PSEG NUCLEAR L.L.C.
SALEM/OPERATIONS

S2.OP-AB.RHR-0001(Q) - REV. 17

LOSS OF RHR

- Biennial Review Performed: Yes ____ No √
- Change Package(s) and Affected Document Number(s) incorporated into this revision: None
- The following OTSC(s) were incorporated into this Revision: None

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REVISION SUMMARY

The following changes were incorporated into this revision:

- Revised procedure to reflect installation of a Equipment Hatch Ventilation Barrier (EHVB) to be utilized in lieu of the Outage Equipment Hatch (OEH) . This change is being incorporated to support replacement of the Steam Generators IAW DCP 80083522, and is consistent with guidance delineated in Engineering Calculation S-2-RC-MDC-2151, Containment Closure in Modes 5 and 6 During Steam Generator Replacement. Utilization of the Equipment Hatch Ventilation Barrier (EHVB) to fulfill the requirements for Containment Closure is only allowed during Refueling Outage 2R16 in order to support replacement of the Steam Generators IAW S-2-RC-MDC-2151, Containment Closure in Modes 5 and 6 During SG Replacement. Affected steps and attachments include; Step 3.32, CAS 4.0 and 6.0, Attachment 14, and Technical Basis Document for Attachment 4 and 14 . **[80094905-0170]**

IMPLEMENTATION REQUIREMENTS

Effective Date: 03/12/2008

None

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

LOSS OF RHR

1.0 ENTRY CONDITIONS

DATE: _____ TIME: _____

1.1 Any indication of loss or reduction in RHR System cooling.

2.0 IMMEDIATE ACTIONS

2.1 None

3.0 SUBSEQUENT ACTIONS

___ 3.1 **INITIATE** Attachment 1, Continuous Action Summary.

___ 3.2 IF the RCS is vented to the Containment atmosphere with the Containment Equipment hatch OPEN AND at least two RCS loops are filled with associated SG's available, THEN **CLOSE** the vent path prior to Core Boil. (Refer to Attachment 4)

NOTE

0% Pressurizer Level Cold Cal. indication corresponds to 108.92 ft. elevation, when the RCS is filled and vented.

3.3 Is RCS aligned for operation <101 ft. elevation (Reduced Inventory)?

___ YES ___ NO ——> **GO TO** Step 3.5

V

_____ Time

___ 3.4 **GO TO** S2.OP-AB.RHR-0002(Q), Loss of RHR at Reduced Inventory.

_____ Time

___ 3.5 Is the loss of RHR due to a mechanical failure or loss of electrical power to the in-service RHR Pump?

___ YES ___ NO ——> **GO TO** Step 3.7

V

_____ Time

___ 3.6 **GO TO** Step 3.50

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.7 **CHECK** RHR cooling availability as follows:

A. Is any RHR pump running?

___ YES ___ NO ——> **GO TO** Step 3.9

Time

V

NOTE

0% Pressurizer Level Cold Cal. indication corresponds to 108.92 ft. elevation when the RCS is filled and vented.

B. Is RCS level >97.5 ft elevation AND stable OR rising consistent with current RCS makeup (Charging, SI) in progress AND no excessive indication of RCS leakage?

___ YES ___ NO ——> **GO TO** Step 3.8

Time

V

___ C. **REDUCE** RHR flow to 1500 - 1800 gpm.

D. Are RHR Pumps cavitating or gas bound as indicated by any of the following?

- ♦ RHR motor amps low or oscillating
- ♦ RHR flow low or oscillating
- ♦ Report of abnormal noise or pump damage
- ♦ RHR discharge pressure fluctuating
- ♦ RHR Suction pressure fluctuating

___ YES ___ NO ——> **GO TO** Step 3.54

Time

V

___ 3.8 **STOP** running RHR Pumps. **[C0354]**

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.9 **PERFORM** the following:

___ ♦ **STOP** 2 RHR Letdown Booster Pump

___ ♦ **ISOLATE** Sampling activities

___ ♦ **ISOLATE** Normal Letdown to CVCS

___ ♦ **ISOLATE** Excess Letdown

___ ♦ **ISOLATE** RHR Letdown to CVCS

___ ♦ **TERMINATE** any known maintenance or testing in progress

___ 3.10 **DETERMINE** time to core boiling using Attachment 4, Time To Reach Boiling After Loss of RHR OR Attachment 5, Heatup Rate For Loss Of RHR Cooling, as applicable.

3.11 Is RCS level >97.5 ft elevation AND stable OR rising consistent with current RCS makeup (Charging, SI) AND no excessive indication of RCS Leakage?

___ YES ___ NO ——> **GO TO** Step 3.34

V

_____ Time

3.12 Does the time to core boiling allow adequate time for normal restoration AND local venting of RHR System?

___ YES ___ NO ——> **GO TO** Step 3.20

V

_____ Time

3.13 Is any RHR Pump available as indicated by all of the following? **[C0329]**

♦ Power available to at least one RHR Pump

♦ RHR Suction and Discharge valves open

- ♦ 2RH1 (RHR COMMON SUCTION VALVE)
- ♦ 2RH2 (RHR COMMON SUCTION VALVE)
- ♦ RH4 (PUMP SUCTION VALVE)
- ♦ SJ49 (RHR COLD LEG ISOLATION VALVE)

♦ Component Cooling available to RHR System

(step continued on next page)

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, **[C0330]**
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs **[C0354]**
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.13 (continued)

♦ Service Water System available as heat sink

___ YES ___ NO ——> **GO TO** Step 3.30

V

Time

CAUTION

♦ **Venting the RHR system may cause a reduction in RCS level requiring more makeup flowrate.**

♦ **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**

♦ **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ 3.14 **VENT** RHR Pumps and piping as follows: **[C0329]**

___ A. **ISOLATE** RHR Suction from RCS by closing 2RH2 OR 2RH1. (2RH2 is preferred, 2RH1 is a backup) **[C0658]**

___ B. IF air supplies to 21RH18 and 22RH18 are isolated, THEN **ALIGN** air to 21RH18 and 22RH18 as follows:

___ ♦ **OPEN** 21RH18-A/S, LOCAL A/S TO 21RH18

___ ♦ **OPEN** 22RH18-A/S, LOCAL A/S TO 22RH18

___ C. **THROTTLE** OR **CLOSE** 21RH18, 22RH18, and 2RH20 as required to control RCS inventory.

___ D. **ENSURE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE. (Control Room)

___ E. **OPEN** 2SJ69, RHR SUCTION FROM RWST. (Control Room)

(continued on next page)

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, **[C0330]**
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs **[C0354]**
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.14 (continued)

___ F. Send Operators to **PERFORM** the following:

___ 1. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ 2. IF the bioshield area inside containment is accessible, THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

___ 3. **MONITOR** RHR Pump in preparation for pump start.

___ G. **CLOSE** 2SJ69, RHR Suction From RWST.

___ H. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

___ I. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ J. **RAISE** makeup flow to RCS to prevent level drop as voids collapse.

CAUTION

- **Changes in RCS pressure or voiding in the Reactor Coolant System may result in inaccuracies in RCS level indication.**
- **Lower flow rates when starting RHR Pumps are preferable to limit initial sudden cooldown and to minimize level loss caused by collapsing voids.**

___ 3.15 **START** one RHR Pump as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS, THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling, THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.16 Notify local Operator to **PERFORM** observation at RHR Pumps:

- ♦ No abnormal noise
- ♦ No seal damage
- ♦ No RHR suction pressure oscillations

NOTE

0% Pressurizer Level Cold Cal. indication corresponds to 108.92 ft. elevation, when the RCS is filled and vented.

3.17 Is RHR System normal as indicated by ALL of the following?

- ♦ RCS level - >97.5 ft. elevation AND stable OR rising
- ♦ RHR flow - stable between 1800 AND 3000 gpm
- ♦ RCS temperature - stable or lowering
- ♦ Component Cooling available to RHR System
- ♦ Service Water available as heat sink
- ♦ No local indication of RHR Pump damage

___ YES ___ NO ——> **GO TO** Step 3.30

V

Time

___ 3.18 IF an alternate decay heat removal method is established, THEN **SECURE** the alternate decay heat removal method IAW the Attachment in effect.

___ 3.19 **GO TO** Section 4.0.

Time

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.20 CONTINUE

CAUTION

**IF adequate time is not available to locally vent RHR Pumps,
THEN the fastest way to restore RHR flow is to recover level in the RCS and sweep entrained air from the system by operating the system at a relatively high flow rate.**

3.21 IS RCS level >101 ft.?

___ YES ___ NO ——> **GO TO** Step 3.30

V

____
Time

___ 3.22 Send an Operator to locally **MONITOR** RHR Pump while starting.

___ 3.23 **START** one RHR Pump at full flow as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS,
THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling,
THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ 3.24 Notify local Operator to **PERFORM** observation at RHR Pumps:

♦ No abnormal noise

♦ No seal damage

♦ No RHR suction pressure oscillations

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, **[C0330]**
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs **[C0354]**
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.25 Is RHR System normal as indicated by ALL of the following?

- ♦ RHR Pumps - at least one running
- ♦ RCS Level - >101 ft. elevation AND stable OR rising
- ♦ RHR Flow - stabilized >1500 gpm
- ♦ RCS Temperature - stable or lowering
- ♦ No local indication of RHR Pump damage

___ YES ___ NO ——> **GO TO** Step 3.30

Time

V

___ 3.26 **ADJUST** appropriate RH18 to establish RHR flow as required between 1800 and 3000 gpm to result in stable or lowering Core Exit Thermocouple temperatures.

___ 3.27 **STABILIZE** RCS level >101 ft., as determined by the SM/CRS.

___ 3.28 IF an alternate decay heat removal method is established, THEN **SECURE** the alternate decay heat removal method IAW the Attachment in effect.

___ 3.29 **GO TO** Section 4.0.

Time

___ 3.30 **STOP** any running RHR Pumps.

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.31 CONTINUE

CAUTION

- **Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**

___ 3.32 **INITIATE** one of the alternate methods of decay heat removal:

- Attachment 7, Hot Leg Injection (Feed & Bleed - Preferred method if RCS NOT intact or Loops NOT filled AND core exit TCs ≥200°F)
  [Attachment 7 is NOT applicable if Attachment 14 has been initiated]
- Attachment 8, Cold Leg Injection
  (Feed & Bleed - Preferred Method if Core Exit TCs < 200°F)
  [Attachment 8 is NOT applicable if Attachment 14 has been initiated]
- Attachment 9, Steam Generator Reflux Cooling
  (RCS depressurized AND no other means of decay heat removal is available)
- Attachment 10, Forced Flow Or Natural Circulation Cooldown
  (RCS intact and filled to greater than 0% in the Pressurizer with Loops filled)
- Attachment 11, Cooling the RCS with Spent Fuel Pool
  (Reactor Vessel Head Removed)

___ 3.33 **NOTIFY** SM/CRS to refer to the following:

- Event Classification Guide

NOTE **[C0609]**

The RCS may be substituted for one RHR Loop IAW Tech Spec 3.4.1.4#, provided the following conditions exist:

- The RCS is filled and vented IAW S2.OP-SO.RC-0003(Q) or S2.OP-SO.RC-0002(Q), with RCS pressure maintained >100 psig.
- At least two steam generator water levels are maintained ≥9% narrow range indication with an Auxiliary Feedwater supply and a vent path available.
- RVLIS is monitored at least once per shift IAW S2.OP-DL.ZZ-0002(Q).

- Technical Specifications

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.34 Is there indication of RCS leakage as indicated by any of the following? **[C0354]**

- ♦ Level rise in the RWST **[C0631]**
- ♦ Level drop in RCS prior to initiation of alternate decay heat removal methods
- ♦ More frequent Containment Sump pump operation
- ♦ OHA C-26, 21 RHR SUMP OVERFLO alarm
- ♦ OHA C-34, 22 RHR SUMP OVERFLO alarm
- ♦ RHR MIDLOOP SYS TRBL OHA D-47 (if installed)
- ♦ Reduced Inventory Instrumentation indicating RCS level loss (RVLIS or Mid-Loop, if in service)

___ YES ___ NO ——> **GO TO** Step 3.50

V

_____ Time

___ 3.35 **ISOLATE** RHR as follows: **[C0354]**

___ A. **CLOSE** 2RH1 AND 2RH2, RHR Common Suction Valves **[C0658]**

___ B. **PLACE** 2RP4 lockout switch for 21SJ49 AND 22SJ49, RHR Discharge to Cold Leg Valves in VALVE OPERABLE

___ C. **CLOSE** 21SJ49 AND 22SJ49, RHR Discharge to Cold Leg Valves.

__ D. Send an Operator to **ENSURE** 2RH21 is fully CLOSED AND LOCKED. **[C0631]**

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, **[C0330]**
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs **[C0354]**
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.36 Has the isolation of RHR stopped the leak in RCS as indicated by any of the following?

- ♦ RCS level rising at a faster rate
- ♦ Containment or RHR sumps pumping less frequently

___ YES ___ NO ——> **GO TO** Step 3.46

___
Time

___ 3.37 Send Operators to **LOCATE** AND **ISOLATE** the leak from RHR System.

NOTE

If possible, the leak should be isolated from the RCS and the other train of RHR. This will allow placing one train of RHR back in service.

3.38 Is either train of RHR available for shutdown cooling?

___ NO ___ YES ——> **GO TO** Step 3.42

___
Time

___ 3.39 **CONTINUE** OR **INITIATE** decay heat removal using alternate methods IAW Step 3.32 until RHR System is repaired and restored to service.

___ 3.40 WHEN RHR System is restored to service, THEN:

___ A. **INITIATE** recovery from alternate decay heat removal method selected IAW attachment in effect.

___ B. **PLACE** an RHR loop in service as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS, THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling, THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ C. **GO TO** Section 4.0.

___
Time

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.41 Does available RHR Pump require venting?

___ NO ___ YES ——> **GO TO** Step 3.47

V

Time

___ 3.42 **RESTORE** RHR as follows: **[C0354]**

___ A. **OPEN** 2RH1 AND 2RH2, RHR Common Suction Valves

___ B. **OPEN** 21SJ49 AND 22SJ49, RHR Discharge to Cold Leg Valves.

___ C. **PLACE** 2RP4 lockout switch for 21SJ49 AND 22SJ49, RHR DISCHARGE TO COLD LEG VALVEs in LOCKED OUT.

___ 3.43 **PLACE** one RHR Loop in service as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS, THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling, THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ 3.44 **SECURE** alternate decay heat removal method selected IAW attachment in effect.

___ 3.45 **GO TO** Section 4.0.

Time

___ 3.46 **LOCATE** AND **ISOLATE** leakage from the RCS, paying particular attention to locations of known maintenance or testing activities.

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.47 When RCS leakage is stopped, becomes controllable OR otherwise contained, **RESTORE** RHR as follows:

CAUTION

- **Venting the RHR System may cause a reduction in RCS level requiring more makeup flowrate.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ A. **VENT** RHR Pumps and piping as follows: [C0329]

___ 1. **CLOSE** 2RH2 OR 2RH1.
(2RH2 is preferred, 2RH1 is a backup) [C0658]

___ 2. IF air supplies to 21RH18 and 22RH18 are isolated, THEN **ALIGN** air to 21RH18 and 22RH18 as follows:

___ ♦ **OPEN** 21RH18-A/S, LOCAL A/S TO 21RH18

___ ♦ **OPEN** 22RH18-A/S, LOCAL A/S TO 22RH18

___ 3. **THROTTLE** OR **CLOSE** 21RH18, 22RH18, and 2RH20 as required to control RCS inventory.

___ 4. **PLACE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE. (Control Room)

___ 5. **OPEN** 2SJ69, RHR SUCTION FROM RWST. (Control Room)

___ 6. Send Operators to **PERFORM** the following:

___ a. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ b. IF the bioshield area inside containment is accessible, THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

___ c. **MONITOR** RHR Pump in preparation for pump start.

(continued on next page)

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.47 (continued)

___ 7. **ESTABLISH** RCS level >97.5 ft. elevation as determined by the CRS.

___ 8. **CLOSE** 2SJ69, RHR Suction From RWST.

___ 9. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

CAUTION

- **Changes in RCS pressure or voiding in the Reactor Core may result in inaccuracies in RCS level indication.**
- **Lower flow rates when starting RHR Pumps are preferable to limit initial sudden cooldown and to minimize level loss caused by collapsing voids.**
- **Operating at low RHR System flowrates greatly reduces the risk of air entrainment (vortexing).**

___ B. **OPEN** 21SJ49 AND 22SJ49, RHR Discharge To Cold Leg Valves.

___ C. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ D. **RAISE** makeup flow to RCS to prevent level drop as voids collapse.

___ E. **START** one RHR Pump as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS, THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling, THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ F. Notify local Operator to **PERFORM** observation at RHR Pumps:

- ♦ No abnormal noise
- ♦ No seal damage

(continued on next page)

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

3.47 (continued)

G. Is RHR System normal as indicated by ALL of the following?

- ♦ RCS Level - >97.5 ft. elevation AND stable OR rising
- ♦ RHR Flow - stable between 1800 and 3000 gpm
- ♦ RCS Temperature - stable or lowering
- ♦ Component Cooling available to RHR System
- ♦ Service Water available as heat sink
- ♦ No local indication of RHR Pump damage.

___ YES ___ NO ——> **GO TO** Step 3.50

Time

V

___ 3.48 IF an alternate decay heat removal method is established,
THEN **SECURE** the alternate decay heat removal method IAW the attachment in effect.

___ 3.49 **GO TO** Section 4.0.

Time

3.50 Is a heat sink available for Residual Heat Removal?

- ♦ Component Cooling to RHR System
- ♦ Service Water to Component Cooling System

___ YES ___ NO ——> **GO TO** Step 3.62

Time

V

___ 3.51 Is an RHR Loop available?

___ YES ___ NO ——> **RETURN TO** Step 3.31

Time

V

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.52 **PLACE** the alternate RHR Loop in service:

___ ♦ IF alternate RHR Loop is aligned for ECCS,
THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling,
THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ 3.53 Is RHR in service?

___ YES ___ NO ——> **RETURN TO** Step 3.7 _____ Time

V

3.54 Is a heat sink available for Residual Heat Removal?

♦ Component Cooling to RHR System

♦ Service Water to Component Cooling System

___ YES ___ NO ——> **GO TO** Step 3.62 _____ Time

V

3.55 Is RHR flow stable?

___ NO ___ YES ——> **GO TO** Step 3.68 _____ Time

V

___ 3.56 **ATTEMPT** to stabilize RHR flow between 1800 and 3000 gpm as follows:

___ ♦ **THROTTLE** the appropriate RH18 valve:

♦ 21RH18, RHR Flow Control Valve
♦ 22RH18, RHR Flow Control Valve

___ ♦ **THROTTLE** 2RH20, RHR HX BYPASS VALVE

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.57 **ADJUST** Component Cooling flow to RHR Heat Exchangers between 4000 and 4200 gpm.

3.58 Is RHR flow stable?

___ YES ___ NO ——> **RETURN TO** Step 3.7

___
Time

V

3.59 Is RHR System normal as indicated by ALL of the following?

- ♦ RHR Pumps - at least one running
- ♦ RCS Level - >97.5 ft. elevation AND stable OR rising
- ♦ RHR Flow - stable between 1800 and 3000 gpm
- ♦ RCS Temperature - stable or lowering
- ♦ No local indication of RHR Pump damage

___ YES ___ NO ——> **GO TO** Step 3.62

___
Time

V

___ 3.60 IF an alternate decay heat removal method is established, THEN **SECURE** the alternate decay heat removal method IAW the attachment in effect.

___ 3.61 **GO TO** Section 4.0.

___
Time

3.62 Is Component Cooling available to RHR as indicated by the following?

- ♦ 21 RHR Heat Exchanger flow
- ♦ 22 RHR Heat Exchanger flow
- ♦ RHR PUMPS CCW FLOW LO alarm clear (2CC2)

___ NO ___ YES ——> **GO TO** Step 3.65

___
Time

V

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

___ 3.63 **INITIATE** S2.OP-AB.CC-0001(Q), Component Cooling Abnormality.

___ 3.64 When Component Cooling is restored, **ADJUST** Component Cooling flow to RHR components IAW S2.OP-SO.CC-0001(Q), Component Cooling System Normal Operation.

3.65 Is Service Water available as an ultimate heat sink for RHR cooling?

___ NO ___ YES ——> **GO TO** Step 3.68

Time

V

___ 3.66 **INITIATE** S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure.

___ 3.67 When Service Water System is returned to service:

___ A. **RETURN** RHR to normal operation IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ B. **RESTORE** normal cooling (Service Water) to plant components IAW Attachment 12, Alternate Cooling Water, Step 8.0.

3.68 Is RHR System normal as indicated by ALL of the following?

- ♦ RHR Pumps - at least one running
- ♦ RCS level - >97.5 ft. elevation AND stable OR rising consistent with current RCS makeup AND no excessive indication of RCS Leakage.
- ♦ RHR flow - stable between 1800 and 3000 gpm
- ♦ RCS temperature - stable or lowering

___ NO ___ YES ——> **GO TO** Section 4.0

Time

V

___ 3.69 **RETURN TO** Step 3.7 for symptom rediagnosis or as directed by the CRS.

SELECTED CAS ITEMS

- IF the Unit is in Mode 5 OR 6, [C0330]
  THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

- IF AT ANY TIME a complete loss of all vital buses occurs,
  THEN **PERFORM** the applicable Attachment:

  - Attachment 9, Steam Generator Reflux Cooling

    OR

  - Attachment 10, Forced Flow or Natural Circulation Cooldown

- IF AT ANY TIME RWST LO Level Alarm annunciates
  AND Containment Sump level exceeds 62%,
  THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

- IF AT ANY TIME a loss of RCS inventory occurs [C0354]
  AND Attachment 14 has NOT been initiated (2R16),
  THEN **PERFORM** one of the following:

  - IF in Mode 5 OR 6,
    THEN **START** Safety Injection and Charging Pumps as required:
    AND:

    - **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

      OR

    - **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

  - IF in Mode 4,
    THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

* Refer to Exhibit 1 for Briefing Sheet

4.0 **COMPLETION AND REVIEW**

___ 4.1 **EXPLAIN** Entry Condition in Comments Section of Attachment 15.

___ 4.2 **COMPLETE** Attachment 15, Sections 1.0 and 2.0,
AND **FORWARD** this procedure to the SM/CRS for review and approval.

___ 4.3 SM/CRS **PERFORM** the following:

___ A. **REVIEW** this procedure with Attachments 1 through 14 for completeness and accuracy.

___ B. **COMPLETE** Attachment 15, Section 3.0.

___ C. **FORWARD** completed procedure to Operations Staff.

END OF PROCEDURE

ATTACHMENT 1
(Page 1 of 2)

CONTINUOUS ACTION SUMMARY

___ 1.0 IF the Unit is in Mode 5 OR 6, [C0330]
THEN **INITIATE** Containment Closure IAW S2.OP-AB.CONT-0001(Q), Containment Closure.

___ 2.0 IF AT ANY TIME a complete loss of all vital buses occurs,
THEN **PERFORM** the applicable Attachment:

- Attachment 9, Steam Generator Reflux Cooling

  OR

- Attachment 10, Forced Flow or Natural Circulation Cooldown

___ 3.0 IF AT ANY TIME the Loss of RHR cooling is due to a loss of Service Water or Component Cooling as a heat sink,
THEN concurrently **CONNECT** hoses AND **ALIGN** alternate water sources to available equipment IAW Attachment 12, Alternate Cooling Water.
AND **PERFORM** the applicable attachment:

- Attachment 9, Steam Generator Reflux Cooling

  OR

- Attachment 10, Forced Flow or Natural Circulation Cooldown

___ 4.0 IF credit is being taken for the Equipment Hatch Ventilation Barrier (EHVB) to provide Containment Closure prior to filling the cavity to > 125' 6",
THEN Immediately **INITIATE** Attachment 14, 2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6").

___ 5.0 IF AT ANY TIME RWST LO Level Alarm annunciates
AND Containment Sump level exceeds 62%,
THEN **ALIGN** intact RHR train(s) to Containment Sump IAW Attachment 13, Cold Leg Recirculation.

ATTACHMENT 1
(Page 2 of 2)

CONTINUOUS ACTION SUMMARY

NOTES

- Violation of Technical Specification 3.5.3 requires notifications IAW ECG.
- 0% Pressurizer Level Cold Cal. indication corresponds to 108.92 ft. elevation when the RCS is filled and vented.

CAUTION

Extreme care and judgement should be utilized in using more than one Charging or Safety Injection Pump. If the size of the leak is misjudged, use of high head pumps could cause a cold overpressurization accident. At low temperatures, use of high head pumps should be deliberate.

___ 6.0 IF AT ANY TIME a loss of RCS inventory occurs AND Attachment 14 has NOT been initiated (2R16), THEN **PERFORM** one of the following: [C0354]

___ A. IF in Mode 5 or 6,
THEN **START** Safety Injection and Charging Pumps as required
AND

- **CONTROL** Pressurizer level between 5% and 50% while maintaining RHR System in service,

OR

- **CONTROL** injection flow to result in lowering Core Exit Thermocouple temperatures if RHR is not available.

___ B. IF in Mode 4,
THEN **GO TO** S2.OP-AB.LOCA-0001(Q), Shutdown LOCA.

ATTACHMENT 2
(Page 1 of 2)

ALIGNING RHR LOOP FROM ECCS TO SHUTDOWN COOLING

___ 1.0 IF placing RHR Loop 21 in service,
THEN:

___ A. **ENSURE** RHR Loop 21 is aligned for ECCS injection.

___ B. **PLACE** 21RH29, RHR PUMP MINIMUM FLOW VALVE in AUTO.

___ C. Locally:

- **OPEN** 21RH12, RHR HX BYPASS ISOLATION VALVE
- **OPEN** 21RH17, RHR LETDOWN ISOLATION VALVE
- **OPEN** 21RH18-A/S, RHR LETDOWN ISOLATION VALVE AIR SUPPLY

___ D. In the Control Room:

- **CLOSE** 21RH18, RHR PUMP FLOW CONTROL VALVE
- **CLOSE** 22RH18, RHR PUMP FLOW CONTROL VALVE
- **CLOSE** 2RH20, RHR HX BYPASS
- **CLOSE** 22CC16, RHR HX COMPONENT COOL OUT VALVE
- **OPEN** 21CC16, RHR HX COMPONENT COOL OUT VALVE

___ E. **START** 21 RHR Pump.

___ F. **OPERATE** 21RH18 AND 2RH20, to maintain stable RHR flow to the Reactor Coolant System.

ATTACHMENT 2
(Page 2 of 2)

ALIGNING RHR LOOP FROM ECCS TO SHUTDOWN COOLING

___ 2.0 IF placing RHR Loop 22 in service,
THEN:

___ A. **ENSURE** RHR Loop 22 is aligned for ECCS injection.

___ B. **PLACE** 22RH29, RHR PUMP MINIMUM FLOW VALVE in AUTO.

___ C. Locally:

- **OPEN** 22RH12, RHR HX BYPASS ISOLATION VALVE
- **OPEN** 22RH17, RHR LETDOWN ISOLATION VALVE
- **OPEN** 22RH18-A/S, RHR LETDOWN ISOLATION VALVE AIR SUPPLY

___ D. In the Control Room:

- **CLOSE** 22RH18, RHR PUMP FLOW CONTROL VALVE
- **CLOSE** 21RH18, RHR PUMP FLOW CONTROL VALVE
- **CLOSE** 2RH20, RHR HX BYPASS
- **CLOSE** 21CC16, RHR HX COMPONENT COOL OUT VALVE
- **OPEN** 22CC16, RHR HX COMPONENT COOL OUT VALVE

___ E. **START** 22 RHR Pump.

___ F. **OPERATE** 22RH18 and 2RH20, to maintain stable RHR flow to the Reactor Coolant System.

___ 3.0 **RETURN** to procedure step in effect.

ATTACHMENT 3
(Page 1 of 1)

ALIGNING RHR LOOP FOR SHUTDOWN COOLING

___ 1.0 IF placing RHR Loop 21 in service,
THEN:

___ A. **PLACE** 21RH29, RHR PUMP MINIMUM FLOW VALVE in AUTO.

___ B. **CLOSE** 21RH18, RHR PUMP FLOW CONTROL VALVE.

___ C. **CLOSE** 22RH18, RHR PUMP FLOW CONTROL VALVE.

___ D. **CLOSE** 2RH20, RHR HX BYPASS.

___ E. **CLOSE** 22CC16, RHR HX COMPONENT COOL OUT VALVE.

___ F. **OPEN** 21CC16, RHR HX COMPONENT COOL OUT VALVE.

___ G. **START** 21 RHR Pump.

___ H. **OPERATE** 21RH18 AND 2RH20, to maintain stable RHR flow to the Reactor Coolant System.

___ 2.0 IF placing RHR Loop 22 in service,
THEN:

___ A. **PLACE** 22RH29, RHR PUMP MINIMUM FLOW VALVE in AUTO.

___ B. **CLOSE** 22RH18, RHR PUMP FLOW CONTROL VALVE.

___ C. **CLOSE** 21RH18, RHR PUMP FLOW CONTROL VALVE.

___ D. **CLOSE** 2RH20, RHR HX BYPASS.

___ E. **CLOSE** 21CC16, RHR HX COMPONENT COOL OUT VALVE.

___ F. **OPEN** 22CC16, RHR HX COMPONENT COOL OUT VALVE.

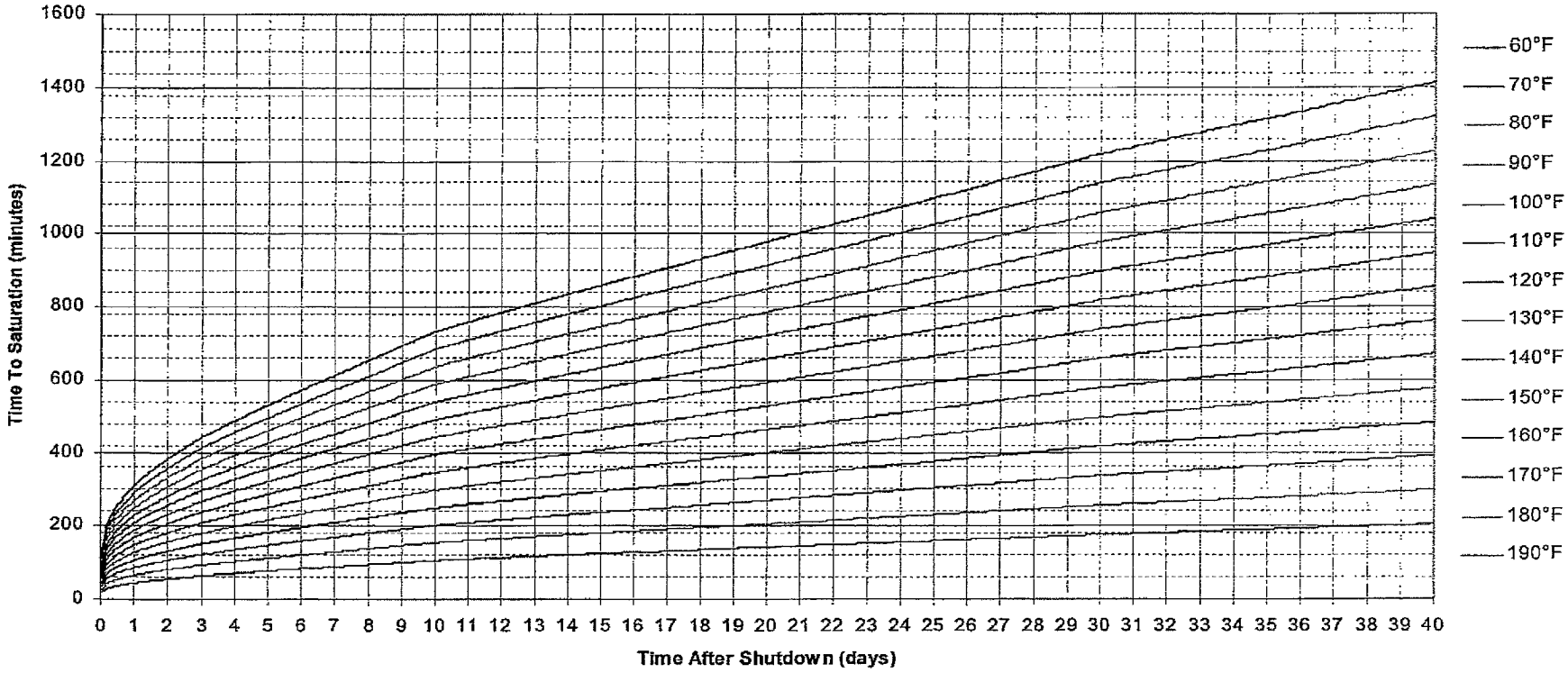
___ G. **START** 22 RHR Pump.

___ H. **OPERATE** 22RH18 AND 2RH20, to maintain stable RHR flow to the Reactor Coolant System.

___ 3.0 **RETURN** to procedure step in effect.

ATTACHMENT 4
(Page 1 of 14)

Time To Saturation Before Core Offload - Cavity Flooded Elev. 128.6 ft
At Various Initial RCS Temperatures

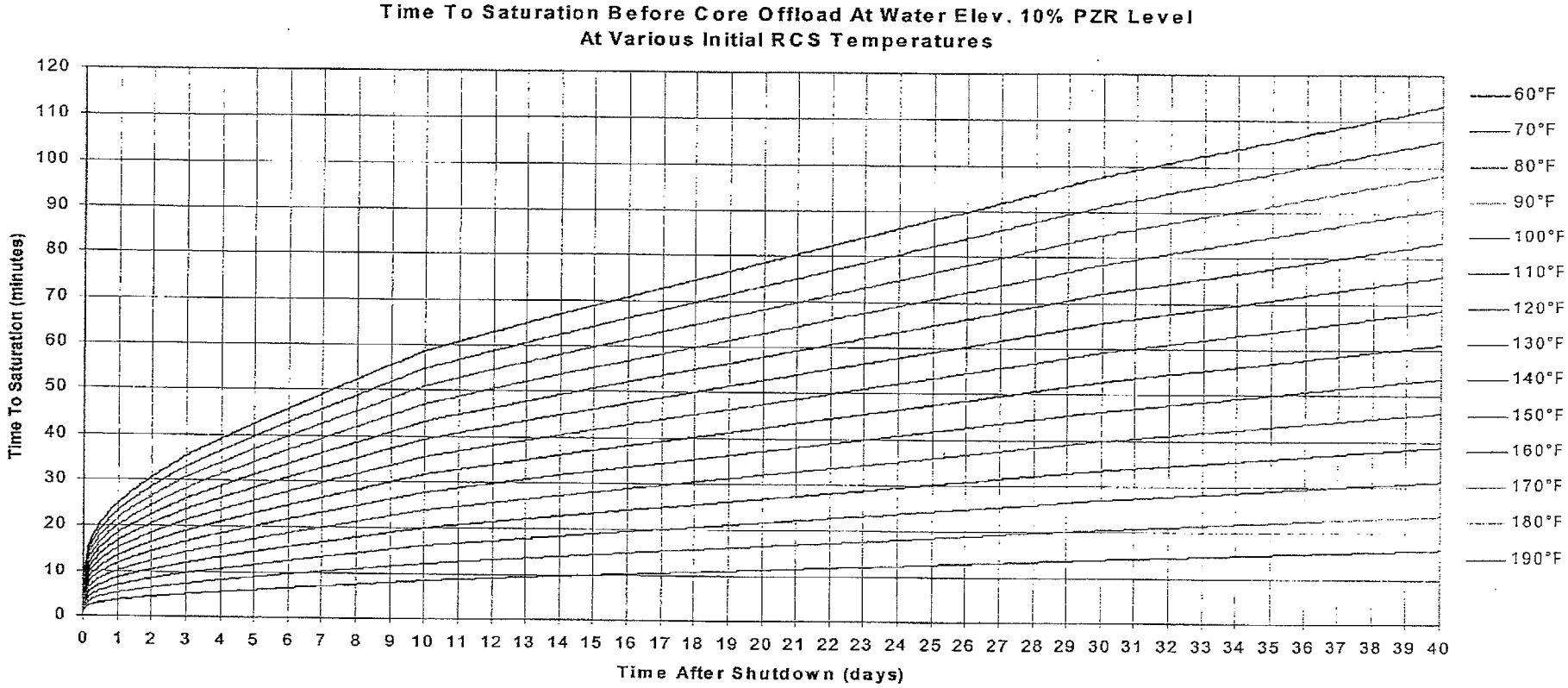


NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 2 of 14)

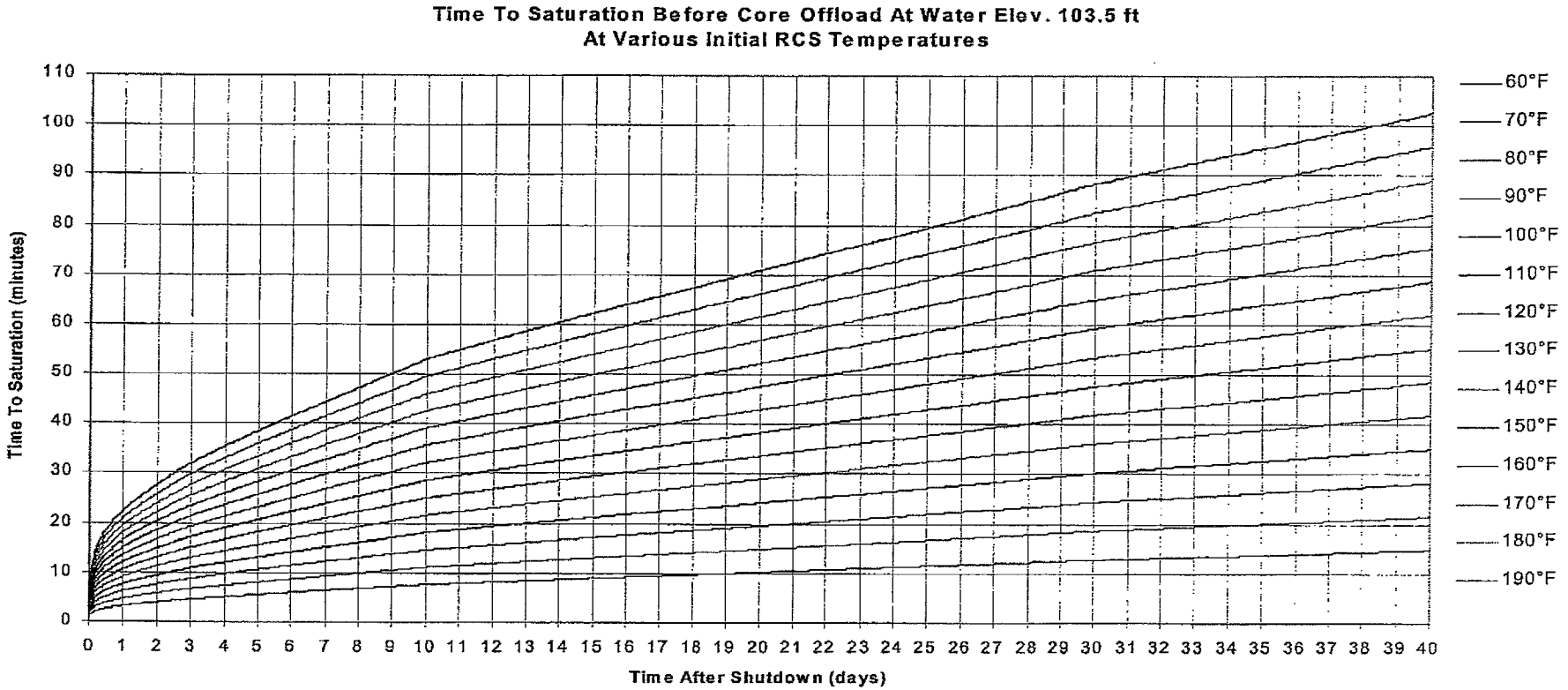


NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 3 of 14)

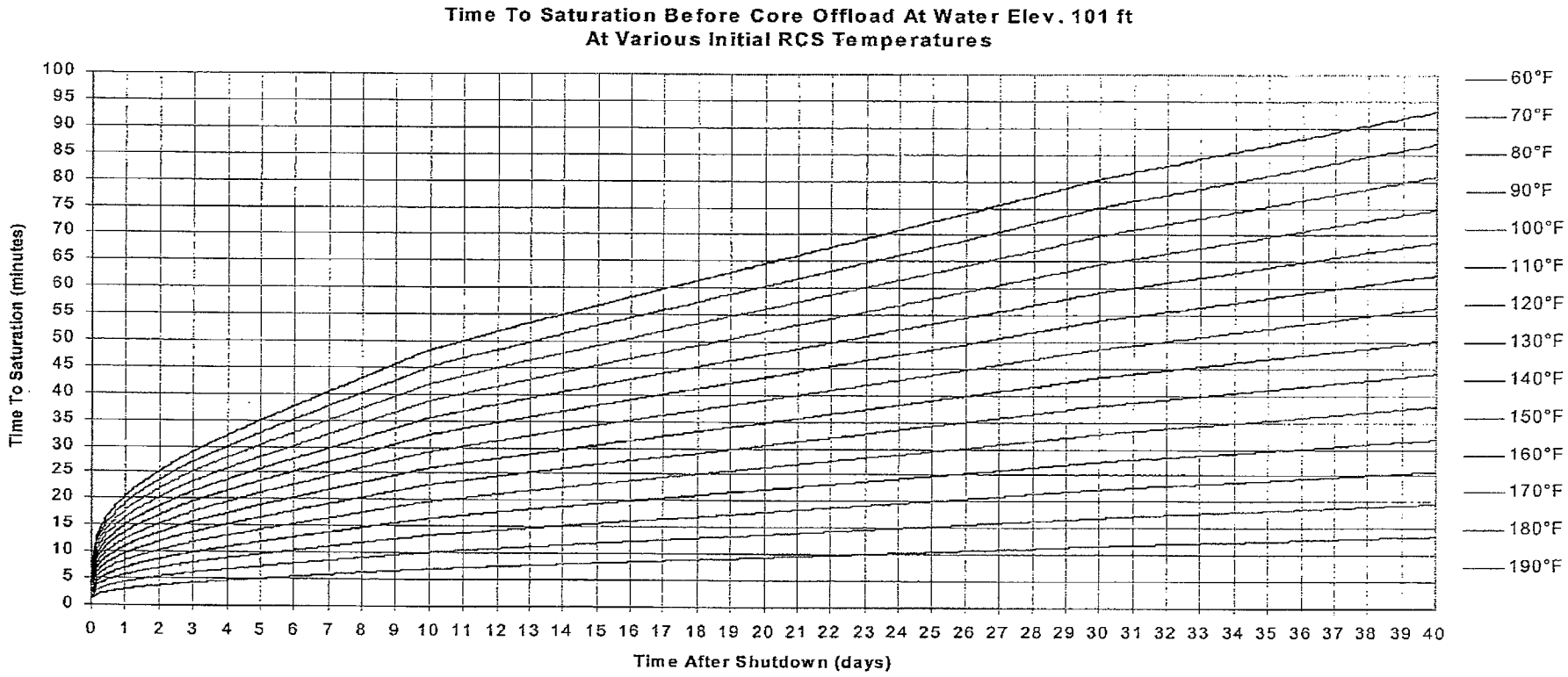


NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 4 of 14)



NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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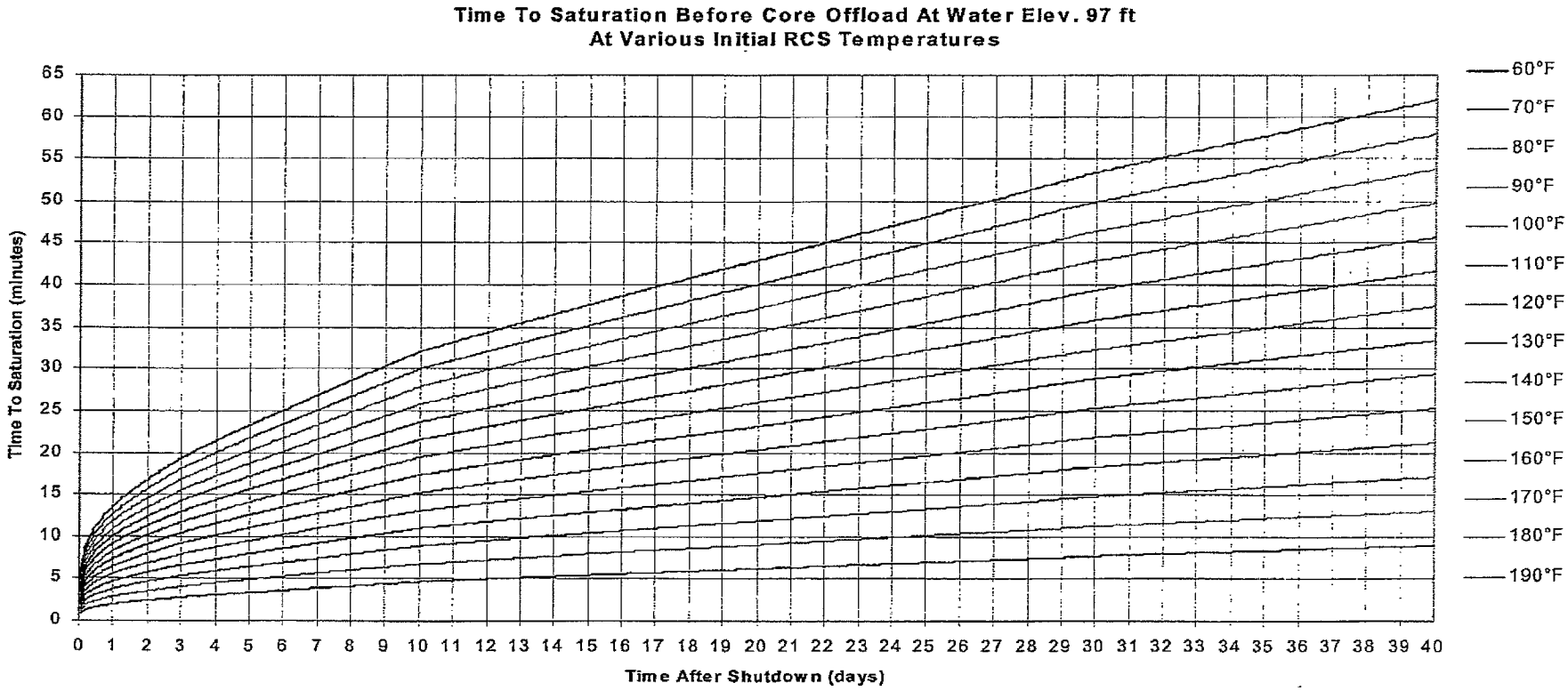

NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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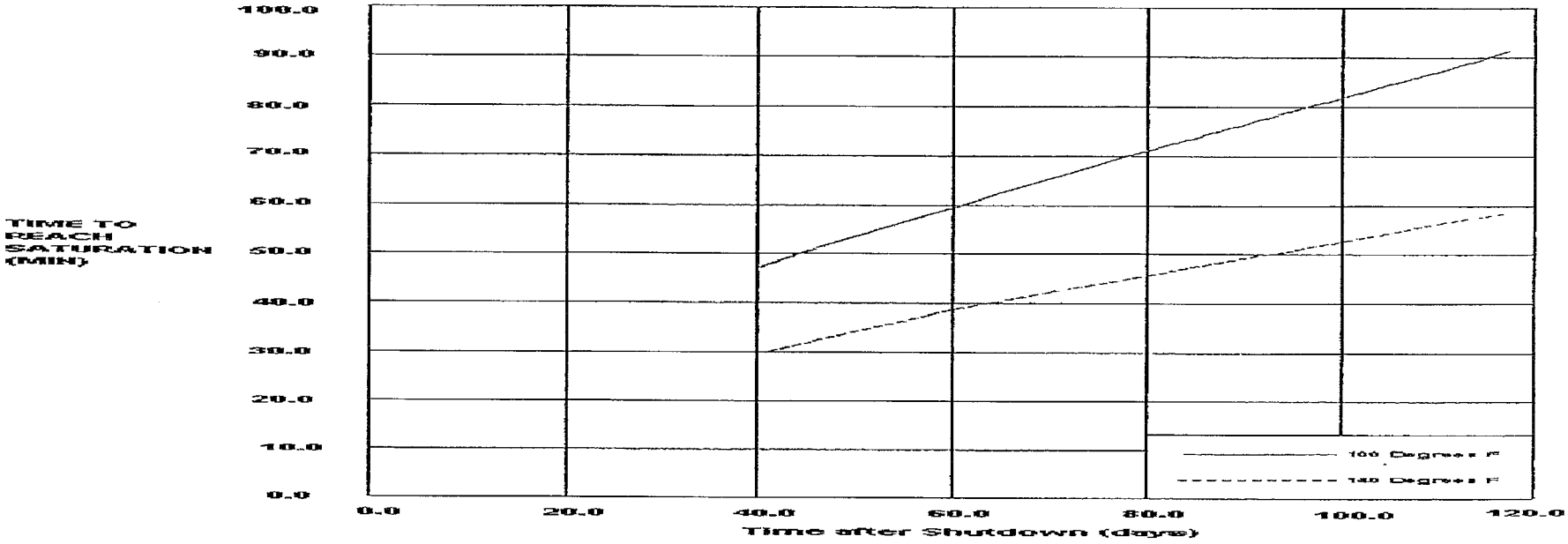
TIME TO REACH CORE BOILING AFTER LOSS OF RHR
(BEFORE REFUELING 40 TO 100 DAYS)



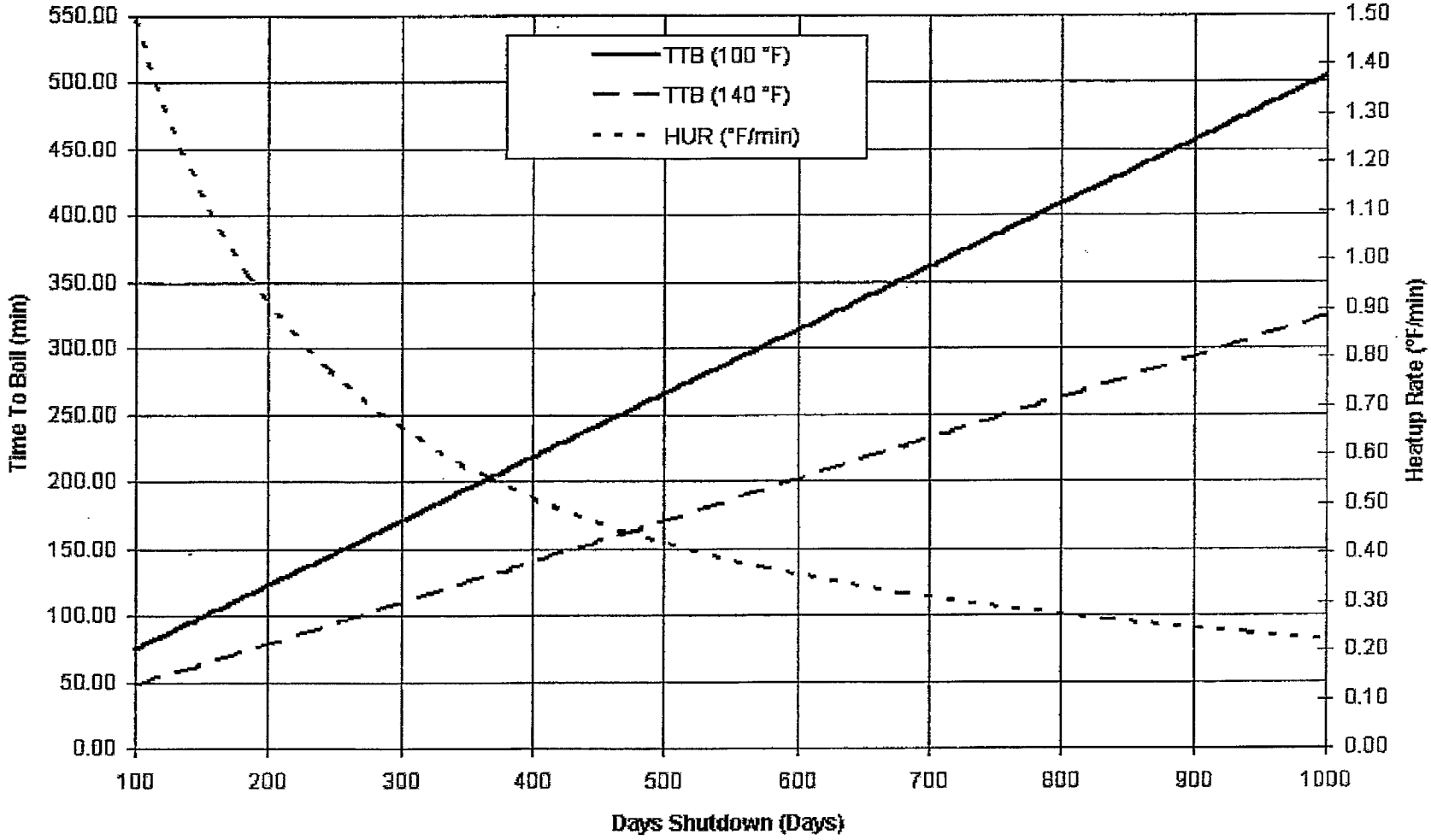
NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

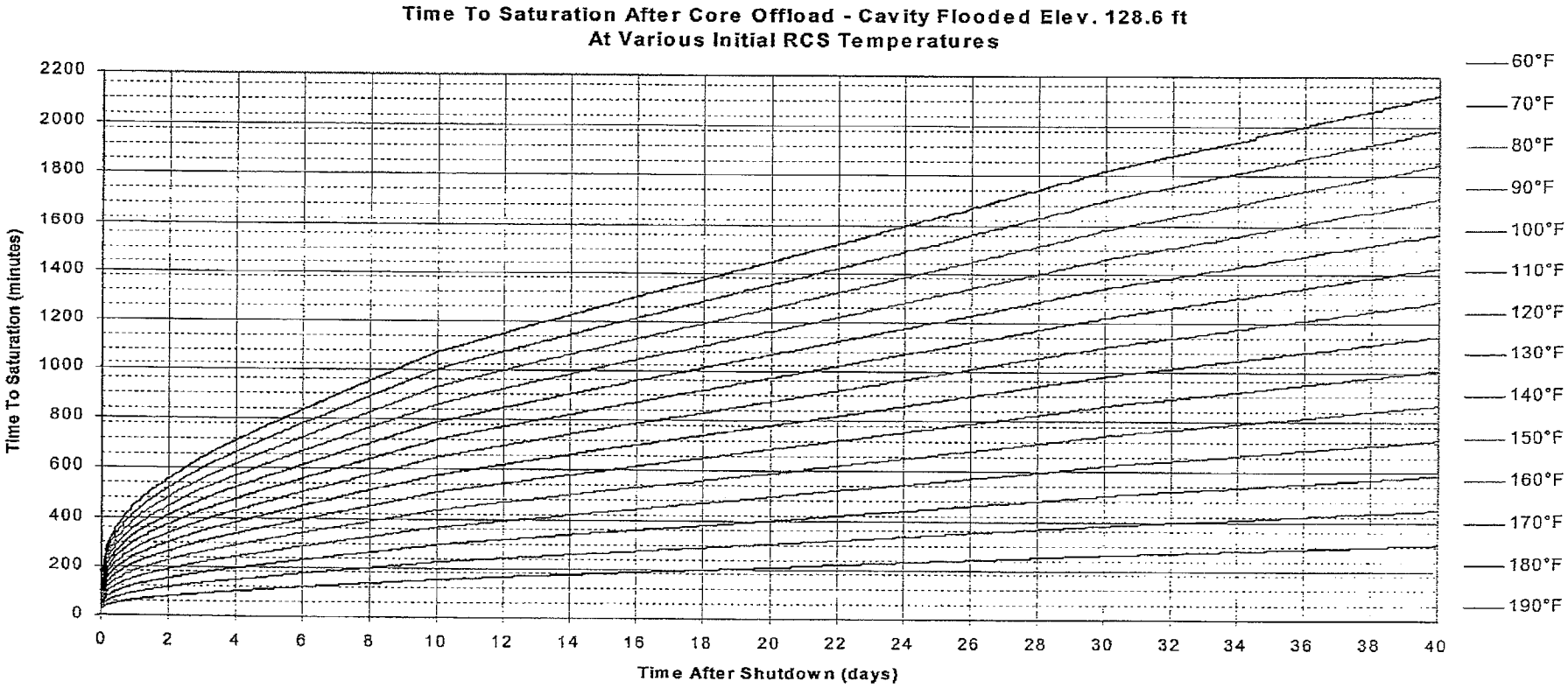
CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 7 of 14)

TIME TO REACH CORE BOILING AFTER LOSS OF RHR
(BEFORE REFUELING 100 TO 1000 DAYS)



ATTACHMENT 4
(Page 8 of 14)



NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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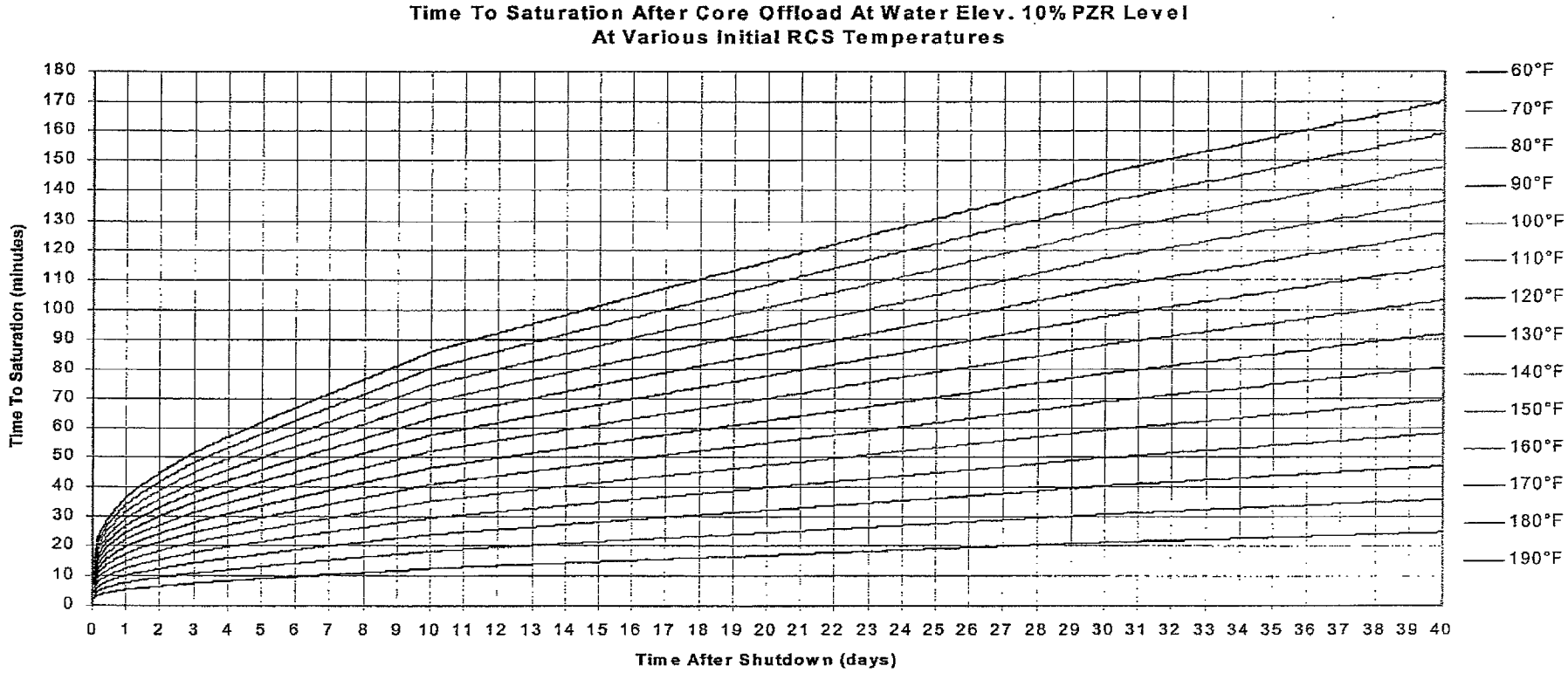
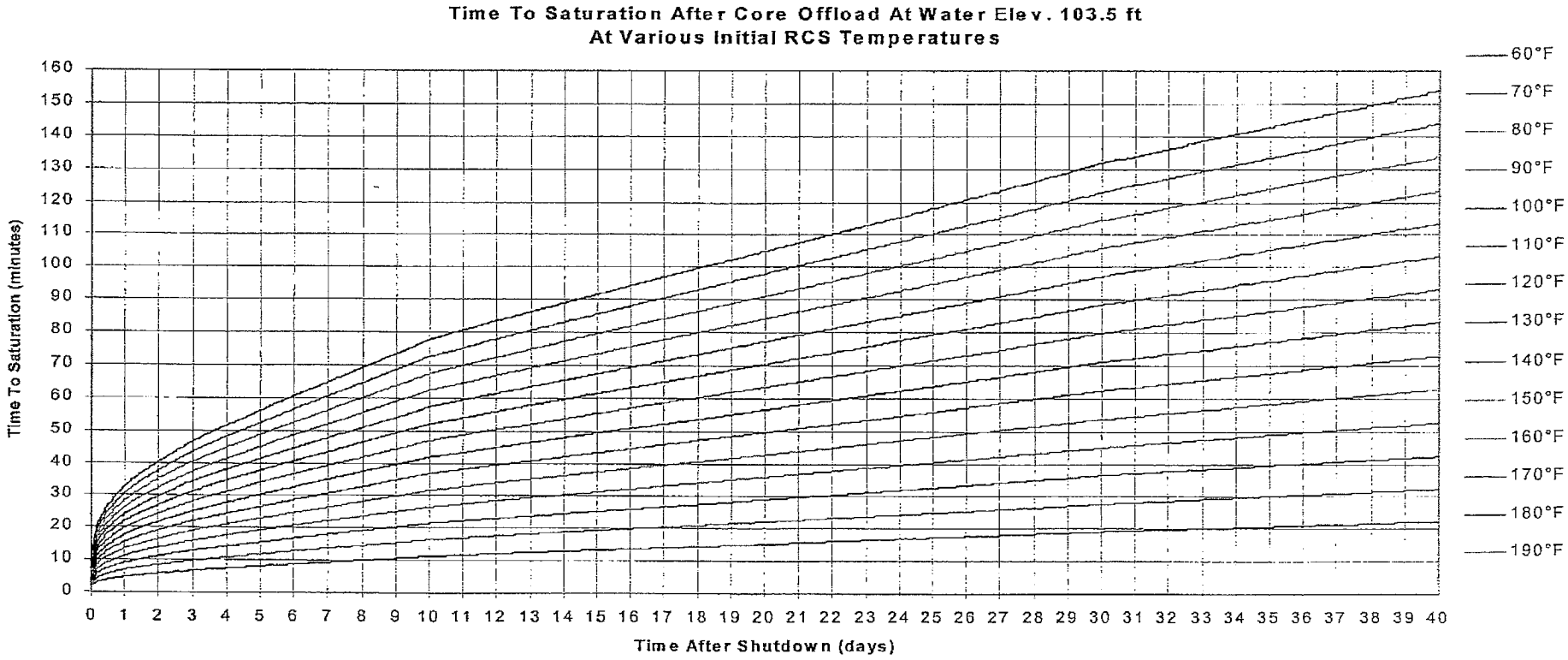


NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 10 of 14)



NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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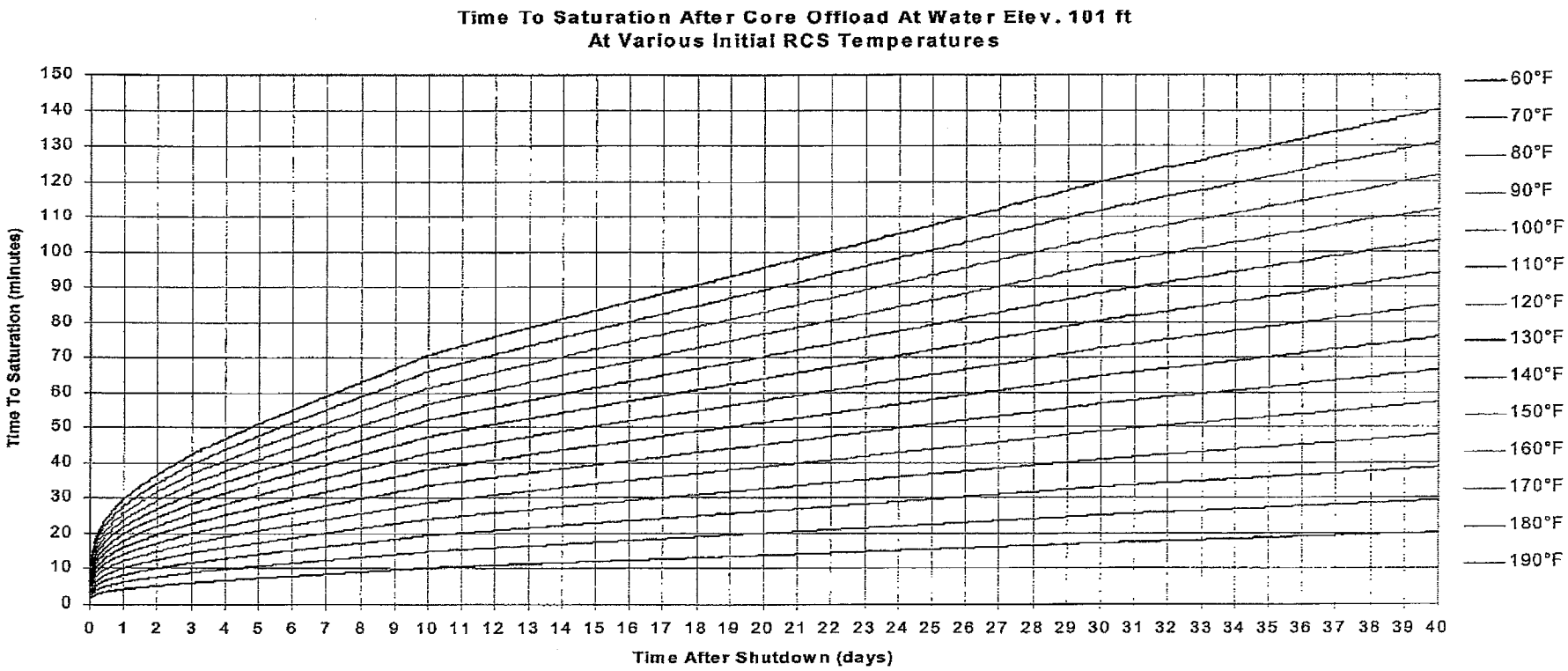

NOTE									
Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core									
CORE	**T/C OR HOT LEG**	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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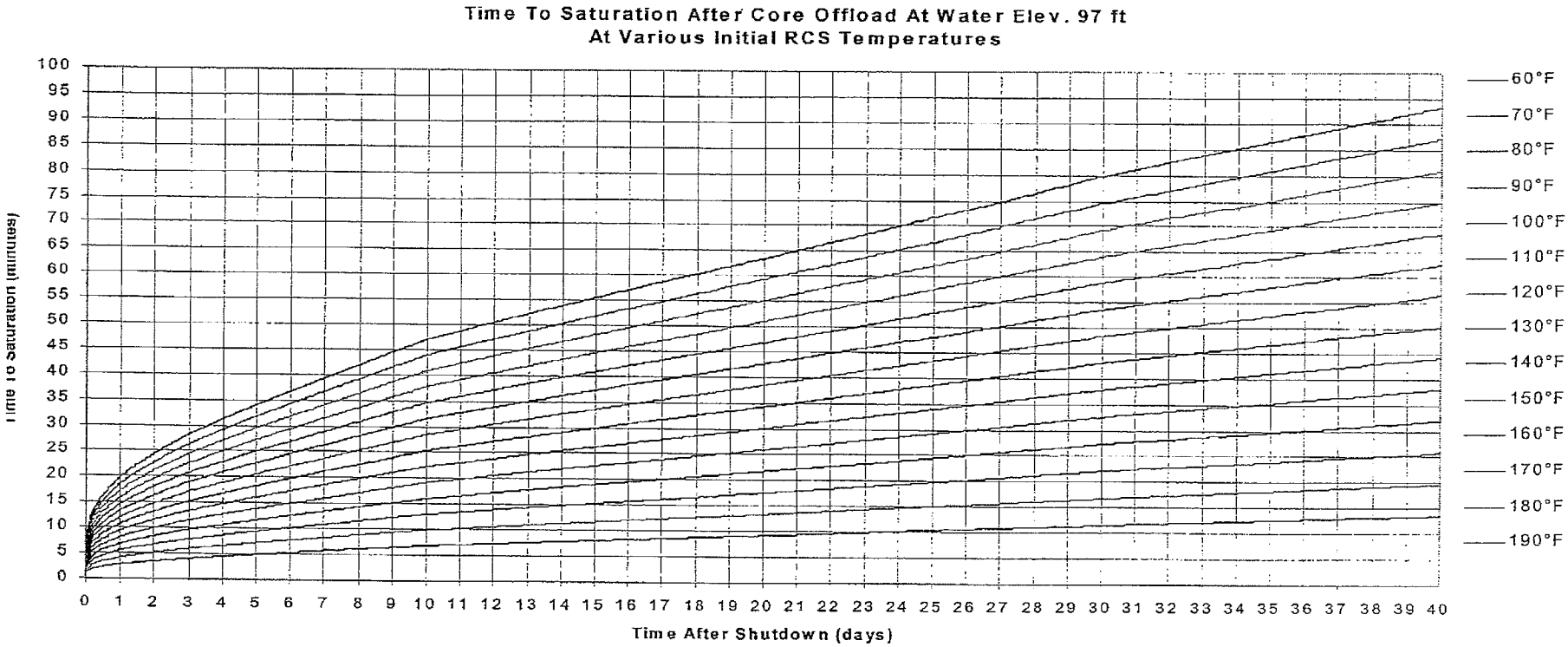


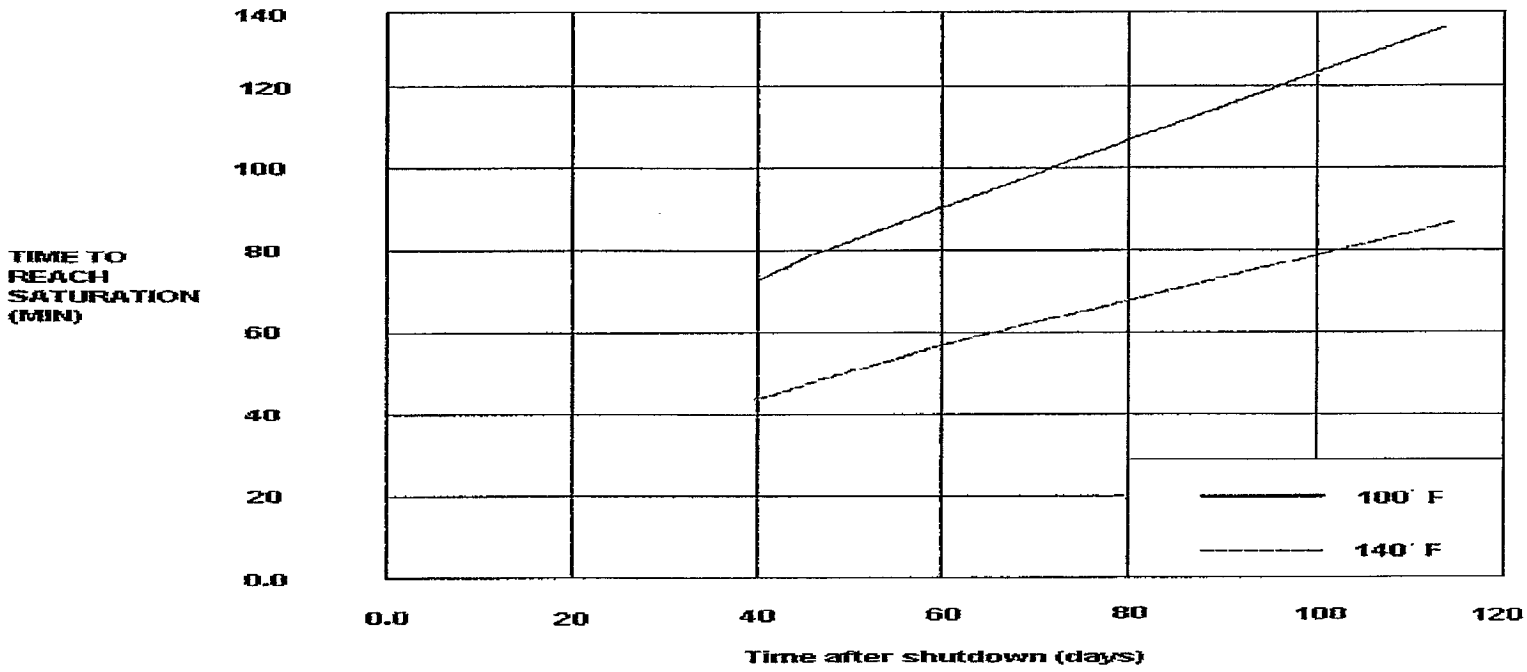
NOTE

Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core

CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
(Page 13 of 14)

TIME TO REACH CORE BOILING AFTER LOSS OF RHR
(AFTER REFUELING 40 TO 100 DAYS)



NOTE Use the highest reading Core Exit Thermocouple OR Hot Leg Temperature to determine the starting temperature for the Reference Core									
CORE	T/C OR HOT LEG	D12	T31 / 21 HOT LEG	K12	T22 / 22 HOT LEG	J1	T46 / 23 HOT LEG	H4	T14 / 24 HOT LEG
	COMPUTER POINT		T0031A / T0419A		T0022A / T0439A		T0046A / T0459A		T0014A / T0479A

ATTACHMENT 4
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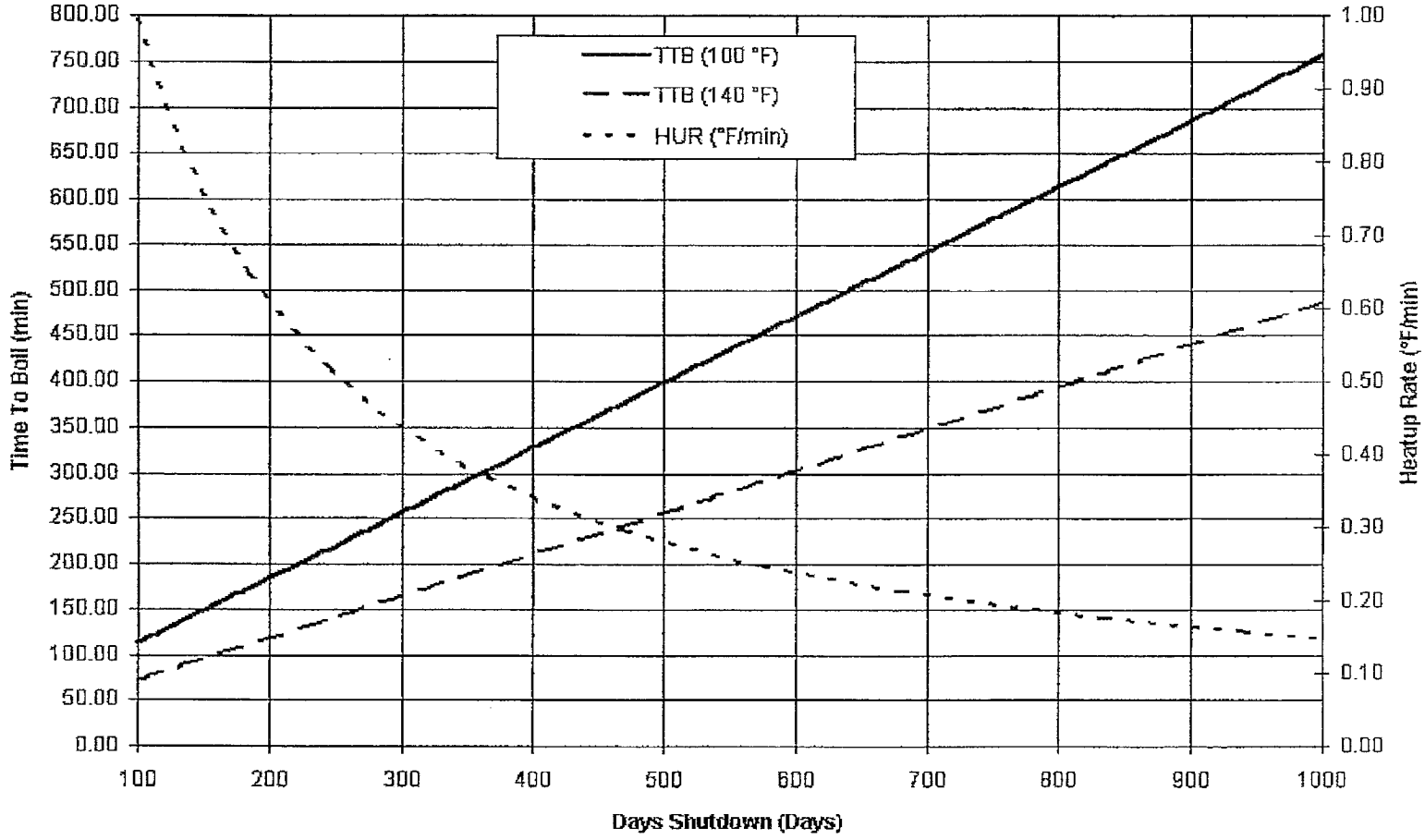
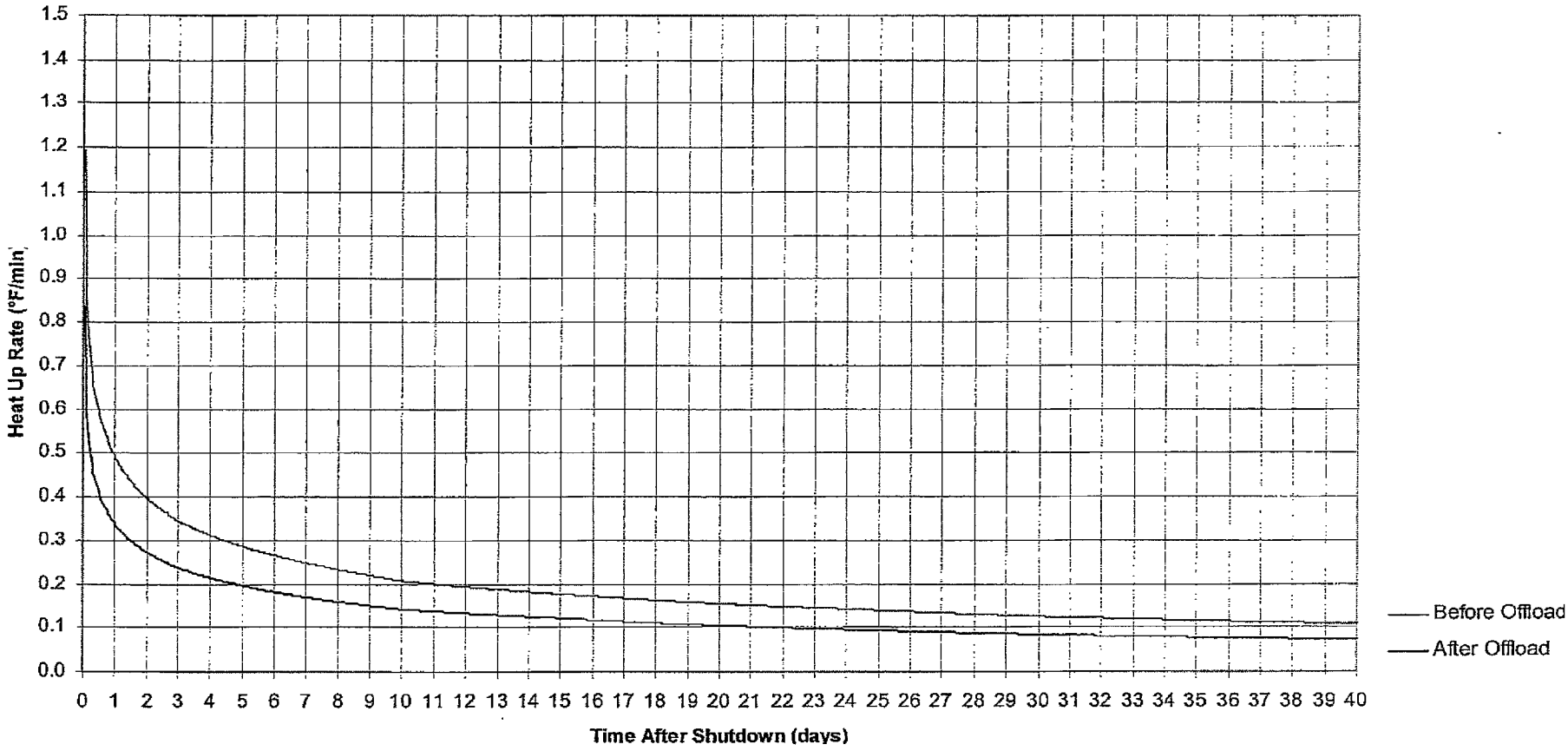
TIME TO REACH CORE BOILING AFTER LOSS OF RHR
(AFTER REFUELING 100 TO 1000 DAYS)



ATTACHMENT 5
(Page 1 of 5)

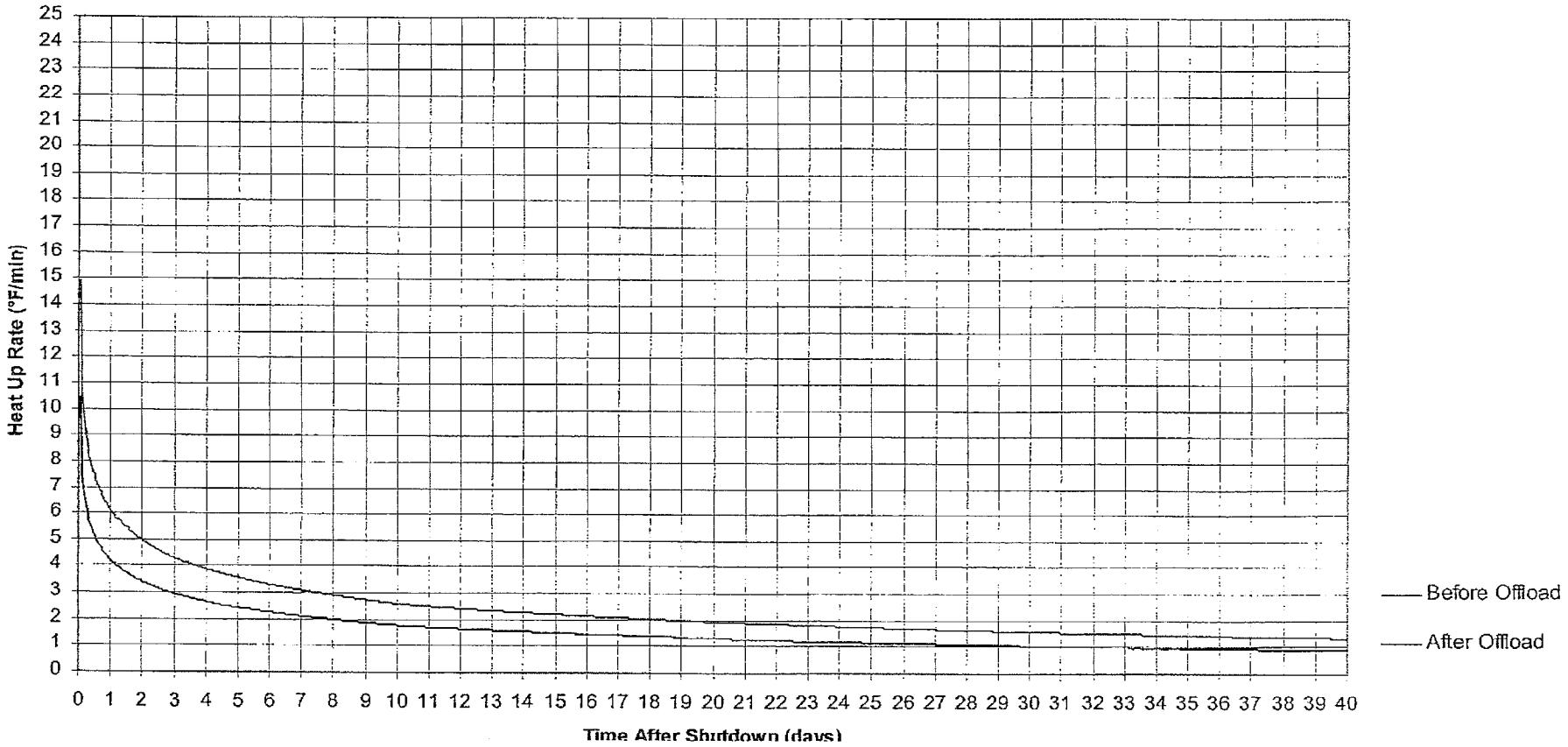
HEATUP RATE FOR LOSS OF RHR COOLING

Heat Up Rate Before and After Core Reload Cavity Flooded



ATTACHMENT 5
(Page 2 of 5)

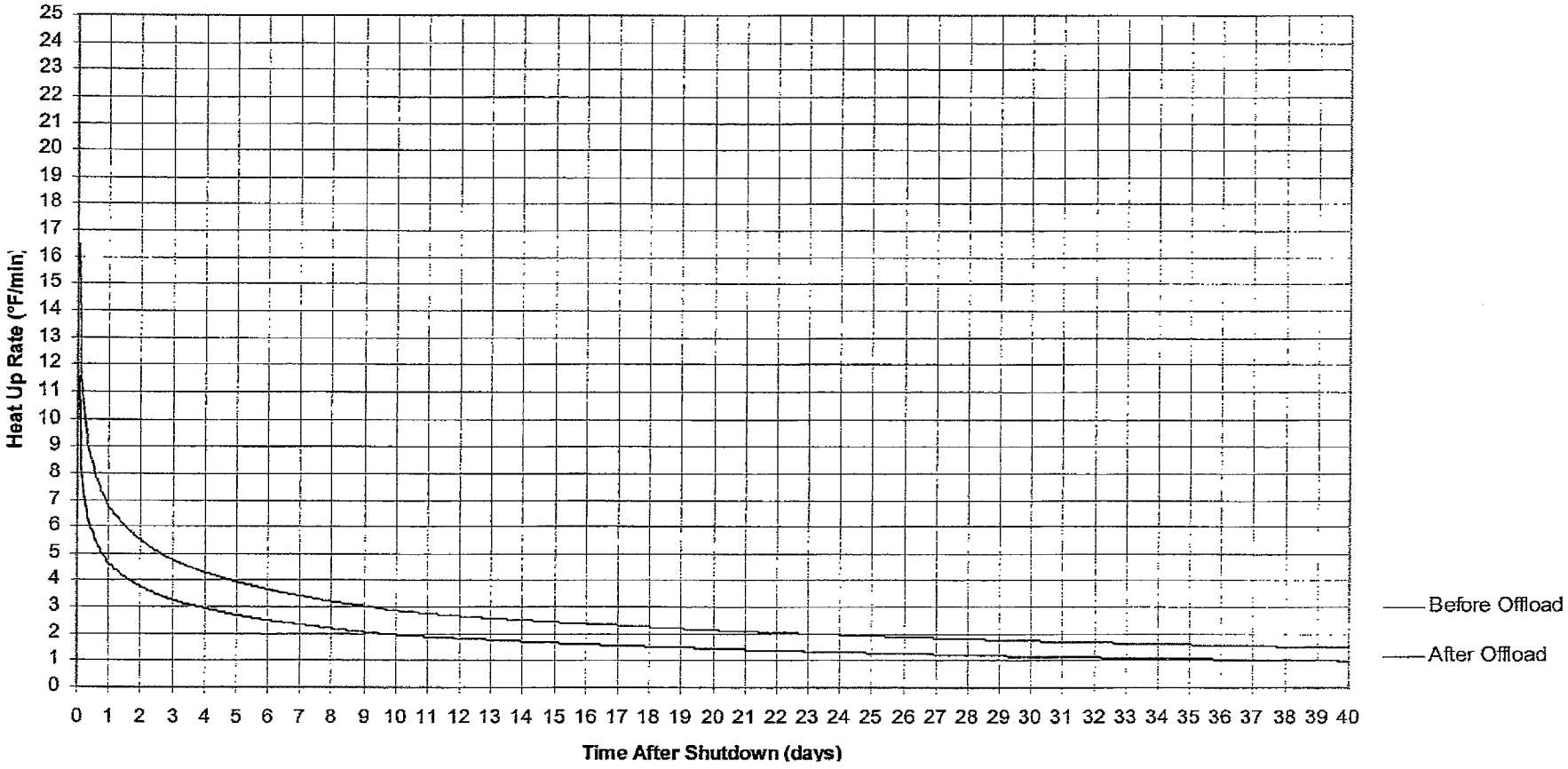
HEATUP RATE FOR LOSS OF RHR COOLING



ATTACHMENT 5
(Page 3 of 5)

HEATUP RATE FOR LOSS OF RHR COOLING

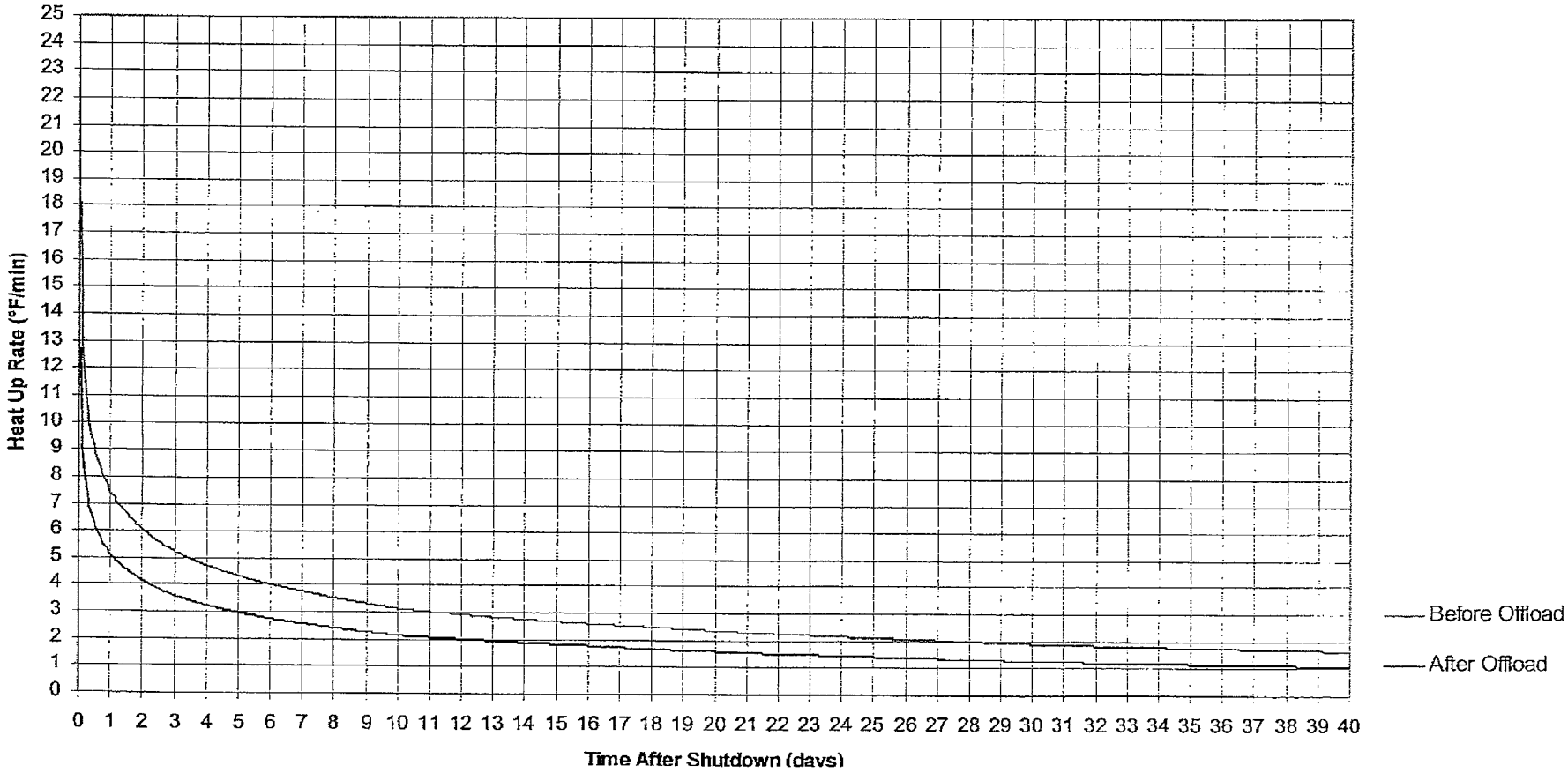
Heat Up Rate Before and After Core Reload At Elev. 103.5 ft



ATTACHMENT 5
(Page 4 of 5)

HEATUP RATE FOR LOSS OF RHR COOLING

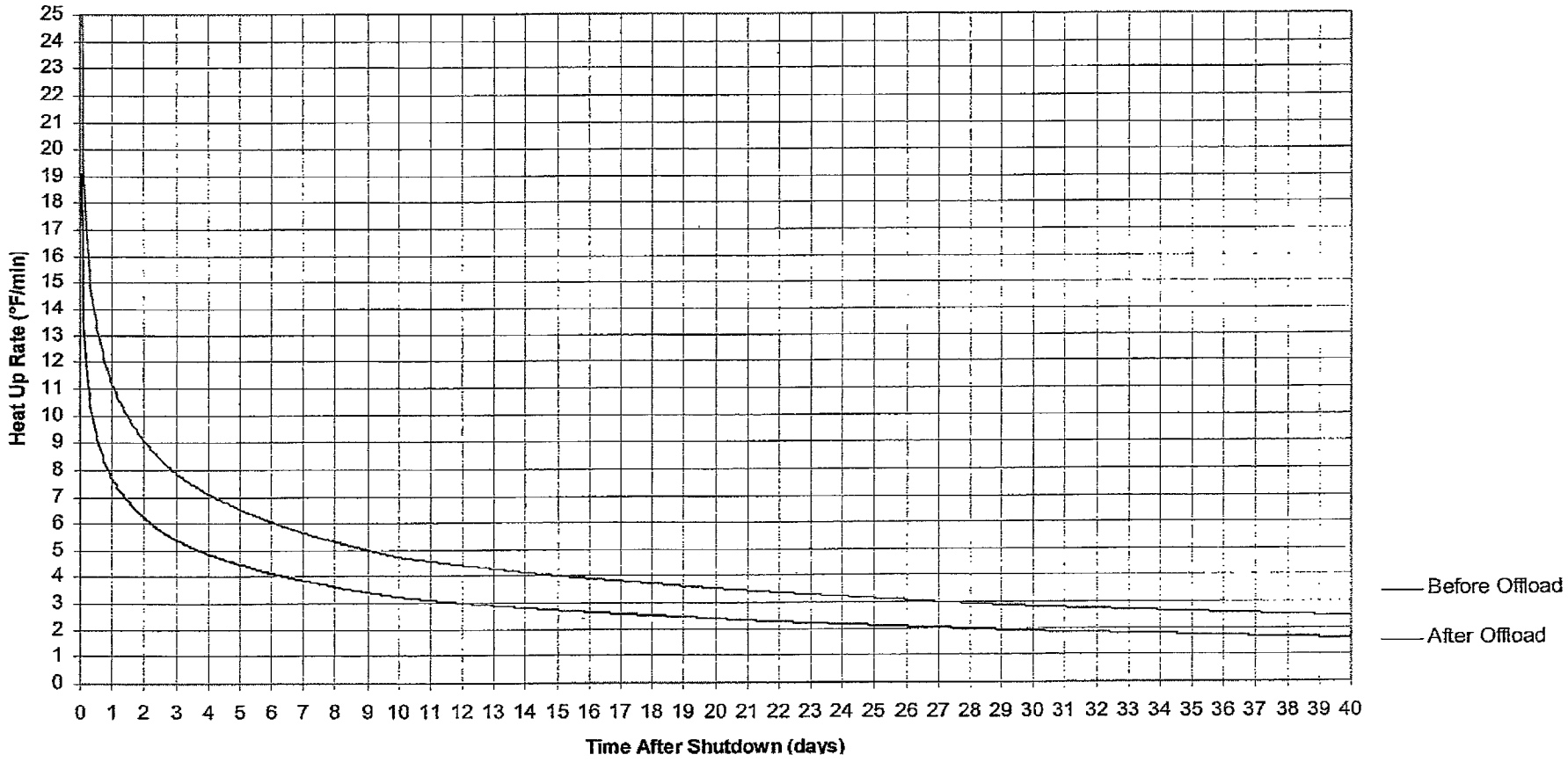
Heat Up Rate Before and After Core Reload At Elev. 101 ft



ATTACHMENT 5
(Page 5 of 5)

HEATUP RATE FOR LOSS OF RHR COOLING

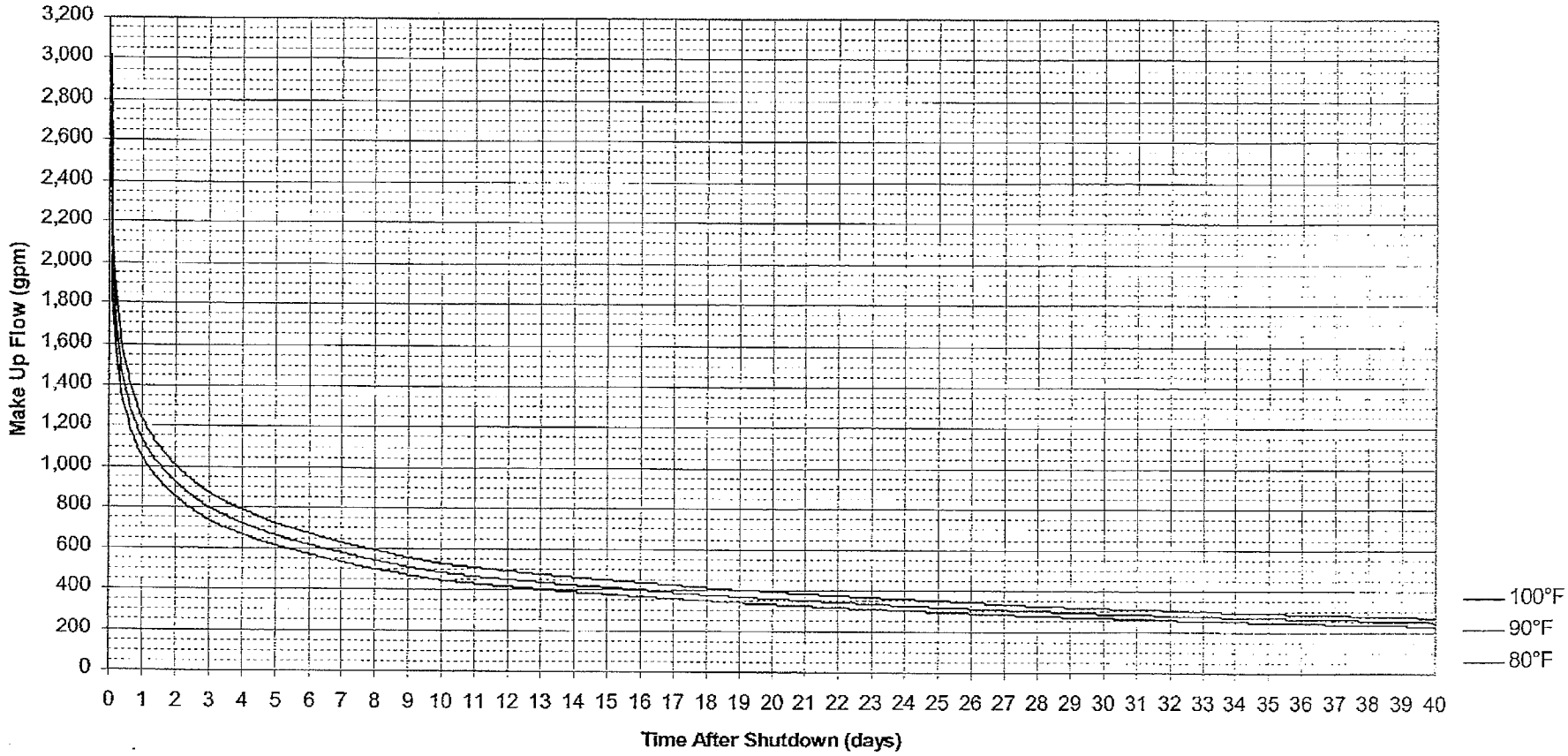
Heat Up Rate Before and After Core Reload At Elev. 97 ft



ATTACHMENT 6
(Page 1 of 2)

MAKEUP RATE REQUIRED TO REFILL RCS AFTER LOSS OF RHR

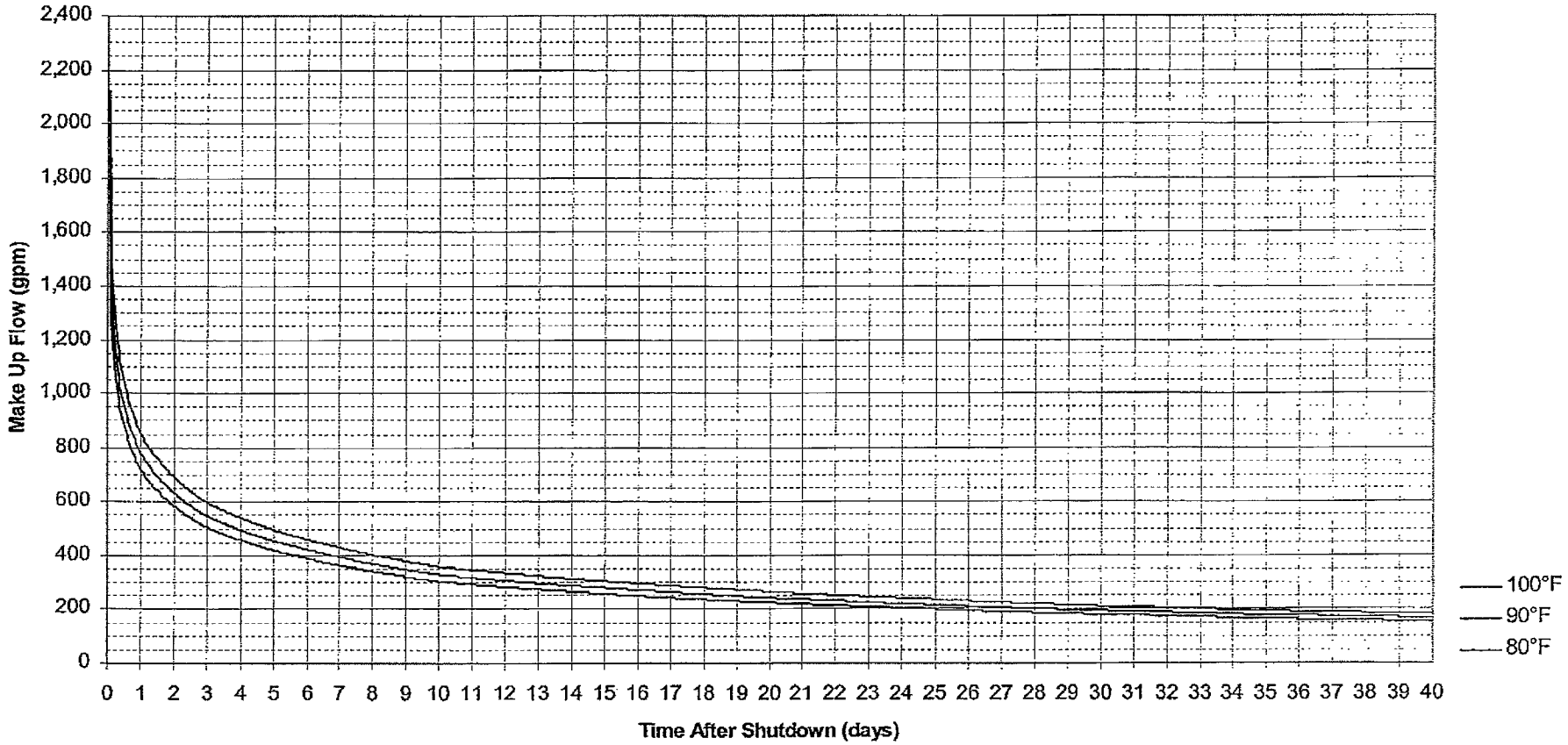
Make Up Flow Before Core Offload
At Various Injection Temperatures



ATTACHMENT 6
(Page 2 of 2)

MAKEUP RATE REQUIRED TO REFILL RCS AFTER LOSS OF RHR

Make Up Flow After Core Offload
At Various Injection Temperatures



ATTACHMENT 7
(Page 1 of 5)

HOT LEG INJECTION (preferred method RCS ≥ 200°F)

[C0354]

CAUTION

- **Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Violation of Technical Specification 3.5.3 requires notifications IAW ECG.**

___ 1.0 **MAKEUP** to the RCS as follows:

___ A. **OPEN** 2SJ30, Suction from RWST.

___ B. IF BOTH Safety Injection Pumps are tagged,
THEN send an Operator to **RELEASE** breaker for one Safety Injection Pump.

___ C. **PLACE** 2RP4 Lockout Switch for the appropriate SJ40, SAFETY INJECTION HEADER STOP VALVE, in VALVE OPERABLE.

___ D. **OPEN** appropriate SJ40 valve, Safety Injection Header Stop Valve.

___ E. **START** the selected Safety Injection Pump.

___ F. **CONTINUE** feeding RCS at maximum rate until ONE of the following occurs:

___ ♦ RHR is restored.

___ ♦ Flow from any RCS opening is adequate to result in lowering Core Exit Thermocouple temperatures.

___ G. When any of the above conditions are satisfied, **CONTROL** injection flow by locally throttling the appropriate SI PUMP DISCH VALVE, 21SJ35 or 22SJ35, to minimize flow to Containment while maintaining Core Exit Thermocouples stable or lowering (SI Pump room, 84' elevation).

___ H. IF Core Exit Thermocouples are not available,
THEN **MAINTAIN** injection flow determined in Attachment 6, Makeup Rate Required To Refill RCS After Loss Of RHR.

ATTACHMENT 7
(Page 2 of 5)

HOT LEG INJECTION

___ 2.0 **INFORM** Containment personnel that high temperature fluids, contamination, and airborne activity will exist at any RCS openings.

___ 3.0 IF Service Water is available,
THEN **START** all available CFCUs in slow speed to minimize Containment pressure rise.

___ 4.0 **ALIGN** bleed path by performing ONE of the following:

___ A. **VERIFY** a 0.5 ft^2 or greater hot leg vent path exists: (circle path verified)

- ♦ All Pressurizer Safety Valves removed

  OR

- ♦ Pressurizer Manway removed

  OR

- ♦ Vent path determined by System Manager

OR

___ B. **OPEN** the following valves:

- ♦ 2PR1, Pressurizer PORV, and 2PR6, Block Valve for 2PR1
- ♦ 2PR2, Pressurizer PORV, and 2PR7, Block Valve for 2PR2
- ♦ Reactor Head Vent Solenoid Valves: **[C0329]**

  ___ 2RC40 ___ 2RC42

  ___ 2RC41 ___ 2RC43

___ 5.0 **CONTROL** Safety Injection Pump flow rate to maintain Core Exit Thermocouple temperature stable or lowering by locally throttling the appropriate SI PUMP DISCH VALVE, 21SJ35 or 22SJ35.

___ 6.0 **MAINTAIN** feed and bleed of the RCS until RHR is restored or other methods of decay heat removal are utilized.

ATTACHMENT 7
(Page 3 of 5)

HOT LEG INJECTION

___ 7.0 When RHR becomes available,
THEN **RETURN** RHR to service IAW the following:

___ A. IF the RHR system requires venting
THEN **VENT** RHR Pumps and piping: [C0329]

CAUTION

- **Venting the RHR system may cause a reduction in RCS level requiring more makeup flowrate.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ 1. **ISOLATE** RHR Suction from RCS, **CLOSE** 2RH1 OR 2RH2, RHR Suction from RCS (2RH2 is preferred, 2RH1 is backup). [C0658]

___ 2. **ENSURE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE. (Control Room)

___ 3. **OPEN** 2SJ69, RHR SUCTION FROM RWST.

___ 4. Send operator to:

___ a. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ b. IF the bioshield area inside containment is accessible,
THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

___ 5. **SEND** an Operator to the RHR Pump Room in preparation for pump start.

(step continued on next page)

ATTACHMENT 7
(Page 4 of 5)

HOT LEG INJECTION

7.A (continued)

___ 6. **CLOSE** 2SJ69, RHR Suction From RWST.

___ 7. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

___ 8. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ B. IF the RHR system requires alignment,
THEN **START** one RHR Pump as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS,
THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling,
THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ C. IF RHR System is ready for normal operation,
THEN **RETURN** to service IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 8.0 When RHR is restored, **REMOVE** Hot Leg Injection from service as follows:

___ A. **STOP** any running Safety Injection Pumps.

___ B. **CLOSE** HOT LEG DISCHARGE valves:

♦ 21SJ40

♦ 22SJ40

___ C. **PLACE** 2RP4 Lockout Switch for 2SJ30, RWST TO SI SUCTION VALVE, in VALVE OPERABLE.

(Continued on next page)

ATTACHMENT 7
(Page 5 of 5)

HOT LEG INJECTION

8.0 (continued)

___ D. **CLOSE** 2SJ30, Suction From RWST.

___ E. **ENSURE** the SI PUMP DISCH VALVEs are Fully Open:

___ ♦ 21SJ35

___ ♦ 22SJ35

___ 9.0 **CLOSE** the Reactor Head Vent Solenoid Valves:

___ ♦ 2RC40

___ ♦ 2RC41

___ ♦ 2RC42

___ ♦ 2RC43

___ 10.0 **RETURN** to procedure step in effect.

ATTACHMENT 8
(Page 1 of 7)

COLD LEG INJECTION (preferred method RCS < 200°F)

[C0354]

CAUTION

- **Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Violation of Technical Specification 3.5.3 requires notifications IAW ECG.**

___ 1.0 **MAKEUP** to the RCS as follows:

___ A. IF the BIT flowpath AND a Charging Pump is available, THEN **ALIGN** feed path to the RCS as follows:

___ 1. **OPEN** RWST outlet to Charging Pumps:

___ ♦ 2SJ1

___ ♦ 2SJ2

___ 2. **CLOSE** VCT outlet to Charging Pumps:

___ ♦ 2CV40

___ ♦ 2CV41

___ 3. IF both Centrifugal Charging Pumps are tagged out, THEN send Operator to **RELEASE** breaker for one Centrifugal Charging Pump.

CAUTION

When the PS25 is the vent path, maximum flow of <300 gpm is required when steam generator nozzle dams are installed. This may be controlled by throttling the pump discharge valve.

___ 4. **START** the designated available Charging Pump AND **FEED** at maximum rate by aligning the following valves in the Cold Leg Injection flow path:

♦ **OPEN** BIT INLET: 2SJ4 or 2SJ5

♦ **OPEN** BIT OUTLET: 2SJ12 or 2SJ13

♦ **CLOSE** Charging Discharge Isolation Valves: 2CV68 OR 2CV69

ATTACHMENT 8
(Page 2 of 7)

COLD LEG INJECTION

1.0 (continued)

___ B. IF BIT flowpath and Charging Pump is NOT available,
AND a Safety Injection Pump with a Cold Leg Injection path is available,
THEN **ALIGN** feed path to the RCS as follows:

___ 1. **ENSURE** OPEN RWST TO SI PUMP valves:

___ ♦ **PLACE** 2RP4 lockout switch in VALVE OPERATE AND **OPEN** 2SJ30

___ ♦ 21SJ33 OR 22SJ33 associated with the available SI Pump

___ ♦ 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES

___ 2. IF both Safety Injection Pumps are tagged out,
THEN send Operator to **RELEASE** breaker for one Safety Injection Pumps.

CAUTION

When the PS25 is the vent path, maximum flow of <300 gpm is required when steam generator nozzle dams are installed. This may be controlled by throttling the pump discharge valve.

___ 3. **START** the designated available Safety Injection Pump
AND **FEED** at maximum rate by aligning the following valves in the Cold Leg Injection flow path:

___ ♦ **OPEN** 21SJ134 OR 22SJ134 associated with the available SI Pump

___ ♦ **PLACE** 2RP4 lockout switch in VALVE OPERATE AND **OPEN** 2SJ135

___ ♦ **CLOSE** 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES

___ C. **CONTINUE** feeding RCS at maximum rate until one of the following occurs:

___ 1. RHR is restored.

___ 2. Pressurizer level is ≥50% cold calibration.

___ 3. Flow from any RCS opening is adequate to result in lowering Core Exit Thermocouple temperatures.

ATTACHMENT 8
(Page 3 of 7)

COLD LEG INJECTION

___ D. When any of the above conditions in Step 1.C are satisfied:

- ♦ **CONTROL** injection flow by using normal charging to minimize flow to containment while maintaining Core Exit Thermocouples stable or lowering.

  OR

___ ♦ **CYCLE** BIT isolation valves to control flow to the RCS:

  ___ ♦ BIT INLET: 2SJ4 OR 2SJ5

  ___ ♦ BIT OUTLET: 2SJ12 OR 2SJ13

  OR

___ ♦ **OPEN** 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES valves AND **CYCLE** 2SJ135 to control flow to the RCS.

___ E. IF Core Exit Thermocouples are NOT available, THEN **MAINTAIN** injection flow determined in Attachment 6, Makeup Rate Required to Refill RCS After Loss of RHR.

___ 2.0 **INFORM** Containment personnel that high temperature fluids, contamination, and airborne activity will exist at any RCS openings.

___ 3.0 IF Service Water is available, THEN **START** all available CFCUs in slow speed to minimize Containment pressure rise.

(continued on next page)

ATTACHMENT 8
(Page 4 of 7)

COLD LEG INJECTION

___ 4.0 **ALIGN** bleed path by performing ONE of the following:

___ A. **VERIFY** a 0.5 ft^2 or greater hot leg vent path exists: (circle path verified)

- ♦ All Pressurizer Safety Valves removed

  OR

- ♦ Pressurizer Manway removed

  OR

- ♦ Vent path determined by System Manager

OR

___ B. **OPEN** the following valves:

- ♦ 2PR1, Pressurizer PORV, AND 2PR6, Block Valve for 2PR1
- ♦ 2PR2, Pressurizer PORV, AND 2PR7, Block Valve for 2PR2
- ♦ Reactor Head Vent Solenoid Valves: **[C0329]**

  ___ 2RC40 ___ 2RC42

  ___ 2RC41 ___ 2RC43

___ 5.0 **MAINTAIN** feed and bleed of the RCS until RHR is restored or other methods of decay heat removal are utilized.

ATTACHMENT 8
(Page 5 of 7)

COLD LEG INJECTION

___ 6.0 When RHR becomes available,
THEN **RETURN** RHR to service IAW the following:

___ A. IF the RHR system requires venting
THEN **VENT** RHR Pumps and piping: [C0329]

CAUTION

- **Venting the RHR system may cause a reduction in RCS level requiring more makeup flowrate.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ 1. **ISOLATE** RHR Suction from RCS, **CLOSE** 2RH1 OR 2RH2, RHR Suction from RCS (2RH2 is preferred, 2RH1 is backup). [C0658]

___ 2. **ENSURE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE.

___ 3. **OPEN** 2SJ69, RHR SUCTION FROM RWST.

___ 4. Send operator to:

___ a. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ b. IF the bioshield area inside containment is accessible,
THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

___ 5. **SEND** an Operator to the RHR Pump Room in preparation for pump start.

___ 6. **CLOSE** 2SJ69, RHR Suction From RWST.

(step continued on next page)

ATTACHMENT 8
(Page 6 of 7)

COLD LEG INJECTION

6, 4.A (continued)

___ 7. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

___ 8. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ B. IF the RHR system requires alignment,
THEN **START** one RHR Pump as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS,
THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling,
THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ C. IF RHR System is ready for normal operation,
THEN **RETURN** to service IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 7.0 WHEN RHR is restored, **REMOVE** Cold Leg Injection from service as follows:

___ A. **STOP** any running Charging Pumps OR Safety Injection Pumps.

___ B. **CLOSE** Charging Header OR Safety Injection Header Stop Valves for Cold Leg Injection:

___ ♦ 2SJ4, INLET TO BIT

___ ♦ 2SJ5, INLET TO BIT

___ ♦ 2SJ12, BIT OUTLET

___ ♦ 2SJ13, BIT OUTLET

___ ♦ 21SJ134 AND 22SJ134, SI Pump Discharge to Cold Leg

___ ♦ 2SJ135, SI Pump Discharge to Cold Leg

(step continued on next page)

ATTACHMENT 8
(Page 7 of 7)

COLD LEG INJECTION

7, 5.0 (continued)

___ C. **OPEN** VCT Outlet to Charging Pumps:

___ ♦ 2CV40

___ ♦ 2CV41

___ D. **CLOSE** RWST Outlet to Charging Pumps:

___ ♦ 2SJ1

___ ♦ 2SJ2

___ E. **OPEN** Charging Discharge Isolation Valves:

___ ♦ 2CV68

___ ♦ 2CV69

___ 8.0 **CLOSE** Reactor Head Vent Solenoid Valves:

___ ♦ 2RC40 ___ ♦ 2RC41

___ ♦ 2RC42 ___ ♦ 2RC43

___ 9.0 **RETURN** to procedure step in effect.

ATTACHMENT 9
(Page 1 of 5)

STEAM GENERATOR REFLUX COOLING

NOTE

Motor operated valves may need to be manually operated.

CAUTION

- **Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.**
- **Any opening in the RCS boundary could result in release of radioactive water or gases to Containment.**

___ 1.0 **ALIGN** the RWST to gravity feed the RCS using one of the following methods:

___ A. RWST To RHR Suction (Preferred)

___ 1. **PLACE** 2RP4 lockout switch for 2SJ69, RHR Suction From RWST in VALVE OPERABLE.

___ 2. **OPEN** 2SJ69, RHR Suction From RWST.

OR

___ B. Throttle **OPEN** 2RH21 to allow flow through RH19s and SJ49s.

OR

___ C. RWST To Hot Leg:

___ 1. **CLOSE** RHR HX DISCH X-CONN valves:

___ ♦ 21RH19

___ ♦ 22RH19

___ ♦ 2RH20

___ 2. **PLACE** 2RP4 lockout switch for 2RH26, HOT LEG ISO VALVE in VALVE OPERABLE.

___ 3. **OPEN** 2RH26, HOT LEG ISO VALVE.

___ 4. Throttle **OPEN** 2RH21, RHR TO RWST STOP VALVE.

ATTACHMENT 9
(Page 2 of 5)

STEAM GENERATOR REFLUX COOLING

NOTE

To maintain RCS pressure low enough for gravity feed from RWST, at least two Steam Generators must be available as heat sinks using reflux cooling.

___ 2.0 **ENSURE** at least two Steam Generators are aligned for heat sink using reflux cooling as follows:

___ ♦ Steam Generator nozzle dams removed

___ ♦ Primary and secondary manways and hand holes installed

___ ♦ Steam Generator contains water or can be filled

___ 3.0 **FEED** available Steam Generators to maintain wide range level >77% using Auxiliary Feedwater System OR Condensate System.

___ 4.0 **REMOVE** decay heat by performing one of the following:

♦ **OPERATE** the appropriate MS10s to maintain Core Exit Thermocouples stable or lowering.

OR

♦ **DRAIN** the Steam Generators as required to maintain level <95% wide range.

___ 5.0 **NOTIFY** Containment personnel that high temperature fluids, contamination, and airborne activity will exist at any RCS openings.

___ 6.0 IF Service Water is available,
THEN **START** all available CFCUs in slow speed to minimize Containment pressure rise.

___ 7.0 **OPEN** Reactor Head Vent Solenoid Valves: **[C0329]**

___ ♦ 2RC40 ___ ♦ 2RC41

___ ♦ 2RC42 ___ ♦ 2RC43

ATTACHMENT 9
(Page 3 of 5)

STEAM GENERATOR REFLUX COOLING

___ 8.0 **MAINTAIN** reflux cooling of the RCS until RHR is restored or other methods of decay heat removal are utilized.

___ 9.0 When RHR becomes available,
THEN **RETURN** RHR to service as follows:

___ A. IF the RHR system requires venting
THEN **VENT** RHR Pumps and piping: [C0329]

CAUTION

- **Venting the RHR system may cause a reduction in RCS level requiring more makeup flowrate.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ 1. **ISOLATE** RHR Suction from RCS, **CLOSE** 2RH1 OR 2RH2, RHR Suction from RCS (2RH2 is preferred, 2RH1 is backup). [C0658]

___ 2. **ENSURE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE.

___ 3. **OPEN** 2SJ69, RHR SUCTION FROM RWST.

___ 4. Send operator to:

___ a. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ b. IF the bioshield area inside containment is accessible,
THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

(step continued on next page)

ATTACHMENT 9
(Page 4 of 5)

STEAM GENERATOR REFLUX COOLING

9.0 (Continued)

___ 5. **SEND** an Operator to the RHR Pump Room in preparation for pump start.

___ 6. **CLOSE** 2SJ69, RHR Suction From RWST.

___ 7. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

___ 8. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ B. IF the RHR system requires alignment,
THEN **START** one RHR Pump as follows:

___ ♦ IF alternate RHR Loop is aligned for ECCS,
THEN **PERFORM** Attachment 2, Aligning RHR Loop From ECCS To Shutdown Cooling.

OR

___ ♦ IF alternate RHR Loop is aligned for Shutdown Cooling,
THEN **PERFORM** Attachment 3, Aligning RHR Loop For Shutdown Cooling.

___ C. IF RHR System is ready for normal operation,
THEN **RETURN** to service IAW S2.OP-SO.RHR-0001(Q), Initiating RHR.

___ 10.0 When RHR is restored, **SECURE** Gravity Feed Path as follows:

___ A. **CLOSE** 2SJ69, RHR Suction From RWST.

___ B. **CLOSE** the following valves, if aligned for gravity feed:

___ ♦ 2RH21, RHR TO RWST STOP VALVE

___ ♦ 2RH26, HOT LEG ISOLATION VALVE

___ C. **ENSURE** 21RH19 and 22RH19 valves are OPEN.

ATTACHMENT 9
(Page 5 of 5)

STEAM GENERATOR REFLUX COOLING

___ 11.0 **CLOSE** Reactor Head Vent Solenoid Valves:

___ ♦ 2RC40 ___ ♦ 2RC41

___ ♦ 2RC42 ___ ♦ 2RC43

___ 12.0 **RESTORE** Steam Generator level to the level directed by the SM/CRS AND **INITIATE** securing the feeding and draining of Steam Generators IAW appropriate procedures.

___ 13.0 **CLOSE** any MS10s NOT required for decay heat removal, as directed by the SM/CRS.

___ 14.0 **RETURN** to procedure step in effect.

ATTACHMENT 10
(Page 1 of 1)

FORCED FLOW OR NATURAL CIRCULATION COOLDOWN

___ 1.0 **FEED** available Steam Generators to maintain wide range level >77% using Auxiliary Feedwater System or Condensate System.

___ 2.0 **REMOVE** reactor decay heat by performing one of the following:

- **OPERATE** the appropriate MS10s to maintain Core Exit Thermocouples stable or lowering.

  OR

- **DRAIN** Steam Generators as required to maintain level <95% wide range.

___ 3.0 IF forced flow cooling of the RCS is desired,
THEN **OPERATE** Reactor Coolant Pumps IAW S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation.

___ 4.0 IF Natural Circulation Cooldown is desired,
THEN **VERIFY** Natural Circulation by maintaining the following parameters:

- RCS subcooling based on Core Exit Thermocouples >0°F
- Core Exit Thermocouples stable or lowering
- Steam Generator pressures stable or lowering
- RCS Hot Leg temperatures stable or lowering
- RCS Cold Leg temperatures at saturation temperature for Steam Generator pressure

___ 5.0 **CONTINUE** RCS cooling using Steam Generators until RHR System is restored.

- **OPERATE** the appropriate MS10s to maintain Core Exit Thermocouples stable or lowering.

  OR

- **DRAIN** the Steam Generators as required to maintain level <95% wide range.

___ 6.0 **RETURN** to procedure step in effect.

ATTACHMENT 11
(Page 1 of 1)

COOLING THE RCS WITH SPENT FUEL POOL

NOTE

Cooling RCS with Spent Fuel Pool is available only when the Reactor Head is removed.

CAUTION

Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.

___ 1.0 IF the Fuel Transfer Tube Blank Flange is installed,
THEN **REMOVE** the Fuel Transfer Tube Blank Flange.

___ 2.0 **INITIATE** flooding the Refueling Cavity IAW S2.OP-SO.SF-0003(Q), Filling the Reactor Refueling Cavity.

___ 3.0 **RAISE** cooling of the Spent Fuel Pool to maximum IAW S2.OP-SO.SF-0002(Q), Spent Fuel Cooling Operation.

___ 4.0 **RAISE** Reactor Refueling Cavity Filtering and Purification flow to maximum IAW S2.OP-SO.SF-0005(Q), Refueling Water Purification System Operation.

___ 5.0 **SEND** an Operator to the Fuel Transfer Tube Gate Valve.

___ 6.0 When Reactor Cavity AND Spent Fuel Pool levels are equalized at ≈23 ft. water level, **OPEN** the Fuel Transfer Tube Gate Valve.

___ 7.0 **INFORM** Containment personnel that contamination and airborne activity will exist at any RCS openings.

___ 8.0 IF Service Water is available,
THEN **START** all available CFCUs in slow speed to minimize Containment pressure rise.

___ 9.0 **MAINTAIN** Spent Fuel Pool Cooling of the RCS until RHR is restored or other methods of decay heat removal are utilized.

___ 10.0 When RHR is restored, **RETURN** Spent Fuel Pool Cooling to normal operation IAW S2.OP-SO.SF-0002(Q), Spent Fuel Cooling System Operation.

___ 11.0 **RETURN** to procedure step in effect.

ATTACHMENT 12
(Page 1 of 6)

ALTERNATE COOLING WATER

___ 1.0 Prior to aligning the alternate cooling water supply, **STOP** the affected pump normally cooled by Service Water.

NOTE

DM cooling supply hoses are to be furnished with double check valves. DM cooling discharge hoses are to be directed to the closest available floor drain and securely fastened to prevent hoses from coming dislodged from the drain.

___ 2.0 **INSTALL** Demineralized Water supply hoses with double check valves between the applicable DR Header Connection Valves:

Component	Connected From	Connected To	Initials
21 RHR PUMP MECH SEAL HEAT EXCH SUPPLY HOSE	2DR47 (21 RHR Hx Rm, El. 55')	21CC22	
21 RHR PUMP MECH SEAL HEAT EXCH DISCHARGE HOSE	21CC220 (21 RHR Valve Rm, El. 55')	Floor Drain	
22 RHR PUMP MECH SEAL HEAT EXCH SUPPLY HOSE	2DR48 (22 RHR HX Rm, El. 55')	22CC22	
22 RHR PUMP MECH SEAL HEAT EXCH DISCHARGE HOSE	22CC220 (22 RHR Valve Rm, El. 55')	Floor Drain	
21 & 22 CHG PUMPS MECH SEAL HX & GLAND COOLER SUPPLY HOSE	2DR39 (By CS Tank, El. 84')	2CC106	
21 CHG PUMP MECH SEAL HX & GLAND COOLER DISCHARGE HOSE	2CC239	Floor Drain	
22 CHG PUMP MECH SEAL HX & GLAND COOLER DISCHARGE HOSE	2CC231	Floor Drain	
22 CHG PUMP LUBE OIL COOLER & GEAR OIL COOLER SUPPLY HOSE	2DR38 (Conc Hold Tank Area, El. 84")	2SW201	

ATTACHMENT 12
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ALTERNATE COOLING WATER

Component	Connected From	Connected To	Initials
22 CHG PUMP LUBE OIL COOLER & GEAR OIL COOLER DISCHARGE HOSE	22SW961	Floor Drain	
22 SAFETY INJECTION PUMP LUBE OIL COOLER SUPPLY HOSE	2DR36 (CCHX Corr, El. 84')	2SW165	
22 SAFETY INJECTION PUMP LUBE OIL COOLER DISCHARGE HOSE	2SW166	Floor Drain	
21 CHG PUMP LUBE OIL COOLER & GEAR OIL COOLER SUPPLY HOSE	2DR38 (Conc Hold Tank Area, El. 84")	2SW187	
21 CHG PUMP LUBE OIL COOLER & GEAR OIL COOLER DISCHARGE HOSE	21SW952	Floor Drain	
21 SAFETY INJECTION PUMP LUBE OIL COOLER SUPPLY HOSE	2DR36 (CCHX Corr, El. 84')	2SW171	
21 SAFETY INJECTION PUMP LUBE OIL COOLER DISCHARGE HOSE	2SW172	Floor Drain	

___ 3.0 **CROSS-TIE** the Component Cooling System Header to supply 21 and 22 Safety Injection Pump Seal Water Heat Exchanger by removing lock AND opening 2CC318, CC Cross-Tie Valve.

ATTACHMENT 12
(Page 3 of 6)

ALTERNATE COOLING WATER

___ 4.0 **REPOSITION** valves as required to run pumps, from the normal cooling position to the alternate cooling position as shown:

COMPONENT	NORMAL COOLING POSITION	ALTERNATE COOLING POSITION
21 Charging Pump Lube Oil Cooler & Gear Oil Cooler		
2DR38, DR Header Hose Connection	Closed	Open
21SW956, SW Inlet Valve	Open	Closed
21SW955, SW Outlet Valve	Open	Closed
2SW187, SW Inlet Drain	Closed	Open
21SW952, SW Outlet Drain	Closed	Open
22 Charging Pump Lube Oil Cooler & Gear Oil Cooler		
2DR38, DR Header Hose Connection	Closed	Open
22SW960, SW Inlet Valve	Open	Closed
22SW959, SW Outlet Valve	Open	Closed
2SW201, SW Inlet Drain	Closed	Open
22SW961, SW Outlet Drain	Closed	Open
21 Safety Injection Pump Lube Oil Cooler		
2DR36, DM Supply Valve	Closed	Open
2SW160, Inlet to Cooler	Locked Open	Closed
2SW220, Outlet form Cooler	Open	Closed
2SW171, Inlet Drain	Closed	Open
2SW172, Outlet Vent	Closed	Open
2SW513, SI Pmp Rm Clr SW Inlet Valve	Open	Closed

ATTACHMENT 12
(Page 4 of 6)

ALTERNATE COOLING WATER

COMPONENT	NORMAL COOLING POSITION	ALTERNATE COOLING POSITION
22 Safety Injection Pump Lube Oil Cooler		
2DR36, DM Supply Valve	Closed	Open
2SW162, Inlet to Cooler	Locked Open	Closed
2SW181, Outlet form Cooler	Open	Closed
2SW165, Inlet Drain	Closed	Open
2SW166, Outlet Vent	Closed	Open
21 RHR Pump Mechanical Seal Heat Exchanger		
2DR47, DR HEADER HOSE CONNECTION Valve	Closed	Open
21CC21, CC Inlet Valve	Open	Closed
21CC23, CC Outlet Valve	Open	Closed
21CC22, CC Inlet Drain	Closed	Open
21CC220, CC Outlet Drain	Closed	Open
22 RHR Pump Mechanical Seal Heat Exchanger		
2DR48, DR HEADER HOSE CONNECTION Valve	Closed	Open
22CC21, CC Inlet Valve	Open	Closed
22CC23, CC Outlet Valve	Open	Closed
22CC22, CC Inlet Drain	Closed	Open
22CC220, CC Outlet Drain	Closed	Open

ATTACHMENT 12
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ALTERNATE COOLING WATER

COMPONENT	NORMAL COOLING POSITION	ALTERNATE COOLING POSITION
21 Charging Pump Mechanical Seal Heat Exchanger & Gland Cooler		
2DR39, DR Header Hose Connection	Closed	Open
2CC318, CC Cross-tie Valve	Locked Closed	Open
2CC105, CC Inlet Valve	Open	Open
2CC107, CC Outlet Valve	Open	Closed
2CC97, CC Inlet Valve	Open	Closed
2CC214, CC Header Outlet	Open	Closed
2CC106, CC Inlet Drain	Closed	Open
2CC239, CC Outlet Drain	Closed	Open
22 Charging Pump Mechanical Seal Heat Exchanger & Gland Cooler		
2DR39, DR Header Hose Connection	Closed	Open
2CC318, CC Cross-tie Valve	Locked Closed	Open
2CC319, CC Inlet Valve	Open	Closed
2CC103, CC Outlet Valve	Open	Closed
2CC97, CC Inlet Valve	Open	Closed
2CC105, CC Inlet Valve	Open	Open
2CC107, CC Outlet Valve	Open	Closed
2CC214, CC Header Outlet	Open	Closed
2CC106, CC Inlet Drain	Closed	Open
2CC231, CC Outlet Drain	Closed	Open

ATTACHMENT 12
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ALTERNATE COOLING WATER

___ 5.0 **INSTALL** AND **OPERATE** fans in the following pump rooms for additional cooling as required:

PUMP ROOM	NUMBER OF FANS REQUIRED
Component Cooling Water Pump	2
Residual Heat Removal Pumps	2
Containment Spray Pumps	1
Safety Injection Pumps	1
Charging Pumps	1
Spent Fuel Pool Cooling Pumps	1

___ 6.0 **CLOSE** the following balancing dampers between the Auxiliary Building Ventilation System and the RHR area and 21 & 22 Sump Tank Pumps.

___ A. 2VHE728 (Elev 55 RHR Valve Room)

___ B. 2VHE731 (Aux Bldg Sump Tk Rm)

___ 7.0 **RETURN** to Procedure Step 3.7 to remove decay heat until Service Water is restored.

___ 8.0 When Service Water is restored:

___ A. **REPOSITION** valves on components aligned for alternate cooling to the normal cooling position, unless directed by S2.OP-SO.SW-0002(Q) or S2.OP-SO.SW-0003(Q).

___ B. Direct a second Operator to **PERFORM** an Independent Verification on valves or components repositioned to the "NORMAL COOLING POSITION".

___ C. **REMOVE** alternate cooling and drain hoses installed for alternate cooling and return to storage, unless directed by S2.OP-SO.SW-0002(Q) OR S2.OP-SO.SW-0003(Q).

___ D. **REMOVE** portable fans installed in pump rooms and return to storage, unless required by another procedure.

___ E. **RETURN** Auxiliary Building Ventilation System balancing dampers to normal position.

___ ♦ 2VHE728 (Elev 55 RHR Valve Room)

___ ♦ 2VHE731 (Aux Bldg Sump Tk Rm)

ATTACHMENT 13
(Page 1 of 2)

COLD LEG RECIRCULATION

___ 1.0 IF an intact RHR Train is available,
THEN:

___ A. **VERIFY** Containment Sump level ≥62%. (adequate water supply for Cold Leg Recirculation) **[C0354]**

___ B. **CLOSE** 2RH21, RHR to RWST Stop Valve.

___ C. **ALIGN** intact RHR train to Containment Sump as follows:

___ 1. **PLACE** 2RP4 lockout switch for 2SJ69, RHR Suction From RWST in VALVE OPERABLE.

___ 2. **CLOSE** 2SJ69, RHR Suction From RWST.

___ 3. **CLOSE** RH4, RHR Pump Suction Valve, on intact RHR Train.

___ 4. **OPEN** SJ44, CONT SUMP SUCT VALVE, on intact RHR train.

___ 5. **PLACE** 2RP4 lockout switch for SJ49, RHR Discharge to Cold Legs, on intact RHR train in VALVE OPERABLE.

___ 6. **OPEN** SJ49, RHR Discharge to Cold Legs, on intact RHR train.

___ 7. **CLOSE** RH18, RHR HX Flow Control Valve, on intact RHR train.

___ 8. **CLOSE** 2RH20, RHR HX Bypass Control valve.

___ 9. **ENSURE** applicable RH29, RHR PUMP MINIMUM FLOW VALVE in AUTO.

___ 10. **START** intact RHR Pump to transfer to Cold Leg Recirculation.

___ 11. IF Hot Leg Injection is in service,
THEN:

___ a. **STOP** any running Safety Injection Pumps.

___ b. **CLOSE** 21SJ40 AND 22SJ40, HOT LEG DISCHARGE valves.

ATTACHMENT 13
(Page 2 of 2)

COLD LEG RECIRCULATION

___ 12. IF Cold Leg Injection is in service, THEN:

___ a. **STOP** any running Charging Pumps.

___ b. **CLOSE** Charging Header Stop Valves for Cold Leg Injection:

___ ♦ 2SJ4, Inlet to BIT

___ ♦ 2SJ5, Inlet to BIT

___ ♦ 2SJ12, BIT Outlet

___ ♦ 2SJ13, BIT Outlet

___ 13. **OPEN** CV68 and CV69, Charging Discharge Isolation Valves.

___ 14. **THROTTLE** the following valves to control RCS level:

___ ♦ Applicable RH18 for intact RHR train

___ ♦ 2RH20, RHR HX Bypass Control valve

___ 15. **RETURN** to procedure step in effect.

___ 2.0 IF an intact RHR Train is NOT available, THEN:

___ A. **ESTABLISH** an alternate decay heat removal method:

___ ♦ Attachment 9, Steam Generator Reflux Cooling (RCS depressurized and RCPs NOT available)

___ ♦ Attachment 10, Forced Flow Or Natural Circulation Cooldown (RCS intact and filled to >0% in the Pressurizer)

___ ♦ Attachment 11, Cooling the RCS with Spent Fuel Pool (Reactor Vessel Head Removed)

___ B. **SECURE** Hot Leg injection.

___ C. **SECURE** Cold Leg injection.

___ D. **RETURN** to procedure step in effect.

ATTACHMENT 14
(Page 1 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

NOTE

One Airlock should remain open until notified by Maintenance that the Equipment Hatch Ventilation Barrier (EHVB) is closed.

___ 1.0 **CLOSE** the following valves:

___ ♦ 2VC1, CONT PURGE SUPPLY ISOL VLV

___ ♦ 2VC2, CONT PURGE SUPPLY ISOL VLV (as applicable)

___ ♦ 2VC3, CONT PURGE EXHAUST ISOL VLV (as applicable)

___ ♦ 2VC4, CONT PURGE EXHAUST ISOL VLV

ATTACHMENT 14
(Page 2 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

[C0354]

CAUTION

- **Only Borated water should be added to the RCS to maintain adequate Shutdown Margin.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Violation of Technical Specification 3.5.3 requires notifications IAW ECG.**

___ 2.0 **MAKEUP** to the RCS as follows:

___ A. IF the BIT flowpath AND a Charging Pump is available, THEN **ALIGN** feed path to the RCS as follows:

___ 1. **OPEN** RWST outlet to Charging Pumps:

___ ♦ 2SJ1

___ ♦ 2SJ2

___ 2. **CLOSE** VCT outlet to Charging Pumps:

___ ♦ 2CV40

___ ♦ 2CV41

___ 3. IF both Centrifugal Charging Pumps are tagged out, THEN send Operator to **RELEASE** breaker for one Centrifugal Charging Pump.

___ 4. **START** the designated available Charging Pump AND **FEED** at maximum rate (> 520 gpm) by aligning the following valves in the Cold Leg Injection flow path:

___ ♦ **OPEN** BIT INLET: 2SJ4 AND 2SJ5

___ ♦ **OPEN** BIT OUTLET: 2SJ12 AND 2SJ13

___ ♦ **CLOSE** Charging Discharge Isolation Valves: 2CV68 OR 2CV69

___ ♦ **CLOSE** Charging Pump Miniflow Valves: 2CV139 AND 2CV140

(step continued on next page)

ATTACHMENT 14
(Page 3 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

2.0 (continued)

___ B. IF BIT flowpath and Charging Pump is NOT available, AND a Safety Injection Pump with a Cold Leg Injection path is available, THEN **ALIGN** feed path to the RCS as follows:

___ 1. **ENSURE** OPEN RWST TO SI PUMP valves:

___ ♦ **PLACE** 2RP4 lockout switch in VALVE OPERATE AND **OPEN** 2SJ30

___ ♦ 21SJ33 OR 22SJ33 associated with the available SI Pump

___ ♦ 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES

___ 2. IF both Safety Injection Pumps are tagged out, THEN send Operator to **RELEASE** breaker for one Safety Injection Pump.

___ 3. **START** the designated available Safety Injection Pump AND **FEED** at maximum rate (> 520 gpm) by aligning the following valves in the Cold Leg Injection flow path:

___ ♦ **OPEN** 21SJ134 OR 22SJ134 associated with the available SI Pump

___ ♦ **PLACE** 2RP4 lockout switch in VALVE OPERATE AND OPEN 2SJ135

___ ♦ **CLOSE** 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES

___ C. **OPEN** the following valves:

___ ♦ 2PR1

___ ♦ 2PR2

___ ♦ 2PR6

___ ♦ 2PR7

(step continued on next page)

ATTACHMENT 14
(Page 4 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

2.0 (continued)

___ D. **OPERATE** at least 2 CFCU's in HIGH SPEED with a Service Water Flow of ≥ 2500 gpm, as required, to maintain Containment Differential Pressure < 0.5 psid.

___ E. **CONTINUE** feeding RCS at maximum rate until one of the following occurs:

___ 1. RHR is restored.

___ 2. The Inner Equipment Hatch is installed with a minimum of four bolts.

___ F. When any of the above conditions in Step 2.E are satisfied:

♦ **CONTROL** injection flow by using normal charging to minimize flow to containment while maintaining Core Exit Thermocouples stable or lowering.

OR

___ ♦ **CYCLE** BIT isolation valves to control flow to the RCS:

___ ♦ BIT INLET: 2SJ4 OR 2SJ5

___ ♦ BIT OUTLET: 2SJ12 OR 2SJ13

OR

___ ♦ **OPEN** 2SJ67 AND 2SJ68, SI PMP RECIRC VALVES valves AND **CYCLE** 2SJ135 to control flow to the RCS.

___ G. IF Core Exit Thermocouples are NOT available, THEN **MAINTAIN** injection flow determined in Attachment 6, Makeup Rate Required to Refill RCS After Loss of RHR.

___ 3.0 **INFORM** Containment personnel that high temperature fluids, contamination, and airborne activity will exist at any RCS openings.

ATTACHMENT 14
(Page 5 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

___ 4.0 When RHR becomes available,
THEN **RETURN** RHR to service IAW the following:

___ A. IF the RHR system requires venting
THEN **VENT** RHR Pumps and piping: **[C0329]**

CAUTION

- **Venting the RHR system may cause a reduction in RCS level requiring more makeup flowrate.**
- **Any opening in the RCS boundary could result in release of high temperature fluids, radioactive water, or gases to Containment.**
- **Opening 2SJ69 aligns the RWST to RHR and may result in RCS level rise.**

___ 1. **ISOLATE** RHR Suction from RCS, **CLOSE** 2RH1 OR 2RH2, RHR Suction from RCS (2RH2 is preferred, 2RH1 is backup). **[C0658]**

___ 2. **ENSURE** 2RP4 lockout switch for 2SJ69, RHR SUCTION FROM RWST, in VALVE OPERABLE.

___ 3. **OPEN** 2SJ69, RHR SUCTION FROM RWST.

___ 4. Send operator to:

___ a. **OPEN** 2RH81 AND 2RH82, RHR Suction Line second high point vent, until steady stream of water flows (mechanical penetration area 78' elevation).

___ b. IF the bioshield area inside containment is accessible,
THEN **OPEN** 2RH68 AND 2RH69, RHR Suction Line first high point vent, until steady stream of water flows.

___ 5. **SEND** an Operator to the RHR Pump Room in preparation for pump start.

___ 6. **CLOSE** 2SJ69, RHR Suction From RWST.

___ 7. **OPEN** 2RH1 AND 2RH2, RHR Suction from RCS.

___ 8. Notify Operator in RHR Pump area to **MONITOR** the pump for abnormal conditions after the pump is started.

___ B. **START** one RHR Pump IAW Attachment 3, Aligning RHR Loop For Shutdown Cooling.

ATTACHMENT 14
(Page 6 of 6)

2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

___ 5.0 WHEN RHR is restored, **REMOVE** Cold Leg Injection from service as follows:

___ A. **STOP** any running Charging Pumps OR Safety Injection Pumps.

___ B. **CLOSE** Charging Header OR Safety Injection Header Stop Valves for Cold Leg Injection:

___ ♦ 2SJ4, INLET TO BIT

___ ♦ 2SJ5, INLET TO BIT

___ ♦ 2SJ12, BIT OUTLET

___ ♦ 2SJ13, BIT OUTLET

___ ♦ 21SJ134 AND 22SJ134, SI Pump Discharge to Cold Leg

___ ♦ 2SJ135, SI Pump Discharge to Cold Leg

___ C. **OPEN** VCT Outlet to Charging Pumps:

___ ♦ 2CV40

___ ♦ 2CV41

___ D. **CLOSE** RWST Outlet to Charging Pumps:

___ ♦ 2SJ1

___ ♦ 2SJ2

___ E. **OPEN** Charging Discharge Isolation Valves:

___ ♦ 2CV68

___ ♦ 2CV69

___ ♦ 2CV139 AND 2CV140, Charging Pump Miniflow Valves

___ 6.0 **RETURN** to procedure step in effect.

ATTACHMENT 15
(Page 1 of 2)

COMPLETION SIGN-OFF SHEET

1.0 **COMMENTS**

(Include procedure deficiencies and corrective actions. Attach additional pages as necessary.)

ATTACHMENT 15
(Page 2 of 2)

COMPLETION SIGN-OFF SHEET

2.0 SIGNATURES

Print	Initials	Signature	Date

3.0 SM/CRS FINAL REVIEW AND APPROVAL

This procedure with Attachments 1-15 is reviewed for completeness and accuracy. Entry conditions and all deficiencies, including corrective actions, are clearly recorded in the COMMENTS Section or this attachment.

Signature: _____ Date: _____
SM/CRS

EXHIBIT 1
(Page 1 of 1)

BRIEFING SHEET

NOTE

The following items are a list of potential topics which should be covered during the briefing at SM/CRS discretion.

1. **SAFETY**

   - If sending Operators to inspect for suspected leaks, **OBTAIN** Radiation Protection support, due to possible elevated radiation levels.

2. **TECHNICAL SPECIFICATIONS and ECGs**

   - If in Mode 4, **REFER** to TS 3.5.3 and 3.4.1.3
   - If in Mode 5, **REFER** to TS 3.4.1.4
   - If in Mode 6 or Defueled, **REFER** to TS 3.9.8.1 and 3.9.8.2

3. **PARAMETERS TO BE MONITORED**

   - RHR flow, RWST level, CETs and Pressurizer level
   - Containment and Auxiliary Building radiation levels

4. **SOURCES OF LEAKAGE**

   - Particular attention should be given to components which have on-going maintenance activities or have been recently operated, tagged for maintenance or had valve alignments performed.

5. **CONTINGENCIES**

   - Brief most likely success path to restore core cooling. (Consider Attachment 4, Time to Reach Core Boiling)
   - Restoration of normal RHR cooling - Attachment 2, Aligning RHR Loop From ECCS to Shutdown Cooling.
   - No power available - Attachment 9, Steam Generator Reflux Cooling, or Attachment 10, Forced Flow or Natural Circ Cooldown.
   - If CETs >200°F and RCS not intact - Attachment 7, Hot Leg Injection.
   - If CETs <200°F - Attachment 8, Cold Leg Injection.
   - RCS intact and >0% Pressurizer level - Attachment 10, Forced Flow or Natural Circ Cooldown.
   - Reactor Head removed - Attachment 11, Cooling the RCS with the Spent Fuel Pool.
   - If the RWST level drops to 15.2', cold leg recirculation will be aligned IAW Attachment 13, Cold Leg Recirculation.

LOSS OF RHR
TECHNICAL BASES DOCUMENT

1.0 REFERENCES

1.1 Technical Documents

A. Salem Generating Station Updated Final Safety Analysis Report:
   1. Section 5, Chapter 5.5, Component and Subsystem Design
   2. Section 6, Chapter 6.3, Emergency Core Cooling Systems
   3. Section 7, Chapter 7.4, Systems Required for Safe Shutdown
   4. Section 15, Chapter 15.1, Condition I Faults, Normal Operation and Operational Transients
   5. Section 15, Chapter 15.2, Condition II Faults, Faults of Moderate Frequency
   6. Section 15, Chapter 15.3, Condition III Faults, Infrequent Faults
   7. Section 15, Chapter 15.4, Condition IV Faults, Limiting Faults

B. Salem Generating Station Technical Specifications Unit 2:
   1. 3.5.3, Minimum ECCS Subsystem
   2. 3.4.1.3, Reactor Coolant System
   3. 3.4.1.4, Reactor Coolant System
   4. 3.9.8.1, Refueling-Coolant Circulation
   5. 3.9.8.2, Refueling-Low Water Level

C. Configuration Baseline Documentation:
   1. DE-CB.RHR-0030(Q), Residual Heat Removal System

D. Technical/Engineering Letters:
   1. Salem Generating Station Licensee Event Reports:
      a. NSO LER-83-066, Closure of 2RH1
      b. NSO LER 89-019-00, Nitrogen Injection Into RCS Causes Gas Binding of RHR Pumps
      c. NSO LER-89-021, Overpressurization of RHR Piping
      d. NSO LER-89-022, RHR Cold Leg Discharge Valves Not Meeting Single-Failure Criteria
   2. NSO NLR-189215-01, NRC Corrective Action Plan for Loss of RHR at Salem 1 per inspection 50-272/89-17 **[C0329]**
   3. NRC Inspection Report 50-272/89-17, Loss of RHR Event on May 20, 1989
   4. Letter from L.K. MILLER, General Manager-Salem Operations, to all station employees, dated May 22, 1989
   5. Letter from J.M. Zupko, Jr., General Manager QA and Nuclear Safety Review: Special Investigation into the Loss Of RHR Event of May 20, 1989, to Vice President and Chief Nuclear Officer
   6. Supervisory Letter SL-37, Salem Primary Systems Loss of Decay Heat Removal, from General Manager to all Supervisors, dated April 2, 1990
   7. S-C-RHR-MEE-0390, 12-21-89, RHR Venting and Addition of New Vent Valves on RHR Suction Piping

8. WCAP-11916, 7-88, Loss of RHR Cooling While the RCS is Partially Filled
9. PSE-86-532, Westinghouse letter to PSE&G, ECCS Performance During Mode 4 Operation, April 9, 1986

E. Event Classification Guide, Section 4, Loss of Decay Heat Removal
F. Westinghouse Emergency Response Guidelines, Executive Volume, Technical Specification Violations
G. DCP 2EC-3316, Package 1-Containment Sump Level Setpoint Modification, Calculation SC-WD001-01
H. Calculation SC-CN001-01, Salem Unit 1&2 Steam Generator Level Trip, Alarm, Ind & Rec (Narrow Range)
I. Calculation SC-CN003-01, Salem Unit 1&2 Steam Generator Level Trip, Alarm, Ind & Rec (Wide Range)
J. S-2-RHR-MDC-2074, Time to Boil Reactor Vessel with a Loss of RHR
K. NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management.

1.2 **Procedures**

A. S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation
B. S2.OP-SO.CC-0001(Q), Component Cooling System Normal Operation
C. S2.OP-SO.CN-0001(Z), Placing Feed and Condensate Systems in Operation
D. S2.OP-SO.RC-0001(Q), Reactor Coolant Pump Operation
E. S2.OP-SO.RC-0005(Q), Draining The Reactor Coolant System To ≥ 101 Ft Elevation
F. S2.OP-SO.RC-0006(Q), Draining the Reactor Coolant System
G. S2.OP-SO.RHR-0001(Q), Initiating RHR
H. S2.OP-SO.SF-0002(Q), Spent Fuel Cooling Operation
I. S2.OP-SO.SF-0003(Q), Filling the Reactor Refueling Cavity
J. S2.OP-SO.SF-0005(Q), Refueling Water Purification Operation
K. S2.OP-AB.CONT-0001(Q), Containment Closure
L. S2.OP-AB.CC-0001(Q), Component Cooling Abnormality
M. S2.OP-AB.RCS-0001(Q), Small RCS Leak
N. S2.OP-AB.RHR-0002(Q), Loss of RHR at Reduced Inventory
O. S2.OP-IO.ZZ-0006(Q), Hot Standby To Cold Shutdown
P. SC.OP-DL.ZZ-0027(Q), Log Supplement
Q. 2-EOP-LOCA-3, Transfer to Cold Leg Recirculation

1.3 **Drawings**

A. 205332, Residual Heat Removal
B. 205331, Component Cooling
C. 205333, Spent Fuel Cooling

1.4 **Conformance Documents**

A. C0329, NLR-189215-01, Task 0004, add steps to restore RHR to operability in AOP
B. C0329, NLR-189215-01, Task 0005, recommend use of additional vent paths in AOP
C. C0329, NLR-189215-01, Task 0006, revise AOP for additional vent paths
D. C0329, NLR-189215-01, Task 0007, required reference to this letter in AOP references
E. C0330, NRC GL 88-17-F1, Task 0005, develop procedures for Containment Closure
F. C0354, Westsalepse-86-532, ECCS Performance During Mode 4 Operations, Shutdown LOCA
G. C0631, INPO OE 7261, Reactor Coolant System Draindown At Wolf Creek
H. C0658, AR # 970110263, Response to GL 89-10

1.5 **Industry Concerns**

A. NRC Generic Letter 87-12, Loss of Decay Heat Removal
B. NRC Generic Letter 88-17, Loss of Decay Heat Removal
C. NUREG 1269, Loss of Residual Heat Removal System Diablo Canyon Unit 2
D. NUREG 1410, Loss of Vital AC Power and the Residual Heat Removal System During Mid-Loop Operations at Vogtle Unit 1 on March 20, 1990
E. NRC Bulletin 80-12, Decay Heat Removal System Inoperability
F. NRC INFO 87-23, Loss of Decay Heat Removal Function at PWRs With Partially Drained Reactor Coolant Systems
G. NRC INFO 89-67, Loss of Residual Heat Removal System Caused by Accumulator Nitrogen Injection
H. Westinghouse Owners Group Abnormal Response Guideline (WOG-ARG-1), Loss of RHR While Operating at Mid-Loop Conditions, Rev.0, March 15, 1990
I. INPO SOER 85-4, Loss or Degradation of RHR Capability in PWRs
J. INPO SOER 88-3, Losses of RHR With Reduced Reactor Vessel Water Level at PWRs
K. NSAC-52, Residual Heat Removal Experience Review and Safety Analysis, Pressurized Water Reactors, January 1983

1.6 **Other**

A. Calculation S-C-RHR-NDC-1619, Time To Boil Curve Extension For Loss Of Residual Heat Removal
B. PSBP-324187, Salem RCS Pressurization Studies for Shutdown Configurations with the PS25 Spray Valve Bonnet Removed as a Vent Path

2.0 DISCUSSION

2.1 This procedure provides the direction necessary for shutdown plant operation with RHR malfunctions. It is the intent of this discussion to provide the reasoning behind the logic and flowpath of the procedure. It is not intended to provide additional direction to the procedure.

2.2 Entry Conditions - Entry conditions are based on the Operator recognizing a malfunction in the RHR System.

The symptoms available to the Operator are as follows:

- Indications of RHR Pump Trip
- 2CC1 Alarm DISCHARGE HIGH PRESSURE
- Unexpected drop in RCS level with RHR in service as indicated by Overhead Alarm indicating less than 97.5 ft.:
  - OHA-D47, RHR MIDLOOP SYS TRBL
- Unexpected drop in Reactor Vessel level as indicated by Reduced Inventory Instrumentation (RVLIS and Mid-Loop).
- Unexpected rise in Core Exit temperature indicated by the Plant Computer points:
  - T0014A, Reactor Core location H4
  - T0022A, Reactor Core location K12
  - T0031A, Reactor Core location D12
  - T0046A, Reactor Core location J1
  - RHR Sump alarms:
    - OHA C-26, 21 RHR SUMP OVERFLO
    - OHA C-34, 22 RHR SUMP OVERFLO
- Indication of RHR Pumps cavitating or air bound:
  - Flow oscillations
  - Motor amps fluctuating
  - Excessive pump noise
  - RHR discharge pressure fluctuating
- More frequent operation of Containment Sump Pumps
- Unexpected drop in VCT level as indicated on the Plant Computer points L0112A or L0114A

2.3 Immediate Actions - None

2.4 Subsequent Actions -

Step 3.1 directs initiation of Attachment 1, Continuous Action Summary, which is evaluated in conjunction with performance of this procedure.

Step 3.2 addresses isolating the RCS vent path if the Containment Equipment Hatch is open. The closure of the vent path must be completed prior to Core Boiling. When the RCS is vented to the Containment, Salem's interpretation of NUMARC 91-06 requires that either the RCS is made Intact prior to the time to core boiling should RHR be lost (applicable when the RCS loops are filled and two or more Steam Generators are available as a heat sink for Natural Circulation. Heat sink means the Steam Generators have a feed make-up sources available, Secondary water level above the U-tubes, and a Steam Generator vent path) OR Containment Closure is established prior to time to Core boiling should a Loss of RHR occur. (Containment Closure in this statement only applies the Equipment Hatch and the Personnel Air Locks, and 2VC1 through 2VC6; Containment Closure of all the other penetrations required prior to Core Uncovery and is established IAW S2.OP-AB.CONT-0001(Q).

Step 3.3 determines if the unique situation of Mid-Loop operations exists because of the different requirements associated with those plant conditions. For a Loss of RHR during reduced RCS inventory conditions, the Operator is directed to S2.OP-AB.RHR-0002(Q), Loss Of RHR At Reduced Inventory.

Step 3.5 and 3.7 questions for pump problems. If problem is a result of a loss of electric power, then the Operator is directed to steps which establish a heat sink. If the problem is a result of mechanical problems, then the Operator is directed to steps which will return the RHR system to service or establishes an alternate heat sink. If a pump was not affected then the Operator is directed to check for RHR System capability and directed to steps which check for RHR heat sink problems. If the running pump is cavitating, the other RHR pump will also cavitate if started. If the running pump is affected, flow is throttled and RCS level is raised, to attempt to stabilize the RHR System. If this returns the system to normal, the Operator is directed to close out the procedure. If a loop is not available for cooling, the Operator continues and attempts to restore the lost loop, while providing alternate cooling methods (hot leg injection, cold leg injection, etc.).

If initial indications are RHR Pump cavitation or gas binding, action is taken to raise RCS level and flow is reduced to the minimum value of 1500 to 1800 gpm in an attempt to restore stable flow and reduce cavitation/vortexing. Less than 1500 gpm can result in excessive vibration from the pump. This method has been shown to be effective by Westinghouse analysis. The RCS level indication is normally via RVLIS.

At this point pressurizer level is still on scale which is greater than 108 ft.
In S2.OP-SO.RC-0005(Q), the RCS reduced inventory log is required to be maintained IAW SC.OP-DL.ZZ-0027(Q), Attachment 1, Reduced RCS Inventory Log, whenever RCS level is below PZR level indication (104 ft.). This requires RVLIS reading in feet every hour and a tygon tube reading every 4 hours. RVLIS will only be used in the Refueling/Reduced Inventory Mode in S2.OP-SO.RC-0005(Q) and/or the tygon tube which indicates in foot increments.

If raising level or reducing flow does not stop cavitation or gas binding, RHR Pumps are stopped and the time to core boiling is determined using one of the curves in Attachments 4 or 5, Time To Reach Core Boiling After Loss Of RHR, which accounts for decay heat loads before and after refueling following shutdown.

Using this information, it is decided if adequate time exists to vent the RHR System to attempt restoration of RHR by the normal means. This method requires a Containment entry by operations personnel to vent RHR Pumps and suction piping which has the potential to be a lengthy process.

If time is available, the Operator is directed to attempt to rapidly restore RHR flow if plant conditions are conducive to RHR Pump operation. Whenever an attempt is made to restart an idle RHR Pump, RCS level is verified as being adequate, power availability is checked, proper operation of a heat sink is confirmed, and the system is verified free of air or other gases.

Industry experience has shown the possibility exists of gases other than air or steam can accumulate in the low pressure or high elevation area of RHR piping, notably Nitrogen, due to Safety Injection Accumulator addition or gases leaving solution. When these conditions are satisfied, the RHR Pump is started at low flow to minimize thermal shock and rapid RCS level loss due to sudden void collapse.

If the time to saturation is very short the operator is directed to sweep air from the RHR System as addressed in Westinghouse Owners Group Abnormal Response Guideline ARG-1. Flow is then restored to the normal operating value between 1800 and 3000 gpm, determined by the flow required to stabilize Core Exit Thermocouple temperatures, and if all parameters are normal, the procedure is exited.

Alternate methods of decay heat removal are determined, the entry conditions of the Emergency Plan are checked in the Event Classification Guide, and appropriate Technical Specifications are reviewed to insure operating license compliance. Stability of RCS level is checked to determine if a loss of inventory is occurring. Direction is given to isolate all RCS drain paths. If leakage is indicated, RHR is isolated to determine leak location.

If RHR leakage is the reason for the malfunction, it is determined if an intact train of RHR still exists: if so, the intact train is returned to service after leak isolation or repair is completed. Leakage from the RCS outside the RHR boundaries are located and isolated while alternate methods of decay heat removal continue.

In the event RHR Pumps are operating but a problem exists with flow or RCS temperature, the RHR flow control valve is checked or the standby RHR Pump with its redundant flow control valve is operated, to correct flow problems.

RCS temperature problems are corrected by ensuring proper operation of the Component Cooling System and the required Service Water System. The procedure is then exited, or if the malfunction is not yet corrected, the Operator is directed to Step 3.1 for symptom rediagnosis.

In the event an alternate method of decay heat removal is required, attachments are provided to cool the Reactor Core while Operators continue attempts to restore RHR. Plant conditions and system configuration may require the implementation of one or more of these attachments.

During performance of the Attachments, leak isolation and RHR restoration is continued. Cooling by Component Cooling and Service Water are checked to evaluate additional cooling problems. If Component Cooling or Service Water availability of cooling is challenged, the Operator is directed to initiate S2.OP-AB.CC-0001(Q), Component Cooling Abnormality or S2.OP-AB.SW-0001(Q), Loss Of Service Water Header Pressure.

If the procedure is completed and RHR System is NOT considered normal by flow, temperature and RCS level the Operator is directed to return to Step 3.1 for symptom rediagnosis.

Attachments included with this procedure are as follows:

ATTACHMENT 1 - CONTINUOUS ACTION SUMMARY

The Operator is notified that if power is lost to all RHR pumps and makeup sources, Steam Generator Cooling is still available. If a complete loss of heat sink has occurred, the Operator is directed to perform Attachment 12, Alternate Cooling Water, to provide cooling to pumps necessary for decay heat removal.
Direction to perform S2.OP-AB.CONT-0001(Q), Containment Closure, if in Mode 5 or 6 is provided. Two hours is allotted to complete this verification and should be initiated as soon as recognized to complete this procedure in a timely manner.
Direction to start Safety Injection and Charging pumps as required to control Pressurizer level and core exit thermocouple temperatures. This provides additional guidance for keeping the core covered and cooled, to allow Operator action as soon as the need is recognized prior to starting other pumps in the body of the procedure.

ATTACHMENT 2 AND 3 - ALIGNING RHR LOOP FROM ECCS TO SHUTDOWN COOLING / ALIGNING RHR LOOP FOR SHUTDOWN COOLING

These attachments provide instructions to place an available RHR Loop in service. Attachment 2 provides guidance if the alternate RHR Loop is aligned for ECCS injection. Attachment 3 provides guidance if the alternate RHR Loop is aligned for shutdown cooling. These attachments provide guidance from S2.OP-SO.RHR-0001(Q), Initiating RHR. This information is in this procedure to align the RHR Loop in a timely manner to avoiding the reference to an additional procedure, S2.OP-SO.RHR-0001(Q).

ATTACHMENT 4 - TIME TO REACH CORE BOILING AFTER LOSS OF RHR

Curves depicting the time available before saturation temperature is reached in the Reactor core. An RCS level of 101' elevation is selected since any volume of water in the Pressurizer will not provide any additional time to boiling in the actual core regions. Any volume of water in the Pressurizer is important in time to core uncovery, but not in time to core boiling. This level results in curves which are conservative but not unnecessarily so.

Additional curves provide the time to boil and heatup rate expected for a loss of RHR so that an accurate assessment of time to core boiling can be made. These curves project heatup from 1 up to 1000 days after shutdown. Hot Leg Temperature may be used in place of CETs when CETs are not available (i.e. Reactor Head removed, CETs disconnected etc.).

For 2R16 to support Steam Generator Replacement, Engineering Calculation S-2-RC-MDC-2151, Containment Closure in Modes 5 and 6 During SG Replacement, was developed to allow use of an Equipment Hatch Ventilation Barrier (EHVB). This calculation takes credit for Operator actions taken IAW Attachment 14 of this procedure. When the actions specified in Attachment 14 are adhered to following a Loss of Shutdown Cooling, the time to core boil is calculated to be at least 70 minutes. If the Operator actions of Attachment 14 are NOT taken, the curves provided within this procedure are still valid for calculating time to boil.

ATTACHMENT 5 - HEATUP RATE FOR LOSS OF RHR COOLING

Attachment 5 provides the heatup rate expected for a loss of RHR so that an accurate calculation of time to core boiling can be made in the event the RCS is at some initial temperature other than that depicted in the curves of Attachment 4.

ATTACHMENT 6 - MAKEUP RATE REQUIRED TO REFILL RCS AFTER LOSS OF RHR

Depicts the makeup flow rate required to adequately cool the Reactor core and refill the RCS after a loss of RHR. This is the flowrate necessary to result in lowering Core Exit Thermocouple temperature in a feed and bleed scenario.

ATTACHMENT 7 - HOT LEG INJECTION

Hot Leg Injection is the preferred method when the RCS temperature is greater than or equal to 200°F for restoring RCS inventory lost due to leakage, as it ensures flow through the core in all conditions. Openings in any RCS Hot Leg will provide an adequate vent path to prevent pressurization of the RCS which could inhibit flow to the core. If a hot leg vent path does not already exist, Pressurizer PORVs are opened to provide the desired bleed path. Hot leg injection can provide adequate core cooling at lower flow rates than cold leg injection, since natural circulation within the core promotes mixing of the coolant.

Decay heat removal is accomplished by Feed and Bleed of the RCS: Borated water is pumped into the RCS using a Safety Injection Pump aligned to RCS hot legs, taking suction from the RWST. Design minimum flow of the Safety Injection Pump is 400 gpm. Maximum flow to the RCS is maintained until one of the following conditions is satisfied:

A. RHR is restored

B. Flow from RCS opening is adequate to result in lowering Core Exit Thermocouple temperatures

The bases of these conditions is as follows:

RHR is restored, normal shutdown operation is resumed and procedure is exited.

Flow from RCS openings is adequate to result in lowering Core Exit Thermocouple temperatures. This determines that decay heat removal is adequate and core will remain covered. In the event Core Exit Thermocouples are not available, injection flow is maintained IAW Attachment 6, Makeup Rate Required to Refill RCS After Loss of RHR. Decay heat removal is accomplished by Feed and Bleed of the RCS. Borated water is pumped into the RCS using a Safety Injection Pump aligned to RCS hot legs, taking suction from the RWST. If the RCS is boiling, the use of hot leg level and pressurizer level may not provide an accurate indicator of inventory in the RCS.

To avoid frequent starting and stopping of Safety Injection Pumps, the appropriate SJ35 valve is throttled to obtain the flow rates addressed above. Minimum flow recirculation is maintained at all times to the Safety Injection Pumps, therefore throttling discharge flow is acceptable and within UFSAR analysis.

Heat is removed from the Containment by operation of all available Containment Fan Cooling Units (CFCUs) in slow speed, which is the UFSAR analyzed accident configuration, which also insures Containment or RCS pressure rises are minimized. A note informs the Operator that if the RCS is intact, the possibility of starting a Reactor Coolant Pump to provide forced flow through the Reactor Core should be considered. RCS feed flow is adjusted to exceed boil off rate or to stabilize level while maintaining Core Exit Thermocouples stable or lowering. A bleed path is aligned from the Pressurizer to the PRT, and ultimately to the Containment Sump. The Reactor Head is vented to remove any bubble which may have formed, and to provide additional vent path. Attempts to correct primary system leakage continue and when accomplished, RHR is restored and the procedure is exited.

ATTACHMENT 8 - COLD LEG INJECTION

Decay heat removal is accomplished by feed and bleed of the RCS. Cold Leg Injection is the preferred method when the RCS temperature is less than 200°F. Borated water is charged into the RCS using a Charging Pump or Safety Injection Pump aligned to RCS cold legs taking suction from the RWST. If any opening exists in any RCS Cold Leg, flow may not reach the Reactor Core unless Cold Leg Injection is initiated before any RCS pressurization due to boiling.

Failure of a Steam Generator Nozzle Dam or removal of a Cold Leg Steam Generator Manway, with no Hot Leg vent path on the same loop could result in core uncovery within several minutes after boiling starts due to Hot Leg pressurization. As a result of these concerns, Salem Generating Station has incorporated several practices to minimize the possibility of this event occurring:

A. Hot side Steam Generator Manways are removed first and installed last.

B. Cold side Steam Generator Manways are installed first and removed last.

These precautions ensure that if Cold Leg Injection is required, a Cold Leg opening does not exist without an adequate Hot Leg vent path on the same loop. Maximum makeup flow is maintained as described in the bases for Hot Leg Injection. The design minimum flowrate of the Charging Pumps is 460 gpm, well above the flow required to remove core heat in the conditions addressed in this procedure.

Heat is removed from the Containment by operation of all available CFCUs in slow speed (UFSAR analyzed) which also insures Containment or RCS pressure rises are minimized. A note informs the Operator that if the RCS is intact, the possibility of starting a Reactor Coolant Pump to provide forced flow through the Reactor Core should be considered. RCS feed flow is adjusted to exceed boil off rate or to stabilize level while maintaining Core Exit Thermocouples stable or lowering.

A Bleed path is aligned from the Pressurizer to the PRT and ultimately to the Containment Sump. The Reactor Head is vented to remove any bubble which may have formed and to provide an additional vent path. Attempts to correct primary system leakage continue and when accomplished, RHR is restored and the procedure is exited.

Conditional steps are included which return RHR to service. Conditional steps are included which provide instructions for venting and/or aligning the system.

ATTACHMENT 9 - STEAM GENERATOR REFLUX COOLING

In the event the RCS is at or near atmospheric pressure, the RWST is available to provide a borated water source to the RCS. This method is of particular importance when electrical power is not available for other methods of decay heat removal. Westinghouse Owners Group analysis has shown that the phenomena known as reflux cooling will adequately remove decay heat if at least two Steam Generators are available as a secondary heat sink. RCS pressure at or near atmospheric is most conducive to the initiation of this phenomena.

Steam in the RCS piping will condense in the relatively cold Steam Generator tubes and "fall back" to the loops and flow to the Reactor Core due to density differences. As temperature rises, RCS pressure rises also, but it has been found through analysis that pressures up to the 20 psig range tend to improve this phenomena once established at lower pressures. Once the secondary side of the Steam Generators reach saturation, continued heat removal can be accomplished by feed and bleed or steaming of the Steam Generator. Feedwater is provided to the Steam Generators for decay heat removal by the Condensate System or the Auxiliary Feedwater System.

Heat removal from the Steam Generators is accomplished by operation of the Main Steam Power Relief Valves (MS10s), or by feed and bleed of the Steam Generator secondary side while maintaining wide range level in the 77% to 95% range. This range was selected based on the following:

A. Wide range level is accurate at low RCS temperatures (Cold Calibrated)

B. 77% WR will ensures Steam Generator tubes remain covered to provide the maximum heat transfer rate from the RCS for all temperature ranges.

C. 95% is selected as the maximum to provide the Operator with an adequate operating margin without going "off-scale high" or passing water through MS10s or to the Main Steam piping.

Heat removal from the Containment is especially critical in this decay heat removal mode since any excessive pressure rise with any openings in the RCS pressure boundary could disrupt flow from the RWST, and reduce heat transfer to the secondary water in the Steam Generators. A more complete explanation of this phenomena can be found in the Westinghouse Owners Group Abnormal Response Guideline. Heat is removed from the Containment by operation of all available CFCUs in slow speed (UFSAR analyzed) which also insures Containment or RCS pressure rises are minimized.

Conditional steps are included which return RHR to service. Conditional steps are included which provide instructions for venting and/or aligning the system.

ATTACHMENT 10 - FORCED FLOW OR NATURAL CIRCULATION COOLDOWN

In the event the RCS is filled, cooldown by steaming the Steam Generators will stop any heatup of the RCS. If RCS pressure is adequate to satisfy RCP seal differential pressure requirements, RCPs are operated IAW the normal Operating Procedure. If a natural circulation cooldown is required, the Operator is provided with parameters to maintain to ensure natural circulation heat removal is occurring. Once decay heat removal from the RCS is stabilized, Operators are dispatched to locate and isolate the source of RCS leakage. When leak isolation is completed, RHR is restored and procedure is exited.

ATTACHMENT 11 - COOLING THE RCS WITH SPENT FUEL POOL

If the Reactor Vessel head is removed, the Operator is directed to initiate flooding of the Reactor Cavity until water level is equalized with the Spent Fuel Pool level. The Reactor Cavity is cross connected to the Spent Fuel Pool and decay heat is removed by raising Reactor Cavity Filtering and Purification flow to maximum and Operating the Spent Fuel Pool Cooling System as required to stabilize or reduce RCS temperature. Heat is removed from the Containment by operation of all available CFCUs which also insures Containment pressure rise is minimized. When RHR becomes available, it is restored to service and the procedure is exited.

ATTACHMENT 12 - ALTERNATE COOLING WATER

This attachment is provided to direct the Operator to align alternate cooling water to pumps and components used throughout this procedure. Failure to do so can lead to failure of components necessary for alternate decay heat removal. If the failure is a loss of Service Water, decay heat is transferred to Component Cooling and then to the Spent Fuel Pool since CC temperature will eventually exceed SFP temperature on extended loss of RHR casualties. Loss of Component Cooling will require initiating one of the specified means of alternate decay heat removal. Since alternate cooling water cannot be provided to Safety Injection Pump Seal Water Heat Exchangers when BOTH trains of CC are lost, decay heat removal by cold leg injection or Steam Generators would be preferred in this very unique case.

ATTACHMENT 13 - COLD LEG RECIRCULATION

This attachment provides direction for alignment of RHR pump suction to Containment Sump as described in 2-EOP-LOCA-3, Transfer to Cold Leg Recirculation. As discussed in Westinghouse background documents, this provides long term decay heat removal.

This attachment is referred to in Attachment 1, when RWST LO Level Alarm actuates (15.24 ft) and Containment Sump level indication reaches 62% This has been determined to be the level necessary to provide adequate Net Positive Suction Head for RHR Pumps taking a suction on the Containment Sump.

ATTACHMENT 14 - 2R16 COLD LEG INJECTION (Prior to Filling Cavity to > 125' 6")

For 2R16 to support Steam Generator Replacement, Engineering Calculation S-2-RC-MDC-2151, Containment Closure in Modes 5 and 6 During SG Replacement, was developed to allow use of an Equipment Hatch Ventilation Barrier (EHVB). This calculation takes credit for Operator actions taken IAW Attachment 14 of this procedure. When the actions specified in Attachment 14 are adhered to following a Loss of Shutdown Cooling, the time to core boil is calculated to be at least 70 minutes. If the Operator actions of Attachment 14 are NOT taken, the curves provided within this procedure are still valid for calculating time to boil.

Attachment 14 implements the requirements of S-2-RC-MDC-2151, Containment Closure in Modes 5 and 6 During SG Replacement, and is to be utilized when a Loss of Shutdown Cooling occurs during 2R16 prior to filling the Refueling Cavity to > 125' 6".

END OF DOCUMENT