FNP-2-ESP-0.3
5-19-2010
Revision 12

FARLEY NUCLEAR PLANT

EVENT SPECIFIC PROCEDURE

FNP-2-ESP-0.3

NATURAL CIRCULATION COOLDOWN WITH ALLOWANCE FOR REACTOR VESSEL HEAD STEAM VOIDING (WITH RVLIS)

PROCEDURE USAGE REQUIREMENTS-per FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

SAFETY RELATED

Approved:

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Date Issued: 01/11/11

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A. Purpose

This procedure provides actions to continue plant cooldown and depressurization to cold shutdown, with no accident in progress, under conditions that allow for the potential formation of a void in the upper head region with a vessel level system available to monitor void growth.

B. Symptoms or Entry Conditions

I. This procedure is entered after completing the first ten steps of FNP-2-ESP-0.2 when the limits of FNP-2-ESP-0.2 must be exceeded; from the following:

a. FNP-2-ESP-0.2, NATURAL CIRCULATION COOLDOWN TO PREVENT REACTOR VESSEL HEAD STEAM VOIDING, step 11

b. FNP-2-ESP-0.2, NATURAL CIRCULATION COOLDOWN TO PREVENT REACTOR VESSEL HEAD STEAM VOIDING, step 14

Step	Action/Expected Response	Response NOT Obtained

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CAUTION: [CA] To ensure proper plant response, FNP-2-EEP-0, REACTOR TRIP OR SAFETY INJECTION, must be entered upon any SI actuation.

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CAUTION: The first ten steps of FNP-2-ESP-0.2, NATURAL CIRCULATION COOLDOWN TO PREVENT REACTOR VESSEL HEAD STEAM VOIDING, must be performed before continuing with this procedure.

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CAUTION: If RCP seal cooling had previously been lost, the affected RCP should not be started prior to a status evaluation.

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NOTE:
- FOLDOUT PAGE should be monitored continuously.
- To ensure adequate pressurizer spray, the priority for establishing RCP support conditions is 2B, 2A and then 2C.

___ 1 **[CA] Establish RCP support conditions.**

Step 1 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

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CAUTION: To prevent heat exchanger damage, do not attempt restoration of RCP seal return flow unless the CCW miscellaneous header is aligned to an operating CCW loop.

****

1.1 Verify CCW cooling - ESTABLISHED.

Response NOT Obtained: 1.1 Proceed to step 1.3.

1.1.1 Verify miscellaneous header aligned.

CCW TO
SECONDARY HXS
[] Q2P17MOV3047 open

1.1.2 Verify flow indicated in the On-Service train.

HX 2A(2B,2C)
CCW FLOW
[] FI 3043AA
[] FI 3043BA
[] FI 3043CA

1.2 Verify seal return flow - ESTABLISHED.

RCP SEAL WTR
RTN ISO
[] Q2E21MOV8100 open
[] Q2E21MOV8112 open

1.3 Verify No. 1 seal support conditions established.

1.3.1 Maintain seal injection flow - GREATER THAN 6 gpm.

1.3.2 Verify No. 1 seal leakoff flow - WITHIN FIGURE 1 LIMITS.

1.3.3 Verify No. 1 seal differential pressure - GREATER THAN 200 psid.

Step 1 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
1.4	Verify CCW aligned. CCW FROM RCP THRM BARR [] Q2P17HV3045 open [] Q2P17HV3184 open	
1.5	Check RCP thermal barrier - INTACT. RCP THRM BARR CCW FLOW HI [] Annunciator DD2 clear	1.5 Verify CCW flow isolated. CCW FROM RCP THRM BARR [] Q2P17HV3045 closed [] Q2P17HV3184 closed
1.6	Verify at least one RCP bus - ENERGIZED. [] 2A 4160 V bus [] 2B 4160 V bus [] 2C 4160 V bus	1.6 Proceed to step 1.11.
1.7	Check CCW to RCP oil coolers - SUFFICIENT. CCW FLOW FROM RCP OIL CLRS LO [] Annunciator DD3 clear	1.7 Perform the following. 1.7.1 Verify CCW - ALIGNED. CCW TO RCP CLRS [] Q2P17MOV3052 open CCW FROM RCP OIL CLRS [] Q2P17MOV3046 open [] Q2P17MOV3182 open 1.7.2 IF annunciator DD3 clear, THEN proceed to step 1.8, IF NOT proceed to step 1.11.

Step 1 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
1.8	Check at least one RCP oil level - SUFFICIENT. RCP 2A(2B,2C) BRG UPPER/LOWER OIL RES LO LVL [] Annunciator HH1 clear [] Annunciator HH2 clear [] Annunciator HH3 clear	1.8 Proceed to step 1.11.
1.9	Check RCS pressure - GREATER THAN 1800 psig. 2C(2A) LOOP RCS WR PRESS [] PI 402A [] PI-403A	1.9 IF RCS within FIGURE 2 limits, THEN proceed to step 1.10, IF NOT proceed to step 1.11.

Step 1 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
1.10	Check REACTOR VESSEL LEVEL indication - 100% UPPER HEAD.	1.10 Establish conditions to accommodate void collapse upon RCP start. 1.10.1 Raise pressurizer level to greater than 67% using charging and letdown. • Raise charging flow. CHG FLOW [] FK 122 adjusted • Reduce letdown flow. 1.10.2 Raise SUB COOLED MARGIN MONITOR indication to greater than 40°F subcooled in CETC mode. 1.10.2.1 Dump steam at a faster rate. 1.10.3 Use PRZR heaters, as necessary to saturate the pressurizer water. PRZR HTR GROUP VARIABLE [] 2C PRZR HTR GROUP BACKUP [] 2A [] 2B [] 2D [] 2E

Step 1 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

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CAUTION: Step 1.10 must be complete before starting any RCP.

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NOTE: Changes in RCP configuration may affect pressurizer spray flow.

1.11	[CA] IF support conditions exist to start an RCP THEN start at least one RCP.	1.11 Perform the following. a) Continue efforts to establish RCP support conditions. b) WHEN support conditions exist to start an RCP, THEN return to step 1. c) Proceed to step 2. OBSERVE NOTE PRIOR TO STEP 2.
1.11.1	Start bearing oil lift pump. RCP OIL LIFT PUMP [] 2B(2A,2C)	
1.11.2	Check oil lift pressure indicating light - LIT.	
1.11.3	Start RCP. RCP [] 2B(2A,2C)	
1.11.4	WHEN RCP has operated for one minute, THEN stop bearing oil lift pump. RCP OIL LIFT PUMP [] 2B(2A,2C)	
1.12	[CA] IF at least one RCP started, THEN go to FNP-2-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY.	

Step	Action/Expected Response	Response NOT Obtained

NOTE: To prevent excessive pressure variations, saturated conditions should be established in the pressurizer prior to lowering pressurizer level.

___ **2 Establish pressurizer level to accommodate void growth.**

2.1 Check pressurizer level - 25%-35%.

2.1 Control charging and letdown as necessary.

2.2 Place charging flow control in manual.

CHG FLOW
[] FK 122

___ **3 [CA] Continue RCS cooldown.**

3.1 [CA] Maintain RCS cold legs cooldown rate - LESS THAN 100°F IN ANY 60 MINUTE PERIOD.

RCS COLD LEG TEMP
[] TR 410

3.2 [CA] Maintain SUB COOLED MARGIN MONITOR indication - GREATER THAN 36°F SUBCOOLED IN CETC MODE.

3.3 [CA] Maintain RCS cold leg temperature and pressure - WITHIN FIGURE 3 LIMITS.

RCS COLD LEG TEMP
[] TR 410

2C(2A) LOOP
RCS WR PRESS
[] PI 402A
[] PI 403A

Step	Action/Expected Response	Response NOT Obtained

NOTE: Reactor vessel steam voiding may occur during RCS pressure reduction. This will cause a rapid rise in pressurizer level.

___ **4 Begin RCS pressure reduction.**

4.1 IF normal letdown in service, THEN control auxiliary spray to reduce RCS pressure.

4.1 Open only one PRZR PORV to reduce RCS pressure.

4.2 Maintain RCS cold leg temperature and pressure - WITHIN FIGURE 3 LIMITS.

RCS COLD LEG TEMP
[] TR 410

2C(2A) LOOP
RCS WR PRESS
[] PI 402A
[] PI 403A

___ **5 [CA] Maintain pressurizer level 25%-90%.**

5.1 Check pressurizer level - GREATER THAN 25%.

5.1 Raise pressurizer level using one or both of the following.

- Raise charging flow.
  CHG FLOW
  [] FK 122 manually adjusted

- Reduce letdown flow.

Step 5 continued on next page.

Step	Action/Expected Response	Response NOT Obtained
5.2	Check pressurizer level - LESS THAN 90%.	5.2 Perform the following.

NOTE: The intent of step 5.2.1 is to maintain the pressurizer liquid at saturation temperature.

5.2.1 Turn on additional pressurizer heaters.

PRZR HTR GROUP VARIABLE
[] 2C

PRZR HTR GROUP BACKUP
[] 2A
[] 2B
[] 2D
[] 2E

5.2.2 Reduce pressurizer level to less than 90% by one of the following.

- Control charging and letdown flow as necessary.

  Reduce charging flow CHG FLOW
  [] FK 122 manually adjusted

  Raise letdown flow.

  OR

- Continue RCS cooldown to shrink inventory.

Step	Action/Expected Response	Response NOT Obtained
___ 6	**[CA] Check REACTOR VESSEL LEVEL indication - GREATER THAN 44% UPPER PLENUM.**	6 Perform the following. 6.1 Raise RCS pressure. 6.1.1 Turn on additional pressurizer heaters. PRZR HTR GROUP VARIABLE [] 2C PRZR HTR GROUP BACKUP [] 2A [] 2B [] 2D [] 2E 6.2 Return to step 3.
___ 7	**Check when to isolate SI accumulators.**	
	7.1 Check power to discharge valves - AVAILABLE. 2A(2B,2C) ACCUM DISCH ISO [] Q2E21MOV8808A [] Q2E21MOV8808B [] Q2E21MOV8808C	7.1 Close accumulator discharge valve disconnects using ATTACHMENT 1.
	7.2 [CA] <u>WHEN</u> RCS pressure less than 1000 psig, <u>THEN</u> close all SI accumulator discharge valves. 2A(2B,2C) ACCUM DISCH ISO [] Q2E21MOV8808A [] Q2E21MOV8808B [] Q2E21MOV8808C	7.2 Vent any SI accumulator that cannot be isolated. ACCUM N2 VENT [] HIK 936 open

<u>SI ACCUM</u>	<u>2A</u>	<u>2B</u>	<u>2C</u>
2A(2B,2C) ACCUM N2 SUPP/VT ISO Q2E21HV	[] 8875A open	[] 8875B open	[] 8875C open

Step 7 continued on next page.

Step	Action/Expected Response	Response NOT Obtained

7.3 [CA] WHEN SI accumulator discharge valves closed, THEN open and lock accumulator discharge valve disconnects using ATTACHMENT 2.

___ 8 **[CA] Maintain letdown flow.**

8.1 WHEN letdown flow less than required, THEN open additional letdown orifice isolation valves.

LTDN ORIF ISO
45 GPM
[] Q2E21HV8149A

LTDN ORIF ISO
60 GPM
[] Q2E21HV8149B
[] Q2E21HV8149C

OR

8.2 WHEN letdown flow less than required, THEN adjust low pressure letdown control valve.

LP LTDN PRESS
[] PK 145

___ 9 **[CA] Maintain seal injection flow to each RCP - 6-13 gpm.**

SEAL WTR
INJECTION
[] HIK 186 adjusted

Step	Action/Expected Response	Response NOT Obtained
___10	**Check if RHR system can be placed in service.**	
	10.1 Check RCS hot leg temperatures - LESS THAN 350°F. RCS HOT LEG TEMP [] TR 413	10.1 Return to step 3.
	10.2 Check RCS narrow range pressure - LESS THAN 350 psig. 2C(2A) LOOP RCS NR PRESS [] PI 402B [] PI 403B	10.2 Return to step 3.
	10.3 Place RHR system in service using FNP-2-SOP-7.0, RESIDUAL HEAT REMOVAL SYSTEM.	
___11	**[CA] Continue RCS cooldown to cold shutdown with RHR.**	

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CAUTION: Reactor vessel steam voiding may occur if the RCS is depressurized before the entire RCS is cooled to less than 200°F.

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___12	**[CA] Continue cooldown of inactive portion of RCS.**	
	12.1 Maintain RCS pressure - 350-400 psig. 2C(2A) LOOP RCS NR PRESS [] PI 402B [] PI 403B	
	12.2 Verify both CRDM FANs - STARTED.	
	12.3 Continue dumping steam from all SGs.	
	12.4 Check REACTOR VESSEL LEVEL indication - 100% UPPER HEAD.	12.4 Return to step 11.

Step	Action/Expected Response	Response NOT Obtained
___13	**Check if RCS depressurization is permitted.**	

NOTE: FNP-2-SOP-68.0, INADEQUATE CORE COOLING MONITORING SYSTEM provides detailed operating instructions for the core exit T/C monitor.

13.1	Check reactor vessel upper head temperature - LESS THAN 200°F. CORE EXIT THERMOCOUPLE MONITOR [] TRAIN A (Points 22,23) [] TRAIN B (Points 16,20)	13.1 Return to step 11.
13.2	Check all atmospheric relief valves - OPEN. 2A(2B,2C) MS ATMOS REL VLV [] PC 3371A [] PC 3371B [] PC 3371C	13.2 Perform the following. 13.2.1 Direct counting room to perform FNP-0-CCP-645, MAIN STEAM ABNORMAL ENVIRONMENTAL RELEASE. 13.2.2 Open all atmospheric relief valves. 2A(2B,2C) MS ATMOS REL VLV [] PC 3371A [] PC 3371B [] PC 3371C
13.3	Locally check SGs - NOT STEAMING.	13.3 Return to step 11.
13.4	Go to FNP-2-UOP-2.2, SHUTDOWN OF UNIT FROM HOT STANDBY TO COLD SHUTDOWN.	

-END-

START STEP CONTINUOUS ACTION

☐ CAUTION [CA] To ensure proper plant response, FNP-2-EEP-0, REACTOR TRIP OR SAFETY INJECTION, must be entered upon any SI actuation.

1 [CA] Establish RCP support conditions.

1.11 [CA] IF support conditions exist to start an RCP THEN start at least one RCP.

1.12 [CA] IF at least one RCP started, THEN go to FNP-2-UOP-2.1, SHUTDOWN OF UNIT FROM MINIMUM LOAD TO HOT STANDBY.

☐ 3 [CA] Continue RCS cooldown.

3.1 [CA] Maintain RCS cold legs cooldown rate - LESS THAN 100F IN ANY 60 MINUTE PERIOD.

3.2 [CA] Maintain SUB COOLED MARGIN MONITOR indication - GREATER THAN 36F SUBCOOLED IN CETC MODE.

3.3 [CA] Maintain RCS cold leg temperature and pressure - WITHIN FIGURE 3 LIMITS.

☐ 5 [CA] Maintain pressurizer level 25%-90%.

☐ 6 [CA] Check REACTOR VESSEL LEVEL indication - GREATER THAN 44% UPPER PLENUM.

☐ 7 7.2 [CA] WHEN RCS pressure less than 1000 psig, THEN close all SI accumulator discharge valves.

7.3 [CA] WHEN SI accumulator discharge valves closed, THEN open and lock accumulator discharge valve disconnects using ATTACHMENT 2.

☐ 8 [CA] Maintain letdown flow.

☐ 9 [CA] Maintain seal injection flow to each RCP - 6-13 gpm.

☐ 11 [CA] Continue RCS cooldown to cold shutdown with RHR.

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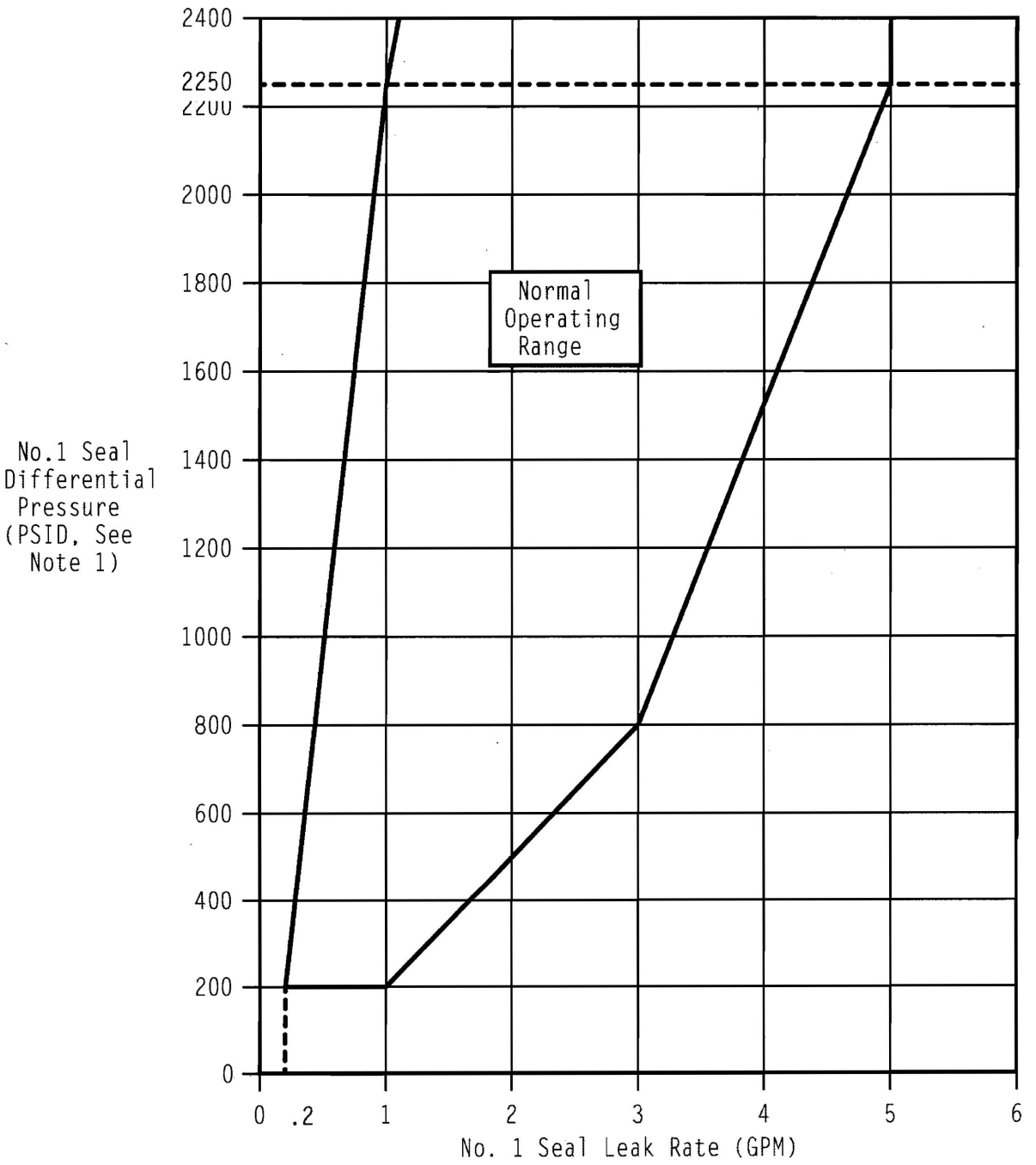
START	STEP	CONTINUOUS ACTION
☐	12	[CA] Continue cooldown of inactive portion of RCS.

FIGURE 1

NO. 1 SEAL NORMAL OPERATING RANGE



Note 1: For No. 1 Seal Differential Pressures greater than 400 psid, use RCS pressure in psig.

FIGURE 2

RCP PRESSURE-TEMPERATURE OPERATING LIMITS

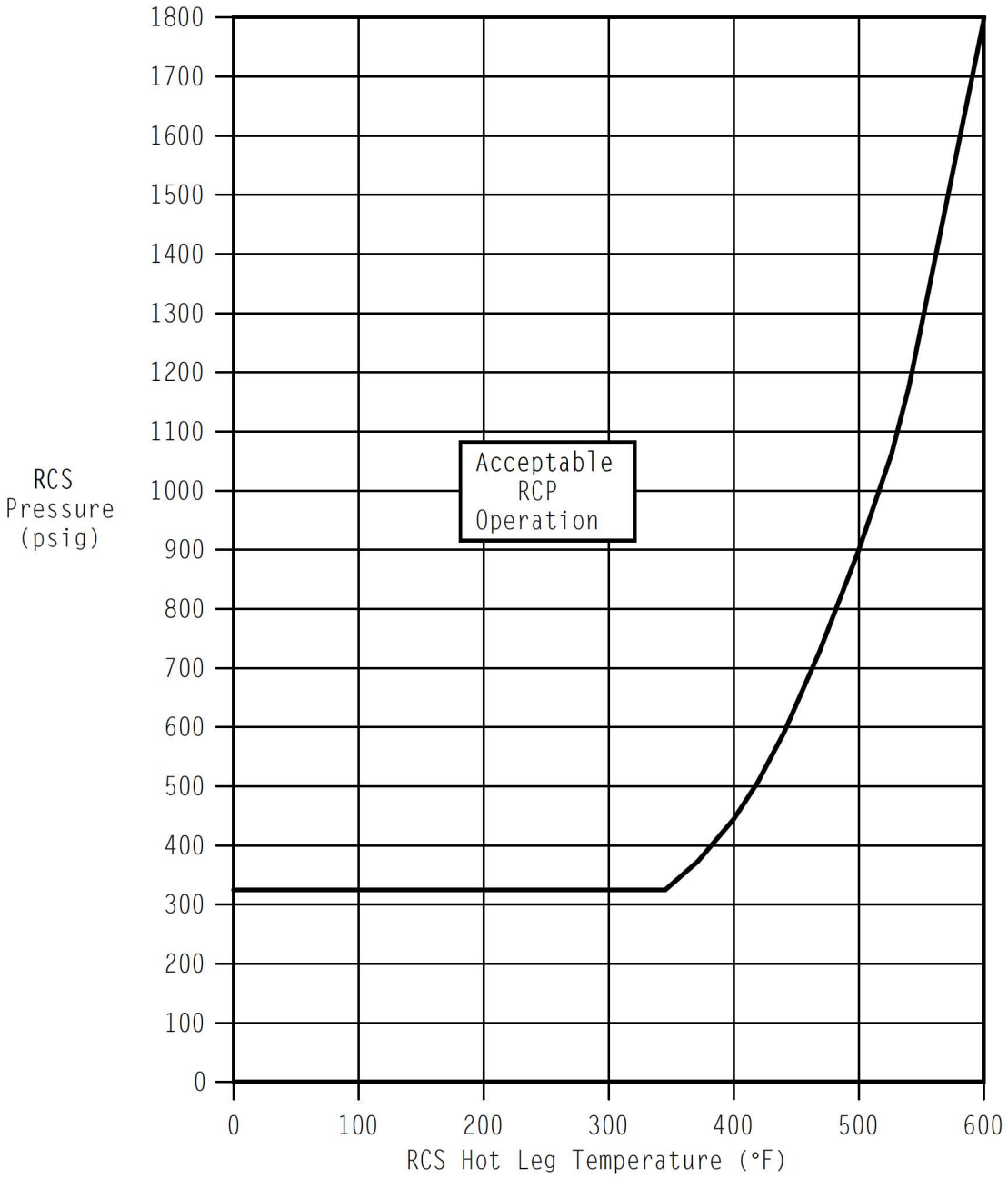


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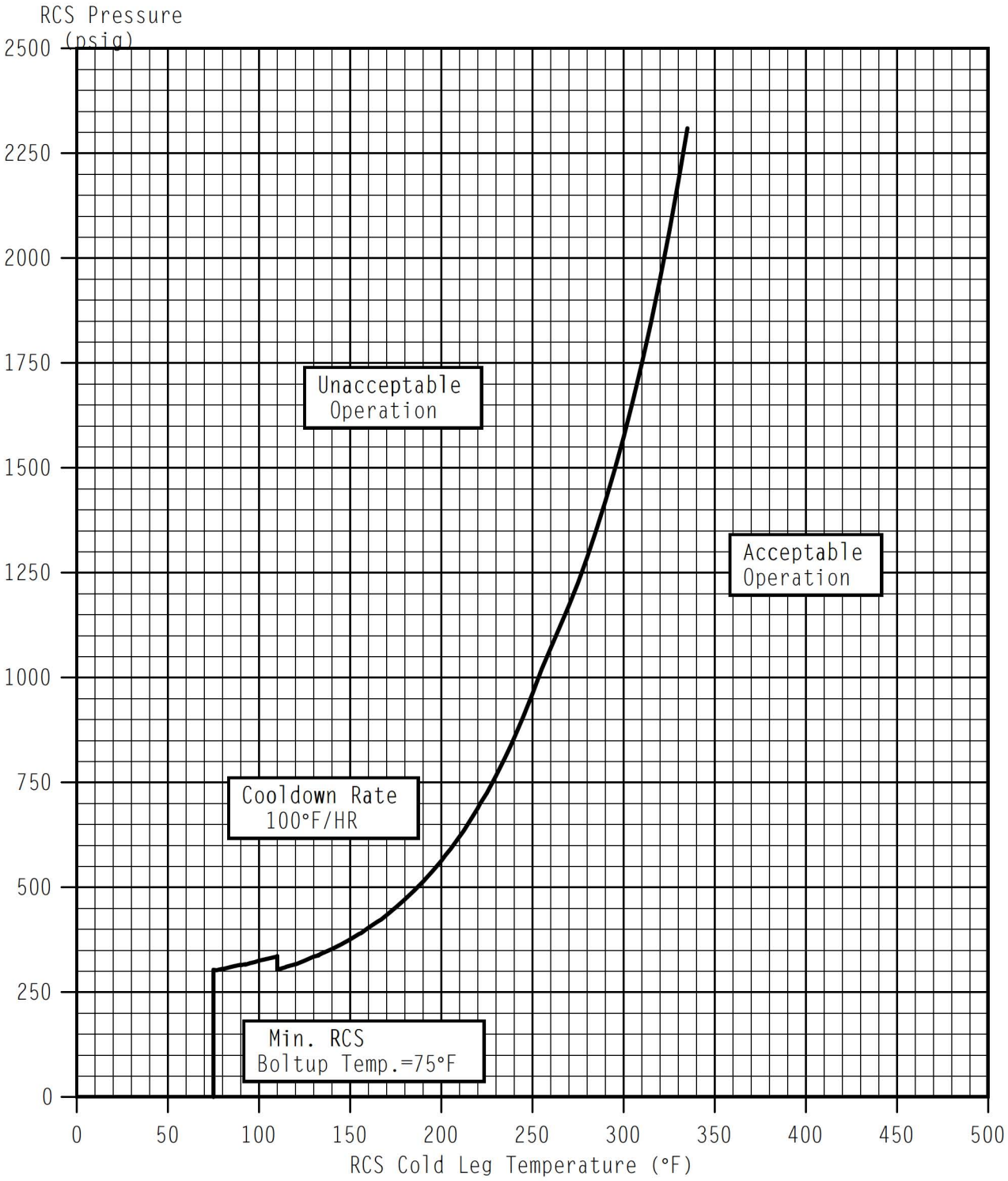
FIGURE 3

UNIT 2 100°F/HR TECH. SPEC. LIMIT RCS COOLDOWN



Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 1

___ 1 **Close the following disconnects.**

'B' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q2R18B035-B	Disconnect FV-S2 MOV 8808B-B	ON	V-5	139' hall way-outside elec. penetration room

'A' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q2R18B031-A	Disconnect FU-Z3 MOV 8808C-A	ON	V-6	139' hall way-outside counting room
Q2R18B032-A	Disconnect FU-Z2 MOV 8888A-A	ON	V-4	

___ 2 **Verify accumulator discharge valves MCB indication - POWER AVAILABLE.**

2A(2B,2C) ACCUM DISCH ISO
[] Q2E21MOV8808A
[] Q2E21MOV8808B
[] Q2E21MOV8808C

___ 3 **Notify control room of accumulator discharge valve disconnect status.**

-END-

Step	Action/Expected Response	Response NOT Obtained

ATTACHMENT 2

___ 1 **Open and lock the following disconnects.**

'A' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q2R18B031-A	Disconnect FU-Z3 MOV 8808C-A	LOCKED OPEN	V-6	139' hallway-outside counting room
Q2R18B032-A	Disconnect FU-Z2 MOV 8808A-A	LOCKED OPEN	V-4	

'B' Train Disconnects				
Disconnect TPNS No.	Description	Position	Key	Location
Q2R18B035-B	Disconnect FV-S2 MOV 8808B-B	LOCKED OPEN	V-5	139' hallway-outside elec. penetration room

___ 2 **Notify control room of accumulator discharge valve disconnect status.**

-END-

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Step	Action/Expected Response	Response NOT Obtained
1	**Monitor SI criteria.**	
1.1	Greater than 16°F subcooled in CETC mode and PRZR level above 4%.	1.1 Verify SI actuated AND go to FNP-2-EEP-0.
2	**Monitor switchover criteria.**	
2.1	CST level greater than 5.3 ft.	2.1 Align AFW pumps suction to SW using FNP-2-SOP-22.0.