT-VP009, which now performs the function of the Div. 1 Drywell Cooler Fan 1A Temperature Controller. Revised to clarify how to change setpoint with new controller. Updated table of contents.

❷ Specific Rev. 32b [Helton]: IR 4017711-02 - Added step to notify the NRC SRI of Mode changes.

[J. Delaney]: IR 4016272-02 - Revised note before step 8.6 to provide guidance to place SJAE in-service between 500 and 530 psig reactor pressure instead of "as early as possible" to prevent intermittent SJAE operation at lower reactor pressure.

IR 4024892-02 - Added limitation to close 1FW004 prior to throttling open 1B21-F065A/B under high dP conditions between feedwater header and reactor vessel to prevent momentary high flow rates to the vessel.

❸ Specific Rev. 32c [Helton]: IR 4029940-02 - Added step to get Engineering recommendation to use FAST speed or MEDIUM speed (after entering MODE 1).

❹ Specific Rev. 32d [Helton]: IR 4010227-60 - Added steps (verbiage) to various sections to have operators notify Security when specific plant conditions change. Fixed minor format errors and typos, rev. balls not used.

❺ Specific Rev 32e [Leffel]: Added step to open/verify open low point drain valve 1B21-F516B, MS to MSR 1A Test Conn due to stem/disk separation of 1B21-RSDV-2 MSR 1B Drn Vlv.

❻ Specific Rev. 32f [Helton]: IR 4125359-16 - Added a DISCUSSION about starting a second Condensate Pump during plant startup to reduce CRD system oscillations. Added a NOTE to start a second CD pump during plant start up prior to placing a SJAE in service.

**CONTINUOUS USE**

**ORIGINATOR:** *Michael R. Helton* **CLASS CODE:** *SNND*

**SQR:** *Ed Tiedemann* **APPROVAL DATE:** *05/03/2017*

*CURRENT CHANGES TO GENERAL REVISION*

| | Change # | Date | List of Affected Pages |
|---|---|---|---|
| ❶ | 32a | 05/23/17 | 1, 2, 23 |
| ❷ | 32b | 07/10/17 | 1, 16, 30, 34 |
| ❸ | 32c | 08/02/17 | 1, 35 |
| ❹ | 32d | 08/29/17 | 1, 8, 25, 38 |
| ❺ | 32e | 05/19/18 | 1, 19 |
| ❻ | 32f | 07/03/18 | 1, 6, 30 |

**TABLE OF CONTENTS**
(Section 8.0 only)

1.0 **PURPOSE**

Provide instructions required to heatup and fully pressurize the reactor pressure vessel (RPV).

2.0 **DISCUSSION/DEFINITIONS**

2.1 This procedure organizes the startup of the Turbine - Generator support systems, warming of the turbine chest and shell, and heatup and pressurization of the unit in a manner conforming to Improved Tech Specs (ITS/ORM/ODCM), Updated Safety Analysis Report (USAR), and administrative requirements.

2.2 Heatup and pressurization will normally be a portion of a startup from ambient conditions to full power operations. Integrated operating procedures should be initiated in such a manner to provide an uninterrupted succession from one procedure to another.

This will require the review and performance of subsequent startup integrated procedures prerequisites and necessary transition steps during the performance of this procedure.

2.3 This integrated procedure is designed to be used as a template, along with the use of the system operating procedures (where applicable) and the knowledge of trained licensed operators to accomplish the wide spectrum of evolutions required.

Some of the evolutions are very time consuming, involve unrelated evolutions, and are dependent on changing plant conditions.

It is therefore acceptable to perform several sections or steps of this integrated procedure concurrently to accomplish the desired result of the integrated procedure.

Any steps or groups of steps which are required to be performed in a specified sequence are so annotated in this procedure, prior to the applicable steps.

2.4 During the performance of this procedure, steps may be re-performed due to changing plant conditions.

Re-performance of previously performed steps is allowed and is documented by re-initialing the step.

An explanatory note may be included, but is not required.

2.0 **DISCUSSION/DEFINITIONS** (cont'd)

2.5 For a non-nuclear heatup, the RPV may be allowed to heatup and pressurize using decay heat and RR pump energy.

This procedure provides separate prerequisites and procedure steps for non-nuclear heatup.

It may not be possible to place some steam loads into service without nuclear heat.

Each load should be evaluated based on its steam usage, ITS requirements and effect on plant operation.

When nuclear heat is available, these steam loads should be placed in service.

When reactor criticality is desired, continue overall plant operation per this procedure and enter CPS 3001.01, Approach To Critical to perform rod withdrawal to criticality.

2.6 This procedure triggers the following ITS/ORM/ODCM items:

| | | |
|---|---|---|
| ITS SR 3.3.3.2.2 | (8.5.1.1) | (RSP RCIC Run) |
| ITS SR 3.4.4.3 | (8.7.1.3) | (SRV Actuation) |
| ITS SR 3.4.11.1.a | (5.4.6) | (PT Limits) |
| ITS SR 3.4.11.1.b | (5.4.6) | (PT Limits) |
| ITS SR 3.5.1.3 | (8.5.1.6) | (ADS Accum Pressure) |
| ITS SR 3.5.1.7 | (8.7.1.3) | (ADS Actuation) |
| ITS SR 3.5.3.1 | (8.5.1) | (RCIC) |
| ITS SR 3.5.3.2 | (8.5.1) | (RCIC) |
| ITS SR 3.5.3.3 | (8.7.1.2) | (RCIC) |
| ITS SR 3.5.3.4 | (8.5.1) | (RCIC) |
| ITS SR 3.5.3.5 | (8.5.1) | (RCIC) |
| ITS SR 3.6.1.2.1 | (5.4.2.2) | (Airlock Leakage) |
| ITS SR 3.6.1.6.1 | (8.7.1.3) | (LLS Actuation) |
| ORM TR 4.2.13.1 | (8.5.1.6) | (ADS Accum LP Alarm) |
| ORM TR 4.3.1.1 | (5.5, 8.1.5.1) | (Chemistry Samples) |
| ORM TR 4.5.2.2 | (8.1.5.2, 8.7.4.5) | (MOV Test Sw) |
| ODCM SR 3.4.1.1 TA | (8.7.8.2) | (Stack Dose Rates) |
| ODCM SR 3.4.1.2 TA | (8.7.8.2) | (Stack Dose Rates) |
| ODCM SR 3.4.1.2 TC | (8.7.8.2) | (Stack Dose Rates) |
| ODCM SR 3.9.1.1 | (8.3.5) | (OG Effluent Flow) |

2.0 **DISCUSSION/DEFINITIONS** (cont'd)

2.8 CRS Scheduling NOTEs (Step pages & Appendix A)

1. Specific pre-designated scheduling NOTEs designated by the Shift Manager or designated Management Representative which are intended to assist the MCR crew in the timely and unencumbered performance of plant activities by minimizing total reliance upon numerous other integrated plans and activities.

   CRS Scheduling NOTEs shall only be used to reflect planned scheduled activities.

   The use of these administrative reminders does not relieve the user from adhering to other programmatic schedules and procedures.

2. CRS Scheduling NOTEs shall not direct the specific operation of plant components or systems.

   A procedure change is required for those type changes.

3. Examples of CRS Scheduling NOTEs may include:

   *Triggering Decisions for WO PMT, special monitoring, etc.*

   Perform WO 1234 PMT (VOTEs) on 1B33-F060A.

   NSED ready to perform special data collection on 3D Monicore.

   Perform CPS 98xx.xx on the SJAE.

   Verify all PMT activities on the Main Turbine complete.

   *Assessment/Evaluation Decisions*

   Power Plant Manager brief crew on reactivity expectations.

   Engineering evaluate main turbine vibration readings for acceptability prior to exceeding 20% turbine load.

   Shift Manager review MODE restraint log for any potential impact to going above the Low Power Setpoint.

   Power Plant Manager's concurrence to continue the startup.

4. CRS Scheduling NOTEs should be entered onto the master integrated procedure (CRS's copy) prior to commencing the procedure.

   New NOTEs may be added throughout the startup as deemed necessary by the SM.

   Any new NOTEs shall be approved by the Operations Department Head, and shall be on Work Schedule.

5. An SRO shall review that each CRS Scheduling NOTE does not constitute a procedure change, and will initial each NOTE to indicate the review.

2.9 CPS 3002.F001, HEATUP AND PRESSURIZATION FLOWCHART may be used as an aid during plant startup. F001 is NOT a substitute for step by step following of the integrated procedure. F001 is meant to be used as a visual guide to major evolutions to allow coordination of upcoming events and to present major milestones to allow Shift Management to identify who will be performing those evolutions, ensure that briefs are held ahead of time, etc. The F001 does not require retention.

2.0 **DISCUSSION/DEFINITIONS** (cont'd)

2.10 After achieving criticality a delay in rod withdrawal during reactor heat up or other issues that add negative reactivity can result in the reactor becoming subcritical, as indicated by all of the following:

1. Before reaching the Point of Adding Heat (POAH) as indicated by multiple SRM or IRM readings continuously lowering without rod insertions.

2. After reaching the Point of Adding Heat (POAH) means the following:

   a. Multiple SRM or IRM readings continuously lowering without rod insertions AND

   b. Multiple IRMs have been down ranged through at least two ranges AND

   c. Multiple IRMs are below the levels established at POAH

0 2.11 EC619218 R/000 created 21 new calculated computer points in the plant process computer (PPC). These computer points provide cool down rates for the reactor vessel as an aid to the Operator during startup and shutdown of the reactor.

1. Revises the Reactor Moderator Heat Up Trends screen to remove the negative scale and added a button to the new Cool Down Trend screen.

2. Modified the Fixed Trends display screen to add a button to the new Reactor Moderator Cool Down Trends screen.

6 2.12 A second Condensate pump should be started per 3104.01, CONDENSATE/CONDENSATE BOOSTER (CD/CB) prior to placing a SJAE in service. This action will reduce the likelihood of CRD system oscillations due to operation of 1CD039.

3.0 **RESPONSIBILITY**

3.1 Operations Department Head is responsible for ensuring the proper implementation of this procedure.

3.2 Supervisor - IMD is responsible for supplying technicians to support performance of procedure.

## 4.0 PRECAUTIONS

4.1 During heatup and pressurization, small changes in RPV pressure, temperature, core flow or feed flow can significantly affect reactivity levels in the core.

Monitor flux level and period indications when performing operations that may affect these parameters.

4.2 Criticality can occur at any count rate, therefore these instruments should be monitored closely for period indications at all times during rod withdrawal.

4.3 During a startup shortly after shutdown from high power, high Xenon levels can cause abnormal flux distributions in the core. Observe the following precautions under these conditions:

1. Source Range Monitor (SRM) and Intermediate Range Monitor (IRM) detectors may not be in the high flux region and may not respond as expected to reactivity changes in the core.
2. Unexpectedly high rod notch worth's can exist in regions where notch worth is normally low.

   Pay special attention to flux level and period indications when withdrawing peripheral rods and when withdrawing non peripheral rods in the region from position 04 to 12.

4.4 All checklists required to be completed per this procedure should be completed within the 24-hour period preceding the reactor startup.

If this time period is exceeded, SMngt should review the applicable checklist to ensure its validity.

If plant conditions have changed sufficiently, a new checklist, or applicable portions should be completed.

4.5 Activities which may distract operators and supervisors involved with the reactor startup (shift turnover, surveillance's, etc.) should be avoided and/or coordinated so as to assure proper attention to the startup. *«CM-5»*

4.6 Adjusting APRM gains [CPS 9431.60, Average Power Range Monitor (APRM) Gain Adjustment] prior to the heat balance being valid (< 21.6% RTP) can result in non-conservative adjustments, and should not be performed until triggered in CPS 3004.01, Turbine Startup And Generator Synchronization (at 21.6% RTP). *«CM-3»*

4.7 Due to HP/LP poppet leak by and control issues with the B TDRFP it is recommended that the B TDRFP be the second turbine placed in service during power ascension and the first turbine removed from service during plant down powers.

4.0 **PRECAUTIONS** (cont'd)

4.8 Prolonged operation in Startup is difficult to manage from a reactivity perspective. This results from the reactor being in a critical OR near-critical state without void feedback AND normal pressure control (Steam Bypass).

4.9 Do not allow a declaration of criticality to relax Reactivity Team's caution regarding potential for very short periods on next or subsequent notches. Appropriate delay and observation of instrument response/stabilization must be provided prior to each 'next notch rod move'. At the same time, the Reactivity Team must maintain awareness that excessive delay or inattention may allow changing reactor coolant temperature to impact (positively or negatively) reactivity/criticality.

4.10 Low Notch Worth Considerations [OPEX]

Due to low notch worths experienced during plant startup, it may be necessary to alter the startup sequence such that low notch worths do not impact the heatup rate of the reactor.

Specifically, enough notch worth needs to be available to maintain the heatup rate to maintain the reactor critical, especially when control rods are notched between positions 00 and 20 respectively.

❹ 4.11 Actions of this procedure have potential that could lead to system or component inoperability, unavailability or energy removal. These actions could create security vulnerabilities that without taking compensatory measures may have regulatory impact. These systems include, but are not limited to: CW, RCIC, 138KV, 12KV, 4508/4538, etc. *[CA#4010227-60] «CM-7»*

❹ 4.12 **IF:** Any normal plant operations could have the possibility of making systems (i.e. RCIC, CW, MP, etc.) inoperable, unavailable, and/or removes energy, such as electricity or flow,

**THEN:** notify Security to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102. *[CAPR 4010227-32] [CA#4010227-60] «CM-7»*

5.0 **PREREQUISITES**

☞ OK to perform in any order.

5.1 Control Room personnel filling positions required for the startup have received Just In Time Training and documented below.

If shift turnover occurs during the startup, then all relieving personnel have had Just In Time Training.

Crew __: JITT / Brief _____/_____
Shift Manager _____ _____

Crew __: JITT / Brief _____/_____
Shift Manager _____ _____

Crew __: JITT / Brief _____/_____
Shift Manager _____ _____

Crew __: JITT / Brief _____/_____
Shift Manager _____ _____

5.2 Pre-evolution briefings conducted for planned shift activities per HU-AA-1211 by the shift crew(s) performing activities per this procedure.
In addition, the Reactor Engineer has briefed the operating crew on impact of any recently replaced NR detectors, expected Moderator Temperature Coefficient (either positive or negative) effects, heatup limits and conservative planned heatup rates.

5.0 **PREREQUISITES** (Cont'd)

Crew briefing topics, in addition to the prepared briefing the pre-job briefing database, must also include the following specific to this start-up:
*«CA 1590671-32»*

- Communicate the Roles and Responsibilities of relevant individuals (i.e. Rod Mover, Peer Checker, RM SRO, and QNE)
- Define the Expectations for Communication
- Discuss Reactivity Considerations:
  - Communicate Expected Critical Rod Pattern and contingency actions if the reactor has NOT been declared critical on or before reaching ECP (including a ±1% band).
  - Communicate any Potential Difficulties (local criticals, short periods), and actions to be taken
  - Identification of ReMA Critical Parameters (heatup rate, SRM period, vessel pressure, reactor coolant temperature, etc)
  - Allowing proper time for instrumentation to respond to Reactivity changes
    Discuss high worth steps and their proximity to the ECP.
- Discuss any potential difficulties or known system problems (i.e., double notching rods) and any Contingencies That May be Necessary
- Communicate any testing taking place during or shortly after criticality that could impact reactor operations

5.3 Verify requirements of CPS 3002.01C001, Heatup And Pressurization Checklist complete. _____

☞ Sub-step 8.1.4 (establishing vacuum) can be performed after the vacuum section of CPS 3002.01C001, Heatup And Pressurization Checklist complete.

5.4.1 **Nuclear Heatup** (N/A if Step 5.4.2 used)

Reactor in MODE 2 per CPS 3001.01, Approach To Critical. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

5.0 **PREREQUISITES** (cont'd)

5.4.2 **Non-Nuclear Heatup** (N/A if Step 5.4.1 used)

1. Indicate Reactor in MODE 2, 3 or 4. MODE:____ _____

2. **IF** In MODE 4,

   **THEN** Verify complete/complete:

   1) CPS 3002.01C003, Mode 3 Checklist. _____

   2) CPS 9861.03, Type B Local Leak Rate Testing for each primary containment airlock completed prior to declaring PRIMARY CONTAINMENT INTEGRITY before entering MODE 3. *«LBD-10»* _____

3. Verify CPS 3002.01C004, Non-Nuclear Heatup Checklist complete. _____

4. Obtain authorization from Power Plant Manager or designee to commence heatup. _____

5. Notify following departments of impending heatup:

   1) Maintenance _____

   2) Chemistry _____

   ☞ Refer to CY-AB-120-120, BWR Startup Chemistry for specific actions to promote optimal system chemistry.

   3) Radiation Protection _____

   4) Plant Engineering _____

6. Initiate CPS 9000.06D001, Heatup/Cooldown, Inservice Leak, And Hydrostatic Testing 30 Minute Testing Log, & ensure applicable temperature limits are met prior to establishing heatup. *«LBD-4»* _____

5.5 Notify Chemistry to verify reactor coolant conductivity and chlorides are within ORM TR 4.3.1.1 limits per CPS 9940.01, Weekly Chemistry Surveillance Log. *«LBD-13»* _____
(required prior to pressurizing the reactor).

☞ Refer to CY-AB-120-120, BWR Startup Chemistry for specific actions to promote optimal system chemistry.

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
|---|---|---|---|
| | | | |
| | | | |

## 6.0 LIMITATIONS

### 6.1 Control Rod Manipulations

1. The Reactor Engineer (RE) is the individual responsible for appropriate control rod sequence selection.

   SMngt shall obtain RE approval for all deviations from approved control rod sequence. *«CM-4»*

2. Reactivity control is only allowed with control rods or recirc flow.

   Operations shall not attempt to control reactivity with FW temperature adjustment. *«CM-4»*

3. Control rod movement shall not be permitted, except by scram, with RPCS inoperable when ≤ 16.7% RTP (~ 580 MWth). *«LBD-1»*

4. Prior to and during manipulation of reactivity controls the operator shall monitor, as a minimum, the appropriate items listed below.

   - Expected plant response prior to rod movement
   - RCIS status (LPSP, LPAP, HPSP, Rod Blocks)
   - Power (SRM, IRM, APRM, LPRM, Generator Load, Bypass Valve position)
     - ☞ *IRM Range 10 at reading 100 ≈ 40% RTP (1389 MWth).*
     - ☞ *SRM, IRM, APRM on DCS displays and P678 recorders.*
     - ☞ *LPRMs on Full Core Display (RC&IS) and DCS displays.*
   - Bypass Valve Position
   - Rod Drive Parameters (flows, dP)
   - Other factors affecting reactivity (temperature, pressure, flow, xenon)
   - Control Rods move as expected
   - Actual plant response compared to expected response

   During power changes monitor diverse, independent indications to verify instrumentation is providing valid signals. *«CM-3, CM-5»*

5. To minimize the risk of inadvertent short periods, use single rod, single notch rod motion between notch positions 00 and 36 when 3 count rate doublings (i.e., 8 times initial reading) is achieved on any SRM.

   - It is permissible to resume continuous withdrawal between notch position 36 and 48.
   - Gang motion and continuous withdrawal may resume when at least one bypass valve is partially open or with the concurrence of a Qualified Nuclear Engineer.

6.0 **LIMITATIONS** (cont'd)

6.1 **Control Rod Manipulations** (cont'd)

6. As the fuel cycle progresses, there is a potential for a positive moderator coefficient (+MTC). A +MTC can be observed as a period that gradually becomes shorter after the initial criticality, without any further rod withdrawals. If a +MTC is observed, the period should be monitored such that IRM range changes remain controllable, additionally, heatup rate should be monitored to obtain a 25 °/hour HUR until positive pressure is established at which time the target HUR should be $\leq$ 80 °/hour and at no time exceeding 100 ° in a 30 minute period. If period or heatup rate become excessive, a notch or two may be inserted, backwards in the sequence, to maintain the reactor critical on a long, controllable period.

   **IF** a +MTC is expected, **THEN** ensure the Reactor Engineer is available to assist in monitoring for and responding to the +MTC. With a +MTC, consider a Non-Nuclear Heatup until positive pressure is established.

   For a reactor startup with a predicted positive Moderator Temperature Coefficient (MTC) during the approach to critical or heatup, reactor period should be maintained greater than 200 seconds until negative MTC conditions have been confirmed (period rising or SRM/IRM reading lowering as reactor coolant temperature rises).

6.2 **Multiple Core Reactivity Changes: Management Philosophy**

During a plant startup and power ascension, it is desirable to have core reactivity changing by only one operator initiated variable.

- Control rod manipulations should be avoided while manipulating systems that may affect reactivity, such as but not limited to:

  Placing RCIC in standby;

  Additions of FW in manual control,

  Manipulations of steam line drains, etc.

- Automatic changes in system status such as an increase in FW flow to maintain level, bypass valve opening more to maintain pressure and etc., should not prevent rod manipulation.

  The rod mover should be cognizant of changing plant parameters and their effect on reactivity.

6.0 **LIMITATIONS** (cont'd)

6.3 APRM indications should be routinely compared with IRM indications and other power indications such as steam flow during power changes. *«CM-3, CM-4»*

6.4 Establish RPV level in the preferred range of 30" - 39" Narrow Range.
(It is acceptable to deviate from this band for short periods of time, due to changing plant conditions.)

6.5 Maintain the correct number of Condensate Polishers in service for the flowrate as condensate/feedwater configurations change per CPS 3104.01, Condensate/Condensate Booster (CD/CB).

6.6 The following are recommendations to be followed during heatup and pressurization that will minimize the thermal duty on the RPV feedwater nozzles: *«CM-6»*

1. Heatup events should be anticipated to avoid any unnecessary delays in establishing feedwater heating.
2. A minimum amount of steam flow should be bypassed. Excessive bypass flow increases the amount of cold feedwater entering the nozzles.
3. RWCU rejection rate should be minimized to prevent unnecessary makeup to maintain RPV water level.
4. When adding feedwater to the RPV, maintain flow as constant as possible and minimize cyclic changes in flow rate.

6.7 Startup activities and reactivity changes will be terminated, after placing the plant in a conservative safe steady state condition, following any personnel errors or equipment deficiencies which result in:

- ESF Actuation.
- ITS LCO or ORM OR Violation.
- Missed ITS LCO or ORM TR Surveillance.
- Reactivity Control Incident.
- Significant Plant Transient.
- Condition specified by the Shift Manager or Management Representative.

Power Plant Manager and Operations Department Head shall be notified immediately if any of the above situations occur.

Decision to continue startup will be made by the Operations Department Head following a review of available critique results, review of Shift Manager's assessment, and satisfactory completion of immediate corrective actions.

6.0 **LIMITATIONS** (cont'd)

6.8 Operation with the reactor mode switch in Startup/Hot Standby and < 10% power for extended periods of time is discouraged. Refer to OP-AA-300-1540 Reactivity Management Administration, for additional guidance.

6.9 **Temperature Monitoring for MODE Change**

1. When verifying reactor coolant temperatures in preparation for a MODE change, monitor all available indications as identified in TABLE 1, REACTOR COOLANT TEMPERATURE INDICATIONS FOR MODE CHANGE.

2. When approaching entry into MODE 3 due to increasing temperature (but prior to MODE 2), assure a conservative declaration of MODE change by declaring the MODE change when the first valid reactor coolant temperature indication is > 200°F.

3. To anticipate a heatup during the performance of this procedure, CPS 3002.01C001, Heatup And Pressurization Checklist shall be completed prior to any reactor coolant temperature reaching or exceeding 200°F.

4. When performing a startup from Cold Shutdown, moderator temperature before commencing removal of Shutdown Cooling from operation must be set sufficiently less than 200°F to allow completion of all required actions and steps, through transfer to MODE 2 before decay heat-up rate would drive moderator temperature greater than 200°F (Hot Shutdown).

**TABLE 1: REACTOR COOLANT TEMPERATURE INDICATIONS FOR MODE CHANGE**

| Monitored Point | PMS | DCS | Recorders |
|---|---|---|---|
| RR Loop A Suct Temp | B33NA033<br>B33NA034 | 4B/C/E/G/J/*,<br>EP Display 2 | 1B33-R604, Pt. 1 (P614) |
| RR Loop B Suct Temp | B33NA035<br>B33NA036 | 4B/C/E/G/J/*,<br>EP Display 2 | 1B33-R604, Pt. 2 (P614) |
| RHR Hx 1A Water Inlet | E12DA003 | 3G | 1E12-R601, Pt. 1 (P601) |
| RHR Hx 1B Water Inlet | E12DA004 | 3G | 1E12-R601, Pt. 2 (P601) |
| RWCU Inlet From Rx | G33DA011<br>G33NA011 | 1B/C/* | |

* refers to combined DCS screen

6.10 Operations Department management should determine, prior to each startup, which major evolutions during startup will be monitored by a management representative. *«CM-5»*

6.0 **LIMITATIONS** (cont'd)

6.11 IF Reactor goes RE-CRITICAL un-intentionally (Rx from a SUBCRITICAL condition to a CRITICAL condition)

**OR**

Rod insertion cannot overcome the positive reactivity insertion due to moderator temperature changes

**AND/OR**

Xenon changes due to low rod worth or other equipment issue THEN SCRAM the reactor

❷ 6.12 Valve 1B21-F065A/B, FEED WATER INLET SHUTOFF VALVE, can stick in its seat if it is throttled and feedwater to the reactor vessel dP is high due to MDRFP operation at low reactor pressure conditions. When 1B21-F065A/B, FEED WATER INLET SHUTOFF VALVE, finally does open, the valve can abruptly release from its seat and has the potential to cause momentary high flow rates to the vessel. (IR 4024892)

**IF**

- high dP conditions exist during MDRFP operation at low reactor pressure as indicated by computer point FW-DA210 reading near MDRFP shutoff head, **AND**
- level is trending down, **AND**
- 1FW004, MDRFP REGULATING VALVE, is open,

**THEN** close 1FW004, MDRFP REGULATING VALVE, in manual control prior to throttling 1B21-F065A/B in the open direction.

7.0 **MATERIALS/TEST EQUIPMENT** - None

8.0 **PROCEDURE**

8.1 **ESTABLISHING HEATUP**

The critical parameter for approach to critical up to the point of adding heat is reactor period. When the point of adding heat is reached, the critical parameter becomes heat-up rate. Furthermore, for post-refuel outages only, consider that the Shutdown Margin Determination (SDM) surveillance requires that moderator temperature shall be between 110 and 320°F when criticality is declared thus moderator temperature will also be a critical parameter.

8.1.1 **IF** It becomes necessary to reinsert rods sufficient to bring reactor subcritical, **OR** the reactor becomes/approaches subcritical due to other reactivity effects or startup delays,

☞ *Subcritical*:

- SRM/IRM count rates continuously lowering and/or
- Rx Pwr < IRM Range 7 and multiple IRMs have been down ranged through at least two ranges.

**THEN**

1. Insert control rods reverse sequence as necessary to maintain the reactor subcritical. _____

2. Insert SRM's to a point where they are reading at established norms to aid in monitoring core criticality. (Rod block may occur) _____

   ☞ Closely monitor reactor power & coolant temperature.

   ☞ Display SRM/IRM split screen on P678 1C51-R603A(B).

3. Contact the QNE to obtain:

   1) The recommended control rod pattern that will maintain the reactor sub-critical for the desired period of time. _____

   2) A new Estimated Critical Position (ECP). _____

4. **WHEN** Desired to recommence reactor start-up,

   **THEN** Return to CPS 3001.01 to recommence reactor start-up at appropriate location. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.1 **ESTABLISHING HEATUP** (Cont'd)

❶ 8.1.2 **IF** Commencing a Nuclear Heatup:

**NOTE**

*IRMs should be maintained between 15 & 75 scale.*

❶ **THEN** Use CPS 9000.06 series heatup/cooldown logs and (once established) use the PPC Moderator Heatup Trends 15, 30 and 60 minute display to monitor RPV heatup. _____

**AND** Withdraw control rods per the approved Control Rod Sequence Package (CRSP) [NF-CL-721 series] to establish and maintain heatup rate of < 100°F/hr. _____

8.1.3 **IF** Commencing a Non-Nuclear Heatup:

❶ **THEN** Use CPS 9000.06 series heatup/cooldown logs and (once established), use the PPC Moderator Heatup Trends 15, 30 and 60 minute display to monitor RPV heatup. _____

**AND** 1) Verify all RHR loops have been removed from shutdown cooling and placed in STANDBY per CPS 3312.03 (RHR-SDC). _____

2) Fully open/verify fully open (~ 90% indicated), the Recirc FCV for each operating loop. 1B33-F060A and/or 1B33-F060B. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.1 **ESTABLISHING HEATUP** (Cont'd)

8.1.4 Establish Condenser Vacuum as follows:

**CAUTION**

*For Recirc Pump seal health, do not allow the vessel to operate at a vacuum.*
*Steam line drains to the condenser must be controlled to avoid operating the vessel at a vacuum.*

1. **IF** Condenser vacuum is not established,

**CAUTION**

*Do not exceed 5% RTP (~ 173 MWth) if the Mechanical Vacuum Pumps are in service.*

**THEN** Start a vacuum pump(s) per CPS 3112.01, Condenser Vacuum (CA). _____

2. Reset the Main Turbine per CPS 3105.01, Turbine (TG, EHC, TS). _____

**CAUTION**

*Seal leakoff steam from the HP turbine will cause uneven heating of the LP turbine as long as the Ext Steam Valve to 3B FW Htr is shut.*

3. Open 1ES007A and 7B, LP Heater 3A(3B) Extraction Steam Isolation Valves. _____

☞ *The associated ES drain valve(s) may not go closed due to the interlock with the associated check valve not being met with no flow.*

❺ 4. Due to a stem/disk separation of 1B21-RSDV-2, MSR 1A Drn Vlv: (locally) open/verify open 1B21-F516B, MS to MSR 1A Test Conn. (Location: L-115-773'. Enter east heater bay by the MDRFP room, travel south to K-115 column. There is a permanent ladder/gallery to the RSDV-2 valve just south of this column. 1B21-F516B is off the west edge of this gallery connected to the bottom of the MS piping, ref M05-1002 sht 005).

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.1 **ESTABLISHING HEATUP** (cont'd)

8.1.5 Verify following conditions prior to exceeding 200°F:

1. Rx coolant conductivity & chlorides are within ORM TR 4.3.1.1 limits per CPS 9940.01, Weekly Chemistry Surveillance Log. *«LBD-13»* _____

   ☞ Refer to CY-AB-120-120, BWR Startup Chemistry for specific actions to promote optimal system chemistry.

2. **IF** In MODE 4,

   **THEN** Prior to reactor coolant temperature exceeding 200°F, verify/place the MOV TEST PREP switches in NORMAL. [Listed on Appendix B] *«LBD-14»* _____

3. Align/verify aligned Main Steam Lines ready for startup per CPS 3101.01, Main Steam (MS, IS & ADS) Section 8.1.1.1 - Establishing Conditions For MSL Startup. _____

   ☞ Normally MSIV's are equalized and opened as soon as RPV Pressure is ~ 3 - 5 psig.

   Operations should be prepared to open MSIV's as soon as these plant conditions occur (step 8.2.1)

8.1.6 Between 200 - 210°F reactor water temperature, perform the following: *«LBD-18»*

1. Shut/verify shut:

   1) 1B21-F001, Rx Head To DW Locked Vent Valve _____

   2) 1B21-F002, Rx Head To DW Vent Valve. _____

2. (Local) At AB MCC 1F-2A (1AP41E), lock open breaker for 1B21-F001, Rx Press Vessel Head Ventilation Valve. **IV** ___/___

3. Verify open/open 1B21-F005, Rx Head To MS Line Vent Valve Stop. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.1 **ESTABLISHING HEATUP** (cont'd)

**NOTE**

*Refer to CPS 3303.01, Reactor Water Cleanup (RT) for RT operation with low FW flow.*

*Digital FWLC control signals may need to be reset/unlatched per CPS 3103.01 during plant startup.*

8.1.7 Line up to feed the RPV with CD/CB pumps per CPS 3103.01, Feedwater (FW). _____

Supply makeup water to the RPV as necessary to maintain the preferred RPV level of 30 to 39 inches indicated on narrow range level instrumentation. _____

☞ It is acceptable to deviate from this band for short periods of time due to changing plant conditions.

**CAUTION**

*Establish a condensate/FW system flow path to the RPV prior to opening MSL drains to the main condenser to prevent inadvertent reduction in RPV inventory. «CM-2»*

8.1.8 **WHEN** RPV achieves a positive pressure:

1. **IF** The STEAM BYPASS AND PRESSURE REGULATOR condenser vacuum is tripped,

   **THEN** Reset STEAM BYPASS AND PRESSURE REGULATOR condenser vacuum trip by depressing the COND VACUUM TRIP push-button. _____

**NOTE**

*Refer to CPS 6001.01 and CY-AB-120-120 series for chemistry limits.*

2. **IF** Dissolved oxygen is ≥ 300 ppb, **THEN**:

   Before reactor water temperature is increased above 284°F (38 psig), establish dissolved oxygen < 300 ppb by operate MSL drains as needed per CPS 3101.01, Main Steam (MS, IS & ADS). _____

   ☞ This will draw steam to deaerate the water.

3. Set PRESSURE SET at ~ 200 psig above RPV pressure to prevent inadvertent operation of the bypass valves when the MSIVs are first opened. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.2 **AT ~ 3 - 5 psig**

**NOTE**

*Main Steam Line drains are normally left open during the startup (especially if 1B21-F071 is shut) in order to minimize potential for unstable bypass valve operation.*

8.2.1 Open Inbd MSIVs (F022) and align MSL drains per CPS 3101.01 (MS, IS, & ADS) per applicable section:

1. **PREFERRED** - Section 8.1.1.2:
   Opening MSIV's From Cold Shutdown. _____
   ☞ ~ 3 - 5 psig on 1LR-SM016, RPV Pressure Lo Range
   ☞ With a low decay heat in the RPV, it may be necessary to alternate between pulling rods and throttling 1B21-F020/F021 in order to maintain ~ 3 - 5 psig in the RPV. This will avoid changing reactivity by more than one method at a time.

2. ALTERNATE - Section 8.1.1.3:
   Opening MSIV'S with Vessel Pressurized. _____

8.2.2 After all MSIVs are open:

1. Maintain pressure set 38 - 40 psig above RPV Pressure during the heatup, (ensures Buffer Error lights remain off)

   **OR**

2. **IF** Main Steam Pressure is < 100 psig,
   **THEN** Place pressure set at 130 psig. _____
   ☞ 135 psig starts ITS SR 3.5.3.4 12 hour clock. Other plant surveillances are required prior to exceeding 150 psig.

3. **IF** needed to maintain heatup rate <100 °F/hr,
   **THEN** use pressure set or BPV Jack to control heatup rate. _____

4. Ensure the Main Steam Line low point drain path is aligned as follows:
   ☞ This path helps to prevent pressure oscillations in the Steam Bypass and Pressure Control System.
   1) 1B21-F066A, B, C and D open. _____
   2) 1B21-F015 open. _____
   3) 1B21-F070 or 1B21-F071 open. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.2 **AT ~ 3 - 5 psig** (cont'd)

8.2.3 At ~ 50 psig, and
RWCU is in Reject Mode to the Condenser:

Ensure that 1G33-F031, Drn Flow Orifice Bypass is positioned (shut until 1G33-F033 is opened) per CPS 3303.01 (RT), Reject Mode section. _____

8.2.4 If installed during CPS 3006.01, Unit Shutdown:

Remove/verify removed 1SM004 MCR Info Tag. *«CM-1»* _____

❶ 8.2.5 Verify/set the temperature controllers below to the setpoints indicated using the following steps:

1. Press DISPLAY key to toggle display to SetPoint.
2. Press SET PT key to toggle to the desired setpoint.

   ☞ *Do not change the Alarm Setpoint of 81.5°F.*

3. Press ▲ or ▼ to change the setpoint value.

| Controller | Location | Setpoint | Initial |
|---|---|---|---|
| ❶ 1TIT-VP009, Div 1 Drywell Cooler Fan 1A Temp Transmitter | Inside Drywell Chiller Local Panel 1PL43JA | 84°F | _____ |
| 1TIT-VP011, Div 2 Drywell Cooler Fan 1B Temp Transmitter | On the front of 1PL43JB | 86°F | _____ |

❶

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.2 **AT ~ 3 - 5 psig** (cont'd)

**CAUTION**

*Exceeding 98 psig Turbine First Stage Pressure (C34DA014) during shell warming may impact RPC Operability, and should be avoided when possible.*

*Evaluate RPC Operability per step 6.1.3 when > 98 psig Turbine First Stage Pressure.*

- *ITS SR 3.3.2.1.5 LPSP for RPC is set 98 - 151 psig (16.7 - 29.2% RTP)[Allowable Values]. ORM Att 2-4 T2.1.b set point is 138 psig (24.7% RTP).*
- *Turbine 1ST stage pressure which activates a turbine trip scram & an RPS trip is set between 158.2 - 171.9 psig (29.2 - 31.5% RTP). ITS SR 3.3.1.1.16 value is 33.3% RTP.*

8.2.6 Commence turbine shell warming, chest warming, and Turbine Control Valve #4 testing per CPS 3105.01, Turbine (TG, EHC, TS). _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.3 **AT ~ 60 psig**

8.3.1 Place/verify displayed all available IRM/APRM channels on P678 recorders 1C51-R603A/B/C/D. _____

Split IRM/APRM screen will support IRM/APRM overlap.

☞ 1C51-R603A: APRM A [Ch 1 ALARM Blue/Ch 2 POWER Red]
IRM A/E [Ch 4 Grn/Ch 5 Prpl]

1C51-R603B: APRM B [Ch 1 ALARM Blue/Ch 2 POWER Red]
IRM B/F [Ch 4 Grn/Ch 5 Prpl]

1C51-R603C: APRM C [Ch 1 ALARM Blue/Ch 2 POWER Red]
IRM C/G [Ch 4 Grn/Ch 5 Prpl]

1C51-R603D: APRM D [Ch 1 ALARM Blue/Ch 2 POWER Red]
IRM D/H [Ch 4 Grn/Ch 5 Prpl]

8.3.2 **IF** It is planned to raise RPV pressure > 150 psig,

**THEN** Place RCIC in standby per CPS 3310.01, Reactor Core Isolation Cooling (RI). _____

❹ 1. Notify security that RCIC is now AVAILABLE and to evaluate removal of compensatory actions in accordance with SY-CL-101-102 and SY-AA-101-102. _____

☞ *(Review 4.11 & 4.12) [CAPR 4010227-32] [CA#4010227-60] «CM-7»*

8.3.3 Warm-up SJAE Recombiner train(s) A and/or B per CPS 3215.01, Off-Gas (OG), Recombiner Preheat Startup section (preferred to warm both). _____

8.3.4 Verify following surveillances are current prior to placing the SJAE in-service in step 8.6.1: *«LBD-17»*

1. CPS 9432.44, Off Gas Effluent Flow Monitor N66-N010(N061). _____
2. CPS 9532.44, Off Gas Effluent Flow Monitor N66-N010(N061) Channel Functional. _____
3. CPS 9437.61, Post Treatment Off Gas System Process Radiation Monitor (PRM) 1RIX-PR035, (1RIX-PR041) Calibration Test. _____

8.3.5 **IF** Condenser deaeration is in service,

**THEN** Remove condenser deaeration per CPS 3104.01 (CD/CB). _____

8.4 **AT ~ 100 psig**

**NOTE**

*ADS system shall be operable prior to > 150 psig.*

*Turbine Bypass Valves are inhibited from opening at 7.5" Hg Vac or less.*

8.4.1 **IF** Steam bypass and pressure regulator condenser vacuum trip is tripped, and vacuum is above reset value,

**THEN** Reset the steam bypass and pressure regulator condenser vacuum trip by depressing the COND VACUUM TRIP push-button. _____

8.4.2 Verify PRESSURE SET regulator operation as follows:

1. Record as found pressure set value. _____psig.
2. Slowly lower the in service regulator setting to below the MSL throttle pressure. _____
3. Verify turbine bypass valve opens in response to the pressure error signal. _____

**CAUTION**

*Raising pressure regulator setting too quickly with turbine bypass valves open may cause reactor power to increase, APRM rod blocks, scram trips, excessive heatup rates, and erratic RPV water level.*

4. **IF** desired to maintain pressure with BPVs,

   **THEN** Restore pressure regulator to the as found condition per 8.4.2.1 above. _____
5. Slowly raise the pressure regulator setting until the turbine bypass valves are shut. _____
6. If required, adjust Pressure Set as needed to support Section 8.5 RCIC Testing, not to exceed 150 psig. _____
7. Verify a scheduled activity exists to retorque/ leak test both 48" Condenser Manways 12 - 24 hrs after steam admitted to condenser. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.4 **AT ~ 100 psig** (cont'd)

8.4.3 Unless plant conditions prohibit the use of Turbine Exhaust Hood Sprays,

Open 1ES-EHS, Exh Hood Spray Inlt Vlv. _____

☞ Use of hood sprays prior to turbine roll helps minimize uneven turbine casing heating and potential for high vibrations during turbine startup and sync.

Hood Sprays should normally remain in use until the Bypass Valves are no longer being used.

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.5 **AT ~ 135 psig**

8.5.1 Prior to exceeding 150 psig,

1. Verify the following surveillance's are current, or perform, if necessary:
   1) CPS 9054.01 series, RCIC Operability Check (Low Pressure & WLP portions only). *«LBD-9»* PMRQ #0015942803 _____
   2) CPS 9054.02, RCIC Valve Operability Checks. *«LBD-9»* PMRQ #0015934001 _____
   3) CPS 9054.04, RCIC Automatic Suction Shift Test. *«LBD-9»* PMRQ #0015943201 _____
   4) CPS 9054.05, RCIC RSP Operability Checks. *«LBD-2»* PMRQ #0015942702 _____
   5) CPS 9054.06, RCIC Filled Discharge Piping, Flow Path And Flow Controller Checks. *«LBD-7»* PMRQ #0015903001 _____
   6) CPS 9056.04, ADS Accum Alarm Channel Functional & Supply Pressure Verification. PMRQ #0015939501 *«LBD-5, LBD-12»* _____
   7) CPS 9054.03, RCIC Simulated Auto Actuation Test. *«LBD-9»* PMRQ #0015945101 _____
2. Verify the RCIC system is operable. _____
3. Obtain Power Plant Manager's & Operations Department Head's approval to exceed 150 psig. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.5 **AT ~ 135 psig** (cont'd)

**CAUTION**

*Raising pressure regulator setting too quickly with the turbine bypass valves open may cause reactor power to increase, APRM rod blocks, scram trips, excessive heatup rates, and erratic RPV water level.*

**NOTE**

*The intent of 8.5.2 is to allow Bypass Valves to control vessel heatup.*

*Maintaining ~ ½ to 1½ Bypass Valves open during heatup will allow for more operational flexibility during an integrated startup.*

*The bypass valve jack may be used to prevent bypass valve from fully closing by applying an ~ 5% valve open position.*

8.5.2 Slowly raise pressure set to a value to maintain ~ ½ to 1½ Bypass Valves open. _____

Raise pressure set until 917 psig pressure set is established. _____

(This step may be N/A'd if using step 8.5.3.)

8.5.3 **IF** NOT using Bypass valves to control heatup rate,

**THEN** Maintain pressure set 38 - 40 psig above Main Steam pressure during the heatup until 917 psig pressure set is established. _____
(ensures Buffer Error lights remain off)

8.5.4 Verify/place RPV Level Instrument Keep-Fill in service per:

CPS 3304.01C001,
RPV Level Instruments Keep-Fill Checklist. _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.6 **CONTINUING THE HEATUP**

❻ **NOTE**

***IF*** *a plant startup is in progress,*

***THEN*** *start a second CD pump prior to placing a SJAE in-service or exceeding 5% RTP..*

**CAUTION**

*Do not exceed 5% RTP (~ 173 MWth) if the Mechanical Vacuum Pumps are in service.*

**NOTE**

❷ *Placing a SJAE in-service at approximately 500-530 psig reactor pressure during the start-up helps to reduce turbine exhaust hood temperature (better vacuum), which in turn helps minimize uneven turbine casing heating and potential for high vibrations during turbine*

❷ *startup and sync. Placing in-service at reactor pressure below 500 psig may cause intermittent SJAE operation.* (IR 4016272)

**NOTE**

*The recombiner catalyst preheater outlet, 1st and 2nd stages shall be warmed to > 250°F, 3rd stage to > 160°F, and purged for at least 1 hour before being placed in service.*

8.6.1 Place the SJAE in service by:

1. Verify Chemistry has performed CPS 6954.01, HVAC Stack Effluent Noble Gas And Tritium. (prior to stopping vacuum pump) _____
2. Verify Step 8.3.4 complete. _____
3. Place a SJAE - Recombiner train in service, and shut down the Mechanical Vacuum pump per CPS 3215.01, Off-Gas (OG). _____

8.6.2 **AFTER** the SJAE is in service; Place HWC in-service with injection into the CB Pump suction per CPS 3111.02, Hydrogen Water Chemistry (HWC/HX). _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.6 **CONTINUING THE HEATUP** (cont'd)

**CAUTION**

*Allow adequate time for prestart checks and warm-up when planning to start feed pumps to ensure RPV makeup is not interrupted.*

*Due to HP/LP poppet leak by and control issues with the B TDRFP it is recommended that the A TDRFP be the first turbine placed in service during power ascension.*

**NOTE**

*The MDRFP is the preferred pump for a plant heatup, but a TDRFP may be used if necessary.*

*Normally a TDRFP would not be put into rolling standby until ~ 10% RTP, unless the MDRFP is not available for the start-up.*

*Maintain 2 CD/CB pump pairs for one TDRFP only, 1 CD/CB pump pair for MDRFP only.*

*Digital FWLC control signals may need to be reset/unlatched per CPS 3103.01 during plant startup.*

8.6.3 Startup and place a TDRFP in rolling standby per CPS 3103.01, Feedwater (FW), as desired. _____

8.6.4 Prior to exceeding 400 psig:

Shift RPV level control from CD/CB pumps to the MDRFP or a TDRFP per CPS 3103.01, Feedwater (FW). _____

8.6.5 When FW flow is > 300 gpm in each FW line:

RT return flow to both the FW lines may be established per CPS 3303.01 (RT). _____

8.6.6 When RPV pressure is greater than or equal to 849 psig, verify annuciators 5066 (5067)-2D, MAIN STEAM LINE PRESSURE LOW, clears _____

8.6 **CONTINUING THE HEATUP** (cont'd)

**NOTE**

*Prior to Shifting to the B/U Pressure Controller Verify TT point 75/76 for the B/U pressure controller has not failed upscale or downscale*

8.6.7 When RPV pressure is >900 psig Shift to backup Pressure Controller B(A) per CPS 3105.04, Steam Bypass And Pressure Regulator (SB). _____

1. Slowly raise the pressure regulator setting until a turbine bypass valve response in the closed direction is observed. A___ B___
2. Place/verify in service desired Pressure Controller A or B per CPS 3105.04 (SB). _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.7 **AT ~ 910 psig**

**NOTE**

*The pressure may be changed for testing, provided rated RPV pressure (1025 psig) and Turbine throttle pressure (MSL Pressure - 975 psig) are not exceeded.* «EC 345825»

*The setpoint shall be re-adjusted to 917 psig after testing is complete, and prior to subsequent reactor power changes.*

8.7.1 Perform following at 917 psig:

1. Stop raising the pressure set. _____

   Record time 917 psig is reached. _____

2. Verify CPS 9054.01 series, RCIC System Operability Check is current, or perform within 12 hours of reaching adequate reactor steam pressure and flow to perform the test. «LBD-8» _____

3. **IF** CPS 9061.11C001/C002/C005, Div 1/2/Non-Div SRV/IA *'Method 2'* Tests are not current, «LBD-3, LBD-6, LBD-11»

   **THEN** Perform CPS 9056.02, Safety/Relief Valve Actuation Test within 12 hours of reaching adequate reactor steam pressure and flow to perform the test. _____

4. Verify/return PRESSURE SET to 917 psig. _____

**NOTE**

*To allow for more operational flexibility, step 8.7.2 may be performed during CPS 3004.01, Turbine Startup And Generator Synchronization. If performed in 3004.01, N/A step 8.7.2.*

*It is possible that the SSE tube side may be pressurized prior to putting the SSE in service. This may happen if the isolation valves on the main steam side supply leak.*

8.7.2 Start up the steam seal evaporator and shift sealing steam to the steam seal evaporator per CPS 3107.01, Turbine Gland Seal (GS). _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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8.7 **AT ~ 910 psig** (cont'd)

**CAUTION**

*APRM upscale rod block will occur at ≤ 12% reactor power, an APRM scram will occur at ≤ 15% reactor power with the MODE switch in STARTUP/HOT STANDBY.*

8.7.3 Continue control rod withdrawal to open turbine bypass valves and raise reactor power to ~ 8 - 10%. _____

☞ 1B21-F065A(B), RPV Inlet Vlv(s) should be full open at ~ 5% reactor power.

8.7.4 Entering MODE 1:

☞ *Steps 8.7.4 1 - 5 may be performed in any order, but step 8.7.4.6 shall be the last step performed.*

1. Obtain Power Plant Manager's & Operations Department Head's approval to enter MODE 1. _____

❷ 1) Notify the NRC SRI of impending change to Mode 1. (IR 4017711) _____

2. Verify CPS 3002.01C002, Mode 1 Checklist complete. _____

3. Chemistry requirements for MODE 1 have been determined to be within specification for the following systems per applicable CY-AB-120-xxx:

   1) Reactor Water [CY-AB-120-100, CY-AB-120-120] _____

   2) Condensate System [CY-AB-120-110, CY-AB-120-120] _____

4. Verify proper IRMs & APRMs overlap by verifying all operable APRM's read between 5% and 12% with all operable IRM's are on scale. _____

5. Verify/place all MOV TEST PREP switches in NORMAL. [Listed on Appendix B] *«LBD-14»* _____

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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❸ 8.7 **AT ~ 910 psig** (cont'd)

**CAUTION**

*APRM downscale rod block will occur at ≤ 5% RTP (~ 173 MWth) with MODE switch in RUN.*

6. Enter MODE 1 by placing the reactor mode switch to RUN. _____

❸ 7. Contact NSED for recommendation on use of FAST or MEDIUM STARTING RATE based on turbine conditions. _____

☞ *Document deviation in CPS MCR AutoLog.*

8.7.5 Verify the four Divisional MSL A, B, C and D CL SCRAM BYP/NOT IN RUN annunciators have cleared. _____

8.7.6 Withdrawal the IRM detectors per CPS 3306.01, Source/Intermediate Range Monitors (SRM/IRM). _____

8.7.7 Place/verify displayed all available APRM channels on P678 recorders 1C51-R603A/B/C/D. _____

☞ 1C51-R603A: APRM A [Ch 1 ALARM Blue/Ch 2 POWER Red]

1C51-R603B: APRM B [Ch 1 ALARM Blue/Ch 2 POWER Red]

1C51-R603C: APRM C [Ch 1 ALARM Blue/Ch 2 POWER Red]
*[Recommend APRM C/RR Loop A Flow Split Screen]*

1C51-R603D: APRM D [Ch 1 ALARM Blue/Ch 2 POWER Red]
*[Recommend APRM D/RR Loop B Flow Split Screen]*

8.7.8 Notify Chemistry to perform the following samples: *«LBD-15, LBD-16»*

1. Reactor coolant per CPS 9940.01, Weekly Chemistry Surveillance Log. _____
2. HVAC stack per CPS 6954.01, HVAC Stack Effluent Noble Gas And Tritium. _____

9.0 **ACCEPTANCE CRITERIA** - None

10.0 **FINAL CONDITIONS**

Reactor power 8 - 10%, MODE switch in RUN.

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
|---|---|---|---|
| | | | |
| | | | |

## 11.0 REFERENCES

### 11.1 Licensing Basis Documents

11.1.1 LBD-1: ITS LCO 3.3.2.1 Action B.1 (RPC Oper) *«6.1.3»*

11.1.2 LBD-2: ITS SR 3.3.3.2.2 (RSP RCIC Run) *«8.5.1.1.4»*

11.1.3 LBD-3: ITS SR 3.4.4.3 (SRV Actuation) *«8.7.1.3»*

11.1.4 LBD-4: ITS SR 3.4.11.1.a/b (PT Limits) *«5.4.6»*

11.1.5 LBD-5: ITS SR 3.5.1.3 (ADS Accum Pressure) *«8.5.1.1.6»*

11.1.6 LBD-6: ITS SR 3.5.1.7 (ADS Actuation) *«8.7.1.3»*

11.1.7 LBD-7: ITS SR 3.5.3.1/2 (RCIC) *«8.5.1.1.5»*

11.1.8 LBD-8: ITS SR 3.5.3.3 (RCIC) *«8.7.1.2»*

11.1.9 LBD-9: ITS SR 3.5.3.4/5 (RCIC) *«8.5.1.1.1/2/3»*

11.1.10 LBD-10: ITS SR 3.6.1.2.1 (Airlock Leakage) *«5.4.2.2»*

11.1.11 LBD-11: ITS SR 3.6.1.6.1 (LLS Actuation) *«8.7.1.3»*

11.1.12 LBD-12: ORM TR 4.2.13.1 (ADS Accum LP Alarm) *«8.5.1.1.6»*

11.1.13 LBD-13: ORM TR 4.3.1.1 (Chemistry Samples) *«5.5, 8.1.5.1»*

11.1.14 LBD-14: ORM TR 4.5.2.2 (MOV Test Sw) *«8.1.5.2, 8.7.4.5, App B»*

11.1.15 LBD-15: ODCM SR 3.4.1.1 TA (Stack Dose Rates) *«8.7.8»*

11.1.16 LBD-16: ODCM SR 3.4.1.2 TA/C (Stack Dose Rates) *«8.7.8»*

11.1.17 LBD-17: ODCM SR 3.9.1.1 (OG Effluent Flow) *«8.3.4»*

11.1.18 LBD-18: CPS Fire Protection Safe Shutdown Analysis *«8.1.6»*

### 11.2 CPS Procedures

11.2.1 CY-AB-120-120, BWR Startup Chemistry

11.2.2 NF-CL-721, Control Rod Sequences And Forms

11.2.3 CPS 3001.01, Approach To Critical

11.2.4 CPS 3004.01, Turbine Startup And Generator Synchronization

11.2.5 CPS 3005.01, Unit Power Changes

11.2.6 CPS 3006.01, Unit Shutdown

11.2.7 CPS 3101.01, Main Steam (MS, IS & ADS)

11.2.8 CPS 3103.01, Feedwater (FW)

11.2.8 CPS 3104.01, Condensate/Condensate Booster (CD/CB)

11.2.10 CPS 3105.01, Turbine (TG, EHC, TS)

11.0 **REFERENCES** (cont'd)

11.2 **CPS Procedures** (cont'd)

11.2.11 CPS 3106.01, Moisture Separator Reheater
11.2.12 CPS 3107.01, Turbine Gland Seal (GS)
11.2.13 CPS 3111.02, Hydrogen Water Chemistry (HWC/HX)
11.2.14 CPS 3112.01, Condenser Vacuum (CA)
11.2.15 CPS 3215.01, Off-Gas (OG)
11.2.16 CPS 3303.01, Reactor Water Cleanup (RT)
11.2.17 CPS 3304.01, Control Rod Hydraulic And Control (RD)
11.2.18 CPS 3304.01C001, RPV Level Instruments Keep-Fill Checklist
11.2.19 CPS 3306.01, Source/Intermediate Range Monitors (SRM/IRM)
11.2.20 CPS 3310.01, Reactor Core Isolation Cooling (RI)
11.2.21 CPS 3312.03, RHR - Shutdown Cooling (SDC) & Fuel Pool Cooling And Assist (FPC&A)
11.2.22 CPS 6001.01, Sampling And Analysis Requirements
11.2.23 CPS 6954.01, HVAC Stack Effluent Noble Gas And Tritium
11.2.24 CPS 9000.06D001, Heatup/Cooldown, Inservice Leak And Hydrostatic Testing 30 Minute Temperature Log
11.2.25 CPS 9054.01 series, RCIC System Operability Checks
11.2.26 CPS 9054.02, RCIC Valve Operability Checks
11.2.27 CPS 9054.03, RCIC Simulated Auto Actuation Test
11.2.28 CPS 9054.04, RCIC Automatic Suction Shift Test
11.2.29 CPS 9054.05, RCIC RSP Operability Checks
11.2.30 CPS 9054.06, RCIC Filled Discharge Piping, Flow Path And Flow Controller Checks
11.2.31 CPS 9056.02, Safety/Relief Valve Actuation Test
11.2.32 CPS 9056.04, ADS Accum Alarm Channel Functional & Supply Pressure Verification
11.2.33 CPS 9061.11C001/C003/C005: Div 1/2/Non-Div SRV/IA *'Method 2'* Tests
11.2.34 CPS 9861.03, Type B Local Leak Rate Testing
11.2.35 CPS 9432.44, Off Gas Effluent Flow Monitor N66-N010(N061) Channel Functional
11.2.36 CPS 9532.44, Off Gas Effluent Flow Monitor N66-N010(N061) Channel Functional

11.0 **REFERENCES** (cont'd)

11.2 **CPS Procedures** (cont'd)

11.2.36 CPS 9437.61, Post Treatment Off Gas System Process Radiation Monitor (PRM) 1RIX-PR035, (1RIX-PR041) Calibration Test

11.2.37 CPS 9940.01, Weekly Chemistry Surveillance Log

11.2.38 OP-AA-300-1540, Reactivity Management Administration

11.2.39 CPS 3002.F001, HEATUP AND PRESSURIZATION FLOWCHART

11.3 **Design/Vendor/Print/Other** - None

11.3.1 EC 362404

11.4 **Commitments**

11.4.1 CM-1: CR1-93-11-020 *«8.2.4»*

11.4.2 CM-2: IE Information Notice 84-81 *«8.1.8 CAUTION»*

11.4.3 CM-3: SOER 90-03, NI MISCALIBRATION *«4.6, 6.1.4, 6.3»*

11.4.4 CM-4: Letters, JGC-1090-89, MAK 89-051 *«6.1.1, 6.1.2, 6.3»*

11.4.5 CM-5: Critique OP-90-0025 *«4.5, 6.1.4, 6.9»*

11.4.6 CM-6: GE SIL No. 208 *«6.6»*

❹ 11.4.7 CM-7: IR 4010227-60 (CA): Communication to Security *«4.11 & 4.12, 8.3.2.1»*

12.0 **APPENDICES**

A: CRS SCHEDULING NOTES CONTINUATION FORM

B: ORM TR 4.5.2.2 MOV TEST PREP SWITCHES

13.0 **DOCUMENTS**

CPS 3002.01C001, Heatup And Pressurization Checklist

CPS 3002.01C002, Mode 1 Checklist

CPS 3002.01C003, Mode 3 Checklist

CPS 3002.01C004, Non-Nuclear Heatup Checklist

**HEATUP AND PRESSURIZATION**

COMMENTS/DEFICIENCIES

Performed by: _____
(Print) (Initials) (Date)

Performed by: _____
(Print) (Initials) (Date)

Performed by: _____
(Print) (Initials) (Date)

Performed by: _____
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Performed by: _____
(Print) (Initials) (Date)

**REVIEW AND APPROVAL**

Shift Management: _____
(Signature) (Date)

## APPENDIX A

## CRS SCHEDULING NOTES CONTINUATION FORM

This form may be used to continue CRS Scheduling NOTEs (SN) from the applicable page of the procedure.

Ensure that the SN step on the source page refers to this form for use.

Multiple copies of this form may be used and attached to the procedure as needed to complete the integrated start-up activities.

This form may be completed electronically if desired.

| Step | CRS Scheduling NOTE (SN) (Criteria in 2.8)<br>Describe the activity to perform, including any restraints to continuing with procedure.<br>Place a circle 'SN' in the left hand margin next to the step number affected. | SRO review | SM/CRS: Item complete |
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Continued on next page? Yes ____ No ____

**APPENDIX B: ORM TR 4.5.2.2 MOV TEST PREP SWITCHES** *«LBD-14»*

| Panel | Switch Label | Position | ✓ |
|---|---|---|---|
| 5067 | SLC A MOV Test Prep | Norm | |
| | CNTNMNT Isol Div 1 MOV Test Prep | Norm | |
| 5066 | SLC B MOV Test Prep | Norm | |
| | CNTNMNT Isol Div 2 MOV Test Prep | Norm | |
| 5065 | RHR C MOV Test Prep | Norm | |
| | RHR B MOV Test Prep | Norm | |
| | SSW Sys Div 2 In Test | Norm | |
| 5064 | RHR A MOV Test Prep | Norm | |
| | SSW Sys Div 1 In Test | Norm | |
| 5063 | LPCS MOV Test Prep | Norm | |
| | RCIC Div 2 MOV Test Prep | Norm | |
| | RCIC Div 1 MOV Test Prep | Norm | |
| 5062 | SSW Sys Div 3 In Test | Norm | |
| | HPCS MOV Test Prep | Norm | |
| 5052 | DW Clg & Chill Wtr In Test (DIV 2) | Normal | |
| 5050 | DW Clg & Chill Wtr In Test (DIV 1) | Normal | |
| 5042 | VQ/VR Sys Div 2 In Test | Normal | |
| | VQ/VR Sys Div 1 In Test | Normal | |
| 5041 | CGCS Sys Div 2 In Test | Normal | |
| | IA Sys Div 2 In Test | Normal | |
| | SF Sys Div 2 In Test | Normal | |
| | SM Sys Div 2 In Test | Normal | |
| | SM Sys Div 1 In Test | Normal | |
| | SF Sys Div 1 In Test | Normal | |
| | IA Sys Div 1 In Test | Normal | |
| | CGCS Sys Div 1 In Test | Normal | |
| 5040 | CCW Sys Div 2 In Test | Normal | |
| | FC Sys Div 2 In Test | Normal | |
| | FP Sys Div 2 In Test | Normal | |
| | FP Sys Div 1 In Test | Normal | |
| | FC Sys Div 1 In Test | Normal | |
| | CCW Sys Div 1 In Test | Normal | |
| 5014 | CY Sys Div 2 | Normal | |
| | MC Sys Div 2 | Normal | |
| | MC Sys Div 1 | Normal | |
| | CY Sys Div 1 | Normal | |

Following 2 switches shall continue to be maintained in NORMAL even though MSIV-LCS has been removed from ITS/ORM and ORM TR 4.5.2.2 is not longer applicable.

| | | | |
|---|---|---|---|
| 1H13-P655, MSIV Aux Relay Panel Division 1 | Inboard System Valve Test | Normal | |
| 1H13-P654, Aux Relay Panel Division 2 | MSIV Leakage Control Outboard System Valve Test | Normal | |

# RHR - SHUTDOWN COOLING (SDC) & FUEL POOL COOLING AND ASSIST (FPC&A)

***SCOPE OF REVISION:***

- Previous revs 10 through 10f accepted, rev balls not retained.
- Specific Rev 11 [Setser]: IR 3948042-07 - Added references for 150 °F temperature limits on certain MOVs. (Page 67)

❶ Specific Revision 11a [Leffel} IR 04004188 Corrected numerous typographical errors not related to original revision.

IR 04003967, EC 403438 to address new jet pump plugs with a lower temperature limit of 140°F.

❷ Specific Rev. 11b [Frederick]: IR 04095140-09 - Replaced guidance in CAUTION statement prior to Section 8.1 with information provided in a new NOTE added to ITS LCO 3.5.1 per License Ammendment 215.

❸ Specific Rev. 11c [J. Delaney]: IR 4043530-07 - Removed references to OPDRVs and updated ITS SR references IAW TSTF 542 changes.

❹ EDITORIAL Revision 11d [Dorn]: IR 4114855-02 -Corrected typos in step 5.3 which referenced the wrong sections in procedure.

**CONTINUOUS USE**

**ORIGINATOR:** *Gary D. Setser* **CLASS CODE:** *SNND*

**SQR:** *Michael R. Helton* **APPROVAL DATE:** *04/03/17*

*CURRENT CHANGES TO GENERAL REVISION*

| | Change # | Date | List of Affected Pages |
|---|---|---|---|
| ❶ | 11a | 05/05/17 | 1, 7, 11, 15, 21, 23, 24, 27, 30,35,37, 43 |
| ❷ | 11b | 02/23/18 | 1, 14 |
| ❸ | 11c | 03/19/18 | 1, 6, 7, 43, 69 |
| ❹ | 11d | 03/27/18 | 1, 8 |
| ❺ | | | |

**TABLE OF CONTENTS** (Section 8.0 only) Page

## 1.0 PURPOSE

Provide operational instructions for the following operational modes of Residual Heat Removal system (RHR):

- Shutdown Cooling (SDC): Loops A & B only.
- Fuel Pool Cooling and Assist (FPC&A): Loop A only.

## 2.0 DISCUSSION/DEFINITIONS

### 2.1 DISCUSSION

2.1.1 The RHR system is designed to remove decay and sensible heat from the reactor and reactor systems during normal plant operations, and during post-accident conditions.

2.1.2 This procedure provides a stand-alone location for the operation of the RHR Shutdown Cooling (SDC) and the Fuel Pool Cooling Assist MODEs of the RHR System.

2.1.3 The procedure interfaces when necessary with CPS 3312.01, Residual Heat Removal (RHR).

2.1.4 Designated operators, both in the MCR and available for local field operations, will be available to perform recovery from a loss of RHR Shutdown Cooling Flow (Step 8.3.1).

### 2.2 DEFINITIONS

2.2.1 Designated Operator is assigned an action (i.e. component manipulations) to expedite system restoration.

1. These individuals have been briefed for expected contingency actions and the field operator should be also be pre-briefed by Radiation Protection for the areas to be entered for response actions
2. The individual can participate in other activities but should not be distracted from performing actions that were briefed, if needed.
3. The dispatching supervisor must ensure that collateral duties do not interfere with the designated operator response.

## 3.0 RESPONSIBILITY

3.1 Operations Department Head shall be responsible for insuring the proper implementation of this procedure.

3.2 Chemistry Department shall be responsible for sampling water when required per this procedure.

3.3 IMD Department shall be responsible for installation and removal of Biddle Test Set per CPS 3312.03C001 (PC-TCC).

## 4.0 PRECAUTIONS

4.1 To minimize pipe vibration, 1E12-F037A(B), RHR A(B) To CNMT Pool Cooling Shutoff Vlvs shall not be throttled < 4300 gpm.

4.2 Anytime Reactor Recirculation (RR) is secured with the steam separator in place, RPV water level should be maintained above the natural circulation level: *«CM-8, CM-11»*

44" - Shutdown Range or 61" - Upset Range (MODE 4/5)

4.3 When shutdown, both loops of SDC should not be rendered INOP unless the RPV head is removed and the RPV cavity is filled in order to ensure adequate core cooling. *«CM-8, CM-11»*

When in MODE 5 refer to ITS LCOs 3.9.8 & 3.9.9, and CPS 3312.02, Alternate Shutdown Cooling (A-SDC) Methods.

4.4 Pump Min Flow/Deadheading *«CM-23»*

1. Extended RHR A/B pump operation on minimum flow only should be minimized (i.e., hours) whenever possible.

   Low flow rates can cause hydraulic instability with the potential for increased pump wear. Normal surveillance data trends any long-term degradation.

2. Normal RHR min flow valve operation may take up to 70 seconds to stroke open from cessation of flow due to saturation of the flow transmitter combined with design delays in valve operation. (EC 361006)

3. RHR A/B pump should not be run deadheaded (no minimum flow; excluding normal min flow vlv ops).

   Prolonged pump operation under deadheaded conditions raises the fluid temperature inside the pump and can lead to eventual vapor locking, cavitation, seal damage and pump seizure.

   Each pump deadheaded event requires an Engineering Evaluation to assess degradation and operability.

4.0 **PRECAUTIONS** (cont'd)

4.5 The RHR loop being placed in SDC/FPC&A Mode must be verified full and pressurized before opening all suction valves between the RPV and the RHR pump to prevent water hammer due to system voids except as provided for in section 8.3.1. *«CM-2»*

4.6 The discharge lines to Radwaste (RW) and waste collector tanks are designed for a maximum of 120°F. *«CM-6»*

Therefore, draining high temperature water to RW should be monitored so as not to exceed the design temperature.

4.7 When a SDC loop is isolated with system temp > 212°F, water hammer can occur when the loop is depressurized (e.g., opening 1E12-F004A(B), RHR A(B) Suppr Pool Suction Valve).

The loop should be allowed to cool before returning it to STANDBY. (GL95-07) *«CM-19»*

4.8 RHR Pump A and LPCS Pump share a common Minimum and Full Flow Test Line. Dual operation of the RHR A and LPCS Pumps will not damage any piping or pumps (min flow criteria) except as noted below for the RHR Pump A: *«CM-3»*

1. If RHR Pump A and LPCS Pump are operated at the same time, do not operate with RHR Pump A in minimum flow and LPCS in full flow test.
2. This configuration will result in a RHR Pump A minimum flow rate that is less than required.

4.9 Shutting 1E12-F004A(B), F024A(B), F027A(B) or F064A(B) when hot (> 200°F) can result in thermal binding (GL95-07). *«CM-19»*

4.10 Reactor Water Cleanup (RT) flow to feedwater (FW) lines not supplied by SDC should be minimized.

1. RT flow alone through FW lines can cause damage to 1B21-F010A/B, FW Check Valves due to oscillations or fluttering of check valves.
2. Although this operating philosophy should be expeditiously implemented, there are plant conditions where this is not feasible.

4.11 Auto or manual RHR initiation can increase radiation levels in the general area of the RHR cubicles.

Radiation Protection shall be notified (ASAP) for surveys.

4.12 This activity can result in radiation dose rates that can present a significant potential for an over exposure. Radiological planning is required for this activity and Radiation Protection surveillance is required for field implementation. *«CM-6»*

4.0 **PRECAUTIONS** (cont'd)

4.13 **GL89-10 MOV Valve Thrust High dP** [5000 gpm limit] *«CM-11»*

The following RHR Hx valves are subject to RHR flow [read on 1E12-R603A(B)] restrictions for when the valves will be throttled for any significant time (excluding stroke time).

1E12-F003A(B), RHR A(B) Hx Outlet Valve
1E12-F047A(B), RHR A(B) Hx Inlet Valve
1E12-F048A(B), RHR A(B) Hx Bypass Valve

1E12-F003/47/48 cannot be assured to operate during design accident conditions in the shut direction when RHR flow is < 5000 gpm.

The valves will function in the open direction.

Open/shut operation during normal plant conditions should continue to function even if these valves are throttled when RHR flow is < 5000 gpm.

The following GL89-10 valve impacts apply:

1. 1E12-F048 shut safety function shall be INOP when: [Required for ITS SR 3.6.1.7.1: CNMT Spray Lineup]

   1) Plant is in MODE 1, 2 or 3, and

   2) RHR flow is < 5000 gpm, and

   3) 1E12-F048 is not fully shut.

   Maintaining RHR flow > 5000 gpm, especially when in suppression pool cooling mode, will ensure that an ITS LCO entry is not required.

   Flows of < 5000 gpm (i.e., when in MODE 3 SDC operation) may require entry into the CNMT Spray ITS LCO.

2. 1E12-F003/47 do not have a shut safety function.

❸ 3. 1E12-F003/47/48 open safety function is not affected.

   These valves are capable of being opened during design accident conditions. [Required for ITS SRs 3.5.1.2/3.5.2.5: ECCS Lineup]

4.0 **PRECAUTIONS** (cont'd)

❶❸ 4.4 When jet pump plugs are installed, Reactor Cavity Pool surface temperature should be maintained below 110°F to prevent premature degradation of the jet pump plug seal material.

**IF** Shutdown Cooling is lost while jet pump plugs are being relied on to prevent a loss of inventory,

**THEN** Alternate SDC methods must be used to stay below 140°F Reactor Cavity Pool surface temperature to avoid degradation of the jet pump plugs creating a loss of inventory via the RR loop(s).

Seal material remains qualified if temperature:

- <110°F for duration not to exceed 37 days

  **AND**

- >110°F and <140°F for duration not to exceed 20 Days

5.0 **PREREQUISITES**

5.1 Verify RHR system is in STANDBY or available for supporting Shutdown Cooling or Fuel Pool Cooling and Assist MODEs per CPS 3312.01, Residual Heat Removal (RHR).

5.2 Prior to RHR Hx 1A(1B) being placed in service, or RHR Pump A(B) Pump being started, *«IR 459099»*

Place/verify SX A(B) PRM 1RIX-PR038(039), Shutdown Service Water A(B) Effluent (SX) in service per CPS 3315.03, Radiation Monitoring (AR/PR). [ODCM OR 2.7.1]

- 1RIX-PR038: RHR A HX and RHR A Pump Seal Cooler.
- 1RIX-PR039: RHR B HX and RHR B Pump Seal Cooler.

5.3 Prepare as needed Information Tags to support procedure. (This is a pre-planning aid only, Prerequisite may be deferred while actually performing lining up the system).

❹ RHR B SDC: Steps 8.1.2.5, 8.1.2.19.3

❹ RHR A SDC: Steps 8.1.4.5, 8.1.4.18.3

FPC&A: Steps 8.2.2.9.1 & 2

5.4 At AB MCC 1A3 (1AP74E) Cub 7C;
Shut breaker for 1E12-F040,
RHR Sys 1A Radwaste Drn Outbd Isol Valve.

**AND**

Place Alarm Bypass Switch 1E12S071 to Normal.

5.5 If desired, prepare 1E12-F037A, RH Sys 1A Shutdn Clg Upper Pool Valve, for operation as follows:

1. Shut both breakers for 1E12-F037A at AB MCC 1A2 (1AP73E) Cub 1B.
2. Place Alarm Bypass Switch 1E12S070A to Normal at AB MCC 1A2 (1AP73E) Cub 1B.

5.6 If desired, prepare 1E12-F037B, RH Sys 1B Shutdn Clg Upper Pool Valve, for operation as follows:

1. Shut both breakers for 1E12-F037B at AB MCC 1B2 (1AP76E) Cub 10B.
2. Place Alarm Bypass Switch 1E12S073 to Normal at AB MCC 1B2 (1AP76E) Cub 10B.

5.0 **PREREQUISITES** (cont'd)

5.7 When warming/placing RHR-SDC into service, verify RPV pressure is:

1. Maintained constant.
2. > 30 psig (preferable higher when possible) *«CR 235832»*

☞ RHR-SDC can be placed in service < 30 psig with SMngt approval; (such as Mode 4 or recovery during Loss of SDC) being aware of increased potential for RPV level transient due to possible pipe draining prior to start of the RHR pump, if the F031 check valve is not open.

*30 psig Bases: Administrative recommended value to help assure that the 1E12-F031A(B) RHR Pump Discharge Check Valve will open when warming flow is initiated, and prevent a possible pipe draining event.*

*An increased forward delta-pressure of up to 22 psid may be required to obtain an observed change in the flow through the F031 valve.*
*This delta-pressure can be monitored via the difference between Reactor Pressure and the RHR Heat Exchanger shell side pressure.*
*The F031 disc normally opens slightly with smaller dP values which aren't readily apparent since the only indication of the valve being "open" is from the RHR Hx inlet temperature indication.*

*Initiating a system fill via 1E12-F044A(B) or 1E12-F063A(B) will normally backseat the RHR pump discharge check valve 1E12-F031.*
*This is due to the CY system pressure of ~ 110 psi being greater than the RHR pump suction pressure.*
*The F031 should normally open once downstream pressure is relieved via the warming path.*

*Although failure of the F031 check valve is not expected, SMngt should consider manually opening the F031 check valve when RHR-SDC parameters are not indicating as expected, or if attempting to initiate SDC warming flow when < 30 psig.*

## 6.0 LIMITATIONS

### 6.1 RHR Hx MC Layup Criteria *«CM-20»*

1. RHR Hx MC layup may be deferred if:
   CA low MC tank level is not a criteria for deferring the flush.
   1) Continuous (> 10 minutes) chlorination of WS/SX was in place during the RHR Hx use (verify status with Chemistry), and
   2) WS/SX flow is expected within the next 5 days. (Each WS/SX Hx flow resets the 5-day MC layup clock)

2. RHR Hx MC layup per CPS 3211.01 (SX) is required:
   1) If WS/SX flow through the Hx was not chlorinated (verify status with Chemistry),
   2) If chlorinated WS/SX flow through the Hx was for < 10 minutes, or
   3) If > 5 days has passed without establishing new chlorinated WS/SX flow (> 10 min) through the Hx.

6.2 Unless required in response to an accident condition, the RHR pumps should be stopped if:

1. RHR Pump Room temperature high of 150°F, or
2. RHR Pump Motor Winding temperature of 170°C (155°C alarm, Comp Pts RH-BA007-15), or
3. RHR Pump Motor Bearing temperature of 100°C (90°C alarm, Comp Pts RH-BA001-6).

6.3 Administrative control of power for 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv and 1E12-F006B, RHR B Shutdown Cooling Suct Valve is allowed during normal operation to the extent that power can be removed. *«LBD-2, CM-13»*

1E12-F008 valve is locked shut at the time power is removed.

1. The power availability alarm and status light shall be available at all times when the valve is open.
2. Power must be available to the valve at all times when the valve is open to permit automatic or remote manual closure if required.

6.0 **LIMITATIONS** (cont'd)

6.4 If an RHR pump is in operation, and it's respective seal cooling water is not available, verify RHR pump discharge temperature remains ≤ 150°F. *«CM-21»*

This will ensure that the RHR pump seal normal temperature limit of 160°F will not be exceeded.

❶ 6.5 Water temperature limits:

During steady state SDC & FC modes, the following water temperature limits should be maintained to insure adequate shutdown margin and to minimize soluble activity releases.

Transient plant conditions (e.g., surveillances, going into and out of SDC, etc.) will require the upper limits to be exceeded.

1. LOWER LIMIT: Fuel in RPV or upper fuel pool: ≥ 70°F. *«LBD-1, CM-9»* (SDM criteria) ITS LCO 3.1.1 limit is 68°F but MCR recorder lower limit is 70°F.

   Fuel in lower spent fuel pool: ≥ 40°F.

2. UPPER LIMIT: MODE 4: < 140°F.
   (Soluble criteria) MODE 5: < 100°F.

❶ In addition, the following limits apply:

1. UPPER CNMT POOL BULK TEMPERATURE: < 140°F.

   This will assure adequate time to prevent pool boiling should a loss of pool cooling occur.

2. REACTOR CAVITY POOL SURFACE TEMPERATURE:

   When jet pump plugs are installed: < 110 °F.

6.6 Whenever 1E12-F027A(B), RHR A(B) To CNMT Outbd Isol Valve is shut, RHR Tech Spec Functions 3.5.1/2 (ECCS) and 3.6.1.7 (CNMT Spray) shall be declared INOPERABLE (but still available). *«CM-17, CM-19»*

GL89-10 criteria for adequate thrust to open against RHR pump shutoff head, and GL95-07 criteria for pressure locking.

6.0 **LIMITATIONS** (cont'd)

6.7 If 1E12-F064A(B), RHR Pump A(B) Min Flow Recirc Valve is not capable of opening (may be due to failed Minimum Flow Instrument, 1E12-N652A(B)), the AUTO start capability of the associated ECCS pump should be disabled and the pump declared INOP. CNMT isolation function is still satisfied. *«CM-18»*

This criteria does not apply when in SDC or FPC&A MODE.

6.8 If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available). *«CM-19»*

GL95-07 criteria for pressure locking on 1E12-F004A(B), RHR A(B) Suppr Pool Suction Valve when it is shut.

**NOTE**

*If in MODE 4 or 5, it is not necessary to warm the RHR Loop.*

*RHR Loop warming in only required when RPV is > 200°F to eliminate thermal shock and differential expansion of the RHR pump per vendor recommendations.* *«CM-2»*

6.9 RHR Loop warm-up (MODE 3 only) is performed to:

- Minimize thermal shock and differential expansion criteria on the RHR pump (> 200°F), or
- To minimize potential for void formation and water hammer (Within 100°F of RPV Saturation Temperature).

Once initial warm-up conditions have been achieved, it is not necessary to redo the warm-up provided SDC is placed in-service in a timely manner.

Redoing warm-up actions increases the potential for draining piping and causing an uncontrollable RPV level change.

Once warm-up is observed, temperatures will continue to rise approximately 15 degrees after warming is secured.

Due to the physical design of the RHR A loop, coupled with the RW Discharge limit of 120°F; the design warm-up values cannot be fully achieved on RHR A.

Therefore, placing RHR A into SDC when > 200°F should only be done when conditions dictate immediate use.

Initiate a CR in this event to assure the temperature transient is evaluated. *«EC 350224»*

6.0 **LIMITATIONS** (cont'd)

6.10 Fuel Pool Cooling and Cleanup Assist is only allowed to be placed in service when (USAR 9.1.3):

1. Reactor is in cold shutdown condition or is in the refueling mode, and

2. An abnormal heat load has been produced in the pools and it appears that the pool will exceed 150°F.

6.11 **RHR Pump A(B)[C] Motor Starting Restrictions**

1. With the windings at ambient temperature (equilibrium with its environment),

   The motor can be started and brought up to operating speed 2 times in succession, coasting to rest between stops.

2. With windings at operating temperature (max steady state temp of the windings, usually reached after ~ 15 min at operating speed),

   Motor can be started & brought up to operating speed 1 time.

3. If the motor has been started (brought up to rated speed) 1 time from operating temperature,

   An additional restart may be done after the following time constraints have been satisfied (motor windings are assumed to have returned to an acceptable temperature):

   1) After 60 minutes with the motor de-energized, or

   2) After 30 minutes with the motor running at operating speed.

4. More frequent starts may result in motor winding damage. Consult NSED as necessary for assistance.

7.0 **MATERIALS/TEST EQUIPMENT**

7.1 Digital TC/mV Test Set(s) - Biddle (or equivalent) (one for each recorder point to be monitored, up to ten recorder points possible) (3312.03C001).

7.2 Air impact gun or bow motor for use in step 8.2.2.14, Fuel Pool Cooling and Cleanup Assist.

8.0 **PROCEDURE**

8.1 **NORMAL PERFORMANCE**

**CAUTION**

*If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available).* «CM-19»

**CAUTION**

*When in SDC with RR secured and the steam separator in place, RPV level should be kept above the natural circulation level of 44 inches on the Shutdown Range or 61 inches on the Upset Range.* «CM-11»

**CAUTION**

*Re-alignment of the RHR Loop for Shutdown Cooling with Reactor Steam Dome Pressure > 104 psig requires entry into LCO 3.5.1.*

**CAUTION**

❷ *Per ITS LCO 3.5.1, one low pressure coolant injection (LPCI) subsystem may be INOPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than the residual heat removal cut in permissive pressure.*

8.1.1 **SHUTDOWN COOLING - Flushing RHR Loop B**

☞ Flushing activities may be N/A'd per SMngt in response to accident events (e.g., fuel damage has occurred, RPV coolant Chemistry is already degraded, ALARA issues, time is of an essence, etc.).

8.1.1.1 Verify demineralized water available for flushing per CPS 3208.01, Cycled/Makeup Condensate (CY/MC).

8.1.1.2.1 Verify waste storage tanks lined up to receive flush water from RHR.

8.1.1.2.2 Notify Chemistry that samples will be required if 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) is not available to verify conductivity during flushing.

8.1.1 **SHUTDOWN COOLING - Flushing RHR Loop B** (cont'd)

8.1.1.3 Shut/verify shut:

1. 1E12-F024B, RHR B Test Valve To Suppr Pool.

2. (Local) 1E12-F531, Wtr Leg Pump Supply To RHR Pump B.
AB 707 RHR B Pmp Rm. (Normally locked open)

☞ 1E12-F531 is being shut to minimize potential for addition to the RPV inventory during this evolution.

❶ 3. 1E12-F064B, RHR Pump B Min Flow Recirc Valve.

☞ If not performing a partial flush, OK to electrically disable F064B per sub-step 8.1.2.19 while proceeding with the flush.

4. 1E12-F004B, RHR B Suppr Pool Suct Valve. *«CM-12»*

8.1.1.4 Open/verify open:

1. 1E12-F049, RHR B To Radwaste First Isol Valve.

2. 1E12-F048B, RHR B Hx Bypass Valve.

3. 1E12-F003B, RHR B Hx Outlet Valve.

4. 1E12-F027B, RHR B To CNMT Outbd Isol Vlv.

5. 1E12-F047B, RHR B Hx Inlet Valve.

**NOTE**

*Performance of step 8.1.1.5 is not necessary if the upper pool SDC flow path is not to be used.*

*N/A if previously performed during partial flush for plant shutdown preparations.*

8.1.1.5 To flush upper pool SDC flow path: *«CM-10»*

1. (Local) Open 1E12-F044B,
Upper Pool S/D Cool Hdr B Flush Wtr Supp.
CT 803' AZ 300 deg. (Normally locked shut)

3. Throttle open 1E12-F040,
RHR B To Radwaste Second Isol Valve.

4. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample.

**THEN**

Shut 1E12-F040.

5. (Local) Lock shut 1E12-F044B,
Upper Pool S/D Cool Hdr B Flush Wtr Supp.

8.1.1 **SHUTDOWN COOLING - Flushing RHR Loop B** (cont'd)

**NOTE**

*N/A if previously performed during partial flush for plant shutdown preparations.*

8.1.1.6 To flush RHR discharge header: *«CM-10»*

1. (Local) Open 1E12-F063B,
   RHR B Pump Disch Hdr Flush Wtr Supp.
   AB 762' West HX Rm. (Normally locked shut)

2. Throttle open 1E12-F040,
   RHR B To Radwaste Second Isol Valve.

3. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F040.

4. (Local) Lock shut 1E12-F063B,
   RHR B Pump Disch Hdr Flush Wtr Supp.

**NOTE**

*Performance of step 8.1.1.7 is not necessary if head spray SDC flow path is not to be used.*

*N/A if previously performed during partial flush for plant shutdown preparations.*

8.1.1.7 To flush head spray SDC flow path: *«CM-10»*

1. (Local) Open 1E12-F086,
   RHR To Head Spray Flush Wtr Supp.
   AB 737' B HX Rm. (Normally locked shut)

☞ While in area, for ALARA, to satisfy step 8.1.2.4.5, Shut /check shut 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve. AB 737' B HX Rm west wall by door. (Normally locked shut)

2. Throttle open 1E12-F040,
   RHR B To Radwaste Second Isol Valve.

3. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F040.

4. (Local) Lock shut 1E12-F086,
   RHR To Head Spray Flush Wtr Supp.

8.1.1 **SHUTDOWN COOLING - Flushing RHR Loop B** (cont'd)

8.1.1.8 Restoring from Partial Flush *«CM-10»*

**IF** Desired at this time to stop flushing and restore RHR B,

**THEN**

1. Open/verify open:

   1) (Local - Normally locked open)
      1E12-F531, Wtr Leg Pump Supply To RHR Pump B.
      AB 707' RHR B Pmp Rm.

   2) 1E12-F064B, RHR Pump B Min Flow Recirc Valve.

   3) 1E12-F004B, RHR B Suppr Pool Suct Valve.

2. Shut/verify shut
   1E12-F049, RHR B To Radwaste First Isol Valve.

3. **IF** Annunciator 5065-5A, RHR Pump B Discharge Press Abnormal alarm [low pressure] is not clear,

   or

   As directed by the SMngt,

   **THEN** Vent RHR Loop A(B) as applicable per CPS 3312.01 (RHR) Fill and Vent section.

4. **WHEN** Further flushing is desired,

   **THEN** Restart procedure at 8.1.1.

8.1.1 **SHUTDOWN COOLING - Flushing RHR Loop B** (cont'd)

**CAUTION**

*If RHR Loop A is in SDC with 1E12-F006A open, or SDC suction path was previously flushed and 1E12-F008 & F009 are open, then do not perform 8.1.1.9.*

*Opening 1E12-F006B may result in a loss of RPV level if a valve in RHR Loop B is out of position.*

8.1.1.9 To flush RHR B SDC suction header: *«CM-10»*

1. (Local) At AB MCC 1B2-5D, AB 781' West, unlock and place 1E12-F006B breaker in ON.
2. (Local) At 1E12-F006B breaker cubicle, place ALARM BYPASS SWITCH to NORMAL.
3. Open 1E12-F006B, RHR B Shutdown Cooling Suct Valve.
4. (Local) Shut/verify shut 1E12-F536, RHR SDC Header Leak-Off Line Isolation Valve. AB 707' RHR C Pmp Rm.
5. (Local) Open 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve. ABST 15' N of CT wall - center. (Normally Locked Shut)
6. Throttle open 1E12-F040, RHR B To Radwaste Second Isol Valve.
7. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F048B, RHR B Hx Bypass Valve.
8. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F040, RHR B To Radwaste Second Isol Valve.
9. Open 1E12-F048B, RHR B Hx Bypass Valve.
10. (Local) Lock shut 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve.

8.1.1.10 Shut 1E12-F049, RHR B To Radwaste First Isol Valve.

8.1.1.11 Continue with section 8.1.2.

**NOTE**

*Section 8.1.2 may be used for placing RHR Loop B in SDC when it is either the first or second loop being placed in SDC. When shifting loops, both will be in service simultaneously and the loop to be shut down is secured per section 8.1.6.*

**CAUTION**

*If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available).* «CM-19»

8.1.2 **Placing RHR Loop B in SDC (Preferred)**

**NOTE**

*Prior to SDC initiation, RHR piping should be flushed to reduce impurity concentrations.*

*Notify RP of impending start of SDC as dose rates will change.*

8.1.2.1 Unless RHR Loop B was previously flushed, perform section 8.1.1 prior to continuing.

☞ This step is normally not necessary if recovering from a Loss of RHR SDC Flow event.

☞ Flushing activities may be N/A'd per SMngt in response to accident events (e.g., fuel damage has occurred, RPV coolant Chemistry is already degraded, ALARA issues, time is of an essence, etc.).

8.1.2.2 Verify WS available to RHR B Hx, or start Div 2 SX per CPS 3211.01, Shutdown Service Water (SX).

8.1.2.3 **IF** Recovering from a Loss of SDC Flow event,

**THEN** Do not perform this step.

**OTHERWISE** (Local) Shut/verify shut 1E12-F531, Wtr Leg Pump Supply To RHR Pump B. AB 707' RHR B Pmp Rm. (Normally locked open)

☞ 1E12-F531 is being shut to minimize potential for addition to the RPV inventory during this evolution.

8.1.2.4 Shut/verify shut:

1. 1E12-F024B, RHR B Test Valve To Suppr Pool.
2. 1E12-F003B, RHR B Hx Outlet Valve.
3. 1E12-F064B, RHR Pump B Min Flow Recirc Valve.
4. 1E12-F004B, RHR B Suppr Pool Suction Valve. «CM-12»
5. (Local) 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve. AB 737' B HX Rm west wall by door. (Normally locked shut)
6. 1E12-F040, RHR B To Radwaste Second Isol Vlv.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

8.1.2.5 Information tag the MCR 1E12-F042B, LPCI Fm RHR B Shutoff Valve control switch as follows: *«CM-4»*

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

"RHR B SDC is in service. Operation of this valve will result in LPCI injection into the core shroud. Do not operate this valve unless required by an emergency or an approved procedure."

8.1.2.6 Open/verify open:

1. 1E12-F048B, RHR B Hx Bypass Valve.

2. 1E12-F027B, RHR B To CNMT Outbd Isol Valve.

8.1.2.7 **IF** RHR Loop A is not in SDC, **THEN**:

1. (Local) At AB MCC 1A3-6D, AB 781' East, unlock and place 1E12-F008 breaker in ON.

2. (Local) At 1E12-F008 breaker cubicle, place ALARM BYPASS SWITCH to NORMAL.

3. Close/Verify closed (in the MCR or locally)

   1E12-F006A, RHR A Shutdown Cooling Suct Vlv

4. (Local) At AB MCC 1A2-8B, place the breaker for 1E12-F006A in OFF *(EC 390155, MSO concern)*

**NOTE**

*Pressurizing RHR Loop B with flushing water will prevent water hammer due to voids when pump suction is lined up to the RPV. «CM-2»*

8.1.2.8 (Local) Open following valves to verify RHR Loop B pressurized: (Normally locked shut) *«CM-2»*

☞ This step is still required even if recovering from a Loss of RHR SDC Flow event and the Water Leg Pump is in service.

1. Open either flushing valve:

   ° 1E12-F044B, Upper Pool S/D Cool Hdr B Flush Wtr Supp, CT 803' AZ 300 deg, or

   ° 1E12-F063B, (Elevated RAD area) RHR Pump B Disch Hdr Flush Wtr Supply, AB 762 West HX Rm.

2. 1E12-F071B, RHR Pump B Flush Line Isol. AB 707' RHR B Pmp Rm.

3. 1E12-F072B, RHR Pump B Flush Line Isol. AB 707' RHR B Pmp Rm.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

8.1.2.9 (Local) When RHR Loop B pressure has increased to ~ flush header pressure, lock shut:
(Comp Pt CY-BA201, CY Flush Water Press)
(Comp Pt RH-DA202, RHR Discharge)
(1E12-R002B at 1H22-P021 RHR B Pmp Rm, RHR Suction)

1. 1E12-F072B.

2. 1E12-F071B.

3. Flushing valve used in 8.1.2.8.1:
   1E12-F044B or 1E12-F063B.

8.1.2.10 Verify:

❶ 1. RPV pressure > 30 psig (see 5.7.2 for exception) and ≤ 104 psig.

2. Group 3 Inboard and Outboard Isolation signals are RESET (~ 96 psig).
   If required, reset the Group 3 isolation signals per CPS 4001.02, Automatic Isolation.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

**NOTE**

*Either step 8.1.2.10 or 8.1.2.11 will be performed depending on status of RHR Loop A.*

8.1.2.11 **IF** RHR Loop A is not in SDC, **THEN**:

1. Verify makeup water to the RPV is available.
2. Open 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv.
3. Open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

   **IF** 1E12-F009 will not open due to thermal binding or hydraulic lock [GE SIL 368 R/1], **THEN**:

   1) (Optional) Per SMngt, fill/vent RHR-SDC piping:
      a) Unlock & open 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve, ABST 15' N of CT wall - center.
      b) Monitor RPV water level until an increase is noticed (water flows into RPV through F009 bypass line once the valve dP has equalized.
      c) Lock shut 1E12-F020.

**NOTE**

*1E12-F009 is INOP in the next step, and applicable ITS LCO 3.6.1.3, 3.4.9/10 and/or 3.9.8/9 entries are required.*

   2) (Local) Dis-engage the MOV actuator, and manually un-seat 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv, DW 750' AZ 10 deg.

      ☞ Mech Maintenance/torque wrench assistance may be needed. Contact NSED as needed.

   3) (MCR) Electrically open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.
   4) (MCR) Per CPS 9053.05, RHR/LPCS Valve Operability (Shutdown), Section 8.2, stroke time 1E12-F009 in the shut direction.
   5) (MCR) Open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

4. (Local) At AB MCC 1B2-5D, AB 781' West, unlock and place 1E12-F006B breaker in ON.
5. (Local) At 1E12-F006B breaker cubicle, place ALARM BYPASS SWITCH to NORMAL.
6. Open/verify open 1E12-F006B, RHR B Shutdown Cooling Suct Valve.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

**CAUTION**

*Minimize the time both 1E12-F006A & B are open during the swapping of SDC loops due to the potential for a loss of RPV level.*

8.1.2.12 **IF** RHR Loop A is in SDC, **THEN**:

1. Verify makeup water to the RPV is available.
2. (Local) At AB MCC 1B2-5D, AB 781' West, unlock and place 1E12-F006B breaker in ON.
3. (Local) At 1E12-F006B breaker cubicle, place ALARM BYPASS SWITCH to NORMAL.

   ☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.
4. Open 1E12-F006B, RHR B Shutdown Cooling Suct Valve.

**NOTE**

*If in MODE 4 or 5, it is not necessary to warm RHR Loop B. RHR Loop B is warmed to eliminate thermal shock and differential expansion of the RHR pump.* «CM-2»

❶

**CAUTION**

*Warming the loop will result in a loss of RPV water inventory.* «CM-7»

*RPV pressure should be normally > 30 psig (see 5.7), and held as constant as possible while warming/placing RHR in SDC, to avoid formation of steam voids and water hammer.* «CM-7»

*The discharge temperature to RW shall not exceed 120°F to prevent damage to RW piping and tanks. (Pt 1E12-N024 (brown) on E12-R601, 1H13-P601)* «CM-6»

8.1.2.13 To warm RHR Loop B: ☞ Refer to 6.9 Limitation.

1. Establish cooling flow through the RHR B Hx:
   1) Verify/place SX B PRM 1RIX-PR039, Shutdown Service Water B Effluent (SX) in service.
   2) Shut 1SX082B, RHR Hx B MU Cond Inlet Vlv.
   3) Open 1E12-F014B, SSW Inlet RHR B Hx Valve.
   4) Open 1E12-F068B, RHR B Hx SSW Outlet Valve.
   5) Verify cooling water flow through RHR B Hx on SSW To RHR B Hx Flow meter, 1E12-R602B.

      When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

      No flow adjustments required when SX supplying cooling.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

8.1.2.13 To warm RHR Loop B: (cont'd)

2. Throttle open for ~ 30 seconds 1E12-F003B, RHR B Hx Outlet Valve.

3. Shut/verify shut 1E12-F048B, RHR B Hx Bypass Valve.

4. Open 1E12-F049, RHR B To Radwaste First Isol Valve.

5. Slowly throttle open 1E12-F040, RHR B To Radwaste Second Isol Valve to commence warm-up of RHR B SDC, ensuring flushing temperature to RW remains < 120°F (Pt 1E12-N024 (brown) on E12-R601, 1H13-P601).

☞ Monitor RPV level while 1E12-F040 is open.

**CAUTION**

*RHR loop steam voids and flashing can occur if SDC suction piping is warmed to within 50°F dT of the corresponding RPV saturation temperature.*

*This is prevented by the warm-up temperature limits in Step 6. Refer also to 5.7.*

| *I.E.:* | *RPV Press* | *RPV Sat Temp* | *Max RHR Hx B Hx Inlet* | *Limit* |
|---|---|---|---|---|
| | *75 psig* | *320°F* | *200°F (120°F dT)* | *200°F* |
| | *50 psig* | *298°F* | *198°F (100°F dT)* | *100°F dT* |
| | *30 psig* | *274°F* | *174°F (100°F dT)* | *100°F dT* |

*Refer to CPS 4003.01F003 for Saturated Temperature/Pressure Correlations.*

*Per Limitation 6.9, it is not necessary to redo RHR-SDC warm-up once warm-up conditions have been satisfied.*

6. Continue warm-up until RHR B Hx Inlet temperature (Pt 1E12-N004B (purple) on E12-R601, 1H13-P601) indicates either:

   - 200°F, **OR**
   - Within 100°F of RPV Coolant Temperature.

   **THEN:**

   1) Shut 1E12-F040, RHR B To Radwaste Second Isol Valve.

   2) Shut 1E12-F049, RHR B To Radwaste First Isol Valve.

   3) Fully open 1E12-F003B, RHR B Hx Outlet Valve.

   ☞ When RHR-SDC is started in 8.1.2.20.3, cooldown will commence immediately. Be prepared to adjust cooldown.

   4) Open 1E12-F048B, RHR B Hx Bypass Valve.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

**CAUTION**

*With no flow other than RT return flow through a FW line, feedwater check valves could be damaged due to fluttering.*

8.1.2.14 Align RT return to the feedwater line currently in use by SDC per CPS 3303.01, Reactor Water Cleanup (RT).

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

8.1.2.15 Initiate CPS 9000.06D003, Shutdown Cooling Temperature Data Sheet.

☞ There are no HU/CD limits associated with the RHR Hx.

8.1.2.16 Verify/place SX B PRM 1RIX-PR039, Shutdown Service Water B Effluent (SX) in service.

8.1.2.17 Fill and vent SDC suction header by opening 1E12-F338, S/D Cool Suct Hdr HP Vent & 1E12-F339, S/D Cool Suct Hdr HP Vent in the ABST.

8.1.2.18 **IF** Annunciator 5065-5A, RHR Pump B Discharge Press Abnormal alarm [low pressure] is not clear, or as directed by the SMngt,

**THEN** Vent RHR Loop A(B) as applicable per CPS 3312.01 (RHR) Fill and Vent section.

☞ 1E12-F044B or F063B opened in CPS 3312.01 will be shut just prior to starting the RHR B pump to help maintain the system pressurized. Hx inlet temp may lower due to CY flow; however, the warm-up does not need to be re-done.

☞ Steps 8.1.2.17 and 8.1.2.18 satisfies ITS SR 3.4.9.2 and 3.4.10.2.

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

8.1.2.19 This step INOPs 1E12-F064B in the shut position to ensure that an inadvertent loss of RPV level does not occur.

Pump minimum flow protection previously provided by the F064B valve is now maintained by securing the RHR B pump when SDC flow is < 1100 gpm.

1. Shut/verify shut 1E12-F064B, RHR Pump B Min Flow Recirc Valve.

2. (Local) At AB 781' West, AB MCC 1B2-8C (1AP76E), place 1E12-F064B, RHR Pump 1B Minimum Flow Valve breaker to OFF.

3. Information tag the MCR 1E12-F064B control switch and the local breaker as follows:

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

"1E12-F064B is in the shut/deenergized position to ensure that an inadvertent loss of RPV level does not occur. Pump minimum flow protection previously provided by the F064B valve is now maintained by securing the RHR B pump when SDC flow is < 1100 gpm."

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

**NOTE**

*Normal SDC flowpath is through 1E12-F053B, RHR B To Feedwater S/D Cooling Rtrn Vlv.*

*Use 1E12-F037B, RHR B To CNMT Pool Cooling Shutoff Vlv while the RPV head is removed.*

**CAUTION**

*When RPV pressure is < 450 psig (Due to normal cooldown, loss of inventory, SRV/Bypass valve operation, or RPV drain path), non-condensable gasses can be released from solution into the RPV level reference legs, resulting in false high level readings and/or level anomalies (notching).*

*Level indications shall be closely monitored and compared during depressurization.* «CM-16»

**CAUTION**

*Do not permit SDC flow to lower < 1100 gpm due to 1E12-F064B min flow protection for the RHR B pump being defeated.*

*If SDC flow > 1100 gpm cannot be established, then RHR Pump A(B) must be secured.* «CM-1»

8.1.2.20 Initiate SDC flow as follows:

1. Notify Refueling Floor (as applicable) that SDC flow in the RPV will start and impact should be expected.

❶ 2. **IF** 1E12-F044B or F063B was opened during CPS 3312.01 (RHR) Fill & Vent in sub-step 8.1.2.18,

**THEN** (Local) Just prior to starting the RHR B Pump (to avoid losing fill & vent), lock shut the flushing valve used:

1E12-F044B, Upper Pool S/D Cool Hdr B Flush Wtr Supp CT 803' AZ 300 deg.

1E12-F063B, RHR Pump B Disch Hdr Flush Wtr Supply. AB 762' West HX Rm.

(Step 8.1.2.20 continued on next page)

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

(Step 8.1.2.20 continued)

**NOTE**

*Cooldown will start immediately due to 1E12-F003B being open. Be prepared to adjust C/D rate per 8.1.2.22.*

3. Start RHR B Pump, 1E12-C002B, and immediately open either:

   1) 1E12-F053B, RHR B To Feedwater S/D Cooling Rtrn Vlv,

   or

   2) 1E12-F037B, RHR B To CNMT Pool Cooling Shutoff Vlv.

   ☞ Do not throttle 1E12-F037B < 4300 gpm.

8.1.2.21 Verify SDC flow ≥ 2000 gpm on RHR Pump B Flow meter, 1E12-R603B.

☞ Do not allow flow to exceed 5350 gpm.

8.1.2.22 (Local) Verify 1SX029B, SX Outlet RHR B Pump Seal Cooler Valve opens, AB 707' RHR B Pmp Rm.

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

**CAUTION**

*Do not cooldown < 70°F before de-tensioning the RPV head bolts.*

*Do not exceed 100°F/hour cooldown rate.*

*Do not cooldown < 68°F with fuel in the RPV.*

8.1.2.23 Establish cooldown as follows:

1. Shut/verify shut 1SX082B, RHR Hx B MU Cond Inlet Vlv.

2. Open/verify open 1E12-F014B, SSW Inlet RHR B Hx Valve.

3. Open/verify open 1E12-F068B, RHR B Hx SSW Outlet Valve.

4. Verify cooling water flow through RHR B Hx on SSW To RHR B Hx Flow meter, 1E12-R602B.

   When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

   No flow adjustments required when SX supplying cooling.

(Step 8.1.2.23 continued on next page)

8.1.2 **Placing RHR Loop B in SDC (Preferred)** (cont'd)

(Step 8.1.2.23 continued)

5. Maintain cooldown rate and flow using as appropriate: [Refer to Precautions 4.1 and 4.13 for throttling restrictions on the following valves:] *«CM-14»*

   - 1E12-F003B, RHR B Hx Outlet Valve.
   - 1E12-F048B, RHR B Hx Bypass Valve.
   - 1E12-F053B, RHR B To Feedwater S/D Cooling Rtrn Vlv.
   - 1E12-F037B, RHR B To CNMT Pool Cooling Shutoff Vlv. (If used when RPV head is removed.)

8.1.2.24 Verify appropriate fan operation:

1. RHR Hx Rm B Sply Fan, 1VY05C - cycles on room temp.
2. RHR Pmp Rm B Sply Fan, 1VY06C - starts with RHR Pump.

8.1.2.25 (Local) Lock open/verify locked open 1E12-F531, Wtr Leg Pump Supply To RHR Pump B, AB 707' RHR B Pmp Rm.

☞ 1E12-F531 is being maintained open to minimize potential for losing fill & vent in event of a Loss of SDC Flow.

8.1.2.26 **WHEN** Using RHR B for SDC when entering a refuel outage,

**THEN** Perform Section 8.1.7, RPV Head Cooling as required to support vessel disassembly.

**CAUTION**

*If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available).* «CM-19»

**CAUTION**

*When in SDC with RR secured and the steam separator in place, RPV level should be kept above the natural circulation level of 44 inches on the Shutdown Range or 61 inches on the Upset Range.* «CM-11»

**CAUTION**

*Re-alignment of the RHR Loop for SDC with Reactor Steam Dome Pressure > 104 psig requires entry into LCO 3.5.1.*

8.1.3 **SHUTDOWN COOLING - Flushing RHR Loop A**

☞ Flushing activities may be N/A'd per SMngt in response to accident events (e.g., fuel damage has occurred, RPV coolant Chemistry is already degraded, ALARA issues, time is of an essence, etc.).

8.1.3.1 Verify demineralized water available for flushing per CPS 3208.01, Cycled/Makeup Condensate (CY/MC).

8.1.3.2.1 Verify waste surge tanks lined up to receive flush water from RHR.

8.1.3.2.2 Notify Chemistry that samples will be required if 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) is not available to verify conductivity during flushing.

8.1.3.3 Shut/verify shut:

1. 1E12-F024A, RHR A Test Valve To Suppr Pool.

2. (Local) 1E21-F372, Wtr Leg Pump Supply To RHR Pump A. AB 707' RHR A Pmp Rm. (Normally locked open)

   ☞ 1E21-F372 is being shut to minimize potential for addition to the RPV inventory during this evolution.

3. 1E12-F064A, RHR Pump A Min Flow Recirc Valve.

   ❶ ☞ OK to electrically disable F064A per sub-step 8.1.4.18 while proceeding with the flush.

4. 1E12-F004A, RHR A Suppr Pool Suction Valve. «CM-12»

8.1.3 **SHUTDOWN COOLING - Flushing RHR Loop A** (cont'd)

8.1.3.4 Open/verify open:

1. (Local) 1E12-F474, HPCS/RHR Comb Drain Hdr Isol, AB 707' RHR B Pmp Rm west wall.
2. 1E12-F048A, RHR A Hx Bypass Valve.
3. 1E12-F003A, RHR A Hx Outlet Valve.
4. 1E12-F027A, RHR A To CNMT Outbd Isol Valve.
5. 1E12-F047A, RHR A Hx Inlet Valve.

8.1.3.5 (Local) Open 1E12-F072A, RHR A Pump Flush Line Isol Valve. AB 707' RHR A Pmp Rm. (Normally locked shut)

**NOTE**

*Performance of step 8.1.3.6 is not necessary if the upper pool SDC flow path is not to be used.*

8.1.3.6 To flush upper pool SDC flow path (Local): *«CM-10»*

1. Open 1E12-F044A, Upper Pool S/D Cool Hdr A Flush Wtr Supp, CT 803' AZ 65 deg. (Normally locked shut)
2. Throttle open 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve, AB 737' B HX Rm west wall. (Normally locked shut)
3. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F070.

4. Lock shut 1E12-F044A, Upper Pool S/D Cool Hdr A Flush Wtr Supp.

8.1.3.7 To flush RHR discharge header (Local): *«CM-10»*

1. Open 1E12-F063A, RHR A Pump Disch Hdr Flush Wtr Supp, AB 762' East HX Rm east wall. (Normally locked shut)
2. Throttle open 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve, AB 737' B HX Rm west wall. (Normally locked shut)
3. (MCR) Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F048A, RHR A Hx Bypass Valve.

8.1.3 **SHUTDOWN COOLING - Flushing RHR Loop A** (cont'd)

4. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Shut 1E12-F070.

5. Lock shut 1E12-F063A, RHR A Pump Disch HdrFlush Wtr Supp.

6. (MCR) Open 1E12-F048A, RHR A Hx Bypass Valve.

**CAUTION**

*If RHR Loop B is in SDC with 1E12-F006B open, or SDC suction path was previously flushed and 1E12-F008 & F009 are open, then do not perform 8.1.3.8.*

*Opening 1E12-F006A may result in a loss of RPV level if a valve in RHR Loop A is out of position.*

8.1.3.8 To flush RHR A SDC suction header: *«CM-10»*

1. Open 1E12-F006A, RHR A Shutdown Cooling Suct Valve.

2. (Local) Shut/verify shut 1E12-F536, RHR SDC Header Leak-Off Line Isolation Valve, AB 707' RHR C Pmp Rm 10' above Wtr Leg Pmp.

3. (Local) Open 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve. ABST 15' N of CT wall - center. (Normally locked shut)

4. (Local) Throttle open 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve. AB 737' B HX Rm west wall. (Normally locked shut)

5. Flush until conductivity is <10 umho as indicated on 1E12-R006 (meter on 1H22-P021 in RHR B Pump Rm) or by sample

   a. Lock shut 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve.

6. (Local) Lock shut 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve.

8.1.3.9 (Local) Lock shut 1E12-F072A, RHR A Pump Flush Line Isol Valve.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)**

**NOTE**

*Section 8.1.4 may be used for placing RHR Loop A in SDC when it is either the first or second loop being placed in SDC. When shifting loops, both will be in service simultaneously and the loop to be shut down is secured per section 8.1.6.*

**CAUTION**

*If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available).* «CM-19»

**NOTE**

*Prior to SDC initiation, RHR piping should be flushed to reduce impurity concentrations.*

*Notify RP of impending start of SDC as dose rates will change.*

8.1.4.1 Unless RHR Loop A was previously flushed, perform section 8.1.3 prior to continuing.

☞ This step is normally not necessary if recovering from a Loss of RHR SDC Flow event.

☞ Flushing activities may be N/A'd per SMngt in response to accident events (e.g., fuel damage has occurred, RPV coolant Chemistry is already degraded, ALARA issues, time is of an essence, etc.).

8.1.4.2 Verify WS available to RHR A Hx, or start Div 1 SX per CPS 3211.01, Shutdown Service Water (SX).

8.1.4.3 **IF** Recovering from a Loss of SDC Flow event,

**THEN** Do not perform this step.

**OTHERWISE** (Local) Shut/verify shut
1E21-F372, Wtr Leg Pump Supply To RHR Pump A.
AB 707' RHR A Pmp Rm. (Normally locked open)

☞ 1E21-F372 is being shut to minimize potential for addition to the RPV inventory during this evolution.

8.1.4.4 Shut/verify shut:

1. 1E12-F024A, RHR A Test Valve To Suppr Pool.
2. 1E12-F003A, RHR A Hx Outlet Valve.
3. 1E12-F064A, RHR Pump A Min Flow Recirc Valve.
4. 1E12-F004A, RHR A Suppr Pool Suction Valve. «CM-12»
5. (Local) 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve. AB 737' B HX Rm west wall.(Normally locked shut)

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

8.1.4.5 Information tag the MCR 1E12-F042A, LPCI Fm RHR A Shutoff Valve control switch as follows: *«CM-4»*

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

"RHR A SDC is in service. Operation of this valve will result in LPCI injection into the core shroud. Do not operate this valve unless required by an emergency or an approved procedure."

8.1.4.6 Open/verify open:

1. 1E12-F048A, RHR A Hx Bypass Valve.

2. 1E12-F027A, RHR A To CNMT Outbd Isol Valve.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

**NOTE**

*Pressurizing RHR Loop A with flushing water will prevent water hammer due to voids when pump suction is lined up to the RPV.* «CM-2»

8.1.4.7 (Local) Open following valves to verify RHR Loop A pressurized: (Normally locked shut) «CM-2»

☞ This step is still required even if recovering from a Loss of RHR SDC Flow event and the Water Leg Pump is in service.

1. Either flushing valve:

   ° 1E12-F044A, Upper Pool S/D Cool Hdr A Flush Wtr Supp, CT 803' AZ 65 deg. or

   ° 1E12-F063A, (Elevated RAD area) RHR Pump A Disch Hdr Flush Wtr Supply, AB 762' East HX Rm east wall.

2. 1E12-F071A, RHR Pump A Flush Line Isol, AB 707' A RHR Pmp Rm.

3. 1E12-F072A, RHR Pump A Flush Line Isol, AB 707' A RHR Pmp Rm.

8.1.4.8 (Local) When RHR Loop A pressure has increased to ~ flush header pressure, lock shut:
(Comp Pt CY-BA201, CY Flush Water Press)
(Comp Pt RH-DA201, RHR Discharge)
(1E12-R002A at 1H22-P018 RHR A Pump Rm, RHR Suction)

1. 1E12-F072A.

2. 1E12-F071A.

❶ 3. Flushing valve used in 8.1.4.7.1:
1E12-F044A or 1E12-F063A.

8.1.4.9 Verify:

❶ 1. RPV pressure > 30 psig (see 5.7.2 for exception) and ≤ 104 psig.

2. Group 3 Inboard and Outboard Isolation signals are RESET (~ 96 psig).
If required, reset the Group 3 isolation signals per CPS 4001.02, Automatic Isolation.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

**NOTE**

*Either step 8.1.4.10 or 8.1.4.11 will be performed depending on status of RHR Loop B.*

8.1.4.10 **IF** RHR Loop B is not in SDC, **THEN:**

1. Verify makeup water to the RPV is available.

2. (Local) At AB MCC 1A3-6D, AB 781' East, unlock and place 1E12-F008 breaker in ON.

3. (Local) At 1E12-F008 breaker cubicle, place ALARM BYPASS SWITCH to NORMAL.

4. Open 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv.

5. Open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

   **IF** 1E12-F009 will not open due to thermal binding or hydraulic lock [GE SIL 368 R/1], **THEN:**

   1) (Optional) Per SMngt, fill/vent RHR-SDC piping:
      a) Unlock & open 1E12-F020, Shutdown Cooling Suction Hdr Flush Water Supp Valve, ABST 15' N of CT wall - center.
      b) Monitor RPV water level until an increase is noticed (water flows into RPV through F009 bypass line once the valve dP has equalized.
      c) Lock shut 1E12-F020.

   **NOTE**

   *1E12-F009 is INOP in the next step, and applicable ITS LCO 3.6.1.3, 3.4.9/10 and/or 3.9.8/9 entries are required.*

   2) (Local) Dis-engage the MOV actuator, and manually unseat 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

      DW 750' AZ 10 deg.

      ☞ Mech Maintenance/torque wrench assistance may be needed. Contact NSED as needed.

   3) (MCR) Electrically open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

   4) (MCR) Per CPS 9053.05, RHR/LPCS Valve Operability (Shutdown), Section 8.2, stroke time 1E12-F009 in the shut direction.

   5) (MCR) Open 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

6. Open/verify open 1E12-F006A, RHR A Shutdown Cooling Suct Valve.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

**CAUTION**

*Minimize time both 1E12-F006A & B are open during swapping of SDC loops due to the potential for a loss of RPV level.*

8.1.4.11 **IF** RHR Loop B is in SDC, **THEN**:

1. (Local) At AB MCC 1A2-8B, place the breaker for 1E12-F006A in ON *(EC 390155, MSO concern)*
2. Verify makeup water to the RPV is available.
3. Open 1E12-F006A, RHR A Shutdown Cooling Suct Valve.

**NOTE**

*If in MODE 4 or 5, it is not necessary to warm RHR Loop A. RHR Loop A is warmed to eliminate thermal shock and differential expansion of the RHR pump.* «CM-2»

❶

**CAUTION**

*Warming the loop will result in a loss of RPV water inventory.* «CM-7»

*RPV pressure should be normally > 30 psig (see 5.7), and held as constant as possible while warming/placing RHR in SDC, to avoid formation of steam voids and water hammer.* «CM-7»

*The discharge temperature to RW shall not exceed 120°F to prevent damage to RW piping and tanks. (Pt 1E12-N024 (brown) on E12-R601, 1H13-P601)* «CM-6»

8.1.4.12 To warm RHR Loop A (Local): ☞ Refer to 6.9 Limitation.

1. Verify open 1E12-F474, HPCS/RHR Comb Drain Hdr Isol, AB 707' RHR B Pmp Rm west wall.
2. Open 1E12-F072A, RHR A Pump Flush Line Isol, AB 707' RHR A Pmp Rm. (Normally locked shut)
   ☞ (MCR) Monitor RPV level while 1E12-F070 is open.
3. Throttle open 1E12-F070, RHR Disch to RW Hdr Isol. AB 737' B HX Rm west wall. (Normally locked shut)

☞ 8.1.4.12, 'To Warm RHR Loop A' continued on next page.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

8.1.4.12 To warm RHR Loop A (cont'd)

**CAUTION**

*RHR loop steam voids and flashing can occur if SDC suction piping is warmed to within 50°F dT of the corresponding RPV saturation temperature.*

*This is prevented by the warm-up temperature limit in Step 4. Refer also to 5.7.*

| *I.E.:* | *RPV Press* | *RPV Sat Temp* | *Max SDC Suct Temp* | *Limit* |
|---|---|---|---|---|
| *Normal* | *> 30 psig* | *> 274°F* | *120°F (> 154°F dT)* | *120°F* |
| *Worst Case* | *0 psig* | *212°F* | *120°F (92°F dT)†* | *120°F* |

† *A warm-up dT < 100°F (worst case 92°F dT) has been evaluated as acceptable for RHR A.*

*Refer to CPS 4003.01F003 for Saturated Temperature/Pressure Correlations.*

*Per Limitation 6.9, it is not necessary to redo RHR-SDC warm-up once warm-up conditions have been satisfied.*

4. Flush to RW until temperature (Pt 1E12-N024 (brown) on E12-R601, 1H13-P601) reaches maximum flushing temperature, not to exceed 120°F; or temperature stabilizes.

5. At the desired maximum flushing temperature, or when temperature is stabilized, lock shut:

   1) 1E12-F070, RHR Disch To Radwaste Hdr Isol Valve.

   2) 1E12-F072A, RHR A Pump Flush Line Isol.

**CAUTION**

*With no flow other than RT return flow through a FW line, feedwater check valves could be damaged due to fluttering.*

8.1.4.13 Align RT return to the feedwater line currently in use by SDC per CPS 3303.01, Reactor Water Cleanup (RT).

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

8.1.4.14 Initiate CPS 9000.06D003, Shutdown Cooling Temperature Data Sheet.

☞ There are no HU/CD limits associated with the RHR Hx.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

**NOTE**

*Fill & vent can also be acctomplished by performing Step 8.2.4 of 3312.01, RESIDUAL HEAT REMOVAL (RHR)*

8.1.4.15 Fill and vent SDC suction header by opening 1E12-F338, S/D Cool Suct Hdr HP Vent & 1E12-F339, S/D Cool Suct Hdr HP Vent in the ABST.

8.1.4.16 **IF** Annunciator 5064-5F, RHR Pump A Discharge Press Abnormal alarm [low pressure] is not clear, or as directed by the SMngt,

**THEN** Vent RHR Loop A as applicable per CPS 3312.01 (RHR) Fill and Vent section.

☞ 1E12-F044A or F063A opened in CPS 3312.01 will be shut just prior to starting the RHR A pump to help maintain the system pressurized. Hx inlet temp may lower due to CY flow; however, the warm-up does not need to be re-done.

☞ Steps 8.1.4.15 and 8.1.4.16 satisfies ITS SR 3.4.9.2 and 3.4.10.2.

8.1.4.17 Verify/place SX A PRM 1RIX-PR038, Shutdown Service Water A Effluent (SX) in service.

8.1.4.18 This step INOPs 1E12-F064A in the shut position to ensure that an inadvertent loss of RPV level does not occur.

Pump minimum flow protection previously provided by the F064A valve is now maintained by securing the RHR A pump when SDC flow is < 1100 gpm.

1. Shut/verify shut 1E12-F064A, RHR Pump A Min Flow Recirc Valve.

2. (Local) At AB 781' East, AB MCC 1A2-10C (1AP73E), place 1E12-F064A, RHR Pump 1A Minimum Flow Valve breaker to OFF.

3. Information tag the MCR 1E12-F064A control switch and the local breaker as follows:

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

"1E12-F064A is in the shut/deenergized position to ensure that an inadvertent loss of RPV level does not occur. Pump minimum flow protection previously provided by the F064A valve is now maintained by securing the RHR A pump when SDC flow is < 1100 gpm."

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

**NOTE**

*Normal SDC flowpath is through 1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv.*

*Use 1E12-F037A, RHR A To CNMT Pool Cooling Shutoff Vlv while the RPV head is removed.*

**CAUTION**

*When RPV pressure is < 450 psig (Due to normal cooldown, loss of inventory, SRV/Bypass valve operation, or RPV drain path), non-condensable gasses can be released from solution into the RPV level reference legs, resulting in false high level readings and/or level anomalies (notching).*

*Level indications shall be closely monitored and compared during depressurization.* «CM-16»

**CAUTION**

*Do not permit SDC flow to lower < 1100 gpm due to 1E12-F064A min flow protection for the RHR A pump being defeated.*

*If SDC flow > 1100 gpm cannot be established, then RHR Pump A must be secured.* «CM-1»

8.1.4.19 Initiate SDC flow as follows:

1. Notify Refueling Floor (as applicable) that SDC flow in the RPV will start and impact should be expected.

2. **IF** 1E12-F044A or F063A was opened during CPS No. 3312.01 (RHR) Fill & Vent in sub-step 8.1.4.15,

   **THEN** (Local) Just prior to starting the RHR A Pump (to avoid losing fill & vent), lock shut the flushing valve used:

   1E12-F044A, Upper Pool S/D Cool Hdr A Flush Wtr Supp CT 803' AZ 65 deg.

   1E12-F063A, RHR Pump A Disch Hdr Flush Wtr Supply, AB 762' East HX Rm east wall.

3. Start RHR A Pump, 1E12-C002A, and immediately open either:

   1) 1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv,

   or

   2) 1E12-F037A, RHR A To CNMT Pool Cooling Shutoff Vlv.

   ☞ Do not throttle 1E12-F037A < 4300 gpm.

8.1.4.20 Verify SDC flow ≥ 2000 gpm on RHR Pump A Flow meter, 1E12-R603A.

☞ Do not allow flow to exceed 5350 gpm.

8.1.4 **Placing RHR Loop A in SDC (Non-preferred)** (cont'd)

8.1.4.21 (Local) Verify 1SX029A, SX Outlet RHR A Pump Seal Cooler Valve opens. AB 707' RHR A Pmp Rm.

☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

**CAUTION**

*Do not cooldown < 70°F before de-tensioning the RPV head bolts.*

*Do not exceed 100°F/hour cooldown rate.*

*Do not cooldown < 68°F with fuel in the RPV.*

8.1.4.22 Initiate cooldown as follows:

1. Shut/verify shut 1SX082A, RHR Hx A MU Cond Inlet Vlv.
2. Open/verify open 1E12-F014A, SSW Inlet RHR A Hx Valve.
3. Open/verify open 1E12-F068A, RHR A Hx SSW Outlet Valve.
4. Verify cooling water flow through RHR A Hx on SSW To RHR A Hx Flow meter, 1E12-R602A.

   When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

   No flow adjustments required when SX supplying cooling.
5. Maintain cooldown rate and flow using as appropriate: [Refer to Precautions 4.1 and 4.13 for throttling restrictions on the following valves.] *«CM-14»*

   1E12-F003A, RHR A Hx Outlet Valve.

   1E12-F048A, RHR A Hx Bypass Valve.

   1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv.

   1E12-F037A, RHR A To CNMT Pool Cooling Shutoff Vlv. (If used when RPV head is removed.)

8.1.4.23 Verify in operation:

1. RHR Hx Rm A Sply Fan, 1VY03C - cycles on room temp.
2. RHR Pmp Rm A Sply Fan, 1VY02C - starts with RHR Pump.

8.1.4.24 (Local) Lock open/verify locked open 1E21-F372, Wtr Leg Pump Supply To RHR Pump A, AB 707' RHR A Pmp Rm.

☞ 1E21-F372 is being maintained open to minimize potential for losing fill & vent in event of a Loss of SDC Flow.

8.1.5 **Shifting SDC Flow Path During Refueling Operations**

8.1.5.1 To prevent feed sparger turbulence from obstructing visibility during fuel handling, shift SDC flow path to the RPV pool as follows:

**NOTE**

*Shutdown Cooling Supply to the Upper Containment Pools and Fuel Pool Cooling to the Upper Containment Pools can be aligned through one common set of Reactor Vessel Pool diffusers (1FC019A/1FC021A or 1FC19B/1FC021B).*

1. Verify FC aligned per:

   CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

**NOTE**

*Do not throttle 1E12-F037A(B) < 4300 gpm.*

*During flow path shifting, preferred system flow should be 2000 - 5350 gpm.*

2. Transfer RHR SDC flow paths by concurrently throttling valves as necessary to maintain system flow limits:

   Throttling open 1E12-F037A(B),
   RHR A(B) To CNMT Pool Cooling Shutoff Vlv,

   while

   Throttling shut 1E12-F053A(B),
   RHR A(B) To Feedwater S/D Cooling Rtrn Vlv.

8.1.5.2 When good visibility in the RPV is no longer necessary:

**NOTE**

*Do not throttle 1E12-F037A(B) < 4300 gpm.*

*During flow path shifting, preferred system flow should be 2000 - 5350 gpm.*

Transfer RHR SDC flow paths by concurrently throttling valves as necessary to maintain system flow limits:

Throttling open 1E12-F053A(B),
RHR A(B) To Feedwater S/D Cooling Rtrn Vlv.

while

Throttling shut 1E12-F037A(B),
RHR A(B) To CNMT Pool Cooling Shutoff Vlv,

8.1.6 **Securing a SDC Loop**

**CAUTION**

*If in SDC and Rx Coolant Temp > 150°F, RHR Tech Spec Functions 3.5.1/2 (ECCS), 3.6.1.7 (CNMT Spray), 3.6.1.9 (FWLCS), and 3.6.2.3 (Supp Pool Cooling) shall be declared INOPERABLE (but still available).* «CM-19»

**NOTE**

*The recorder which will provide the most accurate indication based on flow conditions should be used.*

☞ If the SDC loop is being secured for entering the LPCI mode, perform CPS 3312.01, RESIDUAL HEAT REMOVAL (RH), Section 8.1.12.

❶ 8.1.6.1 **IF** SDC is being secured, and the plant is not entering an integrated heatup or surveillance related heatup (e.g., RCS Leakage Test), SDC should not be secured if above:

- 120°F if jet pump plugs will NOT be used

❶❸ OR

- 105°F if jet pump plugs will be used.

**THEN** Verify RPV has been cooled as indicated by all metal and RPV coolant temperatures on:

- Recirc A&B Water Temperature, B33-R604 (P614).
- Reactor Vessel Temp Monitoring, B21-R643 (P614).
- RHR Service Temp Recorder, E12-R601 (P601),

or

Alternate SDC Temperature Monitoring (Initiate PC-TCC per CPS 3312.03C001, Alternate SDC Temperature Monitoring Checklist.)

8.1.6 continued next page

8.1.6 **Securing a SDC Loop** (cont'd)

8.1.6.2 When SDC is secured for the purpose of entering MODE 2,

or

Any other condition which necessitates the use of CPS 9000.06D001 (e.g., RCS Leakage Test):

1. Terminate CPS 9000.06D003, Shutdown Cooling Temperature Data Sheet, and

2. Initiate CPS 9000.06D001, Heatup/Cooldown, Inservice Leak And Hydrostatic Testing 30 Minute Temperature Log.

**CAUTION**

*Do not permit SDC flow to lower < 1100 gpm due to 1E12-F064A(B) min flow protection for the RHR A(B) pump being defeated.* «CM-1, CM-11»

*If SDC flow > 1100 gpm cannot be established, then RHR Pump A(B) must be secured.*

*1E12-F023, RHR B Supp To Rx Head Spray Valve is shut first to minimize opening of F064B.*

8.1.6.3 To stop SDC flow, shut/verify shut:

1. 1E12-F023, RHR B Supp To Rx Head Spray Valve.

2. 1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Valve.

3. 1E12-F037A(B), RHR A(B) To CNMT Pool Cooling Shutoff Vlv.

4. 1E12-F042A(B), LPCI Fm RHR A(B) Shutoff Valve.

8.1.6.4 Promptly stop RHR Pump A(B), 1E12-C002A(B).

8.1.6.5 Shut 1E12-F006A(B), RHR Shutdown Cooling Suct Valve.

8.1.6 continued next page

8.1.6 **Securing a SDC Loop** (cont'd)

**CAUTION**

*Depressurizing a hot (> 212°F) isolated RHR loop can result in water hammer.*

*If securing one of two operating SDC loops, do not perform 8.1.6.6, proceed to step 8.1.6.7.*

8.1.6.6 If SDC is no longer necessary, secure suction line-up:

1. Shut 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.
2. Shut 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv.
3. (Local) Verify 1E12-F008 hand-wheel LOCKED, ABST N of CT wall - center. (Normally locked shut) *«CM-13»*
4. (Local) At AB MCC 1A3-6D, AB 781 East, place 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv ALARM BYPASS SWITCH in BYPASS.
5. (Local) Lock 1E12-F008 breaker in OFF. *«LBD-2, CM-13»*
6. (Local) At AB MCC 1A2-8B, place/verify the breaker for 1E12-F006A in ON *(EC 390155, MSO concern)*

8.1.6 continued next page

8.1.6 **Securing a SDC Loop** (cont'd)

**NOTE**

*Sub-sections 8.1.6.7 & 8 may be performed in either order or concurrently.*

*Steps within these sections shall be performed in order unless otherwise stated.*

*If entered due to loss of SDC these sections may be delayed until plant conditions allow.*

8.1.6.7 Returning RHR to STANDBY

1. Open/verify open 1E12-F048A(B), RHR A(B) Hx Bypass Valve.
2. Open/verify open 1E12-F003A(B), RHR A(B) Hx Outlet Valve.
3. (Local) Lock open/verify locked open RHR A(RHR B):

   1E21-F372(1E12-F531),
   Wtr Leg Pump Supply To RHR Pump A(B),
   AB 707' RHR A (B) Pmp Rm.
4. If taking RHR A out of SDC:
   1) Clear Information tag from the 1E12-F064A control switch and breaker.
   2) (Local) At AB 781' East, AB MCC 1A2-10C (1AP73E), place the 1E12-F064A breaker to ON.
5. If taking RHR B out of SDC:
   1) Clear Information tag from the 1E12-F064B control switch and breaker.
   2) (Local) At AB 781' West, AB MCC 1B2-8C (1AP76E), place the 1E12-F064B breaker to ON.
6. Open 1E12-F064A(B), RHR Pump A(B) Min Flow Recirc Valve. *«CM-15»*
7. Open 1E12-F004A(B), RHR A(B) Suppr Pool Suction Valve.
8. When securing RHR SDC Loop B (1E12-F006B):
   1) (Local) At AB MCC 1B2-5D, AB 781' West, place 1E12-F006B, ALARM BYPASS SWITCH in BYPASS.
   2) (Local) Lock 1E12-F006B breaker in OFF. *«LBD-2, CM-13»*

**NOTE**

*Realignment of 1G33-F342A(B), RWC Hdr Isol may be required.*

9. Align RT for operation during shutdown per CPS 3303.01, Reactor Water Cleanup (RT).
10. Clear Information Tag on the MCR 1E12-F042A(B) switch. *«CM-4»*

8.1.6 continued next page

8.1.6 **Securing a SDC Loop** (cont'd)

8.1.6.7 Returning RHR to STANDBY (cont'd)

11. Per SMngt direction,

    Using CPS 3312.01 (RHR);
    flush the secured RHR loop via Suppression Pool Cooling or Manual Operation of RHR Pool To Pool to aid in reducing the rad levels in the RHR system.

12. **IF** Annunciator 5064-5F (5065-5A), RHR Pump A(B) Discharge Press Abnormal alarm [low pressure] alarm is received during valve realignment,

    **THEN** The header should be filled and vented as needed per CPS 3312.01 (RHR).

13. **IF** After performing 8.1.6.7.1,

    Difficulty is still being experienced in maintaining annunciator 5064-5F (5065-5A), RHR Pump A(B) Discharge Press Abnormal alarm [low pressure] alarm clear,

    **THEN** Per CPS 3312.01 (RHR);

    The RHR A(B) pump may be operated in Suppression Pool Cooling mode or Manual Operation of RHR Pool To Pool to enhance the seating of the pump discharge check valve.

14. At AB MCC 1A3 (1AP74E) Cub 7C;
    Open breaker for 1E12-F040,
    RHR Sys 1A Radwaste Drn Outbd Isol Valve.
    **AND**
    Place Alarm Bypass Switch 1E12S071 to Bypass.

15. AB AB MCC 1A2 (1AP73E) Cub 1B
    Open BOTH breakers for 1E12-F037A
    RH Sys 1A Shutdn Clg Upper Pool
    **AND**
    Place Alarm Bypass Switch 1E12S070A to Bypass

16. At AB MCC 1B2 (1AP76E) Cub 10B.
    Open BOTH breakers for 1E12-F037B,
    RH Sys 1B Shutdn Clg Upper Pool
    **AND**
    Place Alarm Bypass Switch 1E12S073 to Bypass

8.1.6 continued next page

8.1.6 **Securing a SDC Loop** (cont'd)

8.1.6.8 Securing SX flow through RHR Hx

**NOTE**

*Sub-steps '1 &2' are designed to keep the Hx pressurized and prevents a loss of MC header pressure when 1SX082B is opened in the Hx flush.*

1. Shut 1E12-F068A(B), RHR A(B) Hx SSW Outlet Valve.

2. Wait 15 - 30 secs after close signal to F068A(B), then shut 1E12-F014A(B), SSW Inlet RHR A(B) Hx Vlv.

3. Return SX to STANDBY per CPS 3211.01 (SX).

   ☞ Refer to 6.1 for RHR Hx MC layup criteria. Track RHR Hx status in CPS MCR AutoLog until MC layup is completed.

8.1.6.9 Verify the secured RHR loop is in STANDBY per CPS 3312.01 (RHR) - Appendix A.

**NOTE**

*RPV head spray can be initiated only when RHR Loop B is operating in SDC.*

8.1.7 **RPV Head Spray**
(Used as necessary to support RPV cooldown, etc.)

8.1.7.1 During the use of RPV Head Spray Mode,

Log in the CPS MCR AutoLog each open and shut cycle of 1E12-F023, RHR B Supp To Rx Head Spray Valve.

This data is required to support life cycle use analysis.

8.1.7.2 To initiate RPV head spray:

1. Throttle open 1E12-F023, RHR B Supp To Rx Head Spray Valve.

2. Establish RPV head spray flow rate of ~ 500 gpm, as indicated on RHR B Head Spray Flow meter, 1E12-R607.

8.1.7.3 To stop RPV head spray:

Shut 1E12-F023, RHR B Supp To Rx Head Spray Valve.

8.2 **INFREQUENT OPERATIONS**

**NOTE**

*The preferred method of transferring RPV water to RW is via RHR Loop B.*

*This method of transfer can be accomplished normally from the MCR with MOVs (or locally at the MOV).*

*Local manual valve operation is required to utilize RHR Loop A.*

8.2.1 **Draining RPV Water To Radwaste During SDC Operation** (Alternate RPV Level Control)

8.2.1.1 **RHR LOOP B** (Preferred - normal MCR Operations)

1. Verify RHR Loop B operating in SDC.

2. Verify sufficient volume in the waste surge tank to accept the amount of RPV water to be drained.

**NOTE**

*Preferred drain path is with the F049 open and the F040 being throttled. The drain path valve sequence may be reversed (using [valve #]) as necessary to support unique plant conditions. Local MOV operation may also be used as required.*

**CAUTION**

*The discharge temperature to RW shall not exceed 120°F to prevent damage to RW piping and tanks. (Pt 1E12-N024 (brown) on E12-R601; 1H13-P601)* «CM-6»

3. Open 1E12-F049 [F040], RHR B To Radwaste First [Second] Isol Valve.

4. Throttle 1E12-F040 [F049], RHR B To Radwaste Second [First] Isol Valve as necessary to maintain RPV level in the specified level band.

5. **WHEN** Desired amount of water has been transferred, or RPV level control is no longer needed,

   **THEN** Shut 1E12-F040 [F049], rst] Isol Valve.

6. Shut 1E12-F049 [F040], RHR B To Radwaste First [Second] Isol Valve.

8.2.1 **Draining RPV Water To Radwaste During SDC Operation**
(Alternate RPV Level Control) (cont'd)

8.2.1.2 **RHR LOOP A** (Non-preferred - Local operations)

1. Verify RHR Loop A operating in SDC.

2. Verify sufficient volume in the waste surge tank to accept the amount of RPV water to be drained.

3. Verify open 1E12-F474, HPCS/RHR Comb Drain Hdr Isol, AB 707' RHR B Pmp Rm.

**CAUTION**

*The discharge temperature to RW shall not exceed 120°F to prevent damage to RW piping and tanks. (Pt 1E12-N024 (brown) on E12-R601, 1H13-P601)*

*Maintain RHR A Hx pressure at least 10 to 20 psig < Relief Valve 1E12-F030 setpoint (197 psig), to prevent relieving RPV coolant to the suppression pool.* «CM-5»

4. (Local) Open 1E12-F072A, RHR Pump A Flush Line Isol. AB 707' RHR A Pmp Rm. (Normally locked shut)

5. (Local) Throttle 1E12-F070, RHR Disch To Radwaste Hdr Isol, AB 737' B HX Rm west wall. (Normally locked shut) as necessary to maintain RPV level in the specified level band.

6. (Local) **WHEN:**

   Desired amount of water has been transferred,

   or

   RPV level control is no longer needed by this flow path,

   Then lock shut 1E12-F070, RHR Disch To Radwaste Hdr Isol.

7. (Local) Lock shut 1E12-F072A.

8.2.2 **Fuel Pool Cooling And Cleanup Assist**

**NOTE**

*FPC&A MODE is only allowed to be placed in service when (USAR 9.1.3):*

*a) Reactor is in cold shutdown condition or is in the refueling mode,*

*and*

*b) An abnormal heat load has been produced in the pools and it appears that the pool water temperature will exceed 150°F.*

**CAUTION**

*This mode shall not be used when RHR/LPCI A is required to be OPERABLE. Refer to 6.6 Limitation.* «CM-17»

8.2.2.1 Verify Plant is in MODE 4 or MODE 5 (Refueling).

8.2.2.2 Verify that an abnormal heat load has been produced in the pools and it appears that the pool water temperature will exceed 150°F without the use of the RHR system.

8.2.2.3 Verify RHR Loop A in STANDBY or available for use per CPS 3312.01 (RHR).

8.2.2.4 Verify WS available to RHR A Hx, or start Div 1 SX per CPS 3211.01, Shutdown Service Water (SX).

8.2.2.5 Prepare Fuel Pool Cooling (FC) for use as follows:

1. Shutdown FC per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).
2. (Local) Unlock and open 1FC090, RHR Supply To FC Isolation, FB 750' Mezz above HX Rm door.
3. (Local) Unlock and open 1FC002, FC Surge Tanks Outlet To RHR System Isolation, FB 722' AL-122.
4. (Local) Vent FC piping at following vent valves:
   - 1FC088, FB 750' AL-122, RHR To FC Hi Pt Vent.
   - 1FC168, AB 733' AA-116, FC To RHR Hi Pt Vent.
   - 1FC087, FB 729' AL-121, FC To RHR Sys Hi Pt Vent.
   - 1FC106, FB 721' AK-112, FC Suct Hdr Hi Pt Vent.

8.2.2.6 If the last chemistry sample on the Suppression Pool per CPS 6001.01, Sampling And Analysis Requirements exceeds prescribed limits (sample is performed monthly), flush RHR Loop A per section 8.1.3, then proceed to 8.2.2.9.

8.2.2 **Fuel Pool Cooling And Cleanup Assist** (cont'd)

8.2.2.7 **IF** RHR Loop A was not flushed per section 8.1.3, **THEN**:

1. **IF** RHR Pump A stops,

   **THEN** Shut 1E12-F024A, RHR A Test Valve To Suppr Pool to prevent a draw down of the system to the pool.

   ☞ 1E12-F064A may take up to 70 seconds to open due to flow transmitter saturation. See Precaution 4.8.2

2. During this evolution, verify as appropriate that 1E12-F064A, RHR Pump A Min Flow Recirc Valve,
   -Opens whenever RHR flow is sensed < 1100 gpm for > 8 sec;
   -Shuts whenever RHR flow is > 1100 gpm

3. Shut 1E12-F027A, RHR A To CNMT Outbd Isol Valve.

4. Start RHR Pump A, 1E12-C002A.

5. Open 1E12-F024A, RHR A Test Valve To Suppr Pool.

6. Verify cooling water flow through RHR A Hx on SSW To RHR A Hx Flow meter, 1E12-R602A.

   When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

   No flow adjustments required when SX supplying cooling.

8.2.2.8 After RHR Loop A has flushed for ~ 5 minutes, secure the flush as follows:

1. Shut 1E12-F024A, RHR A Test Valve To Suppr Pool.

2. Stop RHR Pump A, 1E12-C002A.

8.2.2.9 Line up RHR Loop A as follows:

1. This step INOPs 1E12-F064A in the shut position to ensure that an inadvertent loss of FC Surge Tank level and RHR suction head does not occur. Pump minimum flow protection previously provided by the F064A valve is now maintained by securing the RHR A pump when RHR A pump flow is < 1100 gpm.

   1) Shut/verify shut 1E12-F064A, RHR Pump A Min Flow Recirc Valve.

   2) (Local) At AB 781' East, AB MCC 1A2-10C (1AP73E), place 1E12-F064A, RHR Pump 1A Minimum Flow Valve breaker to OFF.

   3) Information tag the MCR 1E12-F064A control switch and the local breaker as follows:

      "1E12-F064A is in the shut/deenergized position to ensure that an inadvertent loss of FC Surge Tank level and RHR suction head does not occur. Pump minimum flow protection previously provided by the F064A valve is now maintained by securing the RHR A pump when RHR A flow is < 1100 gpm."

8.2.2 **Fuel Pool Cooling And Cleanup Assist** (cont'd)

8.2.2.9 Line up RHR Loop A as follows: (cont'd)

2. Lineup valves/breakers as follows, including:

Information tag the MCR 1E12-F027A/F028A/F042A/F053A control switch and the local breaker as follows:

"1E12-F027A(28A)[42A]{53A} is in the shut/deenergized position during CPS 3312.03 FPC&A MODE to ensure that an inadvertent loss of FC Surge Tank level and RHR suction head does not occur."

**CAUTION**

*Do not open F066 until F004A and F064A are closed to prevent FC drain down to the suppression pool.*

| Valve | Valve Position | Breaker Position | Breaker Location |
|---|---|---|---|
| 1E12-F004A | Shut | On | AB MCC 1A2-8A |
| 1E12-F024A | Shut | On | AB MCC 1A2-8D |
| 1E12-F027A | Shut/INFO Tagged | OFF/Tag | AB MCC 1A2-9B |
| 1E12-F028A | Shut/INFO Tagged | OFF/Tag | AB MCC 1A4-10B |
| 1E12-F042A | Shut/INFO Tagged | OFF/Tag | AB MCC 1A3-13C |
| 1E12-F053A | Shut/INFO Tagged | OFF/Tag | AB MCC 1A3-7D |
| 1E12-F048A | Shut | On | AB MCC 1A2-10A |
| 1E12-F006A | Shut | On | AB MCC 1A2-8B |
| 1E12-F066 | OPEN (Monitor FC Surge Tank level when opening F066) | N/A - Local manual valves | AB 707' RHR A Pmp Rm Z-117 Normally locked valves |
| 1E21-F372 | OPEN | | |
| 1E12-F099 | Shut | | AB 712' By SF A |

8.2.2 **Fuel Pool Cooling And Cleanup Assist** (cont'd)

8.2.2.10 Verify RHR Pump A discharge piping filled and vented per CPS 3312.01 (RHR).

**NOTE**

*1E12-F099, RHR A To Fuel Pool Cooling Valve should be opened immediately after RHR Pump A is started to provide RHR A pump min flow protection.*

*1E12-F099 is a 12" manual gate valve and will be difficult to open.*

*Monitor water leg pump discharge pressure while opening 1E12-F099 to ensure the piping is being maintained full.*

8.2.2.11 (Local) Throttle open 1E12-F099, RHR A To Fuel Pool Cooling Valve ~ 1 inch off closed seat. AB 712' N of SF Pmp A, (Normally locked shut)

8.2.2.12 Monitor fuel pool surge tank level closely while placing RHR Loop A in this mode (Comp Pt FC-BA401).

**CAUTION**

*Do not permit RHR A flow to lower < 1100 gpm due to 1E12-F064A min flow protection for the RHR A pump being defeated. «CM-1».*

*If RHR Pump flow >1100 gpm cannot be established, then RHR Pump A must be secured.*

8.2.2.13 Start RHR Pump A, 1E12-C002A.

**NOTE**

*With the RHR pump running, 1E12-F099 is extremely difficult to operate.*

*Use an air impact gun or bow motor on the hex fitting to open 1E12-F099.*

8.2.2.14 (Local) Promptly open 1E12-F099, RHR A To Fuel Pool Cooling Vlv.

8.2.2 **Fuel Pool Cooling And Cleanup Assist** (cont'd)

8.2.2.15 Line up SX to RHR A Hx as follows:

1. Verify/place SX A PRM 1RIX-PR038, Shutdown Service Water A Effluent (SX) in service.

2. Shut 1SX082A, RHR A Hx MU Cond Inlet Vlv.

3. Open/verify open 1E12-F014A, SSW Inlet RHR A Hx Valve.

4. Open/verify open 1E12-F068A, RHR A Hx SSW Outlet Valve.

5. Verify cooling water flow through RHR A Hx on SSW To RHR A Hx Flow meter, 1E12-R602A.

   When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

   No flow adjustments required when SX supplying cooling.

8.2.2.16 Maintain control of cooldown rate using: *«CM-14»*
[Refer to Precaution 4.13 for throttle restrictions.]

1E12-F003A, RHR A Hx Outlet Valve, and/or

1E12-F048A, RHR A Hx Bypass Valve.

8.2.2.17 Maintain:

1. (Local) RHR Pump A suction pressure ≥ 2.1 psig, on 1E12-R002A at panel 1H22-P018.
   (e.g., Surge Tank level/
   Throttling of F003A and/or F048A.)

   The pump should be secured if the suction pressure cannot be maintained as required.

2. Flow > 1100 gpm to ensure that the minimum flow rate for RHR Pump A min flow protection is maintained.

8.2.3 **Fuel Pool Cooling And Cleanup Assist - Shutdown**

8.2.3.1 (Local) Shut 1E21-F372, Wtr Leg Pump Supply To RHR Pump A. AB 707' RHR A Pmp Rm. (Normally locked open)

**CAUTION**

*1E12-F099, RHR A To Fuel Pool Cooling Valve must be shut immediately after securing RHR Pump A to prevent draining RHR piping to the spent fuel pool.*

8.2.3.2 Stop RHR Pump A, 1E12-C002A.

8.2.3.3 (Local) Lock shut 1E12-F099, RHR A To Fuel Pool Cooling Valve, AB 712' N of SF Pmp A.

8.2.3.4 (Local) Lock shut 1E12-F066, RHR A Suct From Fuel Pool Cool Valve, AB 707' RHR Pmp Rm A Z-117.

8.2.3.5 Restoring 1E12-F064A:

1. Clear Information tag from the F064A control switch and breaker.

2. (Local) At AB 781' East, AB MCC 1A2-10C (1AP73E), place the 1E12-F064A breaker to ON.

3. Open 1E12-F064A, RHR Pump A Min Flow Recirc Valve.

8.2.3.6 Line up RHR Loop A as follows, including clearing Information tags from 1E12-F027A/F028A/F042A/F053A.

| Valve | Valve Position | Breaker Position | Breaker Location |
|---|---|---|---|
| 1E12-F003A | OPEN | On | AB MCC 1A2-7D |
| 1E12-F004A | OPEN | On | AB MCC 1A2-8A |
| 1E12-F024A | Shut | On | AB MCC 1A2-8D |
| 1E12-F027A | OPEN | On | AB MCC 1A2-9B |
| 1E12-F028A | Shut | On | AB MCC 1A4-10B |
| 1E12-F042A | Shut | On | AB MCC 1A3-13C |
| 1E12-F048A | OPEN | On | AB MCC 1A2-10A |
| 1E12-F053A | Shut | On | AB MCC 1A3-7D |

8.2.3 **Fuel Pool Cooling And Cleanup Assist - Shutdown** (cont'd)

8.2.3.7 Fill and vent RHR Loop A per CPS 3312.01 (RHR).

8.2.3.8 (Local) Lock open/verify locked open 1E21-F372, Wtr Leg Pump Supp To RHR Pump A.

8.2.3.9 Perform the following to secure SX flow through RHR Hx A:

**NOTE**

*Sub-steps '1 & 2' are designed to keep the Hx pressurized and prevents a loss of MC header pressure when 1SX082A is opened in the Hx flush.*

1. Shut 1E12-F068A, RHR A Hx SSW Outlet Valve.
2. Wait 15 - 30 seconds after close signal to 1E12-F068A, then shut 1E12-F014A, SSW Inlet RHR A Hx Valve.

8.2.3.10 Verify RHR Loop A in STANDBY per CPS 3312.01 (RHR) - Appendix A.

8.2.3.11 Secure FC support lineup as follows:

1. (Local) Lock shut 1FC002, FC Surge Tanks Outlet To RHR System Isolation, FB 722' AL-112.
2. (Local) Lock shut 1FC090, RHR Supply To FC Isolation. FB 750' AL-112.
3. If desired, restart FC as directed by SMngt per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

## 8.2.4 RHR SDC Header Leak-Off Line Operations *«EC 356820»*

1. RHR SDC Header Leak-Off line information:
   1) Normally remains isolated at power.
   2) Placed In-Service when alarm 5064-8F, SHUTDOWN HEADER PRESSURE HIGH is received.
   3) Isolated when RHR-SDC is in-service.
      Remains isolated following RHR-SDC operations until alarm 5064-8F is again received.
   4) Designed to handle up to 2 gpm leakage from 1E12-F008/F009, however, leakage as low as 0.6 gpm can result in high temperatures into RHR WLP.
   5) The SDC volume between 1E12-F006A/6B, F008/9 and the Div 2 RHR WLP is a Closed Loop Outside Containment (CLOC) boundary.
   6) Inadvertent cross-connecting of RHR A and RHR B via 1E12-F006A valve mispositioning will not result in a loss of RHR B/C WLP Keep-Fill system (Line sizing flow Calc IP-M-0562).

2. To place RHR SDC Header Leak-Off Line In-Service:
   1) (Local) Verify open 1E12-F422, S/D Cool Suct Line To RHR C HP Vent, AB 707' RHR C Pmp Rm.
   2) (Local) Open 1E12-F536, RHR SDC Header Leak-Off Line Isolation Valve, AB 707' RHR C Pmp Rm.
   3) Monitor 1E12-C003, RHR B/C WLP discharge temperature where it branches off to RHR B and C (1RH20A 2) at the section of piping outside the high rad area: [Preferred - Magnetic/clamp on RTD read remotely, Alternate - Surface pyrometer or equivalent]
      a) Shiftly- When leak rate (temp change) is changing
      b) Daily- When leak rate (temp change) is stable.
   4) **IF** WLP discharge reaches 120°F,
      **THEN** Notify Engineering.
   5) **IF** WLP discharge temp reaches 185°F,
      **THEN** Remove RHR SDC Header Leak Off Line from service.

3. To remove RHR SDC Header Leak-Off Line From Service:
   ☞ Normally performed in RHR-SDC Flushing steps.
   1) (Local) Shut 1E12-F536, RHR SDC Header Leak-Off Line Isolation Valve.

8.3 **ABNORMAL PERFORMANCE**

8.3.1 **Recovery from Loss of RHR Shutdown Cooling Flow** *«CM-22»*

**NOTE**

*Designated operators, both in the MCR and for local field operations, will be available to perform recovery from a loss of RHR Shutdown Cooling Flow event. (Section 2.1.4 and 2.2.1)*

8.3.1.1 **IF** RHR SDC is not needed to support decay heat removal,

or

Recovery of the RHR SDC Loop that was in SDC is not anticipated.

**THEN**

1. Complete 'Securing a SDC Loop' per 8.1.6.
2. Place other RHR loop in SDC, if desired, using 8.1.2 or 8.1.4 for the RHR Loop to be placed in service.

**OTHERWISE** Proceed to section 8.3.1.2 for SDC recovery in MODEs 3 and 4

or

Proceed to section 8.3.1.3 for SDC recovery in MODE 5.

8.3.1.2 **MODEs 3 and 4: Loss of SDC Flow Recovery - Same Loop**

1. Correct the cause of the Loss of RHR SDC Flow.
2. Verify WS available to RHR A(B) Hx, or start Div 1(2) SX per CPS 3211.01, Shutdown Service Water (SX).

**NOTE**

*Rx Vessel Level may rise when the suction path is restored due to back-leakage through the RHR Pump Discharge Check Valve.*

3. Open/verify open:
   1) 1E12-F048A(B), RHR A(B) Hx Bypass Valve.
   2) 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv.
   3) 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.
   4) 1E12-F006A(B), RHR A(B) Shutdown Cooling Suct Valve.

8.3.1.2 **MODEs 3 and 4: Loss of SDC Flow Recovery - Same Loop** (cont'd)

4. **IF** RHR A(B) PUMP DISCHARGE PRESSURE ABNORMAL annunciator 5064-5F (5065-5A), is alarmed,

   **THEN** Shut 1E12-F027A(B), RHR A(B) To CNMT Outbd Isol Valve,

   ☞ See Limitation 6.6.

   - Verify RPV Level was maintained ≥ 75 inches on shutdown range during the loss of SDC event.

   **OTHERWISE** Proceed to sub-step 8.3.1.2.7.

5. **IF** RPV Level was < 75 inches, on shutdown range at any time during loss of SDC event,

   or

   Loss of SDC was due to isolation of the RHR Pump suction path which could not be promptly restored,

   or

   Suction path was isolated for any amount of time with section 8.2.1, Draining RPV Water To Radwaste During SDC Operation, in use,

   **THEN** Fill and Vent RHR A(B) Hx Header as follows: (Hard pipe drain lines, vent equipment not needed)

   1) If CY is available, then open 1E12-F063A(B), RHR Pump A(B) Disch Hdr Flush Wtr Supply (Elevated RAD area).
   2) Open 1E12-F358A(B), RHR Hx Inlet High Point Vent.
   3) Verify RHR A(B) Hx Header is filled by slowly opening 1E12-F357A(B), RHR Hx Inlet High Point Vent Valve, and establishing a solid stream of water.
   4) Shut 1E12-F357A(B).
   5) Shut 1E12-F358A(B).

6. Initiate SDC flow as follows: (Local)

   **IF** 1E12-F063A(B) was opened to fill & vent in sub-step 8.3.1.2.5,

   **THEN** Just prior to starting the RHR A(B) Pump (to avoid losing fill & vent), shut 1E12-F063A(B), RHR Pump A(B) Disch Hdr Flush Wtr Supply.

8.3.1.2 **MODEs 3 and 4: Loss of SDC Flow Recovery - Same Loop** (cont'd)

7. Verify/place SX A(B) PRM 1RIX-PR038(039), Shutdown Service Water A(B) Effluent (SX) in service.

   ☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

**CAUTION**

*Do not permit SDC flow to lower < 1100 gpm due to 1E12-F064A(B) min flow protection for the RHR A(B) pump being defeated.*

*If SDC flow >1100 gpm cannot be established, then RHR Pump A(B) must be secured.*

8. Start RHR A(B) Pump, 1E12-C002A(B), and immediately open either:

   1) 1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Vlv,

   or

   2) 1E12-F042A(B), LPCI Fm RHR A(B) Shutoff Valve if in alternate SDC.

9. Verify SDC flow ≥ 2000 gpm on RHR Pump A(B) Flow meter, 1E12-R603A(B).

   ☞ Do not allow flow to exceed 5350 gpm.

10. (Local) Verify 1SX029A(B), SX Outlet RHR A(B) Pump Seal Cooler Valve opens.

11. Initiate cooldown as follows:

    1) Open 1E12-F068A(B), RHR A(B) Hx SSW Outlet Valve.

    2) Verify cooling water flow through RHR A(B) Hx on SSW To RHR A(B) Hx Flow meter, 1E12-R602A(B)

       When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

       No flow adjustments required when SX supplying cooling.

    3) Maintain cooldown rate and flow using as appropriate: [Refer to Precautions 4.1 and 4.13 for throttling restrictions on the following valves.]

       1E12-F003A(B), RHR A(B) Hx Outlet Valve.

       1E12-F048A(B), RHR A(B) Hx Bypass Valve.

       1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Vlv.

8.3.1.2 **MODEs 3 and 4: Loss of SDC Flow Recovery - Same Loop** (cont'd)

12. Verify appropriate fan operation:

    1) RHR Hx Rm A(B) Sply Fan, 1VY03C(5C) cycles on room temperature.

    2) RHR Pmp Rm A(B) Sply Fan, 1VY02C(6C) starts with RHR Pump A(B).

13. RHR to Fuel Pool Header Filled-Verification

    1) Prepare 1E12-F330A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent as follows:

       a) Verify shut 1E12-F330A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

       b) Remove cap from 1E12-F330A(B).

       c) Connect a hose to the vent and route to a floor drain or container.

    2) Verify shut 1E12-F329A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

    3) Open 1E12-F330A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

    4) RHR A(B) Discharge Header Full Verification

       a) Unlock 1E12-F329A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

       b) Verify RHR A(B) discharge header is filled by slowly opening 1E12-F329A(B) and establishing a solid stream of water.

       c) Lock shut 1E12-F329A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

    5) Secure 1E12-F330A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent as follows:

       a) Shut 1E12-F330A(B), Upper Pool S/D Cool Supply Hdr A(B) HP Vent.

       b) Remove the hose from 1E12-F330A(B).

       c) Reinstall cap on 1E12-F330A(B).

8.3.1.2 **MODEs 3 and 4: Loss of SDC Flow Recovery - Same Loop** (cont'd)

14. Fill and Vent RHR A(B) CNMT Spray Header for opening 1E12-F027A(B) as follows:

    1) Verify/establish RHR flow > 5000 gpm.

    2) Verify/establish RPV level < 100" on shutdown range.

    3) When CY is available, unlock and open 1E12-F044A(B), Upper Pool S/D Cool Hdr A(B) Flush Wtr Supp.

    4) Prepare 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve for venting as necessary.

    5) Open 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve.

    6) Verify RHR A(B) CNMT Spray Header is filled by slowly opening 1E12-F331A(B), CNMT Spray Supp Hdr A(B) Vent Valve, and establishing a solid stream of water. (Normally locked shut)

    7) Lock shut 1E12-F331A(B), CNMT Spray Hdr A(B) Vent Valve.

    8) Shut 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve.

    9) Just prior to opening 1E12-F027A(B), shut 1E12-F044A(B), RHR Pump A(B) Disch Hdr Flush Wtr Supply. (minimizes D/P across 1E12-F027A(B))

    10) Open 1E12-F027A(B), RHR A(B) To CNMT Outbd Isol Valve

    11) Remove any venting equipment used from 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve.

8.3.1.3 **MODE 5: Loss of SDC Flow Recovery - Same Loop**

1. Correct the cause of the Loss of RHR SDC Flow.

2. Verify WS available to RHR A(B) Hx, or start Div 1(2) SX per CPS 3211.01, Shutdown Service Water (SX).

**NOTE**

*Rx Vessel Level may rise when the suction path is restored due to back-leakage through the RHR Pump Discharge Check Valve.*

3. Open/verify open:
   1) 1E12-F048A(B), RHR A(B) Hx Bypass Valve.
   2) 1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv.
   3) 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.
   4) 1E12-F006A(B), RHR A(B) Shutdown Cooling Suct Valve.

4. **IF** RHR A(B) PUMP DISCHARGE PRESSURE ABNORMAL annunciator 5064-5F (5065-5A) is alarmed and Upper Containment Pool is not at ~ 827' Elev,

   or

   Loss of SDC was due to isolation of the RHR Pump suction path,

   **THEN** Fill and Vent RHR A(B) CNMT Spray Header:
   1) Unlock and Open 1E12-F044A(B), Upper Pool S/D Cool Hdr A(B) Flush Wtr Supp.
   2) Prepare 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve for venting as necessary.
   3) Open 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve.
   4) Verify RHR A(B) CNMT Spray Header is filled by unlocking & slowly opening 1E12-F331A(B), CNMT Spray Supp Hdr A(B) Vent Valve, and establishing a solid stream of water.
   5) Lock shut 1E12-F331A(B), CNMT Spray Hdr A(B) Vent Valve.
   6) Shut 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve.
   7) Remove any venting equipment used from 1E12-F332A(B), CNMT Spray Hdr A(B) Vent Valve

**OTHERWISE** Proceed to sub-step 8.3.1.3.6.

8.3.1.3 **MODE 5: Loss of SDC Flow Recovery - Same Loop** (cont'd)

5. Initiate SDC flow as follows: (Local)

   **IF** 1E12-F044A(B) was opened to fill & vent in sub-step 8.3.1.3.4,

   **THEN** Just prior to starting the RHR A(B) Pump (to avoid losing fill & vent) shut 1E12-F044A(B), RHR Pump A(B) Disch Hdr Flush Wtr Supply.

6. Verify/place SX A(B) PRM 1RIX-PR038(039), Shutdown Service Water A(B) Effluent (SX) in service.

   ☞ This step can be deferred if recovering from a Loss of RHR SDC Flow event.

**CAUTION**

*Do not permit SDC flow to lower < 1100 gpm due to 1E12-F064A(B) min flow protection for the RHR A(B) pump being defeated.*

*If SDC flow > 1100 gpm cannot be established, then RHR Pump A(B) must be secured.*

7. Start RHR A(B) Pump, 1E12-C002A(B), and immediately open:

   1) 1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Vlv,

   and/or

   2) 1E12-F037A(B), RHR A(B) To CNMT Pool Cooling Shutoff Vlvs

      ☞ Do not throttle 1E12-F037A < 4300 gpm.

8. Verify SDC flow ≥ 2000 gpm on RHR Pump A(B) Flow meter, 1E12-R603A(B).

   ☞ Do not allow flow to exceed 5350 gpm.

9. (Local) Verify 1SX029A(B), SX Outlet RHR A(B) Pump Seal Cooler Valve opens.

8.3.1.3 **MODE 5: Loss of SDC Flow Recovery - Same Loop** (cont'd)

10. Initiate cooldown as follows:

    1) Open 1E12-F068A(B), RHR A(B) Hx SSW Outlet Valve.

    2) Verify cooling water flow through RHR A(B) Hx on SSW To RHR A(B) Hx Flow meter, 1E12-R602A(B).

       When WS is supplying cooling flow, adjust/maintain cooling flow to ~ 5000 gpm (optimum heat removal flow rate for WS).

       No flow adjustments required when SX supplying cooling.

    3) Maintain cooldown rate and flow using as appropriate: [Refer to Precautions 4.1 and 4.13 for throttling restrictions on the following valves.]

       1E12-F003A(B), RHR A(B) Hx Outlet Valve.

       1E12-F048A(B), RHR A(B) Hx Bypass Valve.

       1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Vlv.

11. Verify appropriate fan operation:

    1) RHR Hx Rm A(B) Sply Fan, 1VY03C(5C) cycles on room temperature.

    2) RHR Pmp Rm A(B) Sply Fan, 1VY02C(6C) starts with RHR Pump A(B).

8.3.1.4 **RHR SDC Flow Recovery Guidelines**

- Safety Significance/Impact Guidance

  Loss of up to both loops of SDC is an analyzed event.

  Fuel damage is not a near term concern.

  CPS 4006.01, Loss Of Shutdown Cooling maintains ITS/ORM criteria relating to potential MODE changes.

  Actions taken to recover a RHR SDC Loop should be timely in nature, but does not necessitate deviations from normal procedure steps.

  Considerable changes in core damage frequency can occur due to mis-operation of the RHR system, or by defeating valve isolation interlocks.

  System damage is possible when required warm-ups, line-ups, and/or fill & vents are not fully completed.

  Deviation from normal procedure expectations is not recommended unless justified by an event which threatens adequate core/fuel cooling, or to minimize adverse radiological conditions.

  Designated operators, both in the MCR and for local field operations, will be available to perform recovery from a loss of RHR Shutdown Cooling Flow event.

- Flushing Criteria Guidance

  Initial flushing of both RHR SDC loops will generally occur following each plant shutdown when entry into MODE 4 is expected.

  Additional flushing should not be necessary to recover the RHR SDC Loop that was previously in service, to place the standby RHR SDC Loop in service to support meeting ITS 1 hour action statement for restoring coolant circulation, or to avoid other ITS violations (i.e., unplanned MODE change).

  Flushing of standby RHR SDC Loop should be performed prior to placing the standby RHR SDC Loop in service if:

  1. The last chemistry sample on the Suppression Pool per CPS 6001.01, Sampling And Analysis Requirements exceed prescribed limits. (sample performed monthly)
  2. Have reason to suspect Suppression Pool water quality has degraded since last sample (i.e., oil leak, etc.)
  3. The standby RHR SDC Loop is not being placed in service to restore coolant circulation within one hour as required per ITS, or to avoid other ITS violations (i.e., unplanned MODE change).

8.3.1.4 **RHR SDC Flow Recovery Guidelines**

**IF** Flushing is determined to be required,

**THEN** Complete the task of 'Securing a SDC Loop' per section 8.1.6. A timely recovery of the RHR SDC Loop should not be anticipated.

9.0 **ACCEPTANCE CRITERIA** - None

10.0 **FINAL CONDITIONS** - None

11.0 **REFERENCES**

11.1 **Licensing Basis Documents**

11.1.1 LBD-1: ITS LCO 3.1.1: SDM *«6.5.1»*

11.1.2 ITS LCO 3.4.9/10: SDC Loops OPERABILITY

11.1.3 ITS LCO 3.4.11: PT Limits

11.1.4 ITS SR 3.4.11.1.b: PT Limits: HU/CD rate

11.1.5 ITS SR 3.4.11.5/6/7: PT Limits: RPV Head Flange Temp

❸ 11.1.6 ITS LCO 3.5.1/2: ECCS OPERATING/RPV WATER INVENTORY CONTROL

❸ 11.1.7 ITS SR 3.5.1.2/3.5.2.5 NOTE: ECCS: RHR SDC line-up

11.1.8 ITS LCO 3.6.1.7: Containment Spray

11.1.9 ITS SR 3.6.1.7.1 NOTE: CNMT Spray: RHR SDC line-up

11.1.10 ITS LCO 3.6.1.9: Feed Water Leakage Control System (FWLCS)

11.1.11 ITS LCO 3.6.2.3: Suppression Pool Cooling

11.1.12 ITS LCO 3.9.8/9: SDC Loops OPERABILITY: Special

11.1.13 USAR 5.4.7, 5.4.7.1.1.1, 5.4.7.1.5, 5.4.7.2.2(2), 5.4.7.2.7, Figure 5.4-13, 6.3.2.2.5, 7.1.2.1.25.3, 7.4.1.3, 7.4.2.3, 9.1.3.2, Figure 9.2-2, 15.2.9, Fire Protection Shutdown Analysis 3.1.2.2, 3.1.3.2, 3.2.1.2, 3.3.2.2

11.1.14 LBD-2: USAR 5.4.7.2.6: 1E12-F008/F006B Bkr Control *«6.3, 8.1.6.6.5, 8.1.6.7.8.2»*

❶ 11.1.15 Letter Y-108837 B45-99 (04-26)-L (re: 150F Temperature limits on MOVs)

❶ 11.1.16 D21-99 (04-26)-L CR 1-98-12-059 (re: 150F Temperature limits on MOVs)

❶ 11.1.17 CR 1-97-07-006 (re: 150F Temperature limits on MOVs)

❶ 11.1.18 Letter Y-105681 B45-95 (11-29)-L (re: 150F Temperature limits on MOVs)

11.0 **REFERENCES** (Cont'd)

11.2 **CPS Procedures**

11.2.1 CPS 3208.01, Cycled/Makeup Condensate (CY/MC)

11.2.2 CPS 3211.01, Shutdown Service Water (SX)

11.2.3 CPS 3303.01, Reactor Water Cleanup (RT)

11.2.4 CPS 3312.01, Residual Heat Removal (RHR)

11.2.5 CPS 3312.02, Alternate Shutdown Cooling (A-SDC) Methods

11.2.6 CPS 3315.03, Radiation Monitoring (AR/PR)

11.2.7 CPS 3317.01, Fuel Pool Cooling And Cleanup (FC)

11.2.8 CPS 4001.02, Automatic Isolation

11.2.9 CPS 4006.01, Loss Of Shutdown Cooling

11.2.10 CPS 6001.01, Sampling And Analysis Requirements

11.2.11 CPS 9000.06D001, Heatup/Cooldown, Inservice Leak And Hydrostatic Testing 30 Minute Temperature Log

11.2.12 CPS 9000.06D003, Shutdown Cooling Temperature Data Sheet

11.3 **Design/Vendor/Print/Other**

11.3.1 1E12-F027 D/P Limits for Loss of SDC Recovery:
NSED Ltr Y-107294 3/17/99, NSED Calc. IP-M-303 R/5

11.3.2 RPV Level Limit (75") for Loss of SDC Recovery:
NSED Calc IP-C-0052 R/0

11.4 **Commitments**

11.4.1 Condition Reports

1. CM-1: F064 RPV Bypass Flow:
CRs 1-85-02-019 & 1-85-10-149
*«CAUTIONs #2 for 8.1.2.18 & 8.1.4.18;*
*CAUTION for 8.1.6.3 & 8.2.2.13»*

2. CM-2: SDC/FPC&A Voids/Fill & Vent: CR1-89-11-034
*«4.5; 6.9; 8.1.2.8, 8.1.4.8;*
*NOTE for 8.1.2.8, 8.1.2.12, 8.1.4.8 & 8.1.4.12»*

3. CM-3: RHR A/LPCS Dual Limits: CR1-90-10-058 *«4.8»*

4. CM-4: F042 CAUTION Tag: CR1-92-05-050
*«8.1.2.6, 8.1.4.6, 8.1.6.7.10»*

5. CM-5: CR1-99-02-306: Performance of Suppression Pool Let Down Places RHR Loop A Outside ITS criteria.
*«CAUTION #2 for 8.2.1.2.4»*

6. CM-6: IR1462047: IER 11-41 *«4.12»*

11.0 **REFERENCES** (Cont'd)

11.4.2 Letters/SILS/IE Bulletins/Other

1. CM-6: Reject Water To RW:
   NSED Letter Y-093883, Ruwe 4/23/90
   *«4.6; CAUTION #3 for steps 8.1.2.12, & 8.1.4.12; CAUTION #1 for 8.2.1.1.3 & 8.2.1.2.4»*

2. CM-7: SDC Warmup Concerns: GE SIL-175 Cat 2
   *«CAUTIONs #1 & #2 for 8.1.2.12 & 8.1.4.12»*

3. CM-8: RR Stratification Concerns: GE SIL-357 *«4.2, 4.3»*

4. CM-9: SDC & FC Temp Limits: ISEG Review #92-029, Eval of NUMARC 91-06 guideline 4.4.2.1 (Ltr Y-215229)
   *«6.5.1»*

11.4.3 Licensing/Engineering Issues

1. CM-10: RHR Flush/Warmup Step Seq:
   LER 89-030-00, OPs Critique OP-89-066
   *«8.1.1.5 - 9, 8.1.3.6 - 8»*

2. CM-11: SDC/Head Removal Limits: SER 7-87
   *«4.2, 4.3; 2nd CAUTION for 8.1.1, 8.1.3 & CAUTION for 8.1.6.3»*

3. CM-12: Shutting F004 Limits: SOER 87-2
   *«8.1.1.3.4, 8.1.2.5.4, 8.1.3.3.4, 8.1.4.5.4»*

4. CM-13: F008/F006B Hot Short Actions: SS ANALY U-0630
   *«6.3, 8.1.6.6.3/5, 8.1.6.7.8.2»*

5. CM-14: F003/47/48 Flow High DP Limits: GL89-10
   (4.13, 8.1.2.21.6, 8.1.4.21.6, 8.2.2.16)

6. CM-15: F064/04 Step Order: GL89-10 *«8.1.6.7.6»*

7. CM-16: Level Notching:
   NRC Bul 93-03/Gen Ltr 92-04/IN 92-54
   *«CAUTION #1 for 8.1.2.18 & 8.1.4.18»*

8. CM-17: F027 Inop When Shut: GL89-10/CR1-83-09-017
   *«6.6, CAUTION for 8.2.2.4»*

9. CM-18: F064 Opening Capability:
   L&S memo Y-213326 5/1/91 *«6.7»*

10. CM-19: Thermal Binding Concerns: GL95-07
    *«4.7, 4.9, 6.6, 6.8, 8.1.3; CAUTION #1 for 8.1.1/3, CAUTION for 8.1.2/4, CAUTION for 8.1.6.1»*

11. CM-20: RHR Hx Layup Criteria:
    NSED ROC U086-96(6-28)96-6 *«6.1»*

12. CM-21: RHR Pump Seal Temp Limit:
    NSED Ltr Y-90606 2/6/89 *«6.4»*

13. CM-22: LER 98-036: *«8.3.1»*

14. CM-23: Min Flow/Deadheading: EC Eval 343951, IP Ltr U-601223, IEIN 87-59 *«4.4»*

12.0 **DOCUMENTS**

12.1 CPS 3312.03C001, Alternate SDC Temperature Monitoring Checklist

12.2 CPS 3312.03H001, Securing RHR - Shutdown Cooling (If Operating) Hard Card

# AUTOMATIC ISOLATION

***SCOPE OF REVISION:***

- Incorporated Specific Rev's 16a - 16e, rev marks not retained.
- IR 802909: Added 4.9.3.7 reset guidance for an RT system high temperature.
- PCRA 1006612-02: Enhanced 4.5 SLC start criteria per EC 340118/Calc IP-M-0726.

❶ Specific Rev. 17a [Jeans] Editorial
IR 1328827, Correct switch name
(remove 02 from PASS OB Isol Vlv name, add switch number)

❷ Specific Rev. 17b [Leffel] Editorial
IR 1692282, Correct ITS reference for SLC to 3.1.7

❸ Specific Rev. 17c [Leffel]: IR 2418744 to add Attachment 1, Auto Initiation / Actuation Checklist to assist with verifications, especially per EOP-1 and EOP-1A (Dodds).

❹ Specific Revision 17d [Stokes]: IR 2598553-03 Enhanced step 4.5.1 by adding within 20 minutes which is the TCA1 Required Action time limit for having FWLCS in service.

❺ Specific Revision 17e [Helton]: IR 4010227-60 (CA) - Added steps (verbiage) to various sections to have operators notify Security when specific plant conditions change. Fixed minor format errors and typos, rev. balls not used.

❻ Specific Revision 17f [J. Delaney]: Editorial, IR 2452136-02 - Added locations and reordered components by building/floor in Table 1.

**REFERENCE USE**

**ORIGINATOR:** *Thomas J. Landin* **CLASS CODE:** *SNNN*

**SQR:** *Ken Leffel* **APPROVAL DATE:** *07/06/2010*

*CURRENT CHANGES TO GENERAL REVISION*

| | Change # | Date | List of Affected Pages |
|---|---|---|---|
| ❶ | 17a | 02/20/12 | 1, 8 |
| ❷ | 17b | 10/21/14 | 1, 9 |
| ❸ | 17c | 12/11/14 | 1, 2, 10, 14 |
| ❹ | 17d | 01/13/17 | 1, 3, 10 |
| ❺ | 17e | 08/29/17 | 1, 4, 10, 11 |
| ❻ | 17f | 09/25/17 | 1, 12-18 |

1.0 **SYMPTOMS** - Refer to Automatic Isolation Signals section of CPS 4001.02C001, Automatic Isolation Checklist.

2.0 **AUTOMATIC ACTION** - Refer to AUTOMATIC ISOLATION CHECKLIST for automatic isolation conditions and applicable GROUPs.

3.0 **IMMEDIATE OPERATOR ACTION** - NONE

4.0 **SUBSEQUENT ACTION**

4.1 **IF** A radioactive release is suspected (DW/CNMT/Sec CNMT/Outside CNMT),

**THEN**
1. Evacuate the effected areas.
2. Notify RP.
3. Refer to the appropriate CPS 4979 series Radioactivity Off-Normals for action.

4.2 **IF** An isolation is required, but cannot be accomplished from the MCR,

and

A reactor coolant boundary breach is suspected,

**THEN** Scram the reactor per CPS 4100.01, Reactor Scram.

4.3 **IF** CCW to CNMT (GROUP 8) Isolation has occurred,

**THEN** Stop RR Pumps per CPS 3302.01, Reactor Recirculation (RR).

❸ **NOTE**

*Attachment 1, Auto Initiation/Actuation Checklist can be used to assist with verification of significant automatic initiations and actuations at various setpoints [HARD Card at P601]).*

*Attachment 1 is not an all-inclusive list and does not replace performance of this procedure.*

4.4 **IF** A GROUP 1 isolation has occurred,

**THEN** Perform applicable portions of CPS 4100.01, Reactor Scram, whether or not a scram has occurred.

4.0 **SUBSEQUENT ACTION** (Continued)

4.5 **IF** DBA LOCA signature is identified,

- Leakage resulting in low RPV level (-145.5"), and Hi Drywell Pressure (> 1.68 psig).
- Leakage requiring isolation of the MSIVs or 1B21-F065A and B, RPV Inlet Valves.
- SMngt/ERO discretion for containment integrity.

❹ **THEN** 1. Start Feedwater Leakage Control System (FWLCS) per CPS 3312.01, Residual Heat Removal (RHR) within 20 minutes following a DBA LOCA signature identification.

❶ 2. **WHEN** < TAF (-162 in.),

**THEN** Within 3 hours of being < TAF, start/verify running Standby Liquid Control (SLC) System per CPS 4411.10, SLC Operations. *«LBD-1»*

4.6 **IF** Emergency Post Accident Sampling Panel is required,

**THEN** 1. Place following switches in BYPASS,

1H13-P638: PASS OB ISOL VLVS LOCA BYPASS
1H13-P639: PASS IB ISOL VLVS LOCA BYPASS

2. Reset the shunt tripped breakers needed for sampling per TABLE 1, SHUNT TRIPS "‡" items.

**CAUTION**

*Operation of CRVICS buttons, and ECCS actuation buttons may cause system isolations and actuations that are not necessary.*

(4.7) Complete CPS 4001.02C001, Automatic Isolation Checklist for affected isolation GROUPs, including the performance of manual isolation of components/systems that have failed to automatically isolate.

☞ Manual switch isolation may also be accomplished by individual GROUP operation as follows:

1. GROUP 1

Arm & Depress CRVICS MANUAL INITIATION push-button(s):

LOGIC A & D push-buttons (Outboard valves)
LOGIC B & C push-buttons (Inboard valves)

2. GROUPs 2 - 4, 8, 10, 12, 14 - 16, 19 and part of 20

Arm & Depress CRVICS MANUAL INITIATION push-button(s):

LOGIC A push-button (Outboard valves)
LOGIC B push-button (Inboard valves)

(4.7 Continued next page)

(Step 4.7 Continued)

3. GROUP 6

1) If a RCIC initiation signal does not exist,

Arm & Depress RCIC MANUAL INITIATION push-button.

2) Depress the RCIC MANUAL ISOLATION push-button.

4. GROUPs 11 & 17

Arm & Depress LPCS/LPCI FM RHR A MANUAL INITIATION push-button (Outboard valves)

Arm & Depress LPCI FM RHR B & C MANUAL INITIATION push-button (Inboard valves)

4.8 Refer to CPS Emergency Plan Annex (EP-AA-1003).

❺ 4.9 For abnormal or emergency operations (EOPs, Off Normal, etc.), promptly notify Security to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

❺ 4.10 If RCIC is made unavailable, notify Security to implement compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

❺ 4.11 Verify with Security that appropriate actions are taken.
*(CA#4010227-60) «CM-3»*

## 4.10 SYSTEM RESTORATION

### 4.10.1 PRECAUTIONS

1. If it is suspected that there is a breach in the integrity of the system, the system should not be returned to service until it has been positively verified by visual inspection of accessible areas and by available AR/PR instrumentation and other available indications for inaccessible areas that the system is physically intact and operation of the system will not result in an uncontrolled release to the environment.

2. No system should be restored to service before the cause of the isolation has been determined and the affected system is isolated.

3. Obtain RP concurrence prior to restoring ventilation to an area where a release may have occurred.

4. Contact RP prior to rejecting any water from the CNMT.

5. Realigning RHR SDC to LPCI while piping is > 212°F could result in severe water hammer.

   RHR SDC should be depressurized and refilled prior to swapping to LPCI. *«CM-2»*

6. Use the AR/PR system to ensure that a system is intact after restoration.

### 4.10.2

**WHEN** Isolation conditions no longer exist, and

System restoration is desired,

**THEN**

1. Refer to the system's operating procedure for operation and restoration guidance, including the ABNORMAL section as applicable.

2. Reset isolation signals per section 4.9.3, Isolation Signal Reset steps for the applicable GROUP isolation signal.

3. (Local) Reset applicable shunt trips. Refer to Table 1, SHUNT TRIPS.

   ☞ Resetting TB MCC 1M Fdr Bkr (1AP71E) should be given priority when RFP 1C is needed.

   This circuit feeds the hydraulic control for 1FW004, RFP 1C Flow Control Valve, and RFP 1C Aux Oil Pump.

4.10.3 **ISOLATION SIGNAL RESET**

4.10.3.1 **GROUPs 1 - 4, 8, 10, 14 - 16, 19 and part of 20**

☞ Refer to 4.9.3.6 for GROUP 20 valves 1PS043A/B & 1PS044A/B.

**NOTE**

*Sub-step '1' is used to reset isolations caused by HVAC High Rad PRM's signals only.*

*Sub-step '2' is used to reset isolations caused by all other signals except HVAC High Rad PRM's.*

*Both sub-steps '1 & 2' must be performed if HVAC High Rad signals occurred concurrently with other isolation signals.*

1. Resetting Isolations caused by HVAC High Rad Signals

1) For the applicable GROUP(s) being reset:

Place the GROUP valve control switches listed in CPS 4001.02C001 annotated with an asterisk (*) to the CLOSE position.

**GROUP 10, 16, 19, 20**

2) Momentarily place CNMT HVAC ISOL VLV RAD INTLK keylock switches to:

a) TOTAL BYP for GROUP 10, 16, 19 & 20 isolations caused by:

CNMT Bldg CCP Exh Rad - High,

CNMT Bldg Exh Rad - High, or

CNMT Bldg Fuel Transfer Pool Vent Plenum Rad - High.

b) FUEL BLDG BYP for GROUP 19 isolation caused by:

FB Exh Rad - High.

☞ Section 4.9.3.1 continued on next page.

4.10.3 **ISOLATION SIGNAL RESET** (cont'd)

4.10.3.1 **GROUPs 1 - 4, 8, 10, 14 - 16, 19 and part of 20** (cont'd)

2. Resetting Isolations NOT caused by HVAC High Rad Signals

☞ Refer to 4.9.3.6 for GROUP 20 valves 1PS043A/B & 1PS044A/B.

1) For the applicable GROUP(s) being reset:

Place the GROUP valve control switches listed in CPS 4001.02C001 annotated with an asterisk (*) to the CLOSE position.

Valves indicated with a double asterisk (**) shall be positioned to the OPEN position.

**GROUP 1, 2, 3, 4, 14, 15, 16, 19**

**GROUP 8**

In addition to the GROUP 8 valve control switches, the following GROUP 15 valve control switches need to be placed in CLOSE due to the 'slave' relationship with the GROUP 8 valves.

1RE019, DW Eq Drain Sump Disch Inbd Vlv (Gr 15)

1RE020, DW Eq Drain Sump Disch Outbd Vlv (Gr 15)

**CAUTION**

*If the FC Surge Tank was being filled thru 1FC038 prior to the isolation, it will automatically re-open if the switch is in OPEN when the OUTBD ISOLATION SEAL-IN RESET push-button is depressed.*

2) Depress the OUTBD ISOLATION SEAL-IN RESET and INBD ISOLATION SEAL-IN RESET push-buttons.

3) To reset GROUP 8 isolation signal for 1E22-F023, HPCS Test Valve To Suppr Pool, depress the HPCS SEAL-IN RESET push-button.

4.10.3 **ISOLATION SIGNAL RESET** (cont'd)

4.10.3.2 **GROUPs 5 and 6**

1. Place the GROUP 5 and 6 valve control switches listed in CPS 4001.02C001 to AUTO-AFTER-CLOSE or CLOSE position.

2. Place following switches to RESET and return to NORMAL.

   RCIC DIV 1 ISOLATION RESET

   RCIC DIV 2 ISOLATION RESET

4.10.3.3 **GROUPs 7 and 9**

These GROUPs do not require manual resetting since these isolation signals automatically reset.

4.10.3.4 **GROUPs 11 and 17**

1. Place the GROUP 11 and 17 valve control switches listed in CPS 4001.02C001 to AUTO-AFTER-CLOSE or CLOSE position.

2. Depress LPCS/LPCI FM RHR A SEAL-IN RESET and LPCI FM RHR B/C SEAL-IN RESET push-buttons.

4.10.3.5 **GROUPs 13 and 18**

1. Place the GROUP 13 and 18 valve control switches listed in CPS 4001.02C001 to AUTO-AFTER-CLOSE or CLOSE position.

2. Arm & Depress CNMT LEVEL 1 ISOLATION RESET push-button, and verify red indicating light de-energizes.

3. Depress CNMT LVL-1 ISOL SIGNAL RESET push-button, and verify red indicating light de-energizes.

4.10.3 **ISOLATION SIGNAL RESET** (cont'd)

4.10.3.6 **GROUPs 12 and part of 20 (1PS043A/B and 1PS044A/B)**

1. Place the GROUP 12 and part of GROUP 20 (1PS043A/B and 1PS044A/B) valve control switches listed in CPS 4001.02C001 annotated with an asterisk (*) to AUTO-AFTER-CLOSE or CLOSE position.

2. Place following switches to BYPASS:

❶ 1H13-P638:
PASS OB ISOL VLVS LOCA BYPASS
**AND**
$H_2$ CNTM ATMOS MONITORING SYS ISOL VLVS LOCA BYPASS 1HSCM074

1H13-P639:
PASS IB ISOL VLVS LOCA BYPASS
**AND**
$H_2/O_2$ CNTM ATMOS MONITORING SYS ISOL VLVS LOCA BYPASS

3. For GROUP 12 & 20 isolations caused by CNMT Bldg Exh Rad - High, momentarily place the CNMT HVAC ISOL VLV RAD INTLK keylock switches to TOTAL BYP.

4. For GROUP 12 & 20 isolations not caused by CNMT Bldg Exh Rad - High, depress **BOTH** the INBD ISOLATION SEAL-IN RESET **AND** OUTBD ISOLATION SEAL-IN RESET push-buttons.

5. Reset the following switches to NORMAL:

❶ 1H13-P638:
PASS OB ISOL VLVS LOCA BYPASS
**AND**
$H_2$ CNTM ATMOS MONITORING SYS ISOL VLVS LOCA BYPASS 1HSCM074

1H13-P639:
PASS IB ISOL VLVS LOCA BYPASS
**AND**
$H_2/O_2$ CNTM ATMOS MONITORING SYS ISOL VLVS LOCA BYPASS

❶ 4.10.3.7 **Filter Demineralizer Inlet Temperature High 140°F**

1. Reset/verify reset 5000-1C, F-D INLET TEMP HI 140°F.

2. Depress OUTBD ISOLATION SEAL-IN RESET push-button.

5.0 **FINAL CONDITIONS**

5.1 The cause for the isolation(s) has been determined and the affected system(s) is isolated.

5.2 The automatic isolation signal(s) has been reset and the unaffected systems have been restored to normal operation.

6.0 **DISCUSSION**

6.1 Automatic isolation provides protection against the onset and consequences of accidents involving the gross release of radioactive materials from the CNMT.

This protection is the automatic isolation of appropriate pipelines which penetrate the CNMT and/or DW whenever certain monitored variables exceed a preselected operational limit.

6.2 **Feed Water Leakage Control System (FWLCS)** [USAR 5.4.7]

1. The FWLCS creates a water seal at the outboard feedwater isolation check valves (1B21-F032A/B) and gate valves (1B21-F065A/B) within 1 hour following a DBA LOCA, and maintains the seal for a 30 day period.
2. The feedwater fill operation begins ~ 20 minutes after identification of a DBA LOCA (with no feedwater injection capability) by remote manual operation.

   The subsystem is designed to divert flow from RHR A(B) LPCI, Suppression Pool Cooling and Containment Spray Modes without reducing flows in those modes below the modes functional design basis.

❺ 6.3 For abnormal or emergency operations (EOPs, Off Normal, etc.), promptly notify Security to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

Verify with Security that appropriate actions are taken.
*(CA#4010227-60) «CM-3»*

## 7.0 REFERENCES

❷ 7.1 LBD-1: ITS LCO 3.1.7: SLC for post LOCA Suppr Pool pH (EC 340118/Calc IP-M-0726 {3 hr criteria}) *«4.5.2»*

7.2 ITS LCO 3.3.6.1, Pri CNMT & DW Isolation Instrumentation

7.3 ITS LCO 3.3.6.2, Sec CNMT Isolation Instrumentation

7.4 ITS LCO 3.6.1.3, Pri CNMT Isolation Valves

7.5 USAR 5.4.7, 6.2.4.2, 6.2.4.3

7.6 CPS 3302.01, Reactor Recirculation (RR)

7.7 CPS 3312.01, Residual Heat Removal (RHR)

7.8 CPS 4001.02C001, Automatic Isolation Checklist

7.9 CPS 4100.01, Reactor Scram

7.10 CPS 4411.10, SLC Operations

7.11 CPS 4979 series, Radioactivity Off-Normals

❹ 7.12 OP-CL-102-106-1001, Operator Response Time Program At CPS

7.13 EP-AA-1003: CPS Emergency Plan Annex

7.14 CM-1: Memo JHG-86-591 *«GROUP 6 NOTE on C001»*

7.15 CM-2: GE Letter MDM-91-122, dated 8/30/91 *«4.9.15»*

❺ 7.16 CM-3: IR 4010227-60 (CA): Communication to Security *«Note: 4.9, 4.10, 4.11, Discussion 6.3*

## 8.0 ATTACHMENTS

❸ 1. Attachment 1, Auto Initiation/Actuation Checklist

## TABLE 1: SHUNT TRIPS

### LEVEL 1/HIGH DW PRESSURE or ECCS MANUAL INITIATION

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 1HC01G | CNMT Polar Crane | 480V Unit Sub 1A-7B (AB 781', Y-118) |
| 1VP01CA | Drywell Cooling Fan 1A | AB MCC 1A1-1D [2 Brks] (AB 781', Y-121) |
| 1VP01CC | Drywell Cooling Fan 1C | AB MCC 1A1-3B [2 Brks] (AB 781', X-121) |
| 1VP04CA | Drywell Chiller 1A Oil Pump | AB MCC 1A1-8A [2 Brks] (AB 781', X-121) |
| 1E31-P001 | FP Iodine-Noble Gas PNL Cont Pwr | AB MCC 1A1-8C Ckt 39 [2 Brks] (AB 781', X-121) |
| 1E31-P001 | FP Iodine-Noble Gas PNL Cont Pwr | AB MCC 1A1-8C Ckt 43 [2 Brks] (AB 781', X-121) |
| 1E31-P002 | FP Particulate PNL Cont Pwr | AB MCC 1A1-8C Ckt 47 [2 Brks] (AB 781', X-121) |
| 1DC13E | DC MCC 1A (Gnd Detect) | AB MCC 1A1-9B Ckt 23 (AB 781, X-121) |
| 1VP04CA | Drywell Chiller 1A Skid | CB MCC E2-2B Ckt 30 (CB 825', V-133) |
| 1PL43JA | VP Local Pnl 1PL43JA | CB MCC E2-2B Ckt 31 (CB 825', V-133) |
| 0SS12E | Feed To SS System (0SS12E) | 480V Unit Sub 1B-5B (AB 781', X-106) |
| 1AP71E | TB MCC 1M Fdr Bkr | 480V Unit Sub 1B-5C (AB 781', X-106) |

**TABLE 1: SHUNT TRIPS** (cont'd)

**LEVEL 1/HIGH DW PRESSURE or ECCS MANUAL INITIATION** (cont'd)

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 1VP01CB | Drywell Cooling Fan 1B | AB MCC 1B1-2C [2 Brks] (AB 781', X-105) |
| 1VP01CD | Drywell Cooling Fan 1D | AB MCC 1B1-3A [2 Brks] (AB 781', X-105) |
| 1VP04CB | Drywell Chiller 1B Oil Pump | AB MCC 1B1-3B [2 Brks] (AB 781', X-105) |
| 1DC14E | DC MCC 1B (Gnd Detect) | AB MCC 1B1-7B Ckt 3 (AB 781', X-105) |
| 1DC15E | DC MCC 1D (Gnd Detect) | AB MCC 1B1-7B Ckt 11 (AB 781', X-105) |
| 1DG02CA | DG 1B Air Comp B6 | DG MCC 1B-1B (CB 737', AA-132) |
| 1DG02CB | DG 1B Air Comp B2 | DG MCC 1B-1C (CB 737', AA-129) |
| 1VP04CB | Drywell Chiller 1B Skid | CB MCC F2-1B Ckt 30 (CB 825', V-128) |
| 1PL43JB | VP Local Pnl 1PL43JB | CB MCC F2-1B Ckt 31 (CB 825', V-128) |

The following equipment receives a trip signal, but are not shunt trips:

| | | |
|---|---|---|
| 1DG01KA | DG 1A Output Bkr | 4.16 KV 1A1-C (AB 781', V-122) |
| 1VP04CA | Drywell Chiller 1A | 4.16 KV 1A1-F (AB 781', V-122) |
| 1VP03PA | Drywell Chill Wtr Pump 1A | 480V Unit Sub 1A-7D (AB 781', Y-118) |
| 1DG01KB | DG 1B Output Bkr | 4.16 KV 1B1-H (AB 781', V-104) |
| 1VP04CB | Drywell Chiller 1B | 4.16 KV 1B1-E (AB 781', V-104) |
| 1VP03PB | Drywell Chill Wtr Pump 1B | 480V Unit Sub 1B-5D (AB 781', X-106) |

**TABLE 1: SHUNT TRIPS** (cont'd)

**LEVEL 2/HIGH DW PRESSURE**

'*' also trip on High Rad

'**' DG 1A Air Comp B2/B6 also trip on Div 1 CRVICS Manual Initiation

'‡' Reset breaker to allow PASS panel operation

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 1VQ03Y | HVAC To Purge Trn Damper | AB MCC 1A2-13D (AB 781', V-121) |
| *1C11-F370 | RR Aux Seal Inj Pump Disch Vlv | AB MCC 1A4-8C [2 Brks] (AB 781', Y-121) |
| 0VQ03CA | VQ Low Flow Exh Fan A | CB MCC E1-2C (CB 825', V-133) |
| 0VC11C | VC Locker Rm Exh Fan | CB MCC E1-2D (CB 825', V-133) |
| 0VQ10AA | DW Purge Prehtr A | CB MCC E1-2E (CB 825', V-133) |
| 0VQ03CC | VQ Low Flow Exh Fan C | CB MCC E2-1E (CB 825', V-133) |
| *1PS02J/3J | ‡ Post Accident Sample Pnl | CB MCC E2-2B Ckt 1 (CB 825', V-133) |
| 0PL58J | VQ Low Purge Htr Safety Intlk | CB MCC E2-2B Ckt 2 & 29 (CB 825', V-133) |
| *1PS03J | ‡ Post Accident Sample Pnl | CB MCC E2-2B Ckt 32 (CB 825', V-133) |
| *1PS16J | ‡ Heated Sample Line | CB MCC E2-2B Ckt 33 (CB 825', V-133) |
| *1PS03J | ‡ Post Accident Sample Pnl | CB MCC E2-2B Ckt 34 (CB 825', V-133) |
| 0VQ10AC | ‡ DW Purge Prehtr C | CB MCC E2-3B (CB 825', V-133) |
| *1DG01CB | ** DG 1A Air Comp B2 | DG MCC 1A-1B (CB 737', AC-129) |
| *1DG01CA | ** DG 1A Air Comp B6 | DG MCC 1A-1C (CB 737', AC-129) |
| *1PS04P | ‡ PASS Closed Loop Cooling Pmp | DG MCC 1A-2D (CB 737', AC-129) |
| 1VQ20Y/ 1VA100Y | ‡ PASS Isol Dampers | DG MCC 1A-4E (CB 737', AC-129) |
| 1VA20C | ‡ PASS Rm Sup Fan | DG MCC 1A-4F (CB 737', AC-129) |

**TABLE 1: SHUNT TRIPS** (cont'd)

**LEVEL 2/HIGH DW PRESSURE** (cont'd)

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 0VQ05YA | CT/DW Purge Damper | Damper MCC A-6B (CB 737', AA-128) |
| 0VQ08YA | CT/DW Purge Damper | Damper MCC A-6C (CB 737', AA-128) |
| 0VQ05YC | CT/DW Purge Damper | Damper MCC A-6D (CB 737', AA-128) |
| 0VQ08YC | CT/DW Purge Damper | Damper MCC A-7B (CB 737', AA-128) |
| 1E51-C002F | RCIC Gland Seal Comp | DC MCC 1A-10B (AB 781', V-117) |
| 1G36-P002 | RT Filter Demin Pnl | DC MCC 1A-12A Ckt 36 (AB 781', V-117) |
| 1DC11E | DC MCC 1A 1DC11E Cross-Tie Bkr | DC MCC 1A-14A (AB 781', V-117) |
| 0VQ03CB | VQ Low Flow Exh Fan B | CB MCC F1-2C (CB 825', V-128) |
| 0PL58J | VQ Low Purge Htr Safety Intlk | CB MCC F2-1B Ckt 29 (CB 825', V-128) |
| 0VQ10AB | DW Purge Prehtr B | CB MCC F2-2C (CB 825', V-128) |
| 0VQ05YB | CT/DW Purge Damper | Damper MCC B-6B (CB 737', AA-131) |
| 0VQ08YB | CT/DW Purge Damper | Damper MCC B-6C (CB 737', AA-131) |
| 1DC11E | DC MCC 1B 1DC11E Cross-Tie Bkr | DC MCC 1B-6A (AB 781', U-107) |

The following equipment receives a trip signal, but is not a shunt trip:

| | | |
|---|---|---|
| 1E22-S001A | DG 1C Output Bkr | 4.16 KV 1C1-103 (CB 781', AA-128) |

**TABLE 1: SHUNT TRIPS** (cont'd)

**OTHER SHUNT TRIPS CLASSIFIED AS NOT NEEDED FOR LOCA SEPARATION CRITERIA**

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 2AP79E | Turbine Bldg Htg MCC 2A | 480V Unit Sub G-4B (RW 762', F.7-128) |
| 2AP81E | Turbine Bldg Htg MCC 2C | 480V Unit Sub G-4C (RW 762', F.7-128) |
| 0AP98E | Counting Room Htg MCC A | 480V Unit Sub G-4D (RW 762', F.7-128) |
| 0AP64E | Radwaste Bldg Htg MCC A | 480V Unit Sub G-5B (RW 762', F.7-128) |
| 0AP82E | Radwaste Bldg Htg MCC C | 480V Unit Sub G-5C (RW 762', F.7-128) |
| 1AP80E | Turbine Bldg Htg MCC 1B | 480V Unit Sub H-4B (RW 762', F.7-128) |
| 1AP82E | Turbine Bldg Htg MCC 1D | 480V Unit Sub H-4C (RW 762', F.7-128) |
| 0AP99E | Counting Room Htg MCC B | 480V Unit Sub H-4D (RW 762', F.7-128) |
| 0AP65E | Radwaste Bldg Htg MCC B | 480V Unit Sub H-5B (RW 762', F.7-128) |
| 0AP83E | Radwaste Bldg Htg MCC D | 480V Unit Sub H-5C (RW 762', F.7-128) |
| 1AP79E | Turbine Bldg Htg MCC 1A | 480V Unit Sub I-4B (RW 762', F-127) |
| 1AP81E | Turbine Bldg Htg MCC 1C | 480V Unit Sub I-4C (RW 762', F-127) |
| 0AP66E | Machine Shop Htg MCC A | 480V Unit Sub I-4D (RW 762', F-127) |
| 0AP70E | Lab Pre Coil Htg MCC A | 480V Unit Sub I-5B (RW 762', F-127) |
| 0AP73E | Lab Dual Duct Htg MCC | 480V Unit Sub I-5C (RW 762', F-127) |
| 0AP97E | Radwaste Bldg Shop Htg MCC | 480V Unit Sub J-4B (RW 762', F.7-127) |
| 0AP67E | Machine Shop Htg MCC B | 480V Unit Sub J-4D (RW 762', F.7-127) |

**TABLE 1: SHUNT TRIPS** (cont'd)

**OTHER SHUNT TRIPS CLASSIFIED AS NOT NEEDED FOR LOCA SEPARATION CRITERIA**
(cont'd)

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 0AP71E | Lab Pre Htg MCC B | 480V Unit Sub J-5B (RW 762', F.7-127) |
| 0AP72E | Lab Aux Air Htg MCC | 480V Unit Sub J-5C (RW 762', F.7-127) |
| 0AP87E | Lab Humd Stm Blr Htg MCC | 480V Unit Sub J-5D (RW 762', F.7-127) |
| 0AP76E | Aux Bldg Htg MCC A | 480V Unit Sub K-3C (CB 825', V-133) |
| 1AP83E | Control Bldg Htg MCC 1A | 480V Unit Sub K-4A (CB 825', V-133) |
| 0AP60E | Drywell Purge Htg MCC A | 480V Unit Sub K-4B (CB 825', V-133) |
| 0AP74E | Control Room Htg MCC A | 480V Unit Sub K-4D (CB 825', V-133) |
| 0AP61E | Drywell Purge Htg MCC B | 480V Unit Sub L-4B (CB 825', V-128) |
| 1AP84E | Control Bldg Htg MCC 1B | 480V Unit Sub L-4C (CB 825', V-128) |
| 0AP75E | Control Room Htg MCC B | 480V Unit Sub L-4D (CB 825', V-128) |
| 0AP77E | Aux Bldg Htg MCC B | 480V Unit Sub L-5B (CB 825', V-128) |
| 0WD09S | Service Bldg Hot Water Heater | 480V Unit Sub M-3C (SB 722') |
| 0AP88E | Service Bldg Htg MCC A | 480V Unit Sub M-4C (SB 722') |
| 0AP90E | Service Bldg Htg MCC C | 480V Unit Sub M-4D (SB 722') |
| 0AP89E | Service Bldg Htg MCC B | 480V Unit Sub N-4C (SB 722') |

**TABLE 1: SHUNT TRIPS** (cont'd)

**OTHER SHUNT TRIPS CLASSIFIED AS NOT NEEDED FOR LOCA SEPARATION CRITERIA** (cont'd)

| EIN | COMPONENT | PANEL-CUBICLE |
|---|---|---|
| 1AP85E | Fuel Bldg Htg MCC 1A | 480V Unit Sub 1F-4C (CB 702', T-124) |
| 1AP86E | Fuel Bldg Htg MCC 1B | 480V Unit Sub 1G-4C (CB 702', V-124) |
| 1AP87E | DG Make-Up Heater MCC | 480V Unit Sub 1E-4B (AB 762', Z-104) |
| 1G36-A001 | RWCU Precoat Tank Agitator | AB MCC 1G-5B (AB 762', X-106) |
| 1LL58EE | Standby Ltg Cab #158 | AB MCC 1A1-2BR (AB 781', Y-121) |
| 1LL66E | Standby Ltg Cab #166 | DC MCC 1B-4A Ckt 16 (AB 781', U-107) |
| 1LL69EA | Standby Ltg Cab #169 | SSW MCC 1A-3B (SH 699', C-1) |

# ATTACHMENT 1
# Auto Initiation / Actuation Checklist

| | Level 2 (-45.5") |
|---|---|
| | HPCS injecting (L8 or Man Override) |
| | RCIC running |
| | RR pumps OFF |
| | Div 1 SGTS running |
| | Div 2 SGTS running |
| | Div 3 EDG running |
| | Div 3 SX pump running |
| | Div 1 SX running |
| | Div 2 SX running |
| | |
| | ARI initiated |
| | RWCU pumps tripped |
| | TDFRPs tripped (RI injection) |
| | Main Turbine tripped (RI injection) |

| | Level 1 (-145.5") |
|---|---|
| | Group 1 Isolation |
| | ADS B Timer Running for 105 seconds |
| | ADS A Timer Running for 105 seconds |
| | Div 1 EDG running |
| | Div 2 EDG running |
| | LPCS running (injecting or on min flow) |
| | Div 1 SX running |
| | RHR 'A' running (injecting or on min flow) |
| | RHR 'B' running (injecting or on min flow) |
| | RHR 'C' running (injecting or on min flow) |
| | Div 2 SX running |
| | TB MCC 1M Shunt Trip |
| | |
| | |
| | |

| | High DW Press (1.68#) |
|---|---|
| | HPCS injecting (L8 or Man Override) |
| | RR pumps need tripped |
| | Div 1 SGTS running |
| | Div 2 SGTS running |
| | Div 1 EDG running |
| | Div 2 EDG running |
| | Div 3 EDG running |
| | Div 3 SX running |
| | LPCS running (injecting or on min flow) |
| | Div 1 SX running |
| | RHR 'A' running (injecting or on min flow) |
| | RHR 'B' running (injecting or on min flow) |
| | RHR 'C' running (injecting or on min flow) |
| | Div 2 SX running |
| | TB MCC 1M Shunt Trip |

| | Level 3 (8.9") |
|---|---|
| | RR pumps shift to slow speed |
| | Rx Scram |

**NOTE**

As time/resources permit, review CPS 4001.02 for any additional verifications/operations.

Manual Actions Taken (if necessary):

# REACTOR COOLANT LEAKAGE

***SCOPE OF REVISION:***

- Incorporated Specific revs 10a-e.
- IR 641571, Added reference for ER-AB-331-1006, Bwr Reactor Coolant System Leakage Monitoring And Action Plan (pgs 4,6)

❶ Specific revision 12a [Leffel]:
- Added integrated 'Level Control Guidance' into procedure to address lack of controlling direction when primarily in MODEs 3 and 4 (Landin).
- AR 1442553-02, 01511657-63: LORT Cycle 12-06 feedback/enhancement - Added Step 4.7 for High DW Pressure Pre-Emptive Brief items.
- IR 581934: Added FWLCS valves to the list of RCS pressure boundary isolation valves (Table 2), reference USAR 3.9.6.4.

❷ Specific Rev. 12b [Dodd] Added reminders to evaluate RR seal parameters and RT differential flows during initial leak investigation; added discussion associated with expected system leakage duing SBO conditions

**REFERENCE USE**

**ORIGINATOR:** *H. Dan Jeans* **CLASS CODE:** *SNNN*

**SQR:** *N/A* **APPROVAL DATE:** *10/06/14*

*CURRENT CHANGES TO GENERAL REVISION*

| | *Change #* | *Date* | *List of Affected Pages* |
|---|---|---|---|
| ❶ | 12a | 11/20/14 | 1, 4 |
| ❷ | 12b | 4/19/16 | 1,3,7 |
| ❸ | | | |
| ❹ | | | |
| ❺ | | | |

## 1.0 SYMPTOMS

1.1 Any of over 50 annunciators indicate possible leakage from:

CNMT/Drywell Areas;
ECCS Systems/Rooms;
RR Pumps;
RWCU System/Rooms;
AB/Steam Tunnel Areas

1.2 Presence of water or reports of high pressure/fluid escaping noises from primary systems.

1.3 Any ITS LCO 3.4.5 RCS Operational LEAKAGE limit exceeded.

1.4 Unidentified LEAKAGE increase of ≥ 0.5 gpm in a 4 hour period (1.0 gpm in 8 hours). (Triggered in 9000.01D001)

1.5 Unidentified LEAKAGE exceeds 2.5 gpm. (Triggered in 9000.01D001)

## 2.0 AUTOMATIC ACTIONS

2.1 Area equipment/floor drain sumps start on high level.

2.2 Possible group isolations due to degrading conditions.

Refer to CPS 4001.02, Automatic Isolation for detailed set points and group descriptions.

2.3 Possible reactor scram due to high drywell pressure (1.68 psig) or MSIV group 1 isolation.

2.4 Fission product monitor system isolates on high drywell pressure (1.68 psig) or RPV level 2 (-45.5 in.)

## 3.0 IMMEDIATE OPERATOR ACTIONS

Evacuate affected areas.

## 4.0 SUBSEQUENT ACTIONS

4.1 **IF** Unidentified Leakage rate is ≥ 2.5 gpm, or has changed by ≥ 0.5 gpm in 4 hours,

**THEN** Notify Senior Management of the event.

Senior Management shall develop appropriate contingency plans in the event leakage rates continue to worsen.

Senior Management should consider the following items:

- Possible DW entry to locate the leak, including impact of other ITS restrictions/time clocks.
- Impact on type 304/316 austenitic stainless service components in the affected area. (ITS LCO 3.4.5 Action B; see discussion for affected components.)
- Activation of the Outage Control Center (OCC) in anticipation of a forced plant shutdown.
  - ☞ OCC shall be activated at Unidentified Leakage rate of ≥ 4 gpm or a change of ≥ 1.5 gpm in 24 hours.

4.2 Monitor leakage using available LD monitoring systems.

° Floor and Equipment Drain Sump Monitoring Systems.
- ☞ Table 1 (page 4) summarizes key DW RE/RF systems.
- ☞ Manual method for determining DW RE/RF in-leakage rates is available in CPS 3315.02 (LD).
- ☞ CNMT Flr & Equip High Flow signals are disabled. Sump fill and run timers need to be used to evaluate CNMT leakage rates.

° Drywell atmosphere on 1H13-P632:
1E31-K610(1,2), FISSION PRODUCT MONITORs.

❷ 4.3 Attempt to locate and isolate the leakage.

- ☞ Evaluate RR seal parameters
- ☞ Evaluate RT differential flow

**IF** Leakage source is unknown, «CM-1, CM-2»

**THEN** Shut both 1E12-F008 and F009, Shutdown Cooling Outbd (Inbd) Suct Isol Vlv.

4.4 Notify RP of the event.

Monitor radiation levels on the AR/PR LAN Terminal and/or request RP area samples to assist in detecting the location/source of the leak.

4.5 Refer to ITS LCO 3.4.5 & Emergency Plan Annex (EP-AA-1003):

° E-Plan RCS Leakage in Pri CNMT

° Table 2 (page 5) lists allowable RCS PIV leakage to satisfy ITS SR 3.4.6.1 criteria. «LBD-1»

4.0 **SUBSEQUENT ACTIONS** (cont'd)

❶ 4.6 **Level Control During Reactor Coolant Leakage events**

1. MODE 1/2: As needed. refer to CPS 4002.01, Abnormal RPV Level/Loss Of Feedwater At Power.

2. MODE 5: As needed, refer to CPS 4011.01, Reactor Cavity Leakage During Refueling.

3. MODE 3/4

   1) Restore and maintain RPV Level to either:

      ° The previously prescribed level band, or

      ° Per band specified by SM/CRS direction based on current plant conditions and leak rate.

         • Condensate/Feedwater

         • CRD

         • Shift of one loop from SDC mode to LPCI mode per CPS 3312.01 Section 8.1.12.

            ☞ Proceeding to EOP-1 as noted below and using LPCS may be preferential.

   2) **IF** Level cannot be restored, and EOP-1 entry is foreseeable due to the reactor coolant leak,

      **THEN** Enter CPS 4401.01, EOP-1 RPV Control while continuing in this procedure.

         ☞ While in EOP-1, band will be L3 - L8.

❶ 4.7 Consider conducting a MCR Crew Pre-emptive briefing on the effects of a High DW pressure on plant systems.

☞ Not an all inclusive list, see STA/IA Guide also.

- At 1.08#: RR FCV lockup & RR HPU shutdown will limit plant maneuverability.
- At 1.3# and rising: Manual SCRAM threshold.
- At 1.68#:
  - ° Reactor SCRAM set point.
  - ° Auto-start and injection by HPCS.
  - ° Loss of TB MCC 1M due to shunt trip: resulting in loss of MDRFP F004 hydraulic oil pump, MDRFP AOP.
  - ° Loss of CCW to the CNMT/DW - shutdown of RR pumps is required within 1 minute.

Operators should pre-review FWLC, and Auto-Isolation response procedure sections for prompt response actions.

4.0 **SUBSEQUENT ACTIONS** (cont'd)

4.8 Throughout the use of this procedure, refer to as needed:

- SPDS for possible EOP entry on critical parameters.
- CPS 3315.02, Leak Detection (LD).
- CPS 3408.01, Containment Building/Drywell HVAC (VR, VQ) to purge CNMT/DW airborne activity.
- CPS 4001.02, Automatic Isolation.
- Radiological Off-Normal series (4979.xx).
- ER-AB-331-1006, BWR Reactor Coolant System Leakage Monitoring And Action Plan.

5.0 **FINAL CONDITIONS**

5.1 Leakage identified and isolated, or

Leakage limited to ITS LCO 3.4.5 limits, or

ITS LCO 3.4.5 Required Actions result in a plant shutdown and cooldown, or

Senior Management Contingency Plan developed and approved.

5.2 RPV Level Control per prescribed band or EOP guidance.

## 6.0 DISCUSSION/DEFINITIONS

6.1 Reactor coolant system leaks present a hazard to both personnel and the reactor plant.

Small leaks in the pressure boundary can become larger and more of a problem.

Leaks must be found as soon as possible and corrected when plant conditions permit.

6.2 The methods for finding a leak are varied, but the best indicators are:

- Increase in temperature of a specific area.
- Increase in drywell pressure.
- Temperature and/or moisture level.
- Increase in airborne or gaseous activity.
- Drain sump in-flow and pumping requirements.

The operator must be constantly aware of any abnormal changes in the above indications in order to take appropriate action.

6.3 This procedure provides guidance for actions to be taken for small leaks which are within the RPV level control system's capability.
CPS 3315.02, Leak Detection (LD) will help locate and isolate a process system leak or a ventilation system heat exchanger tube leak.

❶ 6.4 During MODEs 3/4, prescribed level bands may vary from low 20" WR, to RPV Flange (204"-210" ASDC), and to near solid conditions due to transition evolutions [SDC, RPV Head Disassembly, RPV Pressure Tests, etc.]

Entry into the EOPs prior to Level 3 is permissible due to the degrading level condition (i.e., significant Bottom Head Drain line leak, etc.) and the need to establish adequate level control measures prior to potentially challenging the fuel/containment.

6.5 As applicable to ITS LCO 3.4.5.B.1, susceptible piping material (stainless steel and Inconnel 82/Inconnel 182 material) inside the drywell is located in the following systems:

- Reactor Recirc Loops 'A' and 'B'
- Reactor water Cleanup (RT) - Small portion of RT piping from RR system, both loops
- RHR Shutdown Cooling (RH) - Small portion of RH piping from RR loop 'B' to RH valve 1E12-F010 valve.
- Reactor Nozzles - Reactor Recirc inlet and outlet nozzles, Feedwater nozzles, Core Spray nozzles, RHR nozzles, Jet pump instrument nozzles,
- Nozzles at the bottom head, and CRD nozzles & bolted flange connections.

6.0 **DISCUSSION/DEFINITIONS** (cont'd)

❷ 6.6 System leakage for a Station Black Out (SBO), including RR pump seals (approximately 38 gpm) and inventory loss from SRVs, is assumed to be approximately 100 gpm for the duration of the SBO.

7.0 **REFERENCES**

7.1 LBD-1: ITS LCO 3.4.5 *«4.5»*

7.2 CM-1: ISEG 90-01, Rec #2 *«4.3 Contingency Action»*
7.3 CM-2: SER 7-87 *«4.3 Contingency Action»*

7.4 ITS SR 3.4.6.1 (USAR 3.1.2.2.5.1)

❶ 7.5 CPS 3312.01, Residual Heat Removal (RHR)
7.6 CPS 3315.02, Leak Detection (LD)
7.7 CPS 3408.01, Containment Building/Drywell HVAC (VR, VQ)
7.8 CPS 4001.02, Automatic Isolation
❶ 7.9 CPS 4002.01, Abnormal RPV Level/Loss Of Feedwater At Power
❶ 7.10 CPS 4011.01, Reactor Cavity Leakage During Refueling
❶ 7.11 CPS 4401.01, EOP-1 RPV Control
7.12 CPS 4979 series, Radiological Off-Normals

7.13 EP-AA-1003, Emergency Plan Annex for Clinton Station
7.14 ER-AB-331-1006, BWR Reactor Coolant System Leakage Monitoring And Action Plan

## Table 1: Drywell RE/RF LD Monitoring System Summary

| Drywell Equipment (RE) Drains | Monitor Input | Range | Alarm Setpt | Annun | Computer |
|---|---|---|---|---|---|
| DW Equip Drn [Pump] Flow | 1E31-N767 [PLC]<br>↳ 1E31-R552, Ch. 3<br>↳ 1E31-N572/N576 | 0 - 64 gpm<br>0 - 64 gpm<br>Dig Counter | 23.6 gpm<br>--<br>-- | 5067-4L<br>--<br>-- | RE-BA301<br>--<br>-- |
| Level: Hi-Hi Lvl DW Sump Equip Drn | 1LS-RE023 | -- | 2' 3 ¾"<br>from top of curb | 5067-3L | RE-BC402 |
| DW Equipment Drain Sump Pump Out | 1E31-R605: K11 | -- | 17 min | 5068-2B | -- |
| DW Equipment Drain Sump Pump Fill | 1E31-R606: K12 | -- | 5 min | 5068-2B | -- |

| Drywell Floor (RF) Drains | Monitor Input | Range | Alarm Setpt | Annun | Computer |
|---|---|---|---|---|---|
| DW Flr Drn [Pump] Flow, Low Range | 1E31-R551, Ch. 1 | 0 - 8 gpm | -- | -- | -- |
| DW Flr Drn [Pump] Flow, High Range | 1E31-R551, Ch. 2<br>1E31-N763 (Q1) | 0 - 64 gpm<br>0 - 64 gpm | --<br>3.6 gpm | --<br>5067-3K | --<br>RF-BA302 |
| DW Flr Drn [Pump] Flow, Increase | 1E31-N763 (Q2) | -- | 2 gpm/24 hr | 5067-4K | -- |
| DW Flr Drn [Sump] Flow, Low Range | 1E31-R552, Ch. 1<br>1E31-N763 (Q3) | 0 - 8 gpm<br>0 - 8 gpm | --<br>3.6 gpm | --<br>5067-5K | --<br>-- |
| DW Flr Drn [Sump] Flow, High Range | 1E31-R552, Ch. 2<br>1E31-N763 (AQ4) | 0 - 64 gpm<br>0 - 64 gpm | --<br>-- | --<br>-- | --<br>RF-BA303 |
| DW Flr Drn [Sump] Flow, Increase | 1E31-N763 (Q4) | -- | 2 gpm/24 hr | 5067-6K | -- |
| DW Flr Drn Sump Level | 1E31-R552, Ch. 4 | 0 - 14 in wc | -- | -- | -- |
| DW [Flr] Area Drain Sump Pump Out | 1E31-R603: K17 | -- | 5 min | 5068-1B | -- |
| DW [Flr] Area Drain Sump Pump Fill | 1E31-R604: K18 | -- | 20 min | 5068-1B | -- |
| Level: Hi-Hi Lvl DW Sump Flr Drn | 1UAY-RF511<br>1E31-N763 (Q8) | -- | 8' 8"<br>from top of sump | 5067-3L | RF-BC402 |

**Table 2: Reactor Coolant System Pressure Isolation Valves**
(Reference ITS SR 3.4.6.1)

| | VALVE | NAME | SIZE | ALLOWABLE LEAKAGE |
|---|---|---|---|---|
| | 1E12-F008 | Shutdown Cooling Outbd Suct Isol Vlv | 18″ | 5 gpm |
| | 1E12-F009 | Shutdown Cooling Inbd Suct Isol Vlv | 18″ | 5 gpm |
| | 1E12-F041A | Testable Check Valve Disc | 12″ | 5 gpm |
| | 1E12-F041B | Testable Check Valve Disc | 12″ | 5 gpm |
| | 1E12-F041C | Testable Check Valve Disc | 12″ | 5 gpm |
| | 1E12-F042A | LPCI Fm RHR A Shutoff Valve | 12″ | 5 gpm |
| | 1E12-F042B | LPCI Fm RHR B Shutoff Valve | 12″ | 5 gpm |
| | 1E12-F042C | LPCI Fm RHR C Shutoff Valve | 12″ | 5 gpm |
| | 1E12-F023 | RHR B Supp To Rx Head Spray Valve | 4″ | 2 gpm |
| | 1E12-F050A | RHR A SDC Return Line Check Valve | 10″ | 5 gpm |
| | 1E12-F050B | RHR B SDC Return Line Check Valve | 10″ | 5 gpm |
| | 1E12-F053A | RHR A To Feedwater S/D Cooling Rtrn Vlv | 10″ | 5 gpm |
| | 1E12-F053B | RHR B To Feedwater S/D Cooling Rtrn Vlv | 10″ | 5 gpm |
| O | 1E12-F495A | RHR B TO FWLC A CHECK VALVE | 2″ | 1 gpm |
| O | 1E12-F495B | RHR B TO FWLC B CHECK VALVE | 2″ | 1 gpm |
| O | 1E12-F496 | RHR 'B' To Feedwater Keep Fill Valve | 2″ | 1 gpm |
| O | 1E12-F497 | RHR "A" To Feedwater Keep Fill Valve | 2″ | 1 gpm |
| O | 1E12-F499A | RHR A TO FWLC A CHECK VALVE | 2″ | 1 gpm |
| O | 1E12-F499B | RHR A TO FWLC B CHECK VALVE | 2″ | 1 gpm |
| | 1E21-F005 | LPCS To CNMT Outbd Isol Valve | 10″ | 5 gpm |
| | 1E21-F006 | Testable Check Valve Disc | 10″ | 5 gpm |
| | 1E22-F004 | HPCS To CNMT Outbd Isln Valve | 10″ | 5 gpm |
| | 1E22-F005 | Testable Check Valve Disc | 10″ | 5 gpm |
| | 1E51-F013 | RCIC Pump Disch To Rx Outbd Isol Valve | 6″ | 3 gpm |
| | 1E51-F066 | Testable Check Valve Disc | 4″ | 2 gpm |

# LOSS OF SHUTDOWN COOLING

***SCOPE OF REVISION:***

- Incorporated specific revs 4a-4e; Rev marks not retained.
- IR 1395502 Expand guidance to include loss of FC when applicable.

❶ Specific revision 5a [Leffel]: Editorial IR 1697195, Corrected typo-9006.01 should be 9000.06

❷ Specific Revision 5b [Leffel]: IR 04003967, EC 403438 to address new jet pump plugs with a lower temperature limit of 140°F. Added discussion of Upper Pool temperature limit of 150°F.

❸ Specific Rev. 5c [J. Delaney]: Mngt Request - Removed references to OPDRVs IAW TSTF 542 LAR 216 changes.

**REFERENCE USE**

**ORIGINATOR:** *HD Jeans* **CLASS CODE:** *SNNN*

**SQR:** *Lee Anderson* **APPROVAL DATE:** *04/24/2013*

*CURRENT CHANGES TO GENERAL REVISION*

| | Change # | Date | List of Affected Pages |
|---|---|---|---|
| ❶ | 5a | 12/09/14 | 1, 5, 6, 9 |
| ❷ | 5b | 05/05/17 | 1, 9, 12, 16 |
| ❸ | 5c | 04/27/18 | 1, 9, 12, 16 |
| ❹ | | | |
| ❺ | | | |

## 1.0 SYMPTOMS

1.1 Failure of Shutdown Cooling (SDC) method in use.

1.2 Failure of Alternate SDC (A-SDC) method in use.

1.3 Unexpected increasing temperatures on:

- Reactor Coolant
- Reactor Recirculation Loops
- RPV Metal Temperatures
- Fuel Pool Cooling System (FC)
- Reactor Water Clean Up System (RT)

1.4 Increasing reactor steam dome pressure.

1.5 Loss of AC power

1.6 Any of following annunciators:

RT: 5000-1C - F-D Inlet Temp Hi 140°F
RT: 5000-1D - F-D Inlet Temp Hi 130°F

CC: 5040-1C - High Temp CCW Hx Outlet Header

FC: 5040-1F - High Temp Spent Fuel Stor Pool
FC: 5040-1G - High Temp FC Hx 1A/1B Disch

RH: 5064-3F (5065-3A) - RHR Pump A (B) Auto Trip
RH: 5064-4E - RHR Equip Area Temp High
RH: 5064-7F - RHR Hx A/B Cooling Water Outlet Temp High
RH: 5064-8F - Shutdown Header Pressure High

## 2.0 AUTOMATIC ACTION

Possible Group Isolation depending on initiating event:

- Group 2: RHR to Upper Pools (1E12-F037A/B)
- Group 3: RHR SDC (1E12-F053A/B, F008, F009, F023)
- Group 4: RWCU
- Group 20: Misc RHR Valves (1E12-F040, F049, F060A/B, F075A/B)

## 3.0 IMMEDIATE OPERATOR ACTIONS

NONE

## 4.0 SUBSEQUENT ACTIONS

**4.1** **IF RHR has tripped**

Place the RHR SDC loop into a safe condition as follows to prevent pump/system damage, to prevent loss of RPV inventory and/or prevent a loss of RHR Fill & Vent.

☞ Preferred order listed, but may be modified based on the event.

**CAUTION**

*A potential exists for a slight addition in RPV inventory from the water leg pump.*

1. **Shut/verify shut:**

- ☐ 1) 1E12-F023, RHR B Supp To Rx Head Spray Valve.
- ☐ 2) 1E12-F053A(B), RHR A(B) To Feedwater S/D Cooling Rtrn Valve.
- ☐ 3) 1E12-F037A(B), RHR A(B) To CNMT Pool Cooling Shutoff Vlv.
- ☐ 4) 1E12-F042A(B), LPCI Fm RHR A(B) Shutoff Valve
- ☐ 5) (Local) 1E12-F070, RHR Disch To RW Hdr Isol
- ☐ 6) (Local) 1E12-F072A, RHR A Pump Flush Line Isol.
- ☐ 7) 1E12-F040, RHR B To Radwaste Second Isol Valve
- ☐ 8) 1E12-F049, RHR B To Radwaste First Isol Valve

☐ 2. Promptly **stop** RHR Pump A(B), 1E12-C002A(B).

☞ A loss of Div 1(2) NSPS power will disable the automatic pump trip related to 1E12-F008/F009 not being fully open.

☐ 3. **Shut verify/shut** 1E12-F068A(B), RHR A(B) Hx SSW Outlet Valve.

☞ This minimizes RHR Hx cooldown effects and helps maintain the Hx pressurized.

## 4.0 SUBSEQUENT ACTIONS

**4.2 IF FC has tripped**

1. **Shut** the following valves minimize upper pool draindown and FC Surge Tank High Level problems:
   1. 1FC008, FC CNMT Outlt Outbd Isol Vlv.
   2. 1FC007, FC CNMT Outlt Inbd Isol Vlv.
   3. 1FC037, FC Supp CNMT Inbd Isol Vlv.
   4. 1FC036, FC Supply CNMT Outbd Isol Vlv.
2. Refer to CPS 4411.02, SPENT FUEL POOL ABNORMAL WATER LEVEL DECREASE

4.3 While continuing in this procedure:

**IF** Loss of SDC while in MODE 3, **THEN** perform section 4.6.

**IF** Loss of SDC while in MODE 4, **THEN** perform section 4.7.

**IF** Loss of SDC while in MODE 5, **THEN** perform section 4.8.

4.4 Complete TABLE 1: INITIAL PLANT CONDITIONS (page 14).

4.5 **WHEN** Adequate RPV pressure and temperature control is established,

**THEN** Enter CPS 3006.01, Unit Shutdown, and exit this procedure.

## 4.6 LOSS OF SDC: STARTING FROM MODE 3

1. Maintain RPV pressure and temperature control using an appropriate SDC control method on Table 2 (page 15).

2. While continuing in this procedure, refer to CPS 3312.03 (SDC/FPC&A) - Section 8.3.1 for guidance on Recovery of a SDC Loop.

3. While continuing in this procedure, refer to CPS 1401.09, CONTROL OF SYSTEM AND EQUIPMENT STATUS and 9065.01, SECONDARY CONTAINMENT ACCESS INTEGRITY to restore/verify secondary containment as required.

4. Based on plant condition, SDC status and RR status:

   1) **Within 30 minutes:**

      Verify ITS LCO 3.4.11 limits using CPS 9000.06, Reactor Coolant And Vessel Metal/Pressure Temperature Limit Logs (use D001).

   2) **Within 1 hour:** (as required by ITS LCO ACTIONs)

      a) Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.

      b) Verify reactor coolant circulation by an alternate method.

      c) Monitor reactor coolant temperature once per hour per CPS 9000.06D003.

5. Attempt to establish reactor coolant circulation.

   When no forced reactor coolant circulation exists, maintain RPV level > minimum natural circulation level.

   44": Shutdown Range  61": Upset Range

6. Refer to as needed:

   - HEATUP RATE AND BOILOFF TIME CURVES (maintained with the CRS) for assistance in determining availability and effectiveness (heat removal vs. decay heat) of SDC methods.
   - ITS LCOs 3.4.9: RHR SDC System - Hot Shutdown
   - ITS LCO 3.4.11: RCS/RPV/RR P/T Limits
   - ORM TR 4.3.1.5: Continuous conductivity
   - CPS Emergency Plan Annex (EP-AA-1003)

**CAUTION**

*Failure to recover adequate SDC control will result in exceeding 200°F (MODE 3 conditions) and RPV boil off will start at 212°F.*

4.7 **LOSS OF SDC: STARTING FROM MODE 4**

1. Maintain RPV pressure and temperature control using an appropriate SDC control method on Table 2 (page 15).

2. While continuing in this procedure, refer to CPS 3312.03 (SDC/FPC&A) - Section 8.3.1 for guidance on Recovery of a SDC Loop.

3. While continuing in this procedure, refer to CPS 1401.09, CONTROL OF SYSTEM AND EQUIPMENT STATUS and 9065.01, SECONDARY CONTAINMENT ACCESS INTEGRITY to restore/verify secondary containment as required.

4. Based on plant condition, SDC status and RR status:

   1) **Within 30 minutes:**
   Verify ITS LCO 3.4.11 limits using CPS 9000.06, Reactor Coolant And Vessel Metal/Pressure Temperature Limit Logs (use D001).

   2) **Within 1 hour:** (as required by ITS LCO ACTIONs)
   a) Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.
   b) Verify reactor coolant circulation by an alternate method.
   c) Monitor reactor coolant temperature once per hour per CPS 9000.06D003. ❶

5. Attempt to establish reactor coolant circulation.
   When no forced reactor coolant circulation exists, maintain RPV level > minimum natural circulation level.
   44": Shutdown Range 61": Upset Range

☞ LOSS OF SDC: STARTING FROM MODE 4 continued on next page.

4.7 **LOSS OF SDC: STARTING FROM MODE 4** (cont'd)

6. Refer to as needed:
   - HEATUP RATE AND BOILOFF TIME CURVES (maintained with the CRS) for assistance in determining availability and effectiveness (heat removal vs. decay heat) of SDC methods.
   - ITS LCOs 3.4.10: RHR SDC System - Cold Shutdown
   - ITS LCO 3.4.11: RCS/RPV/RR P/T Limits
   - ORM TR 4.3.1.5: Continuous conductivity
   - CPS Emergency Plan Annex (EP-AA-1003)

7. **IF** The previously operating loop of RHR SDC has been determined to no longer be available,

   **OR**

   Alternate Decay Heat Removal is not in operation,

   **THEN**

   1) Enter CPS 3002.01, Heatup And Pressurization, Non-Nuclear Heatup section and perform appropriate actions necessary to support plant heatup conditions for entry into MODE 3.

      ☞ Pri/Sec CNMT Integrity should be expedited.

   2) Evacuate the DW and CNMT of unnecessary personnel.

   3) Continue to maintain RPV pressure and temperature control using an appropriate SDC control method found on Table 2 (page 15).

   4) At 1H13-P614, turn on the ADS Safety Valve Temperature recorder, 1B21-R614 to monitor SRV Tailpipe and RPV Head Vent temperatures.

☞ LOSS OF SDC: STARTING FROM MODE 4 continued on next page.

4.7 **LOSS OF SDC: STARTING FROM MODE 4** (cont'd)

8. The following temperature control strategies should be evaluated and utilized as appropriate for plant conditions to support decay heat removal and to avoid/delay MODE 3 conditions:

- Maximize all available heat removal capability.
- OK to bypass the RWCU Regenerative Hx.
- OK to raise RPV level for initial cooling effect.
  - ☞ Avoid raising level above main steam lines.
- OK to feed RPV using CRD/FW, and bleed using RWCU.
- OK to feed RPV using CRD/FW, and bleed using MSL drains.

  CW can be used to enhance heat removal.

**CAUTION**

*Failure to recover adequate SDC control will result in exceeding 200°F (MODE 3 conditions) and RPV boil off will start at 212°F.*

❷ **CAUTION**

*Jet pump plug degradation will occur at an increased rate at temperatures >140°F. The temperature of concern is Reactor Cavity Pool surface temperature.*

4.8 **LOSS OF SDC: STARTING FROM MODE 5**

1. Perform ITS LCO 3.9.8(9) CONDITION B REQUIRED ACTIONs.

   ☞ Contains IMMEDIATE actions for suspending fuel loading and restoring Secondary Containment.

❷ **NOTE**

*See DISCUSSION step 6.4 for more information if step 4.8.2 is applicable.*

❷❸ 2. **IF** Shutdown Cooling is lost while jet pump plugs are being relied on to prevent a loss of inventory

❸ **THEN** RPV Water Inventory Control Drain Time impact must be evaluated

**AND** Alternate SDC methods used to stay below 140°F Reactor Cavity Pool surface temperature to avoid degradation of the jet pump plugs, creating a loss of inventory via the RR loop(s).

3. Maintain RPV pressure and temperature control using an appropriate SDC control method on Table 2 (page 15).

4. While continuing in this procedure, refer to CPS 1401.09, CONTROL OF SYSTEM AND EQUIPMENT STATUS and 9065.01, SECONDARY CONTAINMENT ACCESS INTEGRITY to restore/verify secondary containment as required.

❶ 5. While continuing in this procedure, refer to:
- CPS 3312.03 **(SDC/FPC&A)** - Section 8.3.1
- CPS 3317.01 **(FUEL POOL COOLING AND CLEANUP (FC))**

for guidance on Recovery of a SDC Loop.

☞ LOSS OF SDC: STARTING FROM MODE 5 continued on next page.

4.8 **Loss of SDC: Starting from MODE 5** (cont'd)

6. Based on plant condition, SDC status and RR status:

   1) **Within 30 minutes:**

      Verify ITS LCO 3.4.11 limits using CPS 9000.06, Reactor Coolant And Vessel Metal/Pressure Temperature Limit Logs (use D001).

   2) **Within 1 hour:** (as required by ITS LCO ACTIONs)

      a) Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.

      b) Verify reactor coolant circulation by an alternate method.

      c) Monitor reactor coolant temperature once per hour per CPS 9000.06D003.

7. Attempt to establish reactor coolant circulation.

   When no forced reactor coolant circulation exists, maintain RPV level > minimum natural circulation level.

   44": Shutdown Range 61": Upset Range

8. Refer to as needed:

   - HEATUP RATE AND BOILOFF TIME CURVES (maintained with the CRS) for assistance in determining availability and effectiveness (heat removal vs. decay heat) of SDC methods.
   - ITS LCO 3.4.11: RCS/RPV/RR P/T Limits
   - ITS LCOs 3.9.6/7: FH/CA - RPV Level Limits
   - ITS LCOs 3.9.8/9: MODE 5 (Hi/Lo RPV Level) SDC
   - ORM OR 2.4.8: Fuel Pool Water Level Limits
   - ORM TR 4.3.1.5: Continuous conductivity
   - CPS Emergency Plan Annex (EP-AA-1003)

☞ LOSS OF SDC: STARTING FROM MODE 5 continued on next page.

4.8 **Loss of SDC: Starting from MODE 5** (cont'd)

9. **IF** The previously operating loop of RHR SDC has been determined to no longer be available,

   **OR**

   Alternate Decay Heat Removal is not in operation,

   **THEN**

   1) Enter CPS 3002.01, Heatup And Pressurization, Non-Nuclear Heatup section and perform appropriate actions necessary to support plant heatup conditions for entry into MODE 3.

      ☞ Pri/Sec CNMT Integrity should be expedited.

   2) Evacuate the DW and CNMT of unnecessary personnel.

   3) Continue to maintain RPV pressure and temperature control using an appropriate SDC control method found on Table 2 (page 15).

   4) At 1H13-P614, turn on the ADS Safety Valve Temperature recorder, 1B21-R614 to monitor SRV Tailpipe and RPV Head Vent temperatures.

10. The following temperature control strategies should be evaluated and utilized as appropriate for plant conditions to support decay heat removal and to avoid/delay MODE 3 conditions:

    - Maximize all available heat removal capability.
    - OK to bypass the RWCU Regenerative Hx.
    - OK to raise RPV level for initial cooling effect.
    - OK to feed RPV using CRD/FW, and bleed using RWCU.
    - OK to feed RPV using CRD/FW, and bleed using MSL drains.

      CW can be used to enhance heat removal.

5.0 **FINAL CONDITIONS**

5.1 An adequate decay heat removal method is in operation.

5.2 Plant conditions established for applicable MODE/condition.

6.0 **DISCUSSION**

6.1 This procedure provides for:

- Establishing a conservative mitigating response.
- Collectively groups all available heat removal methods for efficient reference and evaluation.
- Establishes operational position for MODE 3 changes.
- Implementing required ITS/ORM actions.

6.2 Decay heat removal methods and strategies require careful evaluation of required procedure steps.

Potential system damage is possible when necessary warm ups/line ups are not fully completed.

Since plant conditions and available systems will be different for every event, this procedure does not attempt to list every possible operating consideration.

Loss of SDC events are generally slow paced and back-up SDC methods have been pre-established per OU-AA-103 and OU-CL-104 (Shutdown Risk Management) thereby allowing for an adequate review and evaluation of the response actions.

❷ 6.3 The design temperature limit for the Upper Containment Pools is 150°F. Exceeding this temperature should be avoided but the effects of using alternate systems must be weighed against short term excursions above 150°F if recovery of a preferred cooling method is likely.

❷❸ 6.4 Use of jet pump plugs with a relatively low temperature limit creates a special case where a loss of SDC can create a loss of RPV inventory. Evaluate RPV Water Inventory Control Drain Time impact per CPS 3006.01P001, Reactor Pressure Vessel Water Inventory Control. (*reference EC 403438*).

Use of alternate cooling methods is warranted if significant jet pump plug degradation is expected to occur before cooling is restored. The temperature of concern is Reactor Cavity Pool surface temperature and this temperature is NOT adjusted to obtain a derived RPV coolant temperature.

6.0 **DISCUSSION** (cont'd)

6.5 1. Loss of SDC while in MODE 3:

Minimal plant impact.

RPV integrity is maintained and core cooling is adequately maintained via existing plant procedures and as necessary, via the EOPs.

2. Loss of SDC while in MODE 4:

Minor plant impact.

A sustained Loss of SDC will result in an undesired MODE change and pressurization.

RPV integrity is maintained and core cooling is adequately maintained via existing plant procedures and as necessary, via the EOPs.

3. Loss of SDC while in MODE 5:

Significant plant impact.

A sustained Loss of SDC will result in exceeding MODE 3 conditions and RPV boiloff.

The plant will remain in a MODE 5 classification.

Core cooling is adequately maintained via existing plant procedures and as necessary, via the EOPs.

The primary items of concern are:

1) Establishing secondary CNMT integrity.
2) Radiological conditions due to RPV boil off.
3) Maintaining cooling/level to CNMT/FB fuel pools.

Refueling outage's pre-planning, lowering decay heat levels, and the long time periods before reaching boiling conditions assist in minimizing the overall impact of this event while in this MODE/condition.

6.6 A loss of Div 1(2) NSPS power will cause a Group 3 SDC Isolation due to RHR Equip Area High Temp.

When the Div 1(2) NSPS power is not available, the RHR A&B Pump's automatic trip due to loss of a suction path (1E12-F008/9 not full open) will not be available.

## 7.0 REFERENCES

### 7.1 CPS Procedures

7.1.1 EP-AA-1003: CPS Emergency Plan Annex

7.1.2 OU-AA-103, Shutdown Safety Management Program

7.1.3 OU-CL-104, Shutdown Safety Management Program Clinton Power Station

7.1.4 CPS 3101.01, Main Steam (MS, IS & ADS)

7.1.5 CPS 3103.01, Feedwater (FW)

7.1.6 CPS 3104.01, Condensate/Condensate Booster (CD/CB)

7.1.7 CPS 3002.01, Heatup And Pressurization

7.1.8 CPS 3006.01, Unit Shutdown

7.1.9 CPS 3303.01, Reactor Water Cleanup (RT)

7.1.10 CPS 3312.02, Alternate Shutdown Cooling (A-SDC) Methods

7.1.11 CPS 3312.03, RHR - Shutdown Cooling (SDC) & Fuel Pool Cooling And Assist (FPC&A)

7.1.12 CPS 3317.01, Fuel Pool Cooling And Cleanup (FC)

7.1.13 CPS 9000.06, Reactor Coolant And Vessel Metal/ Pressure/Temperature Limit Logs

0 7.1.14 CPS 4411.02 Spent Fuel Pool Abnormal Water Level Decrease

7.1.15 CPS 1401.09, Control of System and Equipment

7.1.16 CPS 9065.01, Secondary Containment Access Integrity

### 7.2 ITS/ORM

7.2.1 ITS LCO 3.4.9: MODE 3 SDC OPERABILITY

7.2.2 ITS LCO 3.4.10: MODE 4 SDC OPERABILITY

7.2.3 ITS LCO 3.4.11: RCS/RPV/RR P/T Limits

7.2.4 ITS LCO 3.6.1.1: Primary CNMT OPERABILITY

7.2.5 ITS LCO 3.6.4.1: Secondary CNMT OPERABILITY

7.2.6 ITS LCO 3.9.6: FH - RPV Level Limits

7.2.7 ITS LCO 3.9.7: FH/CA - RPV Level Limits

7.2.8 ITS LCO 3.9.8: MODE 5 (Hi RPV Level) SDC OPERABILITY

7.2.9 ITS LCO 3.9.9: MODE 5 (Lo RPV Level) SDC OPERABILITY

7.2.10 ORM TR 4.3.1.5: Rx Coolant Continuous Conductivity

7.2.11 ORM OR 2.4.8: Fuel Pool Water Level Limits

## TABLE 1: INITIAL PLANT CONDITIONS

Purpose: To assist in prioritizing response actions and for evaluating the impact on the various pool temperatures.

The completed Table 1 should be included with the Condition Report generated for the Loss of SDC event.

| | | Source of Data |
|---|---|---|
| Time/Date: | _____/_____ | |
| RPV Pressure: | _____ psig | _____ |
| RPV Temperature: | _____ °F | _____ |
| RPV Level | _____ in | _____ |

Pool Temperatures*:

| | | |
|---|---|---|
| CNMT Fuel Storage Pool: | _____ °F | _____ |
| FB Spent Fuel Pool: | _____ °F | _____ |
| Suppression Pool: | _____ °F | _____ |

Estimated Heat-Up Rates†

| | |
|---|---|
| Reactor Coolant: | _____ °F/hr |
| CNMT Fuel Storage Pool:* | _____ °F/hr |
| FB Spent Fuel Pool:* | _____ °F/hr |
| Suppression Pool:* | _____ °F/hr |

Time to reach 200°F RPV Temp: _____ minutes / hours

Time to reach RPV Boiling: _____ minutes / hours

Table completed by: _____

† Outage HU & Boiloff curves developed per OU-AA-103/OU-CL-104 are normally maintained as an outage specific Operator Aid (subject to plant condition updates) located with the CRS.

* As applicable, based on SDC/ Alternate SDC system that was lost.

## TABLE 2: SHUTDOWN COOLING METHODS

| **RPV at Pressure:** | Procedure |
|---|---|
| ° Main Turbine Bypass Valves | 3101.01 (MS) |
| ° RCIC [☞ Isolates at 60 psig decreasing] | 3310.01 (RCIC) |
| ° RFPTs [Turbine RFPs - Pressure & level control] | 3103.01 (FW) |
| ° Condensate/Feedwater [Level control/heat sink only] | 3104.01 (CD/CB) |
| ° Main Steam Line Drains | 3101.01 (MS) |
| ° SRVs | 3101.01 (MS) |
| ° RWCU | 3303.01 (RT) |
| ° RHR SDC [☞ Isolates at 104 psig increasing] | 3312.03 (RHR-SDC) |

| **RPV De-pressurized:** | |
|---|---|
| ° RHR SDC [☞ Isolates at 104 psig increasing] | 3312.03 (RHR-SDC) |
| ° RWCU | 3303.01 (RT) |
| ° FC [RPV head off] | 3317.01 (FC) |
| ° FC Using Natural Circulation [RPV head off] | 3312.02 (A-SDC) |
| ° Condensate/Feedwater [Level control/heat sink only] | 3103.01 (FW)<br>3104.01 (CD/CB) |

### NOTE

*Use of the following Alternate SDC methods places extreme stress on RPV components & systems, may utilize 'dirty' suppression pool inventory, and can create degraded radiological conditions.*

❸ *Unless required to maintain adequate core cooling, spent fuel cooling, or minimize radiological conditions, these methods should not be used to prevent the plant from exceeding 200°F (except when jet pump plugs are installed to protect water inventory).*

❷❸ *In Mode 5, use of these systems may be necessary if Upper Pool temperatures exceed 150°F (refer to step 6.3).*

| | |
|---|---|
| ° RHR-SDC Through LPCI Injection Path [F042A/B]<br>☞ Normally limited to RPV coolant < 125°F.<br>Damage to LPRM's & Fuel Assemblies may occur. | 3312.02 (A-SDC)<br>3312.03 (RHR-SDC) |
| ° ECCS Feed And Bleed Through SRVs | 3312.02 (A-SDC) |
| ° ECCS Feed and Bleed Through SM Dump Valves | 3312.02 (A-SDC) |

# LOSS OF AC POWER

***SCOPE OF REVISION:***

- Incorporated revisions 25 - 25b. Revision marks not retained.

❶ IR 04122939-02 - EDITORIAL - Removed erroneous statement regarding Div III DG as an "alternate AC power source" from section 1.4. Converted all "☞" statements to NOTEs. Added wording to step 4.2.5.2 for consistency with step 4.2.1.6. Minor formatting adjustments - no revision marks used.

IR 04172512-02 - EDITORIAL - Reworded step 4.1.1 for consistency with direction in section 4.4.

Affected Pages: 1, 3-15, 18-32, 40-50

**CONTINUOUS USE**

**ORIGINATOR:** *Steven M. Frederick* **CLASS CODE:** *SNNN*

**SQR:** *N/A* **APPROVAL DATE:** *10/09/18*

*CURRENT CHANGES TO GENERAL REVISION*

| | *Change #* | *Date* | *List of Affected Pages* |
|---|---|---|---|
| ❶ | | | |
| ❷ | | | |
| ❸ | | | |
| ❹ | | | |
| ❺ | | | |

**TABLE OF CONTENTS**

## 1.0 SYMPTOMS

### 1.1 Generic

1. Any interruption of power on an AC bus which results in:

   1. Automatic transfer of the bus to any alternate source,

   2. Loss of voltage, current and watts on the bus, or

   3. Bus under voltage, auto transfer of feeder breaker, breaker tripped, breaker not available, and transfer blocked alarms on the bus(es).

### 1.2 4160V Bus 1A1, 1B1, and/or 1C1 (ECCS)

1. Loss of all operating AC equipment powered from ECCS bus, including partial lighting loss.

### 1.3 6900V Bus 1A(1B) and/or 4160V Bus 1A(1B) (Non-ECCS)

**NOTE**

RC&IS Full Core Display will be lost shortly after the bus deenergizes. Failure to verify Shutdown Criteria before losing the Full Core Display will require alternate means of verifying rod position per CPS 4100.01, Reactor Scram. «CM-4»

1. Loss of all operating AC equipment, including:
   - RC&IS Full Core Display (Feed from 6.9KV Bus 1A, Unit Sub O, MCC C):
   - Nuclear instruments (excluding APRMs)
   - Level indication (P678 - Standby Info Pnl)
   - RPV metal temperatures (P614 - NSSS Recorder Pnl) powered from the non-ECCS bus
   - Partial lighting loss

2. Reactor scram, turbine trip and Group 1 isolation.

1.4 **Station Blackout (SBO)** *«CM-1»*

1. A total loss of offsite AC power sources (including main generator), and failure of Div 1 & Div 2 DG power sources.
   1. Loss of all operating AC equipment including nuclear instruments, level indication and RPV metal temperatures powered from the ECCS and non-ECCS busses, and a loss of all AC lighting.
   2. Reactor scram, turbine trip and MSIV closure.
   3. As long as DC busses are available, instrumentation may be available where powered by UPS supplies, such as the NSPS ATMs.

1.5 **Extended Loss of AC Power (ELAP)**

1. A total and sustained (>1 hour) loss of both offsite and onsite AC power sources as a result of a postulated Beyond Design Basis External Event (BDBEE) which is expected to exceed the 4 hour SBO coping period.

2.0 **AUTOMATIC ACTIONS**

2.1 **4160V Bus 1A1, 1B1 and/or 1C1 (ECCS)**

1. The loss of voltage relays will trip RAT 'B' (ERAT), and close in ERAT (RAT 'B'), if sufficient voltage exists on the standby bus.

2. After a 15 sec time delay with degraded voltage, the secondary under voltage relays will strip the 4.16KV Bus 1A1 (1AP07E), 1B1 (1AP09E), or 1C1 (1E22-S004), start the associated DG, and will tie the DG onto the bus within 12 seconds, even if the alternate off site source is available. Loads will be automatically connected to the ECCS bus as required by ECCS initiation logic, if power is available.

3. If ECCS bus 1B1 is de-energized, the Emergency Seal Oil Pump, 1TO08P and the Emergency Bearing Oil Pump, 1TO05P will start.

2.2 **6900V Bus 1A(1B) and/or 4160V Bus 1A(1B) (Non-ECCS)**

1. When the UAT is the lost bus and the RAT(s) are available, non-ECCS bus(es) on the UAT will transfer to the RAT(s) (6.9KV 1A and 1B to RAT 'A';
   4.16KV 1A to RAT 'B';
   4.16KV 1B to RAT 'C').

2. If one 6900V bus is available, the following 480V bus's cross-tie breakers auto close to re-energize the associated 480V busses.
   - 480V Bus 1D/1E, 1AP14E/15E
   - 480V Bus 1H/1I, 1AP18E/19E
   - 480V Bus 1L/1M, 1AP24E/25E
   - 480V Bus C/D, 0AP43E/44E
   - 480V Bus O/P, 0AP91E/92E

3. If both 6900V busses are **NOT** available or a bus under-voltage condition is reached, all associated bus load breakers will trip.

4. Reactor scram, turbine trip and Group 1 isolation may occur depending on which bus is de-energized.

5. If 6900V Bus 1A(1B) is de-energized, then Diesel Fire Pump 0FP01PA(B) will start.

3.0 **IMMEDIATE OPERATOR ACTIONS**

1. Within a maximum of 1 hour, the Shift Manager SHALL determine if an Extended Loss of AC Power (ELAP) exists.

**NOTE**

1. Throughout the use of this procedure, refer to as needed:
   - CPS Emergency Plan Annex (EP-AA-1003)
   - CPS 4001.02, Automatic Isolation
   - CPS 4100.01, Reactor Scram
   - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
   - CPS 3703.02C001, Irradiated Fuel Handling Checklist
   - ITS LCO section 3.8
   - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability

2. During performance of CPS 4001.02, Automatic Isolation:
   - Local verification may be necessary.
   - Resetting of shunt trips, especially TB MCC 1M, is essential to system recovery actions.

## 4.0 SUBSEQUENT ACTIONS

**NOTE**

1. Security SHALL be notified any time the 138 kV system, the 12kV system, or circuit switchers 4508/4538 are de-energized/re-energized and to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

2. Ensure appropriate Security actions are taken for a loss of AC power.

[CA#4010227-60] <<CM-10>>

### 4.1 Global Subsequent Actions

1. **IF** An ELAP exists (see step 1.5 for Definition)

   **THEN** STOP executing Station Blackout actions

   **AND**

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

2. **IF** 4160V Bus 1A1 OR 1B1 auto transferred to the alternate power supply and re-energized

   **THEN** Proceed quickly to section 4.2.1, **4160v 1A1(1B1) Dead Bus Transfer.**

4.1 **Global Subsequent Actions** (Cont'd)

3. Deleted.

4. Determine which AC busses were transferred/lost and perform applicable sections below:

   - Loss/transfer of 4160V Bus 1A1(1B1) 4.2
   - Loss of Non-ECCS Bus 4.3
   - Station Blackout (SBO) 4.4

## 4.2 Loss/Transfer of 4160V Bus 1A1(1B1)

### 4.2.1 4160v 1A1(1B1) Dead Bus Transfer

**NOTE**

This section is written assuming that, from normal plant conditions, 4160V Bus 1A1(1B1) has properly transferred to the other off site source or its respective DG (i.e., bus was dropped and picked up).

1. Deleted.

2. Verify status of Fuel Pool Cooling (FC):

   **IF** FC has tripped,

   **THEN** Isolate the Upper Containment pools per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

   **AND**

   Monitor Pool Temperature per CPS 3317.01, Abnormal section "High Temperature Spent Fuel Storage Pool."

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

| **NOTE** |
|---|
| Fuel Building Ventilation (VF) should restart without operator action on the STANDBY fans if power is lost for less than ~6 seconds. |

3. Verify running/restore Fuel Building Ventilation (VF).

   1. Open/verify open 1VF04Y/9Y, Fuel Bldg Sply Outbd Isol Dmprs

   2. Open/verify open 1VF06Y/7Y, Fuel Bldg Sply Inbd Isol Dmprs

   3. Verify 1VF04CA(B), Fuel Bldg Exh Fan running/starts

   4. Verify 1VF03CA(B), Fuel Bldg Sply Fan running/starts

   5. **IF** Div 1(Div 2) Sec CNMT Isolation Damper(s) has closed and can **NOT** be reopened,

      **AND/OR**

      VF fans do **NOT** start when the isolation dampers open,

      **THEN** Maintain secondary containment dP using Standby Gas (VG) per CPS 3319.01 (VG).

| **NOTE** |
|---|
| Running a VP train does **NOT** require Non-ECCS power available (IA, WS, etc.) |

4. Verify status of Drywell Cooling (VP).

   **IF** VP has tripped,

   **THEN:** 1) Control drywell pressure using Mixing Compressors per CPS 3316.01, CNMT Combustible Gas Control (HG).

   2) **IF** Div 2(Div 1) ECCS Bus is energized,

   **THEN** Attempt to restore VP.

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

**NOTE**

VC fans should automatically restart approximately 40 seconds after the 480 V bus is reenergized. The control switch for 0VC03CA must remain in the Auto-After Start position for the fans to restart. The amber lights will **NOT** energize when the fans trip.

5. Verify status of Control Room Ventilation (VC).

   **IF** The VC fans and/or chiller do **NOT** restart,

   **THEN** Start one train of VC per CPS 3402.01, CONTROL ROOM HVAC (VC).

**CAUTION**

1. The solenoid valves fail shut on loss of power.
2. The valves do **NOT** automatically reopen when power is restored.
3. The FPM pumps restart when power is restored.
4. Failure to promptly reopen the valves or deenergize the FPM pumps may result in pump damage. (ITS LCO 3.4.7.b impact)

6. Restore **OR** secure the Fission Product Monitor [CPS 3315.02 (LD)] per one of the following steps: «CM-3»

   1) [CNMT 781'] Open/verify open 1E31-F014/15/17/18, LD Drywell Isol Valves.

   **OR**

   2) Deenergize FPM Pumps by opening following breakers at AB MCC 1A1-8C (1AP72E) AB 781' East [Dbl Bkrs]:

      - Ckt #43: Feed to 1E31-P001 Iodine-Noble Gas Sample Panel.
      - Ckt #47: Feed to 1E31-P002 Iodine-Noble Gas Sample Panel.

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

**NOTE**

Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred.

7. Verify status of the RR Pumps/seals.

   **IF** An RR pump has tripped,

   **OR**

   Shows signs of degraded seals,

   **THEN** Take actions per CPS 3302.01, Reactor Recirculation (RR).

8. Ensure that the Div 1(2) Battery Charger is operating or restart it per CPS 3503.01, BATTERY AND DC DISTRIBUTION (DC).

**NOTE**

Shunt Trips are to be expected due to the deenergization of the ECCS busses, especially if NSPS is **NOT** being supplied from its normal source(s). Resetting of shunt trips is essential to system recovery actions.

9. Shunt Trips «CM-5»

   For the Div 1(Div 2) bus(es),

   1) Perform a walkdown of the Div 1(Div 2) shunt trips using CPS 4001.02, Automatic Isolation, Table 1, SHUNT TRIPS.

   2) Notify the CRS of any shunt trip breakers found in the tripped position.

   3) Tripped breakers shall be reset per CRS direction.

10. Verify all MSIV Solenoids are still energized.
    - > 113 mA at MSIV Solenoid Current meters:

    Outboard (1B21-F028's meters 1B21-661/662 A-D) located in 1H13-P661A/C.

    Inboard (1B21-F022's meters 1B21-659/660 A-D) located in 1H13-P662B/E.

11. Verify no NSPS 'blind trips' exist.
    - 1L1 & 1L2 lights energized in 1H13-P661 Bay B, 1H13-662 Bay C, 1H13-663 Bay B, 1H13-664 Bay C

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

| **NOTE** |
| --- |
| During performance of CPS 4001.02, Automatic Isolation, local verification may be necessary. |

12. Refer to as needed:
    - CPS Emergency Plan Annex (EP-AA-1003)
    - CPS 4001.02, Automatic Isolation
    - CPS 4100.01, Reactor Scram
    - ITS LCO section 3.8
    - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
    - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability
13. Verify the status of Div 1(Div 2) Shutdown Service Water (SX) [CPS 3211.01 (SX)]
14. Coordinate with Transmission Supply Services Dispatch) for switchyard status, and for restoration information/support.
15. As resources permit, verify in-service/restore the CNMT SA Header per CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW SA Header section.

4.2.2 **4160V Bus 1A1(1B1) De-Energized**

1. Deleted.

| **NOTE** |
|---|
| Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred. |

2. Verify status of the RR Pumps/seals.

   **IF** An RR pump has tripped

   **OR**

   Shows signs of degraded seals,

   **THEN** Take actions per CPS 3302.01, Reactor Recirculation (RR).

| **NOTE** |
|---|
| Running a VP train does **NOT** require Non-ECCS power available (IA, WS, etc.). |

3. Verify status of Drywell Cooling (VP).

   **IF** VP has tripped,

   **THEN:** 1) Control drywell pressure using Mixing Compressors per CPS 3316.01, CNMT Combustible Gas Control (HG).

   2) **IF** Div 2(Div 1) ECCS Bus is energized,

   **THEN** Attempt to restore the VP train on the opposite bus to service.

4. Maintain secondary containment dP using Standby Gas (VG) per CPS 3319.01 (VG).

5. Verify status of Fuel Pool Cooling (FC):

   **IF** FC has tripped,

   **THEN** Isolate the Upper Containment pools per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

   **AND**

   Monitor Pool Temperature per CPS 3317.01, Abnormal section "High Temperature Spent Fuel Storage Pool."

4.2.2 **4160V Bus 1A1(1B1) De-Energized** (Cont)

**NOTE**

Loss of DC power significantly complicates plant operation. Charger restoration and extending existing DC capability should be pursued aggressively.

6. Reduce non-essential DC loads on the Div 1(Div 2) Battery as necessary to minimize battery discharge rate.
   Use CPS 4200.01C002, DC Load Shedding During A SBO.

**CAUTION**

A loss of power to 4160V Bus 1A1 (1B1) with a concurrent loss of power to 125VDC MCC 1A (1B) will cause 1IA005 and 1IA008 (1IA006 and 1IA007) to fail closed. Closure of either set of valves will isolate the 3" instrument air ring headers in containment and the drywell, leading to gradual depressurization of the air headers and opening of scram valves at the hydraulic control units.

7. **IF** At any point during this procedure, IA to the Primary Containment is lost and can **NOT** be immediately restored,

   **AND**

   The reactor is critical,

   **THEN:** 1) Place Mode Switch in SHUTDOWN.

   2) Enter CPS 4100.01, Reactor Scram.

**NOTE**

During performance of CPS 4001.02, Automatic Isolation, local verification may be necessary.

8. Refer to as needed:
   - CPS Emergency Plan Annex (EP-AA-1003)
   - CPS 4001.02, Automatic Isolation
   - CPS 4100.01, Reactor Scram
   - ITS LCO section 3.8
   - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
   - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability

4.2.2 **4160V Bus 1A1(1B1) De-Energized** (Cont)

**NOTE**

Refer to CPS 3312.03 (RHR-SDC) for Alternate SDC Temperature Monitoring when necessary.

9. Determine remaining operable critical instrumentation per APPENDIX B, Instrument Availability.

10. Coordinate with Transmission Supply Services (Dispatch) for switchyard status, and for restoration information and support.

11. Record TRIP DATA on the appropriate TRIP DATA SHEET listed in section 8.0, DOCUMENTS.

12. As time and resources permit, de-energize rad monitor trip logic power supplies per APPENDIX C prior to restoring 4160V Bus 1A1(1B1) to prevent inadvertent actuation/isolations. «CM-2»

13. **IF** IA is lost to the Primary Containment and Drywell and can **NOT** be restored

**AND**

It is necessary to increase the ability to remove decay heat from the reactor (to achieve COLD SHUTDOWN or avoid lifting Safety Relief Valves, etc.).

**THEN** Consider gagging open IA to the Containment to allow reopening the MSIVs (reference IR 1630318 and EC 396365).

4.2.3 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using RAT 'B' (ERAT)**

1. Place breakers for the dead bus in PULL-TO-LOCK:
   - DG: DG 1A(B)[C] Output Bkr
   - RAT: 4160V Bus 1A1(1B1)[1C1] Mn Bkr
   - ERAT: 4160V Bus 1A1(1B1)[1C1] Res Bkr

2. Make the RAT 'B' (ERAT) and 1RT4 (1ET4) bus ready as appropriate for plant conditions per CPS 3505.01, 345 & 138 KV Switchyard (SY) and ERO recommendations.

3. (Local) For applicable Bus 1A1(1B1) re-energization:

   Verify Ckt 32 (RHR control) on DC MCC 1A(1B) is re-energized if turned off by CPS 4200.01C002, DC Load Shedding During A SBO.

4. (Local) Reset any ECCS Bus and/or RAT 'B' (ERAT) lockouts.

**NOTE**

Reference to "RAT 1" is associated with all Plant 1 RATs, including RAT 'A', 'B' and 'C'.

5. Close RAT 1 (ERAT) Circuit Switcher 4538 (B018).

6. Place 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr Sync switch to ON.

**CAUTION**

ECCS systems may auto start without an adequate fill & vent, resulting in potential water hammer damage and unavailability of the ECCS function. The systems will be restored/restarted as required after the bus is re-energized.

7. As resources are available, prevent the Divisional ECCS system(s) from starting by either:
   - Holding the ECCS pump switch in OFF

   **OR**

   - Pulling the ECCS pump's control power fuses.

| | | |
|---|---|---|
| Div 1: | RHR A | [4160V Bus 1A1 (1AP07E), 1AP07EG] |
| | LPCS | [4160V Bus 1A1 (1AP07E), 1AP07EE] |
| Div 2: | RHR B | [4160V Bus 1B1 (1AP09E), 1AP09ED] |
| | RHR C | [4160V Bus 1B1 (1AP09E), 1AP09EF] |
| Div 3: | HPCS: | [HPCS Switchgear ESF Division 3, 1E22-S004, 1E22-C001] |

4.2.3 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using RAT 'B' (ERAT)** (Cont)

8. Re-energize the bus by holding the 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr in the CLOSE position, **then** return the breaker to the AUTO position.

9. Place 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr Sync switch to OFF.

10. Proceed to section 4.2.5, **Actions After 4160V Bus 1A1(1B1)[1C1] Reenergized.**

4.2.4 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using DG 1A(1B)[1C]**

1. Place breakers for the dead bus in PULL-TO-LOCK:
   - DG: DG 1A(B)[C] Output Bkr
   - RAT 'B': 4160V Bus 1A1(1B1)[1C1] Mn Bkr
   - ERAT: 4160V Bus 1A1(1B1)[1C1] Res Bkr

2. (Local) Place DG 1A(B)[C] Engine Maintenance Switch to LOCKOUT [MAINTENANCE - DG 1C] position.

3. Make DG ready as appropriate for plant conditions per CPS 3506.01, Diesel Generator And Support Systems (DG) and ERO recommendations.

4. (Local) For applicable Bus 1A1(1B1) re-energization:

   Verify Ckt #13(14) [DG 1A(1B) control] & Ckt #32 (RHR control) on DC MCC 1A(1B) [1DC13(14)E] are re-energized if turned off by CPS 4200.01C002, DC Load Shedding During A SBO.

5. (Local) Reset any ECCS Bus and/or DG lockouts.

6. Place DG 1A(B)[C] Output Bkr in AUTO.

7. Place DG 1A(B)[C] Control in AUTO-AFTER-STOP.

8. For DG 1A start during a SBO:

   Stop the RCIC Gland Seal Air Compressor to ensure sufficient DG 1A field flashing current on the DG 1A start sequence.

**CAUTION**

ECCS systems may auto start without an adequate fill & vent, resulting in potential water hammer damage and unavailability of the ECCS function. The systems will be restored/restarted as required after the bus is re-energized.

9. As resources are available, prevent the Divisional ECCS system(s) from starting by either:
   - Holding the ECCS pump switch in OFF

   **OR**

   - Pulling the ECCS pump's control power fuses.

   Div 1: RHR A [4160V Bus 1A1 (1AP07E), 1AP07EG]
   LPCS [4160V Bus 1A1 (1AP07E), 1AP07EE]

   Div 2: RHR B [4160V Bus 1B1 (1AP09E), 1AP09ED]
   RHR C [4160V Bus 1B1 (1AP09E), 1AP09EF]

   Div 3: HPCS: [HPCS Switchgear ESF Division 3, 1E22-S004, 1E22-C001]

4.2.4 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using DG 1A(1B)[1C]** (Cont)

10. (Local) Start DG 1A(B)[C] on a bus under voltage signal by placing DG 1A(B)[C] Engine Maintenance Switch to OPERATE [AUTO - DG 1C] position.

**NOTE**

1. If DG fails to start due to active trip signals, a manually initiated LOCA signal should be considered which will bypass most DG trip signals.

2. If SX pump failed to start, placing the SX pump C/S in AFTER-STOP may reset its logic to allow it to be started.

11. Verify DG auto start actions per CPS 3506.01 (DG) including SX pump start and lineup configuration. «CM-6»

## 4.2.5 Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized

**NOTE**

Section 4.2.5 steps may be performed in any order or concurrently. N/A steps which are **NOT** applicable to bus re-energization event/plant conditions.

1. CNMT/DW Instrument & Service Air (IA & SA)

   1) At 1H13-P800 (Section 5041), verify open/re-open:

      - DW IA Hdr Inbd Isol Vlv, 1IA008.
      - CNMT IA Outbd Isol Vlv, 1IA005.
      - DW IA Outbd Isol Vlv, 1IA007.
      - CNMT IA Inbd Isol Vlv, 1IA006.

   2) As needed, perform any additional actions as described in CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW IA Header section. (i.e., ADS).

   3) As resources permit, verify in-service/restore the CNMT SA Header per CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW SA Header section.

**CAUTION**

1. The solenoid valves fail shut on loss of power.
2. The valves do **NOT** automatically reopen when power is restored.
3. The FPM pumps restart when power is restored.
4. Failure to promptly reopen the valves or deenergize the FPM pumps may result in pump damage. (ITS LCO 3.4.7.b impact)

2. Restore **OR** secure the Fission Product Monitor [CPS 3315.02 (LD)] per one of the following steps. «CM-3»

   1) [CNMT 781'] Open/Verify Open 1E31-F014/15/17/18, LD Drywell Isol Valves.

   **OR**

   2) Deenergize FPM Pumps by opening following breakers at AB MCC 1A1-8C (1AP72E) AB 781' East [Dbl Bkrs]:

      - Ckt #43: Feed to 1E31-P001 Iodine-Noble Gas Sample Panel.
      - Ckt #47: Feed to 1E31-P002 Iodine-Noble Gas Sample Panel.

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

**NOTE**

1. Restarting ECCS systems without a complete fill & vent may be required when ACC is **NOT** available per the EOPs.
2. Water hammer in the system should be expected.
3. ECCS room access may **NOT** be available for fill & vent due to radiation or temperature levels.

3. Perform applicable ECCS fill & vent surveillances.

   Evaluate if any other surveillances or lineups should be performed.

4. Re-energize appropriate DC loads which may have been shed by CPS 4200.01C002, DC Load Shedding During A SBO.

**NOTE**

Shunt Trips are to be expected due to the deenergization of the ECCS busses and relay races upon ECCS bus reenergization.

5. Shunt Trips «CM-5»

   For the affected divisional bus(es),

   1) Perform a walkdown of the divisional shunt trips using CPS 4001.02, Automatic Isolation, Table 1, SHUNT TRIPS.
   2) Notify the CRS of any shunt trip breakers found in the tripped position.
   3) Tripped breakers shall be reset per the CRS direction.

6. Verify all MSIV Solenoids are still energized.

   - > 113 mA at MSIV Solenoid Current meters:

     Outboard (1B21-F028's meters 1B21-661/662 A-D) located in 1H13-P661A/C.

     Inboard (1B21-F022's meters 1B21-659/660 A-D) located in 1H13-P662B/E.

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

7. Verify no NSPS 'blind trips' exist.
   - 1L1 & 1L2 lights energized in 1H13-661B/2C/3B/4C

8. Notify Chemistry of bus restoration (may impact Post Accident Sample Panel or other Chemistry sampling capabilities).

9. **WHEN** Loss of AC event is stabilized, and as resources allow (do **NOT** delay critical system restoration),

   1) Restore ECCS bus power sources to the RAT 'B' (ERAT) per CPS 3506.01 (DG) and/or CPS 3501.01, High Voltage Auxiliary Power System. «CM-7»

   2) Perform:

      a) A detailed MCR panel & alarm window walkdown to ensure no other unidentified issues exist.

      b) A relay house walkdown, preferable concurrent with CPS 4200.01D011, Switchyard Trip Data Sheet.

      c) CPS 9082.01, Offsite Source Verification

      d) CPS 9082.02, Electrical Distribution Verification

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

10. System Restorations

As applicable, verify/complete shutdown of affected systems, and as time/resources permit, recover the system per the CRS direction and system procedure.

This may include, but is **NOT** limited to:

**NOTE**

Concern - ECCS initiation on hi DW pressure.

- Drywell Ventilation (VP) [CPS 3320.01 (VP)]

**NOTE**

May need to start VG [CPS 3319.01) until VF is restored to support Secondary CNMT dP.

- Fuel Bldg Ventilation (VF) [CPS 3404.01 (VF)]

**NOTE**

FC Surge Tank will increase when FC trips. CNMT Upper Pool level will lower.

- Fuel Pool Cleanup (FC) [CPS 3317.01 (FC)]

**NOTE**

RACS 5 VDC Power Supply may 'crow bar' - an OV/Spike protection feature which opens the supply ckt, but does **NOT** cause the power supply breaker to trip open. IMD support required to reset.

- Rod Control via RC&IS / RACS [CPS 3304.01 (RC&IS)]
- Main Control Room HVAC (VC) [CPS 3402.01 (VC)]
- DG Air Compressors [shunt trip item]
- Containment Monitoring and Process Sampling/Post Accident Sampling (CM/PS/PASS) [shunt trip item]
- Reactor Water Cleanup (RT) [CPS 3303.01 (RT)]
- E32/E51 Rosemount ACU Meter Gross Failures (reset)

**NOTE**

Should return to NORMAL To LOAD. Need EMD support to reset NSPS Latching Relay.

- Loss of Sync to NSPS Inverters. [CPS 3509.01 (IP)]
- Shutdown Service Water (SX) [CPS 3211.01 (SX)]

## 4.3 Loss of Non-ECCS Bus

**NOTE**

Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred.

1. **IF** CRD pumps are **NOT** available,

   **THEN** Within one hour **AND** as resources permit, initiate Recirc Pump Auxiliary Seal Injection Pump Operation per CPS 3304.01, Control Rod Hydraulic & Control (RD).

2. **IF** Feedwater is unavailable or unnecessary,

   **THEN** Shut 1B21-F065A(B), RPV Inlet Vlvs.

3. **IF** CW is lost or reduced in flow,

   **THEN** Notify Security to implement compensatory measures in accordance with SY-CL-101-102 and SY-AA-1010-102.

4. Prepare affected busses for re-energization as follows:

   1) Place equipment control switches in PULL-TO-LOCK or LOCKED for the de-energized busses per APPENDIX A (page 27).

   2) For 6900V Bus 1A: 480V Unit Sub C or RW MCC E only: As time and resources permit, de-energize rad monitor trip logic power supplies per APPENDIX C prior to restoring the effected bus(es), to prevent inadvertent actuation/isolations. *«CM-2»*

   3) Prepare applicable de-energized 6900V bus(es), 4160V bus(es) or 480V unit sub-station(s):

      a. Place Mn & Res Feed Brk(s) for the bus(es) in PULL-TO-LOCK.

      b. If normal DC control power is **NOT** available, transfer DC control power at the associated bus(es) by inserting control power fuses to the reserve supply receptacles locally at the bus(es).
      [Cubicles: 6900V 1A: 1AP04EA; 6900V 1B: 1AP05EK;
      4160V 1A: 1AP06EH; 4160V 1B: 1AP08EL]

5. **WHEN** An offsite electrical power source is available,

   **THEN** Energize the affected bus(es) per:

   - CPS 3505.01, 345 & 138 KV Switchyard (SY)
   - CPS 3501.01, High Voltage Auxiliary Power System
   - CPS 3502.01, 480 VAC Distribution

4.3 **Loss of Non-ECCS Bus** (Cont)

**NOTE**

Secure one pump to conserve fuel while maintaining the FP header pressurized.

6. **WHEN** Fire protection jockey pump is restored,

   **THEN** Return Diesel Fire Pumps, 0FP01PA(B) to STANDBY per CPS 3213.01, Fire Detection And Protection.

**NOTE**

1. Loss of DC power significantly complicates plant operation. Charger restoration and extending existing DC capability should be pursued aggressively.
2. It is permissible to use CPS 4200.01C002, DC Load Shedding During a SBO.
3. Per TG Engineer, a turbine coast down takes ~ 2.5 hrs, plus 30 min for bearing cooldown.
4. Use 3509.01C005 (3509.01C006) Appendix A for load list/impacts of UPS 1A (UPS 1B) load shedding. May be desired to keep PPC computers and DCS screens to provide MCR key information as long as possible. UPS 1A (UPS 1B) still assumed to be secured within 90 minutes.

7. Reduce non-essential DC loads as necessary to minimize battery discharge rate.

   The following loads are assumed to be secured in noted time frame: *«CM-9»*

   - BOP 1E: EBOP, 1TO05P [30 minutes]
   - BOP 1E: UPS 1A, 1IP06E [90 minutes]
   - BOP 1F: Emer Ltg Cab 162, 1LL62E [60 minutes]
   - BOP 1F: UPS 1B, 1IP07E [90 minutes]

**NOTE**

BOP battery life is expected to be ~2 hours; after which the EBOP & ESOP will be lost, and hydrogen in the Turb Bldg will then be a concern.

8. Securing ESOP:

   1) Vent HY from Generator per 3111.01 (HY) Emergency Generator HY Venting section

   2) Secure ESOP.

9. Secure EBOP as soon as practical.

4.3 **Loss of Non-ECCS Bus** (Cont)

**NOTE**

1. SDC Temperature recorders 1E12-R601, 1B33-R604 and 1B21-R643 are lost when 6900V Bus 1A is lost.

2. Refer to CPS 3312.03 (RHR-SDC) for Alternate SDC Temperature Monitoring when necessary.

10. Determine operable critical instrumentation per APPENDIX B, Instrument Availability (page 28).

11. Evaluate loss of power impact on communication needs:

**NOTE**

1. Step 4.3.11.1 is required to support LAN router data links for EOF, State and ERDS after UPS is discharged (~ 2 hours).

2. Security support is required to access Door 22: SB Basement Telephone Room.

1) Standard Telephone Service
PCS Phone Service
SBB LAN Core Routers (0CQ04E)

Upon Loss of 6900V Bus 1A or CB MCC C (0AP22E):

In the SB Basement Telephone Room (Door 22):

Swap 0CQ04EA, 208V Transfer Sw (on East Wall)
FROM Main Feed [0CQ07EA: CB MCC C-4BL (0AP22E)]
TO Reserve Feed [0CQ07EB: AB MCC 1A1-8B (1AP72E)].

2) **IF** PCS Phone system is **NOT** available,

**THEN** Use Operations Radios for communication.

3) Refer to Appendix E- Loss of Power Impact on Communications for more information.

12. Coordinate with Transmission Supply Services (Dispatch) for switchyard status, and for restoration information/support.

13. Refer to APPENDIX D - Loss of Offsite Power Site Support Activities for actions that may be appropriate.

14. Record TRIP DATA on the appropriate TRIP DATA SHEET listed in section 8.0, DOCUMENTS.

15. Notify Chemistry of bus restoration (may impact Post Accident Sample Panel or other Chemistry sampling capabilities).

4.3 **Loss of Non-ECCS Bus** (Cont)

**NOTE**

1. Sub-steps of 4.3.16 may be performed in any order or concurrently.
2. Step 4.3.16.1 is required to close 1CD039, SJAE Min Flow Valve, when condensate system is lost.
3. Notify security when CW is AVAILABLE and to evaluate removal of compensatory actions in accordance with SY-CL-101-102 and SY-AA-101-102. [CA 4010227-60] «CM-10»

16. Non-ECCS Bus Re-energized Actions

**WHEN** Power is restored to a non-ECCS bus,

**THEN** Perform the following:

1. Place 1B21-F304A and F304B, MS To SJAE 1A(1B) in NEUTRAL/AFTER-CLOSED.

**NOTE**

Plant conditions may require restoring systems in a different order than listed. However, 1E/1F BOP batteries/battery chargers (DC) should be restored first. Instrument Power from UPS 1A/1B busses is needed to recover remaining systems.

**CAUTION**

1. Water hammer and lifting of relief valves is a concern during system restoration.
2. Fluid systems should be checked, filled, and vented prior to restoring to service.

2. Restore following plant systems to service:
   - 1E/1F BOP batteries/battery chargers (DC)
   - Component Cooling Water (CCW)
   - Plant Service Water (WS)
   - Service and Instrument Air (SA/IA)
   - Reactor Water Cleanup (RT): as needed to support RPV forced circulation/normal heat sink
   - Turbine Building Closed Cooling Water (WT)
   - Control Rod Drive Hydraulics (RD)
   - Reactor Recirculation (RR): as needed to support RPV forced circulation/normal heat sink
   - Makeup/Cycled Condensate (MC/CY)
   - Plant Chill Water (WO)
   - Circulating Water (CW)
   - Feedwater/Condensate (FW/CB/CD)
   - Turbine and Generator Auxiliaries (TG)
   - HVAC systems

## 4.4 STATION BLACKOUT (SBO) «CM-1»

**NOTE**

Executing CPS 4306.01, Extended Loss of AC Power/Loss of UHS, takes precedence over attempts to restore offsite AC and/or DGs.

1. The Shift Manager shall conduct a continuous assessment of the prognosis for restoration of power to Div 1 and/or Div 2.

   **IF** Within 1 HOUR of the Station Blackout, there has **NOT** been action taken that would provide a HIGH ASSURANCE of restoration of Div 1 and/or Div 2 power within the 4 hour SBO coping period,

   **THEN** STOP executing Station Blackout actions

   **AND**

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

2. The Shift Manager shall continue to monitor SBO recovery actions.

   **IF** While executing SBO actions, recovery actions prove to be unsuccessful

   **THEN** STOP executing Station Blackout actions

   **AND**

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

3. ***TIME CRITICAL ACTIONS***

**NOTE**

1. Divisional Battery distribution panel load shedding should be completed first followed by BOP 1E/1F.
2. The one-hour time to complete load shedding begins at the onset of the SBO.

**CAUTION**

Equipment losses or malfunctions can occur when battery voltages are ≤ 105 VDC.

1. Initiate and complete within 1 hour, CPS 4200.01C002, DC Load Shedding During A SBO.
2. Bypass RCIC trips/isolations per CPS 4410.00C001 DEFEATING RCIC INTERLOCKS.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

| **NOTE** |
|---|
| The following actions for section 4.4.3.3 are referenced from section 8.2.4 of CPS 3101.01. Local manual valve operation may be necessary. |

3. Place ADS Backup Air Bottles in service by performing the following:

   a. Open 1IA012A - AB 762' East Gas Control Boundary

   b. Open 1IA013A - FB 781' West above Div 1 $H_2O_2$ skid

| **NOTE** |
|---|
| Performance of steps 4.4.3.3.c - 4.4.3.3.d may be delayed if containment is inaccessible. |

   c. Close/Verify Closed 1IA012B - Located AZM 50 - 788

   d. Close/Verify Closed 1IA013B - Located AZM 240 - C788 - Above BW Recv Tnk Room

4.4 **STATION BLACKOUT (SBO)** *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

**NOTE**

1. Preferred HPCS suction source for injection during a SBO is the suppression pool.
2. Minimize HPCS operations which pump the RCIC storage tank into the suppression pool.
3. Preferred RCIC suction source is the suppression pool when utilized for level control.
4. RCIC isolations are bypassed per step 4.4.3.2.
5. Use of suppression pool as a RCIC suction source is limited to 197°F suppression pool temperature during a SBO.

4. **Level Control Actions**

Control RPV water level Level 3 (8.9 in.) to Level 8 (52 in.) using HPCS or RCIC.

**IF** RPV level can **NOT** be stabilized,

**THEN** Expand level band to -30 in. to +40 in. Wide Range with a target of 0 in. to +10" Wide Range.

Expanding the pressure band to 600 - 1065 psig will assist with pressure/level coordination efforts.

**IF** HPCS is available or in service

**THEN** Secure RCIC (if running)

**AND**

**ENSURE** RCIC DC Loads are secured within 10 minutes of event.

- HPCS [preferred] (CPS 3309.01 - HPCS)
- RCIC [alternate] (CPS 3310.01 - RCIC, or (if required) CPS 4003.01C002, RSP - RCIC Operation)

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

**NOTE**

Minimize depressurization to maximize RCIC availability and to minimize suppression pool heat-up.

5. **Pressure Control Actions**

Stabilize RPV pressure below 1065 psig using SRV's or RCIC.

- SRVs (CPS 3101.01 - MS/SRVs)
  [Ref. Fig 1, SRV DISCHARGE LOCATIONS, page 25]

  Use non-ADS SRVs first, followed by ADS SRVs in a manner that:
  - Precludes uneven suppression pool heating, and
  - Avoids the running HPCS or RCIC pump suction.

- RCIC (CPS 3310.01 or CPS 4003.01C002)

  Maintain RPV pressure > 150 psig when using RCIC.

4. **Additional Actions**

**NOTE**

Some of the following actions may require support from the ERO and IMD. The CRS is expected to initiate these actions.

1. Initiate IMD actions to remotely monitor suppression pool, CNMT and DW temperatures per CPS 4200.01C003, Monitoring CNMT Temperatures During A SBO. *«CM-8»*

2. Initiate manual CNMT isolation actions per CPS 4200.01C004, Manual CNMT Isolation During A SBO.

3. Refer to step 4.3 **Loss of Non-ECCS Bus**, for action required to further reduce loads on BOP DC Busses.

4. To provide cooling to an operating Div 1 or 2 inverter, block open the inverter room door and the door from the cable spreading area to the insulation lay-down area.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

4. **Additional Actions** (Cont)

**NOTE**

1. It is expected during a SBO that a High Drywell Pressure will occur. Performing an upper suppression pool dump at the one hour point is performing action that would be expected to occur if power were available.

2. The upper pool dump should be performed promptly at the one hour point; containment conditions are expected to degrade as time progresses.

5. **IF** CPS 4306.01 Extended Loss of AC Power/Loss of UHS has **NOT** been entered

**AND**

Entry is **NOT** anticipated.

**THEN** **WHEN** the SBO reaches the one (1) hour point, dump the upper containment pools by manually opening both of the valves in either set below:

1) 1SM001A **AND** 1SM002A (Containment 803' elev, AZM 45)

**OR**

2) 1SM001B **AND** 1SM002B (Containment 803' elev, AZM 315)

**NOTE**

Portable lighting designated for fire protection should be used during the SBO.

6. Keep trying to make any power source available per:

- CPS 4200.01, Section 4.2, **Loss/Transfer of 4160V Bus 1A1/1B1**
- Consider using 'Backfeed Using MPTs & UATS' per CPS 3501.01, High Voltage Auxiliary Power System.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

4. **Additional Actions** (Cont)

**NOTE**

1. Habitability concerns are based on prolonged exposure to > 120°F. Peak worst case MCR area temperatures are expected to be 107°F.

2. This action also includes deenergizing non-essential computer equipment in the computer room.

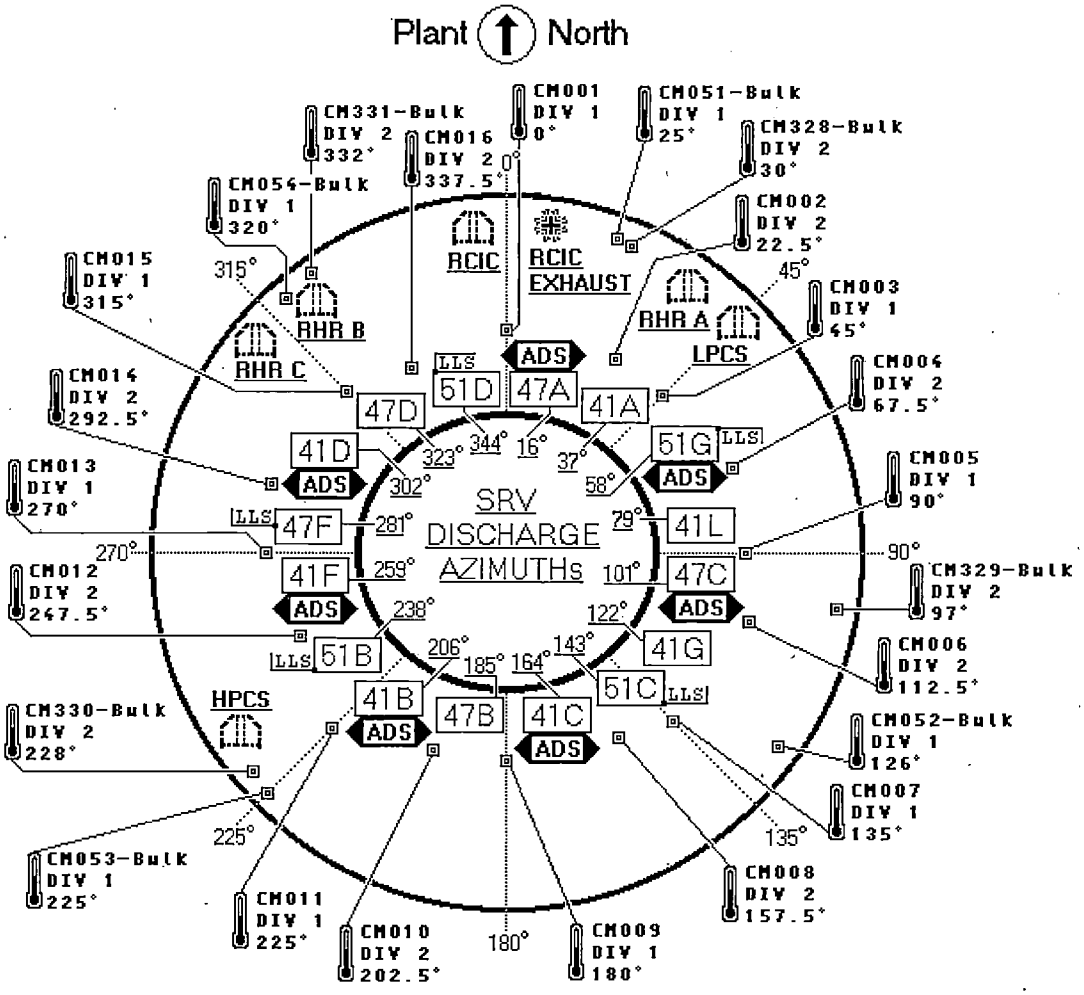
3. The DCS/PMS computer is left in-service until it has failed due to high heat conditions. DCS/PMS should be de-energized after it is no longer functioning.

7. When ERO support is available, initiate supplemental MCR cooling per CPS 4200.01C001, MCR Cooling During A SBO.

8. CPS 4303.01P023, Cross Connecting Div 3 DG to Div 1(2) ECCS Electrical Busses, was written for extensive damage/beyond design basis events.

   For extended SBO conditions, it should be referenced for strategies the ERO could employ to supply Div 1 or 2 ECCS busses from the Division 3 diesel generator to support decay heat removal.

# Figure 1
## SRV DISCHARGE LOCATIONS




**NOTE**

If pool level drops below 18 ft 6 in., read pool temperature on bulk locations.

Relative Thermocouple Location

ECCS Ring Header Suction - Relative Suction Pipe Location