

DOCUMENT TRANSMITTAL FORM 89349
FOR DOCUMENTS TRANSMITTED TO DC DESK(NRC)*

DATE: 13 Apr 1993
BATCH: 100

DOCUMENT NUMBER	SHEET NUMBER	REVISION NUMBER	COPY NUMBER
AP 330		06	7
AP 380		22	7

INSTRUCTIONS TO THE ADDRESSEE

COMPLETE EACH OF THE INSTRUCTIONS BELOW WHICH ARE MARKED WITH AN " X "

- ☒ (1) VERIFY THE DOCUMENTS RECEIVED AGREE WITH THE ABOVE DESCRIPTION
- ☒ (2) INCORPORATE THE TRANSMITTED DOCUMENTS INTO YOUR FILES
- ☒ (3) DESTROY DOCUMENTS OR PORTIONS OF DOCUMENTS SUPERSEDED BY THE ABOVE
- ☒ (4) SIGN AND DATE IN THE SPACES BELOW INDICATING THAT YOU COMPLETED THESE INSTRUCTIONS.
- ☐ (5) SIGN BELOW INDICATING THAT YOU HAVE READ AND UNDERSTOOD THE CHANGES AS IDENTIFIED
- ☒ (6) RETURN TO DOCUMENT CONTROL, CRYSTAL RIVER UNIT 3, MAC# NA1C____
NR2A ☒ SA1G____ FLORIDA POWER CORP., P.O. BOX 219
CRYSTAL RIVER FLA. 32623
- ☐ (7) QUALITY PROGRAMS PERSONNEL HAVE READ AND UNDERSTOOD THE CHANGES TO THE AFFECTED QAP'S

SIGNATURE OF ADDRESSEE _____

DATE _____

INDEPENDENT VERIFICATION _____

DATE _____

(OPS)

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LSW	REV 6	DATE 04/08/93	AP-330
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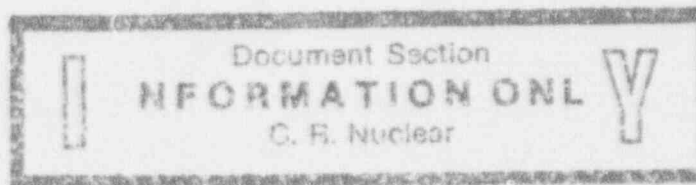
LOSS OF NUCLEAR SERVICE WATER

1.0 ENTRY CONDITIONS

IF any of the following conditions exist:

- o TEMPs of SW cooled components are high and rising,
- o SW surge tank is < 5 ft,
- o SW flow is lost,

THEN use this procedure.



THIS PROCEDURE ADDRESSES SAFETY RELATED COMPONENTS		
APPROVED BY MNPO: <u>W. Marshall</u> DATE: <u>4/12/93</u>		
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2.0 IMMEDIATE ACTIONS

ACTIONS

DETAILS

Note

There are no Immediate Actions in this procedure.

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3.0 FOLLOW-UP ACTIONS

ACTIONS	DETAILS
3.1 — Notify personnel of plant conditions as required.	<ul style="list-style-type: none">— SOTA,— Plant Operators,— SCOD to evaluate plant conditions for potential entry into the Emergency Plan.
3.2 — CONCURRENTLY PERFORM VP-580, Plant Safety Verification Procedure, beginning with Step 1.1.	
3.3 — <u>IF</u> , at any time while performing this procedure, <u>any</u> of the following conditions exist: <ul style="list-style-type: none">o SW surge tank is < 1 ft, and level can <u>NOT</u> be restored,o SW flow is lost, and can <u>NOT</u> be restored,o Multiple CRDM stator TEMPs are $\geq 180^{\circ}\text{F}$, <u>THEN</u> trip the Rx. <u>AND CONCURRENTLY PERFORM</u> AP-580, Reactor Trip beginning with Step 2.1.	Depress the Rx Trip pushbutton.
3.4 — <u>IF</u> SW flow is lost, <u>AND</u> SW surge tank is > 1 ft, <u>THEN</u> start 1 SW pump.	Start 1 of the following: <ul style="list-style-type: none">o SWP-1A,o SWP-1B,o SWP-1C.
3.5 — <u>IF</u> SW surge tank is < 5 ft, <u>THEN</u> increase DW flow to SW surge tank.	<ul style="list-style-type: none">o Start both DW transfer pumps WTP-6A and WTP-6B.o Notify Building Operators to look for high DW usage.

3.3 IF any of the following conditions exist:

- o SW surge tank is < 1 ft,
and level can NOT be restored,
- o SW flow is lost and can NOT be restored,
- o Multiple CRDM stator TEMPs are $\geq 180^{\circ}\text{F}$,

THEN trip the Rx.

Table 1: SW Cooled Components.

___	RB Main fan assemblies
___	Letdown coolers
___	RCPIT cooler
___	CRDMs
___	SF coolers and air handling units
___	Sample coolers
___	Seal return coolers
___	Evaporators
___	WG compressors
___	EFP-1
___	SWP-1A, SWP-1B and SWP-1C
___	RWP-2A, RWP-2B and RWP-1
___	IA and SA compressors, if aligned
___	Water box ARPs, if aligned
___	Control Complex chillers, if aligned
___	RCPs
___	MUPs if aligned

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.6 — IF DW makeup to the SW surge tank is NOT available, THEN use FS water for makeup.

DETAILS

Notify AB Operator to align the FS header for SW surge tank makeup:

- 1 — Connect pre-staged hose between FSV-186 and SWV-520.
- 2 — Close SWV-298.
- 3 — Open FSV-186.
- 4 — Open SWV-520.
- 5 — Maintain SW surge tank > 5 ft using the SW fill fill valve, SWV-277.
- 6 — Notify TB Operator to place the Motor driven FS pump, FSP-1, on recirc.

- 3.7 — IF SW surge tank is < 1 ft, THEN:

- 1 — Ensure operating MUP is DC cooled,
- 2 — Stop all SWPs,
- 3 — Stop all SW cooled RWPs.

Stop SW cooled pumps by:

- 1 — Select SWP-2A and SWP-2B to "PULL-TO-LOCK".
- 2 — Ensure SWP-1C and RWP-1 in "NORMAL-AFT-STOP".
3. Maintain pumps in stopped position:
 ___ SWP-1A ___ SWP-1B
 ___ RWP-2A ___ RWP-2B.
4. Open DC knife switch at ES 4160V Bkr for:
 ___ SWP-1A ___ SWP-1B
 ___ RWP-2A ___ RWP-2B.

3.3 IF any of the following conditions exist:

- o SW surge tank is < 1 ft,
and level can NOT be restored,
- o SW flow is lost and can NOT be restored,
- o Multiple CRDM stator TEMPs are $\geq 180^{\circ}\text{F}$,
THEN trip the Rx.

Table 1: SW Cooled Components.

___	RB Main fan assemblies
___	Letdown coolers
___	RCDT cooler
___	CRDMs
___	SF coolers and air handling units
___	Sample coolers
___	Seal return coolers
___	Evaporators
___	WG compressors
___	EEP-1
___	SWP-1A, SWP-1B and SWP-1C
___	RWP-2A, RWP-2B and RWP-1
___	IA and SA compressors, if aligned
___	Water box ARPs, if aligned
___	Control Complex chillers, if aligned
___	RCPs
___	MUPs if aligned

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.8 — IF SW flow is lost to the RCPs for > 5 min, THEN ensure Rx tripped, AND trip all RCPs.	Trip all RCPs and ensure oil lift pumps Auto start.
3.9 — IF SW flow does NOT exist, THEN stop or isolate SW cooled components.	See Table 1 for SW cooled components.
3.10 — IF CRDM TEMPS are the only TEMPS increasing, THEN increase CRDM cooling.	<ul style="list-style-type: none">o Observe computer points X-211 through X-279.o Ensure SWV-109 and SWV-110 are open.o Increase CRDM cooling by:<ul style="list-style-type: none">— Start Emergency Duty SW pump, SWP-1A or SWP-1B— Start both CRDM booster pumps<ul style="list-style-type: none">— SWP-2A — SWP-2B— Place spare CRD filter in service— Fail open SW-763: Isolate and vent air to SW-224-TIC via filter regulator left of SW-224-TIC located 119, AB in RMA-6 Pen area— Isolate TEMP control loop: Close SW-766 and SW-767 (95' AB by CRDM booster pumps)

3.3 IF any of the following conditions exist:

- o SW surge tank is < 1 ft,
and level can NOT be restored,
- o SW flow is lost and can NOT be restored,
- o Multiple CRDM stator TEMPs are $\geq 180^{\circ}\text{F}$,

THEN trip the Rx.

Table 1: SW Cooled Components.

___	RB Main fan assemblies
___	Letdown coolers
___	RCDT cooler
___	CRDMs
___	SF coolers and air handling units
___	Sample coolers
___	Seal return coolers
___	Evaporators
___	WG compressors
___	EFP-1
___	SWP-1A, SWP-1B and SWP-1C
___	RWP-2A, RWP-2B and RWP-1
___	IA and SA compressors, if aligned
___	Water box ARPs, if aligned
___	Control Complex chillers, if aligned
___	RCPs
___	MUPs if aligned

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

3.11 — IF SW flow exists,
AND SW cooled component
TEMPs are increasing,
THEN ensure maximum SW
cooling to essential
components.

Ensure:

- Emergency Duty SW RW pump
in operating, RWP-2A
or RWP-2B,
- Emergency Duty SW pump is
operating, SWP-1A or
SWP-1B,
- The "RW RECIRC CONTROL
SURVEILLANCE SWITCH" is in
the "NORMAL" position.
Located on the Bkr cubicle
for RWP-3B in the B ES
4160 V Switchgear Room,
- The RW Recirc Control
valve, RWV-150, is either
closed or isolated,
- All SW heat exchangers are
in service,
- Non-essential components
are isolated, see Table 1
for list of SW cooled
components,
- Proper intake canal
conditions exist,
- RB Fans are aligned to Cl.

3.12 — IF SW leak exists,
THEN determine location
of leak.

- o Observe Bldg sump levels.
- o Observe RCDT level.
- o Observe DC surge tank
level.

3.13 — IF SW leak is in the RB,
THEN isolate SW to
non-essential loads in RB,
AND notify Operator to
perform SW walkdown in RB,
if possible,

See to Table 1 for SW cooled
components.

3.3 IF any of the following conditions exist:

- o SW surge tank is < 1 ft,
and level can NOT be restored,
- o SW flow is lost and can NOT be restored,
- o Multiple CRDM stator TEMPs are $\geq 180^{\circ}\text{F}$,

THEN trip the Rx.

Table 1: SW Cooled Components.

___	RB Main fan assemblies
___	Letdown coolers
___	RCDT cooler
___	CRDMs
___	SF coolers and air handling units
___	Sample coolers
___	Seal return coolers
___	Evaporators
___	WG compressors
___	EFP-1
___	SWP-1A, SWP-1B and SWP-1C
___	RWP-2A, RWP-2B and RWP-1
___	IA and SA compressors, if aligned
___	Water box ARPs, if aligned
___	Control Complex chillers, if aligned
___	RCPs
___	MUPs if aligned

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

3.14 — IF SW leak is in the AB,
THEN notify AB Operator
to perform SW walkdown.

Notify AB Operator to:

- Observe local SW tank level,
- Ensure proper SW valve alignment. Refer to OP-408, Nuclear Services Cooling System.
- Observe normal SW and SW RW Pump discharge pressures.

3.15 — IF SW leak exist and can
NOT be found,
THEN determine if SW heat
exchangers are leaking.

1. Notify AB Operator to place standby SW heat exchanger in service and to isolate 1 inservice SW heat exchanger.
2. Repeat the above process 1 at a time until all SW heat exchangers have been isolated.

3.16 — IF adequate SW cooling
can NOT be established,
THEN GO TO OP-209, Plant
Cooldown, beginning with
appropriate Step, based on
RCS TEMP and PRESS.

3.17 — IF adequate SW cooling has
been restored,
THEN EXIT this procedure.
GO TO the appropriate
procedure as determined by
the SSOD.

ESA	REV 22	DATE 04/08/93	AP-380
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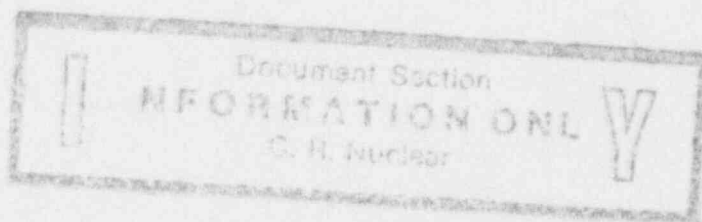
ENGINEERED SAFEGUARDS ACTUATION

1.0 ENTRY CONDITIONS

IF any of the following conditions exist:

- o Manual ES Actuation,
- o RCS PRESS is < 1500 PSIG,
- o RB PRESS is > 4 PSIG,

THEN use this procedure.



This Procedure Addresses Safety Related Components		
Approved by MNPO <i>W. Marshall</i>		Date <i>4-12-93</i>
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2.0 IMMEDIATE ACTIONS

ACTIONS

DETAILS

- 2.1 Ensure ES status lights are blue for the actuated systems.

CAUTION

IF RCPs have NOT been stopped within 2 min from the time that adequate subcooling margin was lost,
THEN one RCP in each loop must remain running to prevent core damage.

- 2.2 Verify adequate subcooling margin.

IF adequate subcooling margin does NOT exist,
THEN stop all RCPs.

Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

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3.0 FOLLOW-UP ACTIONS

ACTIONS

3.1 — Notify personnel of plant conditions as required.

DETAILS

- o — SOTA
 - o — Plant Operators
 - o — SSOD to evaluate plant conditions for potential entry into the Emergency Plan
-

3.2 — CONCURRENTLY PERFORM
VP-580, Plant Safety
Verification Procedure,
beginning with Step 1.1.

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

IF RCPs have NOT been stopped within 2 min from the time that adequate subcooling margin was lost,
THEN one RCP in each loop must remain running to prevent core damage.

3.3 IF, at any time while performing this procedure, adequate subcooling margin does NOT exist,
THEN:

See Table 1 for adequate subcooling margins.

___ Stop all RCPs,

Stop all RCPs and ensure Oil Lift pumps start.

___ Raise OTSG levels to 80-90% using EFW,

Raise OTSG level to 80-90%:

1. Ensure both EFW trains are initiated.

2. Depress "95%" level select pushbuttons on OTSG A and B.

___ Start full HPI.

Start full HPI:

1. ___ Open MUP suction valves from BWST:

o MUV-73 o MUV-58

2. ___ Ensure 2 MUPs and their cooling water pumps are operating.

3. Open all 4 HPI valves:

___ MUV-23 ___ MUV-24

___ MUV-25 ___ MUV-26.

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.4 — <u>IF</u> adequate subcooling margin does <u>NOT</u> exist, <u>AND</u> all RCPs have <u>NOT</u> been stopped within 2 min, <u>THEN</u> reduce operating RCPs to 1/loop.	One RCP/loop must remain running until: o Adequate subcooling margin is restored, <u>OR</u> o LPI flow is $\geq 1,000$ GPM in each line.

3.5 — <u>IF</u> at anytime while performing this procedure an HPI actuation is present, <u>THEN</u> bypass HPI actuation, <u>AND</u> balance HPI flows.	1. Select the following to "BYPASS" on both A and B HPI channels: — "HPI RC1" — "HPI RC2" — "HPI RC3" 2. Close MUV-27. 3. <u>IF</u> 1 HPI line flow indicates off scale high as indicated on the narrow range HPI flow instrument and is verified to be a high flow condition using the wide range indication, <u>THEN</u> isolate the high line, <u>AND</u> balance the other 3 lines. <u>IF NOT</u> , <u>THEN</u> balance all 4 HPI lines.
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Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

LPI will not automatically actuate at 4 PSIG RB PRESS during a loss of off-site power.

- 3.6 IF, at anytime while performing this procedure, LPI actuation is present, AND RCS pressure is > 500 PSIG THEN:

- ___ Stop both LPI pumps.
- ___ Go to Step 3.9 of this procedure.

1. Reset LPI bistables:

- ___ RC4 in ACT. CHAN. CAB #1
- ___ RC5 in ACT. CHAN. CAB #2
- ___ RC6 in ACT. CHAN. CAB #3

2. STOP DHP-1A and DHP-1B

- 3.7 IF, at anytime while performing this procedure, LPI actuation is present, AND RCS pressure is < 500 PSIG AND LPI flow is > 300 GPM / pump THEN:

- ___ Ensure proper operation
- ___ Bypass LPI actuation
- ___ Go to Step 3.9 of this procedure.

- o Ensure DHV-110 and DHV-111 are operating properly.
- o Select the following to "BYPASS" on both A and B channels:

- ___ "LPI RC4"
- ___ "LPI RC5"
- ___ "LPI RC6"

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

WHEN HPI suction is supplied from LPI, HPI flow must be added to LPI flow to determine total flow.

3.8 — IF, at anytime while performing this procedure, LPI has or should have actuated,
AND LPI flow is < 300 gpm/pump,
THEN perform the following:

- 1 — Ensure LPI status lights are blue
- 2 — Ensure LPI is bypassed
- 3 — Increase LPI flow
- 4 — GO TO Step 3.9

- 1 Select the following to "BYPASS" on both A and B LPI channels:
 - "LPI RC4"
 - "LPI RC5"
 - "LPI RC6"
- 2 — Ensure 1 HPI pump is running in each train.
- 3 — Ensure DHV-110 and DHV-111 are open.
- 4 — Open MUP suction from LPI for each running LPI pump.
 - o DHV-11 open from DHP-1A
 - o DVH-12 open from DHP-1B
- 5 — Control HPI flow \leq 540 gpm per HPI pump to prevent runout.
- 6 — IF LPI flow remains < 300 gpm/pump,
THEN open the PORV, RCV-10.
- 7 — IF LPI flow remains < 300 gpm/pump,
THEN energize and Open the High Point Vent Valves:

High Point Vent Valves:

PZR	A HOT LEG	B HOT LEG
DPDP-8A SW #13	DPDP-5A SW #1	DPDP-5B SW #1
— RCV-159	— RCV-157	— RCV-163
— RCV-160	— RCV-158	— RCV-164

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

Only 2 out of 3 RB isolation actuation channels will bypass.

- 3.9 IF RBIC actuation is present,
THEN perform the following:
- 1 Ensure all RBIC status lights are blue
 - 2 Bypass RBIC
 - 3 IF RCPs are running,
THEN restore RCP services.
- o Select "BYPASS" on both A and B channels of RBIC:
- "RB ISO RB1"
 - "RB ISO RB2"
 - "RB ISO RB3"
- o Restore RCP services:
- 1 Select OPEN on the "ES TRAIN (B) NON-ESSEN. VALVES" switch
 - 2 Open RCP controlled bleed-off valves:
 - MUV-253
 - MUV-258 MUV-259
 - MUV-260 MUV-261

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.10 — IF RB Spray actuation is present,
THEN ensure proper RB Spray flow.

DETAILS

- o Ensure BSV-3 and BSV-4 are regulating flow at 1500 to 1600 gpm.
- o IF either BSP does NOT start, THEN close discharge valve on affected pump:
 - o BSP-1A: BSV-3
 - o BSP-1B: BSV-4

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

IF loss of subcooling was due to an overcooling event,
THEN OTSG PRESS control should be regained prior to
raising OTSG level.

3.11 IF ES actuation is due to
an overcooling event,
THEN determine cause,
AND stop overcooling.

Observe for:

- o Low OTSG PRESS,
- o High OTSG level,
- o High MFW or EFW flow.
- o SPDS trace indicating
overcooling.

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.12 — Isolate possible sources
of low RCS PRESS.

DETAILS

1. Isolate the following:
 - o IF the PORV is NOT
required to be opened,
THEN close RCV-11,
PORV block.
 - o Close RCV-13, PZR spray
block valve.
 - o Ensure DHV-3 is closed.
 - o Close the following letdown
coolers inlet valves:
 - MUV-38,
 - MUV-39,
 - MUV-498.
2. Reopen RCV-11 while observing RCS
PRESS.
3. IF desired,
THEN open RCV-13, PZR spray block
valve, while observing RCS PRESS.
4. IF desired,
THEN restore letdown path while
observing RCS PRESS.

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

Table 2: Required OTSG Levels

Condition	Required Level	EFIC Setpoint Select
Inadequate subcooling Margin	80-90%	"95%"
No RCPs Running, Adequate Subcooling Margin Exists	60-70%	"65%"
RCPs Running, Adequate Subcooling Margin Exists	Low Level Limits	"30 inches"

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

High RB TEMP may cause level instrumentation located inside the RB to read 10% higher than actual.

NOTE

EFP-1 will automatically trip upon actuation of LPI coincident with a loss of off-site power.

NOTE

EFIC control valves will not feed the OTSG until the EFIC setpoint ramps up to meet actual OTSG level.

3.13 — Ensure EFW is actuated and selected to required OTSG setpoint.

- o See Table 2 for required OTSG levels.
- o IF Adequate subcooling margin does NOT exist, AND OTSG levels are NOT continuously progressing towards setpoint, THEN place EFIC level control in manual and maintain EFW flow ≥ 200 gpm to each OTSG OR ≥ 400 gpm to one OTSG until 80-90% level.

IF EFW and MFW are NOT available,
THEN GO TO Step 3.42 in this procedure.

IF EFW is NOT available,
THEN CONCURRENTLY PERFORM AP-450, EFW Actuation, beginning with Step 3.9.

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

Table 2: Required OTSG Levels

Condition	Required Level	EFIC Setpoint Select
Inadequate subcooling Margin	80-90%	"95%"
No RCPs Running, Adequate Subcooling Margin Exists	60-70%	"65%"
RCPs Running, Adequate Subcooling Margin Exists	Low Level Limits	"30 inches"

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

DHV-7 and DHV-8 may not open unless LPI flow is momentarily reduced below 2000 GPM.

3.14 WHEN LPI flow is ≥ 1000 GPM in each injection line,
THEN isolate CFTs.

1 Notify AB operator to remove locks and close Bkrs for CFT isolation valves at ES MCC-3AB:

o CFV-5 o CFV-6

2 Close:

o CFV-5 o CFV-6

3.15 IF at any time while performing this procedure, RCS PRESS is > 2400 PSIG,
THEN reduce RCS PRESS based on subcooling margin.

IF adequate subcooling margin does NOT exist,
THEN open PORV to reduce RCS PRESS until $T_{\text{incore}} = 50^{\circ}\text{F} > \text{OTSG } T_{\text{sat}}$.

IF adequate subcooling margin exists,
THEN open PORV to reduce RCS PRESS until:

o RC PRESS ≈ 100 PSIG $>$ adequate subcooling margin curve

OR

o RCS PRESS ≈ 1600 PSIG

c High Point Vent Valves:

IF PORV is NOT available,
THEN energize and Open the High Point Vent Valves:

PZR	A HOT LEG	B HOT LEG
DPDP-8A SW #13	DPDP-5A SW #1	DPDP-5B SW #1
RCV-159	RCV-157	RCV-163
RCV-160	RCV-158	RCV-164

Table 1: Tsat Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

Table 2: Required OTSG Levels

Condition	Required Level	EFIC Setpoint Select
Inadequate subcooling Margin	80-90%	"95%"
No RCPs Running, Adequate Subcooling Margin Exists	60-70%	"65%"
RCPs Running, Adequate Subcooling Margin Exists	Low Level Limits	"30 inches"

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.16 — IF 2 running MUPs are lined up to a single BWST suction path,
THEN prior to going below 25 ft BWST level, align the suction header to provide separate flow paths.

IF the MU suction header can NOT be separated,
THEN establish LPI to HPI piggyback operation.

DETAILS

MU suction header separation:

- o IF MUP-1A AND MUP-1B are aligned to MUV-73,
THEN:
 - 1 — Open MUV-58
 - 2 — Open MUV-62
 - 3 — While observing MUP-1B for signs of cavitation, Close MUV-69.
- o IF MUP-1B AND MUP-1C are aligned to MUV-58,
THEN:
 - 1 — Open MUV-73
 - 2 — Open MUV-69
 - 3 — While observing MUP-1B for signs of cavitation, Close MUV-62.

LPI - HPI piggyback operation:

- o IF MUP-1A AND MUP-1B are aligned to MUV-73,
THEN establish the following lineup:
 - 1 Ensure open DHV-34 and DHV-110.
 - 2 Start DHP-1A.
 - 3 Open DHV-11.
 - 4 Control HPI \leq 540 GPM/pump to prevent runoff.
- o IF MUP-1B AND MUP-1C are aligned to MUV-58,
THEN establish the following lineup:
 - 1 Ensure open DHV-35 and DHV-111.
 - 2 Start DHP-1B.
 - 3 Open DHV-12.
 - 4 Control HPI \leq 540 GPM/pump to prevent runoff.

Table 1: T_{sat} Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

HPI flows must not be throttled to < 100 gpm/pump with MUP recirc valves closed, to prevent pump damage.

- 3.17 — IF HPI throttle requirements are met,
THEN throttle HPI as required.
- o MUP recirc valve operation:
 - o MUP recirc valves are NOT required to be open when throttling HPI to prevent pump runout.
 - o MUP recirc valves must be opened prior to throttling HPI to < 100 gpm/pump.
 - o MUP recirc valves:
 - o MUV-53 o MUV-257.
 - o HPI throttle requirements:
 - o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
 - o IF adequate subcooling exists based on incores, THEN HPI must be throttled to maintain RCS PRESS and TEMP below the NDT curve, see SPDS or Enclosure 2.
 - o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
 - o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
 - o HPI may be throttled when adequate subcooling margin exists based on incores.

Table 1: T_{sat} Monitor Adequate Subcooling Margin

Reactor Coolant	MARGIN
> 1500 PSIG	30°F
≤ 1500 to > 250 PSIG	50°F
≤ 250 to > 150 PSIG	70°F
≤ 150 PSIG	SPDS
≤ 200°F	N/A

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.18 — <u>WHEN</u> either OTSG PRESS is between 725 and 600 PSIG, <u>THEN</u> bypass EFIC MS and MFW isolation actuations. Continue on in this procedure.	Depress "< 725 PSI OTSG PRESS EFIC ACT. BYPASS" pushbuttons: ___ Channel A ___ Channel B ___ Channel C ___ Channel D.

Note

Subcooling margin should be closely observed after starting each RCP.

- | | |
|---|--|
| 3.19 — <u>IF</u> , at any time while performing this procedure, RCPs are available, <u>AND</u> ≥ 1 OTSG is available, <u>THEN</u> start 1 RCP in each loop.
<u>OR</u> 2 RCPs in 1 loop

<u>IF</u> RCPs are available, <u>AND</u> OTSGs are <u>NOT</u> available, <u>THEN</u> start 1 RCP. | <ul style="list-style-type: none">o RCPs are available when <u>all</u> the following exist:<ul style="list-style-type: none">o RCP start permissives are met,o RCS PRESS and TEMP are above RCP NPSH curves, see SPDS or Enclosure 1,o Adequate subcooling margin, see Table 1.o OTSGs are available when <u>all</u> the following exist:<ul style="list-style-type: none">o EFW or MFW or AFW available,o TBVs or ADVs available,o OTSG integrity.o Establish RCP-1B operating for maximum PZR spray. |
|---|--|

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.20 — IF at any time while performing this procedure, adequate subcooling margin is established, AND Nat Circ is desired, THEN CONCURRENTLY PERFORM AP-530, Nat Circ, beginning at Step 3.5.

DETAILS

Nat Circ is desired when all of the following conditions exist:

- o RCPs are NOT available,
- o ≥ 1 OTSG is available.

- 3.21 — Establish and maintain OTSG Tsat 40 to 60°F below incore TEMP until OTSG heat removal is established.

- o OTSG heat removal exists when feeding OR steaming causes a decrease in Incore temperatures.
- o Lower OTSG PRESS using TBVs or ADVs.

Desired OTSG Pressure Incore Tsat - 50°F
600°F - 1035 PSIG
550°F - 685 PSIG
500°F - 410 PSIG
450°F - 235 PSIG
400°F - 120 PSIG

600°F - 1035 PSIG
550°F - 685 PSIG
500°F - 410 PSIG
450°F - 235 PSIG
400°F - 120 PSIG

- 3.22 — IF adequate subcooling margin does NOT exist, AND RCS cooldown rate is < desired, THEN determine if RCPs should be bumped.

RCPs should be bumped when all of the following conditions exist:

- o RCS cooldown rate is < desired.
- o RCP power is available.
- o All RCP start permissives are met.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

HPI flow may affect the indications of Nat Circ.

NOTE

Subcooling margin should be closely observed after each RCP bump.

NOTE

EFIC will automatically select low level limit control of OTSG level when any RCP is started.

NOTE

Bumping RCPs may result in OTSG pressure swings which could cause MS/MFW isolation actuation.

3.23 — IF RCPs should be bumped,
THEN bump RCPs at ≈ 15 min
intervals and observe for
saturated Nat Circ after
each bump.

- o To bump a RCP, start it, wait for current to drop off to normal, then stop it.
- o First RCP bump should be in the loop with the highest OTSG level.
- o Balance the bumps between available RCPs.
- o Record the times of the RCP bumps.

- o Indications of saturated Nat Circ are:
 - o $T_c \approx T_{sat}$ of OTSG,
 - o T_c and incores lower when OTSG PRESS is lowered.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.24 — IF OTSG heat removal is established,
 THEN ensure PORV is closed,
 AND ensure High Point vents are closed.

DETAILS

1. Ensure PORV is closed.
2. Verify PORV closed using ultrasonic flow indication.
3. Ensure High Point vents are closed

PZR	Hot Leg "A"	Hot Leg "B"
RCV-159	RCV-157	RCV-163
RCV-160	RCV-158	RCV-164

CAUTION

HPI flow must not be throttled to < 100 gpm/pump with MUP recirc valves closed, to prevent pump damage.

- 3.25 — IF RCS cooldown can be controlled,
 THEN maintain RCS cooldown within limits.

RCS Cooldown Rate Limits:

	RCS TEMP °F	LIMIT
Normal	> 280	≤ 50°F ½ hr
	280 to 150	≤ 25°F ½ hr
	≤ 150	≤ 10°F/hr
Nat Circ	> 280	≤ 10°F/hr
	280 to 150	≤ 5°F/hr
	≤ 150	≤ 2.5°F/hr
	Enclosure 2	≤ 50°F/hr
OTSG Tube Leak	Refer to EP-390 Table 3	

Maintain RCS cooldown rate:

- o Throttle TBVs or ADVs.
- o Throttle EFIC control valves.
- o IF adequate subcooling margin exists,
 THEN throttle HPI flows.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.26 — IF RCS PRESS lowers to 700 PSIG, AND adequate subcooling margin exists, THEN isolate CFTs.	1. — Notify AB Operator to remove locks and close Bkrs for CFT isolation valves at ES MCC 3AB. o CFV-5 o CFV-6 2. — Close: o CFV-5 o CFV-6
3.27 — IF RCS PRESS lowers to 700 PSIG, AND adequate subcooling margin exists, THEN bypass LPI Actuation.	Select the following to "BYPASS" on both A and B LPI channels: — "LPI RC4" — "LPI RC5" — "LPI RC6"

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.28 IF conditions exist to stop HPI,
• THEN:

1. Ensure PORV closed,
2. Ensure High Point vents are closed,
3. Stop HPI.

DETAILS

- o Stop HPI if all of the following conditions exist:
 - o Adequate subcooling margin,
 - o PZR level is $\geq 50"$,
 - o OTSG heat removal,
 - o Leak is within normal make-up capabilities.
- o PORV is RCV-10
- o High Point vents:
 - o RCV-159 o RCV-160
 - o RCV-157 o RCV-158
 - o RCV-163 o RCV-164
- o Stop HPI:
 1. Ensure MUV 27 is open,
 2. Ensure MUP recirc valves are open,
 - o MUV-53 o MUV-257
 3. Close all HPI injection valves:
 - MUV-23 MUV-24
 - MUV-25 MUV-26
 4. Ensure 1 MUP in service.

-
- 3.29 IF EF Tank is < 8 ft,
THEN CONCURRENTLY PERFORM AP-450, EFW Actuation, beginning with Step 3.18.
-

- 3.30 IF PZR bubble is desired,
THEN refer to OP-305, operation of the PZR, Section 4.2.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.31 — IF cooldown is on 1 OTSG,
THEN ensure tube to shell
 ΔT on idle OTSG is
maintained within limits.

OTSG shell temps:

A OTSG R-771 or A-730-734

B OTSG R-772 or A-735-739

$$T_{\text{shell}} - T_c = \text{Tensile } \Delta T$$

$$T_h - T_{\text{shell}} = \text{Compressive } \Delta T$$

DETAILS

- o Tensile limit is 100°F, tubes
colder than shell.

IF tensile limit is approached,
THEN reduce cooldown rate.

- o Compressive limit is 60°F, tubes
hotter than shell.

IF compressive limit is
approached,
THEN increase cooldown rate using
TBVs or ADVs without exceeding
cooldown rate limits.

- 3.32 — IF EDGs are NOT energizing
the ES busses,
THEN stop EDGs.

1. — Ensure HPI is bypassed or
reset

2. — Depress the STOP pushbutton
for the affected EDGs

- 3.33 — IF boron concentration of
RB sump could have been
diluted by significant
steam or FW leaks in the RB,
THEN notify Chemistry to
sample RB Sump.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.34 — <u>WHEN</u> BWST LEVEL is $\leq 5'$, <u>THEN</u> transfer LPI suction from BWST to RB sump. Continue on in this procedure.	<div data-bbox="839 308 1443 1095"><div data-bbox="839 308 1443 372">1 — Verify RB WATER level is $\geq 2.2'$</div><div data-bbox="839 405 1443 577">2 — Throttle LPI flow for each train to ≈ 2000 gpm using LPI valves: <div data-bbox="1004 541 1344 577">o DHV-5 o DHV-6</div></div><div data-bbox="839 605 1443 735">3 — Ensure 1200 gpm and "LOCAL" are selected for: <div data-bbox="1004 698 1344 735">o BSV-3 o BSV-4</div></div><div data-bbox="839 763 1443 871">4 — Open RB sump outlet valves: <div data-bbox="1004 834 1361 871">o DHV-42 o DHV-43</div></div><div data-bbox="839 899 1443 1095">5 — <u>WHEN</u> RB sump outlet valves are open, <u>THEN</u> close BWST outlet valves: <div data-bbox="1004 1058 1361 1095">o DHV-34 o DHV-35</div></div></div> <div data-bbox="839 1123 1443 1187">Perform steps 6, 7 & 8 only <u>IF</u> HPI pumps are running.</div> <div data-bbox="839 1215 1443 1679"><div data-bbox="839 1215 1443 1366">6 — Establish HPI suction from LPI by opening. <div data-bbox="1004 1330 1361 1366">o DHV-11 o DHV-12</div></div><div data-bbox="839 1394 1443 1502">7 — <u>IF</u> only 1 LPI pump is operating, <u>THEN</u> ensure MUV-62 is open.</div><div data-bbox="839 1524 1443 1679">8 — Close BWST suctions to HPI while observing for signs of cavitation: <div data-bbox="1004 1647 1361 1679">o MUV-73 o MUV-58</div></div></div>

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

HPI flow must NOT be throttled < 100 gpm/pump with MUP recirc valves closed, to prevent pump damage.

3.35 ____ IF LPI flow is > 1000 gpm
per injection line for
for \geq 20 min.
THEN:

____ Stop HPI,
____ Ensure PORV is closed,
____ Select PORV to
"Low Range",

____ Ensure all high point

Stop HPI:

1. ____ Stop all MUPs
2. ____ Close all HPI
injection valves:

____ MUV-23 ____ MUV-24
____ MUV-25 ____ MUV-26

3. ____ Open MUP recirc valves:
o MUV-53 o MUV-257

Ensure closed:
vents are closed.

____ RCV-159 ____ RCV-160
____ RCV-157 ____ RCV-158
____ RCV-163 ____ RCV-164

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.36 — IF adequate subcooling margin exist,
AND both LPI trains are available,
THEN establish 1 LPI train in the DHR mode.

DETAILS

Refer to OP-404, Decay Heat Removal System, Section 4.12.

- 3.37 — WHEN LPI or DHR is supplying core cooling,
THEN stop OTSG cooling.

Continue on in this procedure.

1. — Stop MFW, EFW and AFW pumps
2. — Ensure the following valves are closed:

VALVE	A OTSG	B OTSG
MBV	FWV-30	FWV-29
LLBV	FWV-31	FWV-32
SUCV	FWV-40	FWV-39
MS to EFP-2	MSV-55	MSV-56
MS to TBVs and MFWPs	MSV-53	MSV-54
EFW BLOCK VALVES	EFV-11 EFV-14	EFV-32 EFV-33
AFW Iso. VALVES	FWV-222	FWV-223
MS to MSRs	MSV-30 MSV-32	MSV-29 MSV-31

- 3.38 — WHEN RB PRESS is < 10 PSIG and not rising,
THEN stop RB spray.

Continue on in this procedure.

1. — Stop BSP-1A and BSP-1B.
2. — Select LOCAL/MANUAL,
THEN close control valves:
 - o — BSV-3
 - o — BSV-4
3. — Depress "HPI SEAL IN RESET" pushbuttons on both ES channels.
4. — IF RB PRESS increases to 10 PSIG,
THEN reestablish RB spray.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZ level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

RB Cooling Fans should stay in operation until RB H₂ levels are known, in order to provide mixing of RB atmosphere.

3.39 — Notify Operator to begin monitoring RB atmosphere H₂ level.

Refer to EM-308, Post Accident monitoring of the RB Atmosphere.

3.40 — WHEN RB PRESS < 4 PSIG,
THEN ensure RB isolation is reset.

Select the following to "RESET" on both A and B channels:

— "RB ISO RB1"

— "RB ISO RB2"

— "RB ISO RB3"

3.41 — GO TO applicable procedure based on subcooling margin:

IF adequate subcooling margin exists,
THEN GO TO OP-209, Plant Cooldown.

IF adequate subcooling does NOT exist,
THEN GO TO OP-404, Decay Heat Removal System, Section 4.13, to establish long term core cooling.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

Note

The following steps are to initiate HPI/PORV cooling.

Note

Steps establishing HPI/PORV cooling and AFW may be performed concurrently.

CAUTION

HPI cooling must be established prior to any opening of the PORV.

3.42 ___ Start full HPI.

1. Open MUP suction from the BWST:

o MUV-58 o MUV-73.

2. Ensure 2 MUPs and their cooling water pumps are running.

3. Open HPI Valves:

___ MUV-23 ___ MUV-24

___ MUV-25 ___ MUV-26.

4. Balance flow between available injection lines.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required. .

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

- 3.43 — IF OTSG heat removal is
NOT available,
AND only 1 MUP is available,
THEN open the PORV to
increase HPI flow.

IF PORV is NOT available,
THEN energize and Open the
High Point Vent Valves:

DETAILS

- o PORV should be left open
until any of the following
conditions exist:
- o HPI can be stopped,
- o OTSG heat removal is
established.
- o High Point Vent Valves:

PZR	A HOT LEG	B HOT LEG
DPDP-8A SW #13	DPDP-5A SW #1	DPDP-5B SW #1
___ RCV-159	___ RCV-157	___ RCV-163
___ RCV-160	___ RCV-158	___ RCV-164

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

NOTE

≥ 1 OTSG should be $\geq 6"$ prior to closing the PORV.

3.44 — Open the PORV before exceeding RCS PRESS limits.

1. — Ensure RCV-11, PORV block, is open.
2. — Open PORV before:
 - o Exceeding PTS limits,
 - o Exceeding NDT limits,
 - o Exceeding 2400 PSIG.
3. — Verify PORV is open using ultrasonic indications.
 - o High Point Vent Valves:

IF PORV is NOI available,
THEN energize and Open the
High Point Vent Valves:

PZR	A HOT LEG	B HOT LEG
DPDP-8A SW #13	DPDP-5A SW #1	DPDP-5B SW #1
— RCV-159	— RCV-157	— RCV-163
— RCV-160	— RCV-158	— RCV-164

- o Maintain PORV or High Point vents open until OTSG heat removal is established or LPI is providing core cooling.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.45 ___ Turn off all PZR heaters.

DETAILS

Select all PZR heater banks to "OFF"

- ___ PZR heater bank "A" off
 - ___ PZR heater bank "B" off
 - ___ PZR heater bank "C" off
 - ___ PZR heater bank "D" off
 - ___ PZR heater bank "E" off
-

3.46 IF AFW is available,
THEN feed OTSGs using AFW.

- o ___ Start FWP-7
 - o ___ Notify plant operator to OPEN:
 - o FWV-222, 119' IB, A OTSG iso.
 - o FWV-223, 119' IB, B OTSG iso.
 - o ___ Maintain total indicated AFW flow \leq 590 GPM to prevent pump runout.
 - o ___ Control AFW using FWV-216 and FWV-217 to obtain desired flow to OTSGs.
-

3.47 ___ IF >1 RCP is operating,
THEN reduce operating RCPs to 1.

Maintain RCP-1B operating to maximize PZR spray.

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.48 — WHEN RCS is < 1700 PSIG,
THEN bypass HPI.

Continue on in this
procedure.

DETAILS

Bypass HPI by selecting the
following to "BYPASS" on both
A and B channels:

— "HPI RC1",

— "HPI RC2",

— "HPI RC3".

3.49 — Select both RB sump pumps
to "PULL TO LOCK".

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

- o HPI must be throttled to maintain subcooling margin < 100°F when no RCPs are operating.
- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to 220" WHEN adequate subcooling margin exists based on incores.
- o HPI may be throttled when adequate subcooling margin exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

3.50 — Establish RB cooling.

- o Ensure all RB cooling fans are operating in slow speed.
- o Ensure RB cooling fans are on SW cooling.

DETAILS

NOTE

WHEN RCS TEMP < 425°F AND OTSG PRESS < 400 PSIG,
THEN MFWBPs may be used to recover from HPI/PORV cooling.

NOTE

HPI bistables may need to be reset prior to or during recovery from HPI/PORV cooling to prevent an inadvertent HPI actuation.

3.51 — Ensure feedwater valves are aligned to prevent inadvertently feeding an OTSG.

Ensure the following valves are selected closed:

Valve Ident.	A-OTSG	B-OTSG
Main Block	FWV-30	FWV-29
LL Block	FWV-31	FWV-32
LL Control	FWV-37	FWV-38
SU Control	FWV-40	FWV-39

3.3 IF adequate subcooling margin does NOT exist,
THEN:

- o Within 2 min, stop all RCPs,
- o Raise OTSG levels to 80-90% using EFW,
- o Start full HPI.

3.15 IF RCS PRESS is > 2400 PSIG,
THEN reduce RC PRESS based on subcooling margin.

3.17 IF HPI throttle requirements are met,
THEN throttle HPI flows as required.

HPI must be throttled to maintain subcooling margin
< 100°F when no RCPs are operating.

- o IF adequate subcooling margin exists based on incores
THEN HPI must be throttled to maintain RCS PRESS and TEMP
below NDT curve.
- o HPI must be throttled to maintain HPI flow < 540 gpm/pump.
- o HPI should be throttled to maintain PZR level 80" to
220" WHEN adequate subcooling margin exists based on
incores.
- o HPI may be throttled when adequate subcooling margin
exists based on incores.

3.19 IF RCPs are available,
AND OTSGs are available,
THEN start 1 RCP in each loop.

IF RCPs are available,
AND OTSGs are NOT available,
THEN start 1 RCP.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS

DETAILS

CAUTION

During the transition from AFW to EFW, flow to the high nozzles should be maintained < 1000 gpm per OTSG to prevent exceeding OTSG cross flow limits.

- 3.52 — WHEN MFW or EFW become available,
THEN CONCURRENTLY PERFORM AP-450, EFW Actuation, beginning with Step 3.9.

Continue on in this procedure.

- 3.53 IF AFW is running
AND EFW or MFW has been established
THEN stop AFW

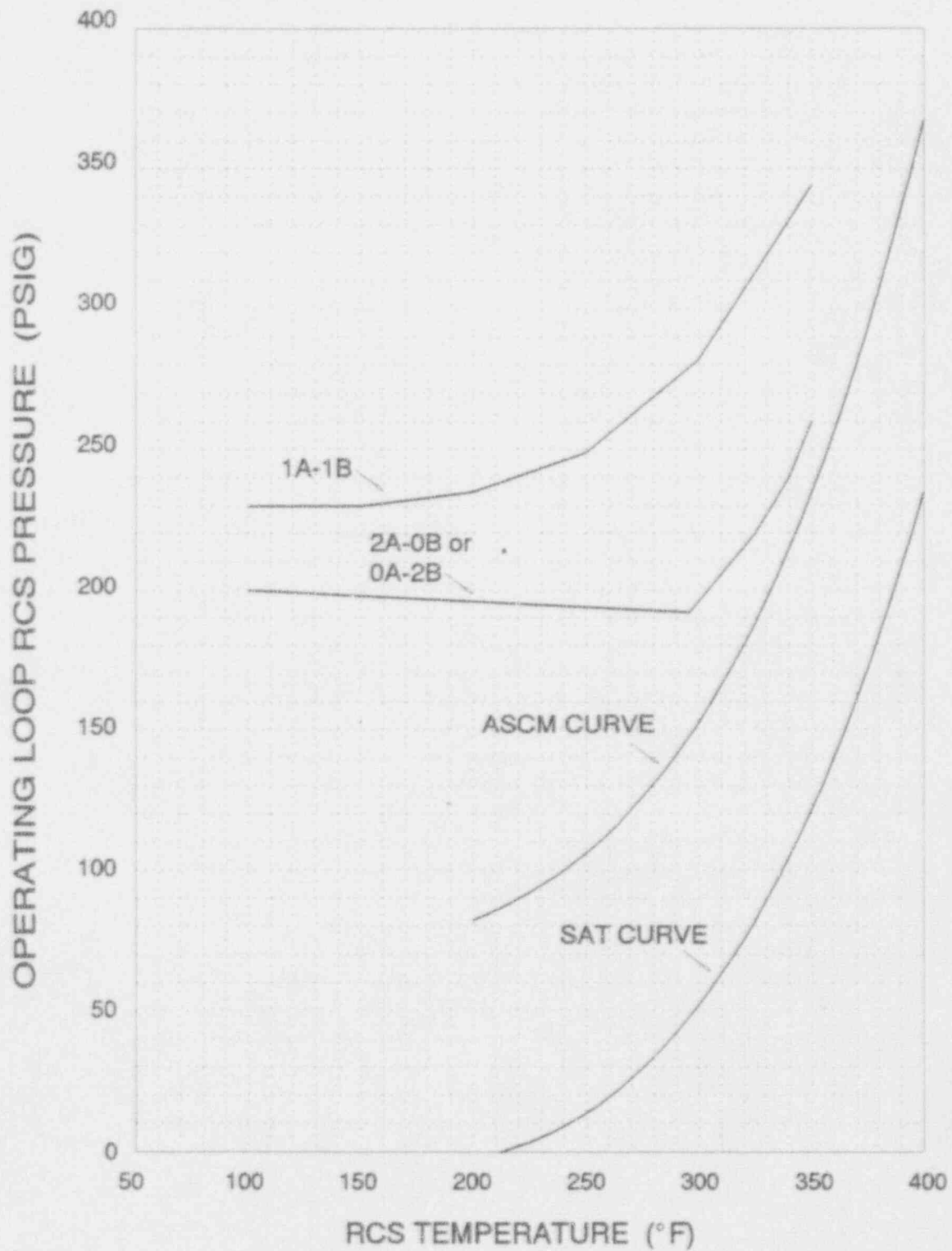
- o — Close FWV-216 and FWV-217,
(AFW control valves)
- o — Stop FWP-7
- o — Close FWV-222
(A OTSG manual Isolation location 119' 1B)
- o — Close FWV-223
(B OTSG manual Isolation location 119' 1B)

- 3.54 — GO TO Step 3.16
in this procedure.

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Enclosure 1

RCP NPSH Curves

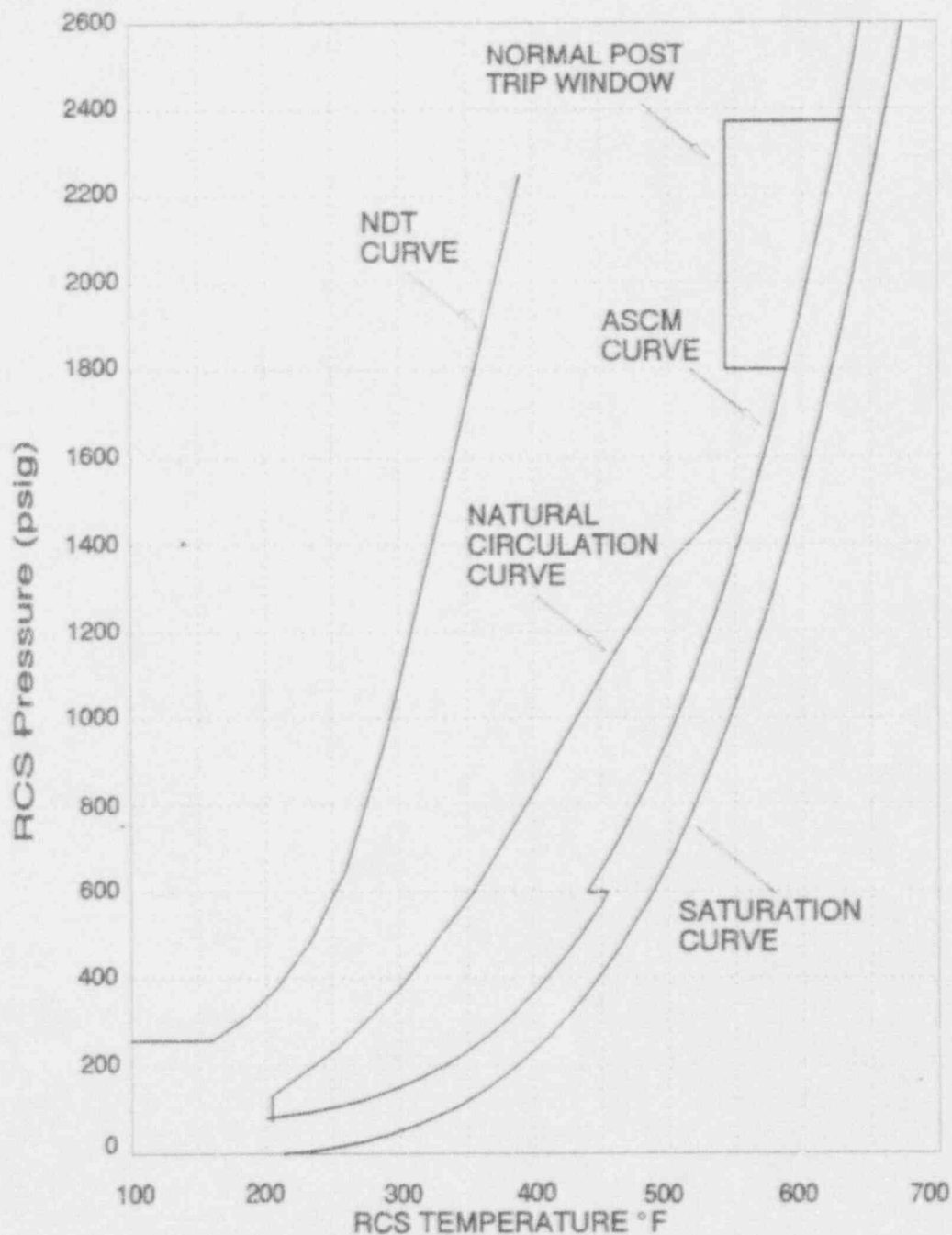


The acceptable region is above the applicable NPSH curve.

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Enclosure 2

Cooldown Curve for Natural Circulation and Forced Flow



Acceptable region is:

- o below and to the right of the NDT curve
- o above and to the left of the ASCN curve
- o above and to the left of the Natural Circulation curve if RCPs are off and cooldown rate $\geq 10^{\circ}\text{F/hr}$