
All pages
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INDIAN POINT STATION

UNIT 2

SYSTEM OPERATING PROCEDURE 1.2.2 REV. 0

DRAINING REACTOR COOLANT SYSTEM
VIA RHR TO RWST

Anthony R. Reese
Written By

RN Ruddy
Reviewed By

Thomas J. ...
Concurrence by
General Manager / Section Head

SNSC Review Mtg. No. / Date

Approved By / Date

Effective Date

8710060119 870929
PDR ADOCK 05000247
PDR

DRAINING REACTOR COOLANT SYSTEM
VIA RHR TO RWST

1 PRECAUTIONS AND LIMITATIONS

- 1.1 Maintain two RHR heat exchangers with CCW in service until minimum temperature can no longer be maintained.
- 1.2 Maintain RHR flow balanced between RHR heat exchangers when two RHR heat exchangers are in service.
- 1.3 WHEN Reactor Coolant System (RCS) level is lowered below 63 ft. EL, frequently monitor level indication to ensure RHR pumps are not cavitating.
- 1.4 PRIOR to draining RCS below 63 ft. EL following shall be met:
 - 1 RCS Iodine 131 Activity less than $9.0E^{-3}$ uc/cc.
 - 2 At least one safety injection pump available.

NOTE: SI Pump may be held off for RCS protection but shall not be held off for maintenance.
- 1.5 IF RHR is lost in mid loop drained down condition, RCS boiling could occur in as little time as 2.5 minutes.
- 1.6 WHEN RCS is in drained down condition, close HCV 638 AND HCV 640 prior to starting RHR pump to prevent vortexing.
- 1.7 Level indicating system is vented to Pressurizer. PORVs and block valves should be open to Pressurizer Relief Tank (PRT) AND Reactor Vessel Head should also be vented to PRT. This prevents pressure differential between Reactor Head and reference leg on RCS level indicating system. This also ensures all points of RCS are under common atmosphere.
- 1.8 WHEN loops are being drained, indicated hose level will lag actual level.
- 1.9 To ensure steam generator tubes remain full, do NOT lower water level in pressurizer surge line to point where air or nitrogen enters RCS loop piping, unless required for maintenance operations.

- 1.10 WHEN RCS is initially drained to 63 ft. 2 inch EL, level will increase due to breaking of vacuum in steam generator tubes, if vacuum is not broken with nitrogen.
- 1.11 WHEN nitrogen is introduced to steam generator tubes, displacing coolant, operator should anticipate slight level increases on drain down level indicator.
- 1.12 WHEN venting Pressurizer to PRT, pressure in PRT should not exceed 25 psig AND Pressurizer should be less than 200F.
- 1.13 Maintain seal injection in service until RCS level is below Reactor Coolant Pump (RCP) seal package (64 ft. 6 inch EL).
- 1.14 Hydrogen concentration in RCS should be less than 5 cc/Kg and gaseous activity should be less than 0.01 uc/cc.
- 1.15 Observe applicable Health Physics procedures when venting potentially contaminated liquids or vapors.
 - 1 Install vent lines to prevent water traps from forming OR collection device should be used to collect water.
- 1.16 RWP shall be obtained when ever RCS is to be opened to atmosphere.
- 1.17 Radiation release permit shall be completed prior to opening any steam generator manway diaphragm or valve which may cause rapid venting of RCS to Containment exhaust system.
- 1.18 DO NOT place Purification Booster Pump in service UNTIL RCS pressure is 50 psig or less.

2 INITIAL CONDITIONS

- 2.1 Ensure RHR system in service with only ONE RHR pump running.

3 PROCEDURE

3.1 Draining Via RHR to RWST (Normally Used During Refueling)

3.1.1 Establish normal RHR letdown purification path
(SOP 4.2.1, RHR). _____

3.1.2 Station operator in each locations as follows:

1 Inside Vapor Containment (95 ft. EL) with
direct communication to CCR to monitor
Reactor Cavity level if head off, or observe
clear hose level if head on. _____

2 At RHR recirculation valves to RWST MOV-883,
1863, (PAB, 35 ft. EL under Steam Generator
Blowdown Tank Room). _____

NOTES: 1 883-key switch is on 15 ft. EL.

2 Equip operators with portable radios
if conditions permit.

3.1.3 Ensure RHR heat exchanger discharge valves adjusted
to obtain minimum required RCS flow.

RHR Heat Exchanger 21
Outlet Flow Control HCV-638 ADJUSTED _____

RHR Heat Exchanger 22
Outlet Flow Control HCV-640 ADJUSTED _____

3.1.4 Open RHR Recirculation MOV-883 to RWST
(PAB 15 ft. EL). OPEN _____

3.1.5 Station Health Physics to monitor radiation levels
during draindown. _____

3.1.6 Slowly open Recirculation Stop 1863 (PAB,
35 ft. EL) to establish desired draindown rate. _____

3.1.7 WHEN Pressurizer has been drained to approximately
20 percent of span, as indicated by cold calibrated
level indicator, close Recirculation Stop 1863. _____

3.1.8 Vent Pressurizer per SOP 3.3. _____

3.1.9 IF RCS Level is to be drained below 20 percent,
place RCS Level system in service as per SOP 1.2
step 3.1.7. _____

* * * * *
* CAUTION *
* * * * *
* Leave HCV-133 fully open if Purification *
* Booster Pump is in service. *
* * * * *
* * * * *

3.1.10 Place purification Booster Pump in service if needed as follows:

- NOTES:
- 1 RHR Purification Pump may be placed in service when RCS has depressurized under 50 psi, temperature is less than 350F and letdown cannot be maintained at 50 gpm.
 - 2 RHR Purification Pump should be used with at least one residual heat removal pump in operation.
 - 1 Ensure RHR Letdown HCV-133 fully open. _____
 - 2 Ensure Purification Pump Bypass 4055 open (VC, 46 ft. EL Recirculation Sump Room). _____
 - 3 Close Purification Pump Inlet Drain 4979. _____
 - 4 Open Inlet Stop 4054 (VC, 46 ft. EL Recirculation Sump Room). _____
 - 5 Vent Pump as follows:
Outboard (1st stage) Casing Vent _____
Inboard (2nd stage) Casing Vent _____
Discharge Vent 4937 _____
 - 6 Open Discharge Stop 4056 (VC, 46 ft. EL Recirculation Sump Room). _____
 - 7 Energize Purification Pump from MCC-28A (VC, 68 ft. EL compartment 2B). _____
 - 8 Close Letdown Isolation LCV-459. _____

* * * * *
* CAUTION *
* * * * *
* Do NOT completely close Purification Pump *
* Bypass 4055 during pump operation. *
* * * * *
* * * * *

- 9 Throttle Purification Pump Bypass 4055 to regulate flow. _____

10 Throttle PCV-135 to regulate letdown and
Volume Control Tank (VCT) level. _____

11 Maintain VCT level greater than 60 percent. _____

12 Ensure VCT Inlet LCV-112A in NORM to prevent
draining RCS to Holdup Tank via this path. _____

3.1.11 Recommence draining by opening 1863. _____

NOTE: Monitor RWST level closely to avoid
overflowing tank.

3.1.12 WHEN level is reduced below 76 ft. 6 inches EL,
vent Reactor Head by opening following steps:

Head Vent Stop 4142 OPEN _____

Head Vent Stop 4143 OPEN _____

3.1.13 IF draindown level differences per Attachment 1,
of SOP 1.2 indicate significant vacuum in head
THEN:

1 Have NPO energize HCV 3100 and 3101 at MCC
26AA and 26BB respectively. _____

2 OPEN 3100 and 3101, relieve vacuum, THEN
CLOSE.

Valve 3100 CLOSED _____

Valve 3101 CLOSED _____

NOTE: Repeat above step if necessary as draindown
continues.

3.1.14 Place RHR Purification with VCT bypassed if needed
as follows:

NOTE: Charging flow will be established
without charging pumps by
RHR purification head.

3.1.14.1 RCS drained below RCP seal package (64 ft.6
inches) and seal flow terminated. _____

1 Fully open HCV-142. _____

- 2 RCP 21 Seal Injection 250A. CLOSED _____
- RCP 22 Seal Injection 250B. CLOSED _____
- RCP 23 Seal Injection 250C. CLOSED _____
- RCP 23 Seal Injection 250D. CLOSED _____
- 3 Seal Injection Filter Inlet Stop 4906 closed. CLOSED _____
- 3.1.14.2 At Charging Pump 21 cubicle, check closed Drain Stop 4057 (PAB, 80 ft. EL inside cubicle). _____
- 3.1.14.3 Open VCT Bypass Stop 4051 (PAB, 80 ft. EL). _____
- 3.1.14.4 Place line in service by:
 - 1 Stopping charging pumps. _____
 - 2 Close VCT Inlet Stop 357 while slowly opening VCT Bypass Stop 4050.
VCT Inlet Stop 357 (PAB, 98 ft. EL) CLOSED _____
VCT Inlet Stop 4050 (PAB, 98 ft. EL) OPEN _____
 - 3 Close Charging Stop 4062 (PAB, 80 ft. EL outside cubicle). _____

* * * * *
* CAUTION *
* *
* Do NOT exceed relief valve set pressure *
* of 150 psig. *
* *
* * * * *

- 3.1.14.5 Adjust Charging Line Flow Control HCV-142 to control flow in charging line and prevent overpressurization of bypass line. _____
- 3.1.14.6 Continue draindown as desired via 1863. _____

3.1.15 WHEN level is below RCP Seal Package
(64 ft. 6 inches),

- 1 Secure charging pump. _____
- 2 Terminate seal flow:
 - RCP 21 Seal Injection 250A. CLOSED _____
 - RCP 22 Seal Injection 250B. CLOSED _____
 - RCP 23 Seal Injection 250C. CLOSED _____
 - RCP 24 Seal Injection 250D. CLOSED _____

3.1.16 IF desired, add nitrogen to primary side of
each steam generator to eliminate vacuum during RCS
draindown:

3.1.16.1 Have available for each steam generator
approximately 900 cubic ft. of nitrogen (4
bottles at full pressure), manifold with
nitrogen regulator (0-2400 psi) and
associated tubing and fittings. _____

3.1.16.2 Using Hi Side of FT 415, FT 425, FT 435 and
FT 445, perform following valve line-up
(Refer to Figure 1).

- 1 Open transmitter equalizing valve. _____
 - 2 Close Low Side inlet root
Stop at transmitter. _____
 - 3 Close Low and High Side stops to
transmitter block. _____
 - 4 Ensure both series drain valves
are CLOSED on Low Side. _____
 - 5 Ensure both series drain valves are
CLOSED on High Side. _____
 - 6 Connect nitrogen supply to High Side
capped connection between series drain
valves. _____
 - 7 Ensure High Side inlet root stop at
transmitter is open. OPEN _____
 - 8 Ensure High Side inlet root stops at
Intermediate legs are OPEN. _____
- Valve 513 OPEN _____
Valve 509 OPEN _____
Valve 503 OPEN _____
Valve 506 OPEN _____
- 9 Open first of High Side series drain
valves. _____
 - 10 Establish nitrogen flow through line by
adjusting regulator setting. _____

- 3.1.16.3 Continue nitrogen addition until each steam generator has received approximately 900 cubic ft. _____
- 3.1.16.4 All nitrogen shall be added before RCS level is brought below 64 ft. _____
- 3.1.16.5 Restore FT 415, 425, 435 and 445 line up as follows:
 - 1 Close nitrogen bottle stops (at bottles). _____
 - 2 Close first High Side series drain valve. _____
 - 3 Disconnect nitrogen line and cap open end. _____
 - 4 Open Low Side inlet root stop at transmitter. _____
 - 5 Open Low and High Side inlets to transmitter block. _____
 - 6 Ensure High Side inlet root stop at transmitter is OPEN. _____
 - 7 Close equalizing valve. _____

* * * * *
* CAUTION *
* * * * *
* Minimum level for Cold S/D drained down *
* condition is 62 ft. 10 inches, to avoid *
* vortexing RHR suction piping. *
* * * * *

- 3.1.17 WHEN desired RCS level is obtained:
 - 1 Close 1863, close MOV-883 and remove key from 883 for return to key locker.

RHR Recirculation Stop 1863 (PAB, 35 ft. EL)
CLOSED _____

RHR Recirculation Stop MOV-883 (PAB, 35 ft. EL)
CLOSED _____
KEY REMOVED _____
 - 2 Readjust RHR purification flow to maintain constant RCS level. _____
 - 3 Complete Table 1, Section 2.4, 2.5 and 2.6 of SOP 1.2. _____

3.1.18 To drain RCS below level 62 ft. 10 inches, go to SOP 1.2.4. _____

* * * * *

CAUTION

* Prior to removal of steam generator manway
* diaphragms, adjust PRT eductor to maintain
* approximately 6 inch Hg on PI 3100, to
* preclude high radiogas in work area during
* removal. When high activity has dissipated,
* return eductor setting to .5 to 1 inch Hg.

* * * * *

CAUTION

* IF RHR pump is secured, when restarting, close
* HCV 638 AND HCV 640, THEN start pump to
* prevent vortexing. Reestablish RHR flow for
* cooling.

* * * * *

3.1.19 During RHR operation with loops partially drained,
frequently monitor RHR pumps for cavitation. _____

FIGURE 1

Valving alignment for FT 415, 425, 435, 445
From Loops

