

PDR
CFWestinghouse
Electric CorporationWater Reactor
Divisions

Nuclear Technology Division

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Pittsburgh Pennsylvania 15230

August 2, 1982

Mr. Brent Clayton
U.S. Nuclear Regulatory Commission
Air Rights III Building
4550 Montgomery Avenue
Bethesda, MD 20814

Dear Mr. Clayton:

Enclosed with this letter you will find a set of four (4) preliminary copies of the Critical Safety Function Status Trees and Function Restoration Guidelines associated with the following safety functions for the High Pressure-BASIC Revision of the Westinghouse Owners Group Emergency Response Guidelines:

- Subcriticality
- Core Cooling
- Heat Sink
- Containment
- Primary Inventory

The Status Tree and Function Restoration Guidelines for the Reactor Coolant System Integrity safety function are not included in this submittal, since they have not yet received extensive review by the Westinghouse Owners Group Procedures Subcommittee. All material being submitted in this package is to be considered as "Preliminary" in status, pending final approval by the subcommittee which is expected at the August 3-4-5 meeting in Pittsburgh. The final approved versions are not expected to be changed from those being submitted.

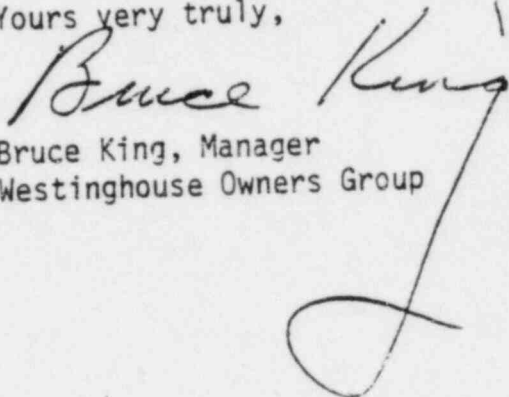
The exact list of High Pressure-BASIC Function Restoration Guidelines is as follows:

- FR-S.1 Response to Nuclear Power Generation
- FR-S.2 Response to Loss of Core Shutdown
- FR-C.1 Response to Inadequate Core Cooling
- FR-C.2 Response to Degraded Core Cooling
- FR-C.3 Response to Potential Loss of Core Cooling
- FR-C.4 Response to Saturated Core Cooling Conditions
- FR-P.1 Response to Imminent Pressurized Thermal Shock Condition
- FR-P.2 Response to Anticipated Pressurized Thermal Shock Condition
- FR-H.1 Response to Loss of Secondary Heat Sink

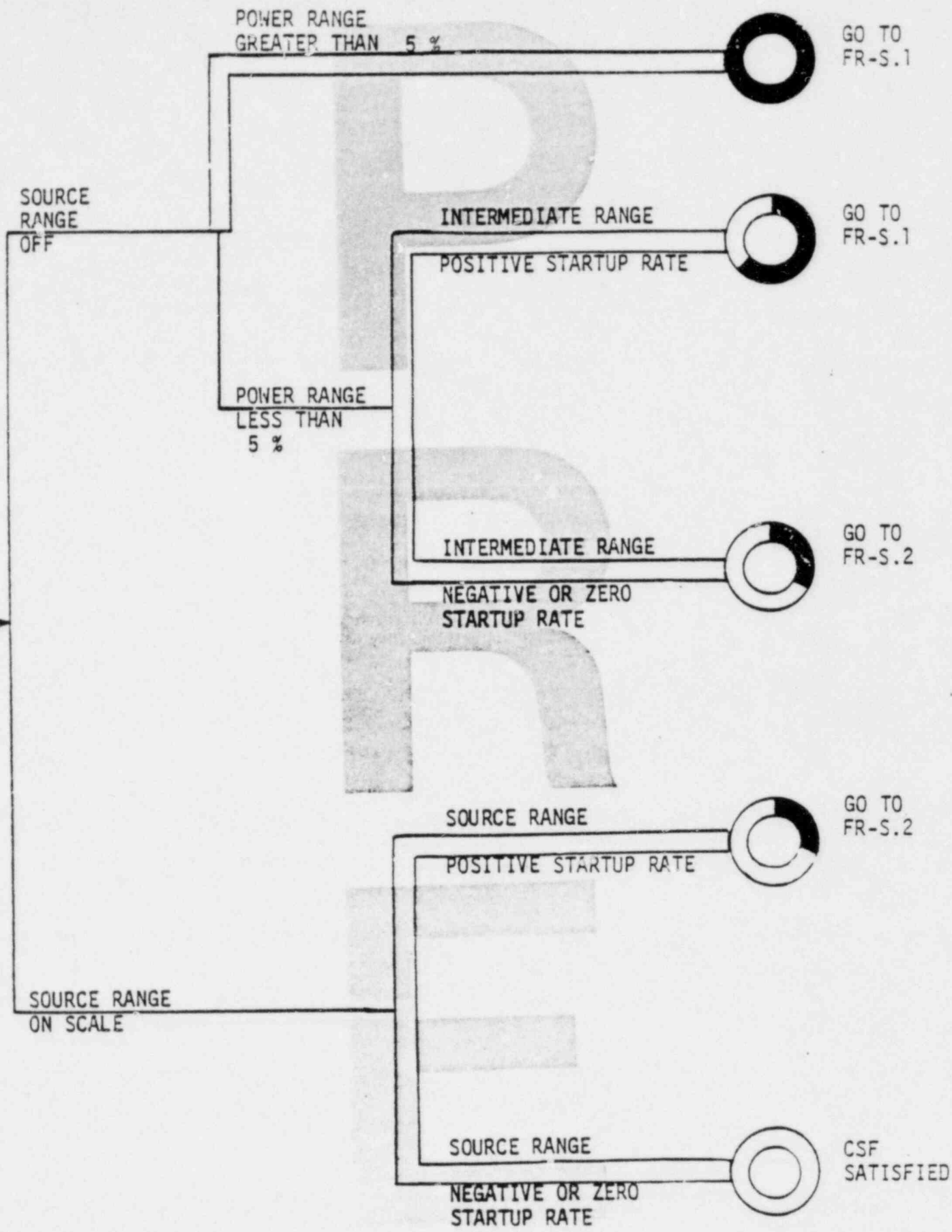
FR-H.2 Response to Steam Generator Overpressure
FR-H.3 Response to Steam Generator High Level
FR-H.4 Response to Steam Generator Low Level
FR-H.5 Response to Loss of Steam Generator PORVs and Condenser Dump Valves
FR-Z.1 Response to High Containment Pressure
FR-Z.2 Response to High Containment Sump Level
FR-Z.3 Response to High Containment Radiation Level
FR-I.1 Response to Pressurizer Flooding
FR-I.2 Response to Low System Inventory

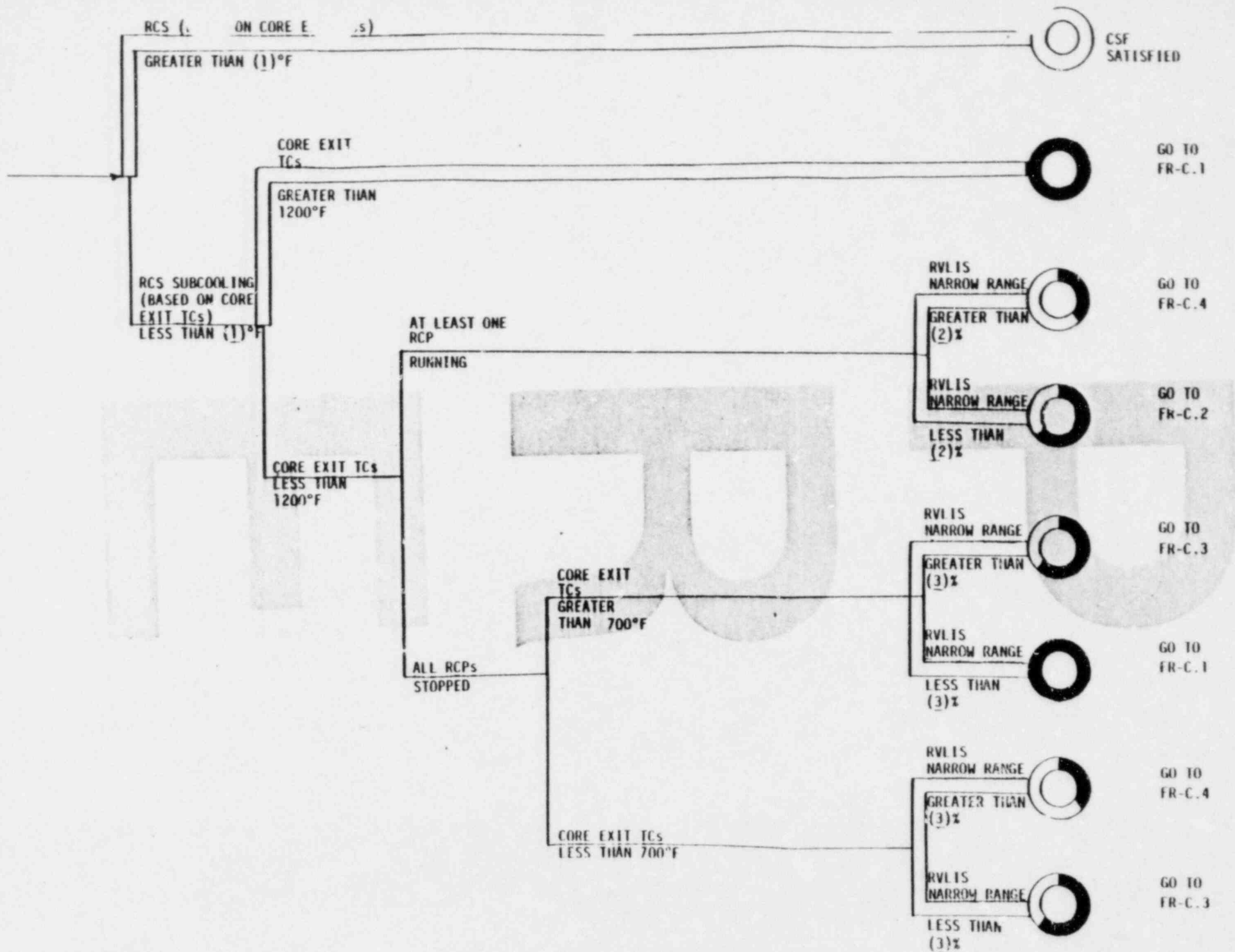
Thus, only FR-P.1 and P.2 are not included. In this submittal, 19 of 21 FRGs are fully developed at this time and the Status Tree and FRGs for RCS Integrity are planned to be made available in time for the late September WOG Seminar. The WOG currently plans to finalize all Status Trees and FRGs and make available background documents for the 1982 ERG Seminar. A final formal transmittal to the USNRC of all ERG-BASIC Revision information is now planned for October 1982. This includes the remaining portions of the LP-BASIC ERG set.

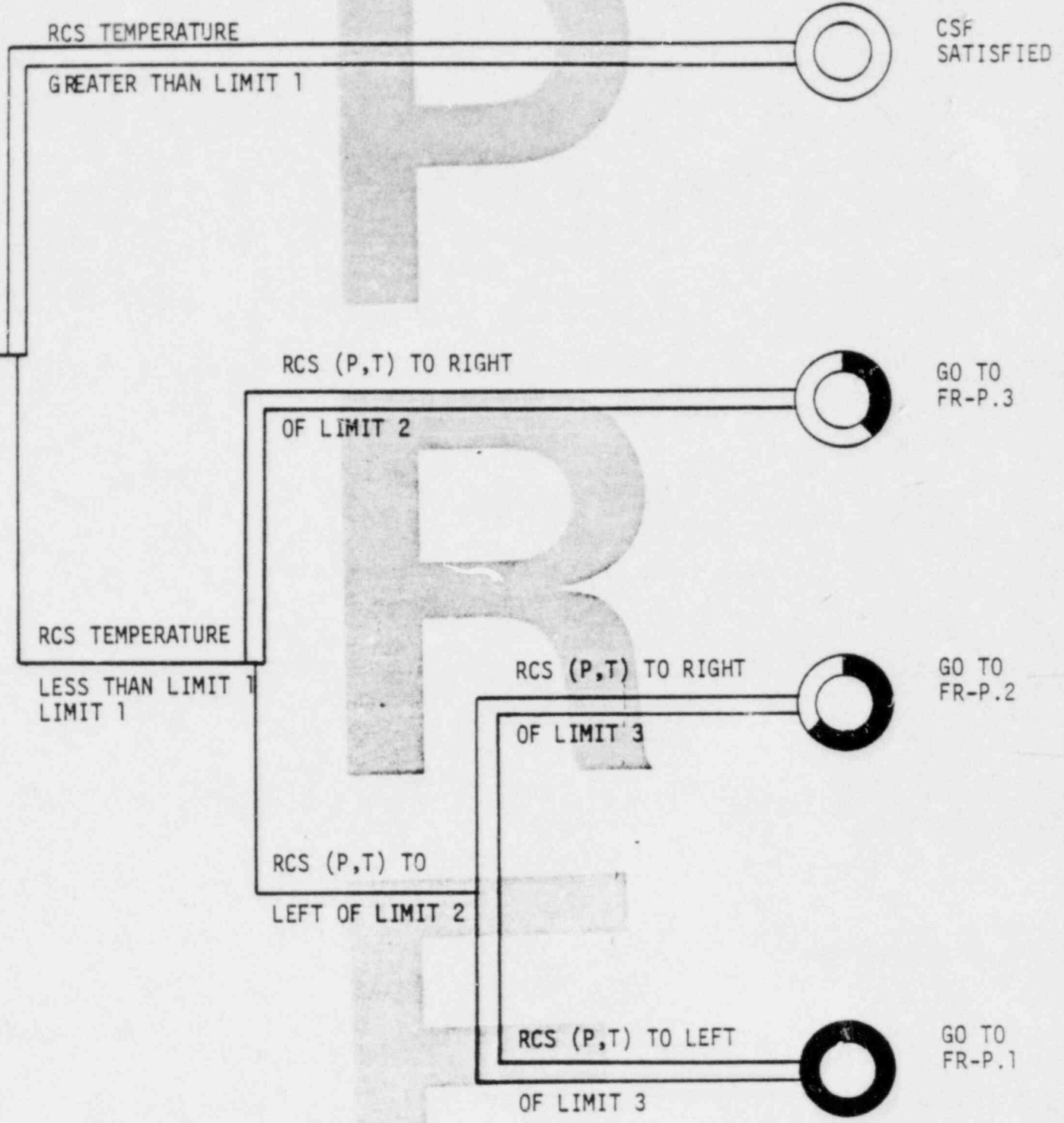
Yours very truly,

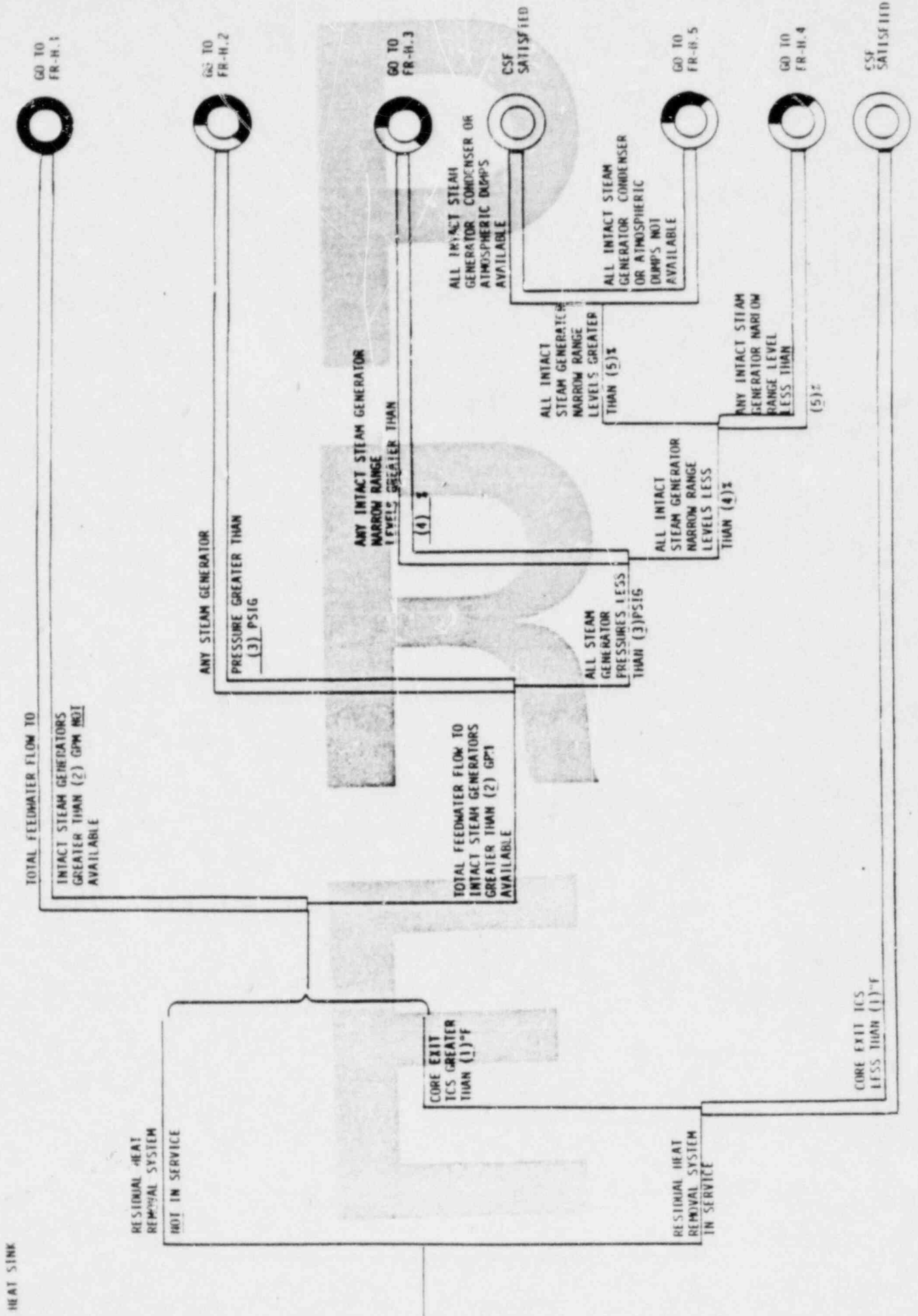

Bruce King, Manager
Westinghouse Owners Group

/bh









HEAT SINK

RESIDUAL HEAT REMOVAL SYSTEM
NOT IN SERVICE

RESIDUAL HEAT REMOVAL SYSTEM
IN SERVICE

CORE EXIT ICS
GREATER THAN (1) °F

CORE EXIT ICS
LESS THAN (1) °F

TOTAL FEEDWATER FLOW TO
INTACT STEAM GENERATORS
GREATER THAN (2) GPM (M01)
AVAILABLE

TOTAL FEEDWATER FLOW TO
INTACT STEAM GENERATORS
GREATER THAN (2) GPM
AVAILABLE

ANY STEAM GENERATOR
PRESSURE GREATER THAN
(3) PSIG

ANY INTACT STEAM GENERATOR
NARROW RANGE
LEVELS GREATER THAN
(4) %

ALL INTACT STEAM
GENERATOR
NARROW RANGE
LEVELS GREATER
THAN (5) %

ALL INTACT
STEAM GENERATOR
NARROW RANGE
LEVELS LESS
THAN (4) %

ANY INTACT STEAM
GENERATOR NARROW
RANGE LEVEL
LESS THAN
(5) %

ALL INTACT STEAM
GENERATOR CONDENSER OR
ATMOSPHERIC DUMPS
AVAILABLE

ALL INTACT STEAM
GENERATOR CONDENSER
OR ATMOSPHERIC
DUMPS NOT
AVAILABLE

GO TO
FR-H.1

GO TO
FR-H.2

GO TO
FR-H.3

CSF
SATISFIED

GO TO
FR-H.5

GO TO
FR-H.4

CSF
SATISFIED

CONTAINMENT

5

CONTAINMENT PRESSURE

GREATER THAN
(1) PSIG

GO TO
FR-Z.1

CONTAINMENT PRESSURE

GREATER THAN
(2) PSIG

GO TO
FR-Z.1

CONTAINMENT
PRESSURE
LESS THAN
(1) PSIG

CONTAINMENT
SUMP LEVEL

GO TO
FR-Z.2

GREATER THAN (3)

CONTAIN-
MENT
PRESSURE
LESS THAN
(2) PSIG

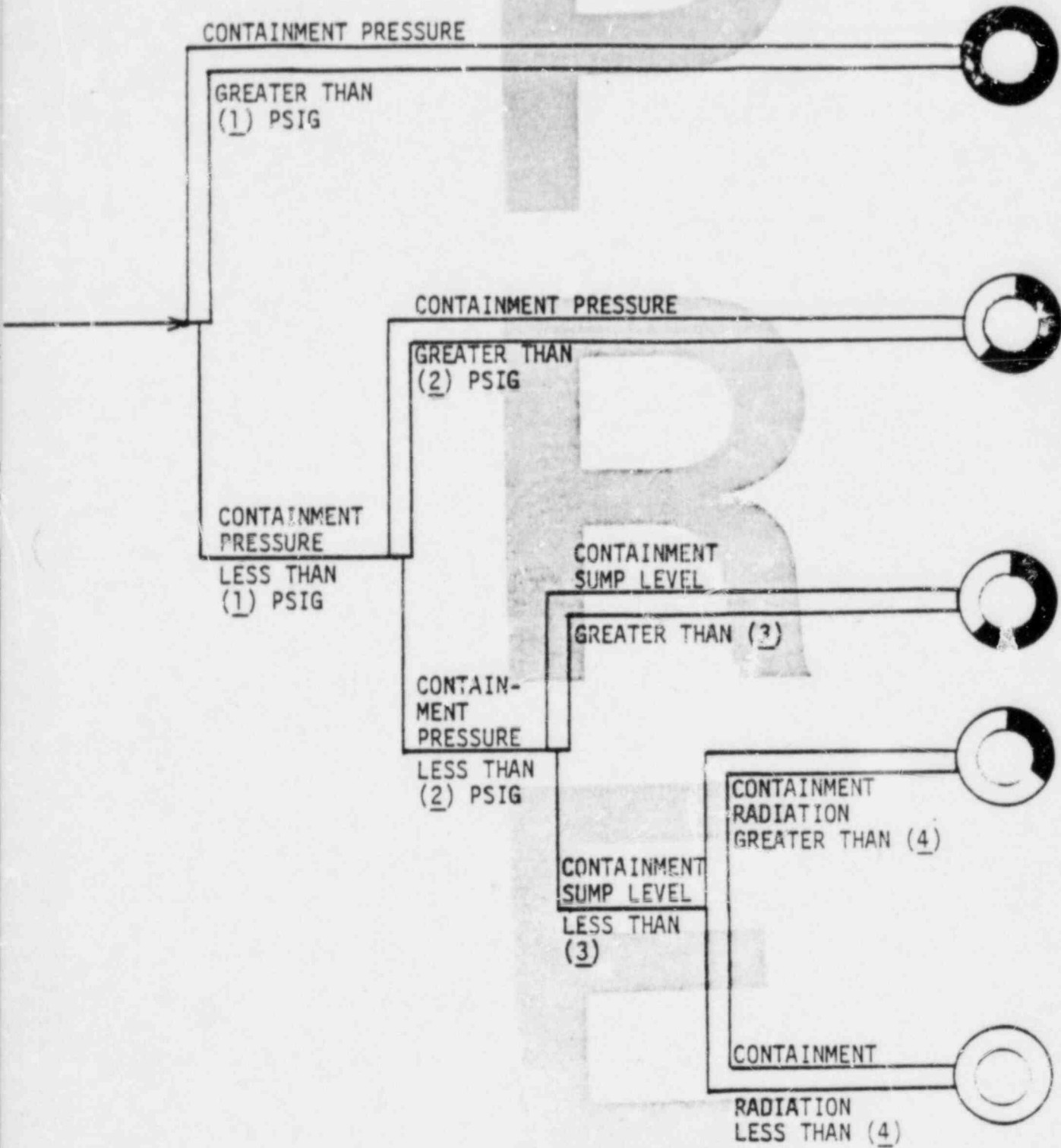
GO TO
FR-Z.3

CONTAINMENT
RADIATION
GREATER THAN (4)

CONTAINMENT
SUMP LEVEL
LESS THAN
(3)

CONTAINMENT
RADIATION
LESS THAN (4)

CSF
SATISFIED



REACTOR COOLANT INVENTORY

PRESSURIZER
LEVEL GREATER THAN (1)%

RVLIS
UPPER HEAD

GREATER THAN OR
EQUAL TO (3)%

GO TO
FR-I.1

RVLIS
UPPER HEAD

LESS THAN (3)%

GO TO
FR-I.3

RVLIS
UPPER HEAD

GREATER THAN OR
EQUAL TO (3)%

CSF
SATISFIED

PRESSURIZER
LEVEL
GREATER THAN
(2)%

RVLIS
UPPER HEAD

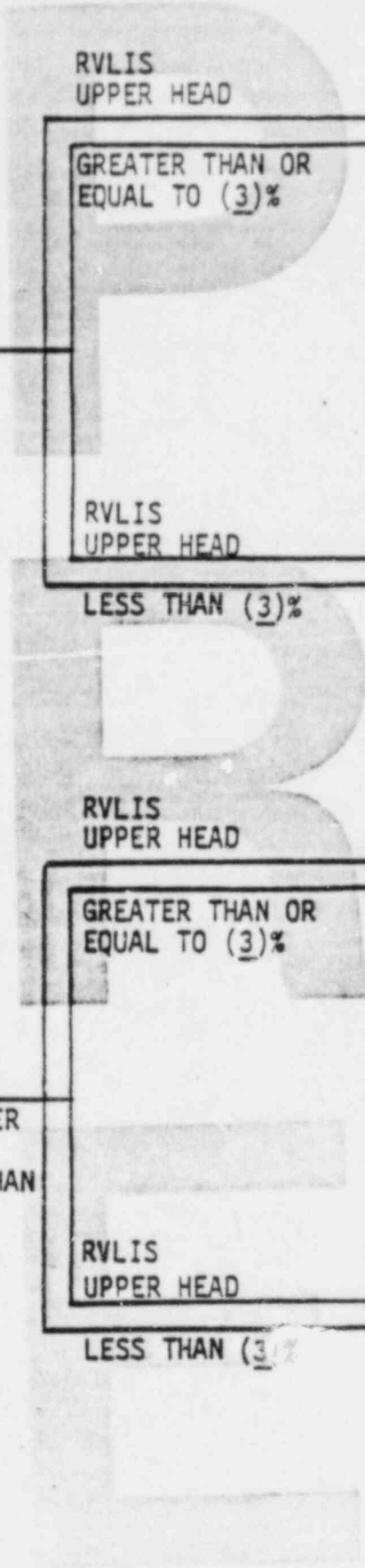
LESS THAN (3)%

GO TO
FR-I.3

PRESSURIZER
LEVEL LESS
THAN (1)%

PRESSURIZER LEVEL
LESS THAN (2)%

GO TO
FR-I.2



FR-S.1

RESPONSE TO NUCLEAR POWER GENERATION

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

1

Verify Reactor Trip:

- Rod bottom lights - LIT
- Reactor trip and bypass breakers - OPEN
- Rod position indicators - ZERO
- Neutron flux - DECREASING

Manually trip reactor. IF reactor will NOT trip, THEN go to ECA-1, ANTICIPATED TRANSIENT WITHOUT SCRAM.

2

Verify Reactor Critical:

a. Nuclear power generation:

- 1) Power range channels - GREATER THAN 5%
- 2) [Enter other plant specific means]

-OR-

Intermediate range **positive** startup rate:

- i) Intermediate range channels - POSITIVE STARTUP RATE
- 2) [Enter other plant specific means]

IF reactor NOT critical, THEN return to guideline in effect.

FR-S.1

RESPONSE TO NUCLEAR POWER GENERATION (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

Caution Charging pump miniflow valves must remain open when RCS pressure is greater than pump shutoff head.

- 3 **Initiate Rapid Boration Of RCS:**
- Start charging pumps
 - Align boration flow path ⁽¹⁾
 - Check RCS pressure - LESS THAN ⁽²⁾ PSIG
 - Open pressurizer PORVs, as necessary, until RCS pressure is ⁽³⁾ psig; verify Containment Ventilation Isolation. IF dampers NOT verified closed, THEN manually close dampers.
- 4 **Verify All Dilution Paths Are Isolated.**
- 5 **Check For Reactivity Insertion From Uncontrolled RCS Cooldown:**
- RCS temperature - LESS THAN 500°F AND DECREASING
- OR-
- Any steam generator pressure - LESS THAN ⁽⁴⁾ PSIG AND DECREASING
- IF uncontrolled cooldown NOT in progress, THEN go to step 9.

(1) Enter plant specific means.

(2) Enter plant specific pump shutoff head.

(3) Enter 200 psig below plant specific pump shutoff head.

(4) Enter 300 psig below plant specific no load steam pressure.

Number:	Symptom/ Title:	Revision No./ Date
FR-S.1	RESPONSE TO NUCLEAR POWER GENERATION (Cont.)	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6	Verify Main Steamline Isolation: a. Main and bypass steamline isolation valves - CLOSED	a. Manually close valves.
7	Identify Faulted Steam Generator(s): a. Pressure lower in any steam generator(s) than the others	a. <u>IF</u> all steam generator pressures approximately equal, <u>THEN</u> go to step 9.
8	Isolate Faulted Steam Generator(s): a. Isolate main feedwater [Enter plant specific means] b. Isolate AFW [Enter plant specific means] c. Close steam generator(s) PORV d. Close steam supply valve to turbine driven AFW pump	c. Locally close steam generator(s) PORV block valve.
9	Check Intact Steam Generator Levels: a. Narrow range level - GREATER THAN <u>(1)</u> % b. Throttle AFW flow to maintain narrow range level at <u>(2)</u> %	a. <u>IF</u> less than <u>(1)</u> %, <u>THEN</u> maintain full AFW flow until narrow range level is greater than <u>(1)</u> %.

(1) Enter plant specific value showing level just in the narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter plant specific value corresponding to no-load steam generator level including allowances for post-accident transmitter errors and reference leg process errors.

Number: FR-S.1	Symptom/Title: RESPONSE TO NUCLEAR POWER GENERATION (Cont.)	Revision No., Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10	<p>Verify Reactor Subcritical:</p> <p>a. Power range channels – LESS THAN 5%</p> <p>b. Intermediate range channels – NEGATIVE STARTUP RATE</p> <p>NOTE <i>Boration may be stopped when the reactor is subcritical and any uncontrolled cooldown is stopped.</i></p>	<p><u>IF</u> reactor <u>NOT</u> subcritical, continue to borate and return to step 5.</p>
11	<p>Return To Guideline In Effect.</p>	<p>— END —</p>

FR-S.2

RESPONSE TO LOSS OF CORE SHUTDOWN

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

1

Verify Loss Of Core Shutdown:

a. Source range positive startup rate:

- 1) Source range channels – POSITIVE STARTUP RATE
- 2) [Enter other plant specific means]
- 3) Go to step 3

-OR-

Intermediate range negative or zero startup rate:

- 1) Intermediate range channels – NEGATIVE OR ZERO STARTUP RATE
- 2) [Enter other plant specific means]

IF core shutdown verified, THEN return to guideline in effect.

2

Check Intermediate Range Flux:

a. Flux – BELOW ⁽¹⁾

a. WHEN flux decreases below ⁽¹⁾ THEN do steps 2b,c,d. IF flux not decreasing, THEN check intermediate range channels for undercompensation. IF under compensated, THEN manually energize source range detectors. IF NOT under compensated, THEN borate RCS until flux BELOW ⁽¹⁾.

b. Verify source range detectors re-energized

b. Manually re-energize source range detectors.

c. Transfer nuclear recorders to source range scale

d. Go to step 4

(1) Enter plant specific value for intermediate range permissive to block source range high flux trip (P-6).

Number: FR-S.2	Symptom/Titles: RESPONSE TO LOSS OF CORE SHUTDOWN (Cont.)	Revision No./ Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3	Borate RCS: a. [Enter plant specific means]	
4	Verify Source Range Channels - ZERO OR NEGATIVE STARTUP RATE.	Borate, if needed, until source range startup rate is negative or zero.
	<p>NOTE <i>Boration may continue, as necessary, to obtain adequate shutdown margin or may be stopped at this time.</i></p>	
5	Return To Guideline In Effect.	
	—END—	

Number: FR-C.1	Symptom/Title: RESPONSE TO INADEQUATE CORE COOLING	Revision No./ Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution If RWST level reaches (1), align SI system for cold leg recirculation per ES-1.3, TRANSFER TO COLD LEG RECIRCULATION FOLLOWING LOSS OF REACTOR COOLANT.

- | | | |
|---|---|--|
| 1 | Check Accumulator Isolation Valve Status:
a. Power available to isolation valve
b. Isolation valves - OPEN | a. Restore power to isolation valves.
b. Open isolation valve. |
| 2 | Check RCP Support Conditions:
a. Conditions available for running an RCP - [Enter plant specific list] | a. Try to establish conditions for running an RCP. |
| 3 | Reestablish High Pressure SI Flow To RCS:
a. Charging/SI pump breaker indicator lights - LIT
b. High-head SI pump breaker lights - LIT
c. SI valves - PROPER EMERGENCY ALIGNMENT - [Enter plant specific list]
d. Try to start - [Enter plant specific list] | a. Try to start pumps.
b. Try to start pumps.
c. Manually open or close valves as appropriate. |

(1) Enter plant specific value corresponding to RWST switchover alarm, in plant specific units.

Number: FR-C.1	Symptom/Title: RESPONSE TO INADEQUATE CORE COOLING (Cont.)	Revision No., Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution *Alternate water sources for AFW pumps will be necessary if CST level is low.*

- 4 Check Steam Generator Levels:**
- | | |
|---|---|
| <p>a. Narrow range level – GREATER THAN <u>(1)</u> %</p> <p>b. Throttle AFW flow to maintain narrow range level at <u>(2)</u> %</p> | <p>a. <u>IF</u> less than <u>(1)</u> %, <u>THEN</u> maintain full AFW flow until narrow range level is greater than <u>(1)</u> %.</p> |
|---|---|
-
- 5 Check Low-head SI Pump Status:**
- | | |
|--|---|
| <p>a. Low-head SI pump breaker indicator lights – LIT</p> <p>b. SI valves – PROPER EMERGENCY ALIGNMENT – [Enter plant specific list]</p> | <p>a. Manually start pumps.</p> <p>b. Manually open or close valves as appropriate.</p> |
|--|---|

Caution *Low-head pumps should not be run longer than (3) without CCW.*

- 6 Check Core Exit TCs:**
- | | |
|--|---|
| <p>a. Temperature – LESS THAN 1200°F</p> | <p>a. <u>IF</u> greater than 1200°F, <u>THEN</u> go to step 10.</p> |
|--|---|
-
- 7 Check Containment Conditions:**
- | | |
|--|---|
| <p>a. Containment pressure – NORMAL</p> <p>b. Containment radiation – NORMAL</p> <p>c. Containment recirculation sump level – NORMAL</p> <p>d. <u>IF</u> all containment conditions normal, <u>THEN</u> go to E-O, REACTOR TRIP OR SAFETY INJECTION, STEP 18</p> | <p>a. <u>IF</u> high, <u>THEN</u> go to step 8.</p> <p>b. <u>IF</u> high, <u>THEN</u> go to step 8.</p> <p>c. <u>IF</u> high, <u>THEN</u> go to step 8.</p> |
|--|---|

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter plant specific value corresponding to no-load steam generator level including allowances for post-accident transmitter errors and reference leg process errors.

(3) Enter plant specific time.

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

8

Check RVLIS Narrow Range Indication:

a. RVLIS narrow range - **LESS THAN (1)**

a. **IF** greater than (1), **THEN** go to E-1, LOSS OF REACTOR COOLANT, STEP 1.

9

Check Core Exit TCs:

a. Temperature - **GREATER THAN 700°F**

a. **IF** less than 700°F, **THEN** go to E-1, LOSS OF REACTOR COOLANT, STEP 1.

NOTE Continue with this guideline while obtaining hydrogen sample in step 10.

10

Check Containment Hydrogen Concentration:

a. Dispatch plant chemist to obtain hydrogen sample

b. Hydrogen concentration - **LESS THAN 4% IN DRY AIR**

b. **Consult TSC for further recovery actions.**

NOTE Steps 11 through 21 provide instructions for depressuring RCS using steam generator secondary depressuration.

11

Check Accumulator Status:

a. Accumulator isolation valve - **OPEN**

a. **IF** accumulators have been previously isolated, **THEN** go to step 17.

b. Accumulator gas - **HAS NOT BEEN VENTED**

b. **IF** accumulators have been previously vented, or are being vented, **THEN** go to step 16.

(1) Enter plant specific value which is 3½ feet above bottom of active fuel in core with zero void fraction, plus uncertainties.

Number:

FR-C.1

Symptom/Title:

RESPONSE TO INADEQUATE CORE COOLING (Cont.)

Revision No./ Date

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
12	<p>Check RCS Vent Paths:</p> <p>a. Power available to PORV block valves</p> <p>b. PORVs - CLOSED</p> <p>c. Block valves - OPEN</p> <p>d. Other RCS vent paths - CLOSED</p>	<p>a. Restore power to block valves.</p> <p>b. Manually close PORVs. <u>IF</u> any valve cannot be closed, <u>THEN</u> manually close its block valve.</p> <p>c. Open block valve unless it was closed to isolate a faulty PORV.</p> <p>d. Manually close any open RCS vent path.</p>
13	<p>Rapidly Decrease Steam Generator Pressure To <u>(1)</u> Psig:</p> <p>a. Dump steam to condenser</p> <p>1) [Enter plant specific steps]</p>	<p>a. Dump steam with steam generator PORVs.</p> <p><u>IF</u> steam generator pressure cannot be decreased to <u>(1)</u> psig, <u>THEN</u> go to step 22. <i>OBSERVE NOTES PRIOR TO STEP 22.</i></p>
14	<p>Check RCS Hot Leg Temperatures:</p> <p>a. At least two temperatures - LESS THAN 400°F</p>	<p>a. <u>IF NOT</u> less than 400°F, <u>THEN</u> go to step 22. <i>OBSERVE NOTES PRIOR TO STEP 22.</i></p>
5	<p>Stop All RCPs.</p>	
16	<p>Isolate All Accumulators:</p> <p>a. Close all accumulator isolation valves</p>	<p>a. For any accumulator that can not be isolated, vent accumulator gas to less than <u>(2)</u> psig. Do not proceed to step 17 until the venting is completed. Continue to monitor core exit TCs. <u>IF</u> temperature exceeds 1200°F, <u>THEN</u> go to step 22. <i>OBSERVE NOTES PRIOR TO STEP 22.</i></p>

(1) Enter plant specific value which is 200 psig plus instrument uncertainties.

(2) Refer to background document.

Number: FR-C.1	Symptom/Title: RESPONSE TO INADEQUATE CORE COOLING (Cont.)	Revision No./ Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17	Rapidly Decrease Steam Generator Pressure To Atmospheric Pressure: a. Dump steam to condenser [Enter plant specific steps]	a. Dump steam with steam generator PORVs.
18	Verify Low-head SI Flow: a. [Enter plant specific steps]	a. Manually start pumps and align valves as appropriate.
19	Check RCP Status: a. All RCPs - STOPPED	a. Stop all RCPs.
20	Check Core Cooling: a. Core exit TCs - LESS THAN 400°F b. RVLIS narrow range indication - GREATER THAN <u>(1)</u>	a. Do not proceed until core exit TCs less than 400°F. b. Do not proceed until RVLIS narrow range greater than <u>(1)</u> .
21	Go To E-1, LOSS OF REACTOR COOLANT, STEP 13.	

(1) Enter plant specific value which is top of core plus instrument uncertainties.

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- NOTE**
- Steps 22 through 31 provide a method for depressurizing the RCS in the event secondary depressurization is not effective.
 - If the capability for dumping steam is restored while performing steps 22 through 31; then, return to step 11.
 - Normal conditions are desired but not required for starting RCPs.

22

Check Core Exit TCs:

a. Temperature - LESS THAN 1200°F

a. Start RCPs as necessary until core exit TCs less than 1200°F.

IF core exit TCs greater than 1200°F and all available RCPs running, THEN open all pressurizer PORVs and block valves.

IF core exit TCs greater than 1200°F and all pressurizer PORVs and block valves are open, THEN open all other RCS vent paths to containment.

23

Initiate Depressurization Of Steam Generators To Atmospheric Pressure:

[Enter plant specific steps]

24

Check Steam Generator Levels:a. Narrow range level - GREATER THAN (1) %a. IF less than (1) %, THEN maintain full AFW flow until narrow range level is greater than (1) %.b. Throttle AFW flow to maintain narrow range level at (2) %

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter plant specific value corresponding to no-load steam generator level including allowances for post-accident transmitter errors and reference leg process errors.

FR-C.1

RESPONSE TO INADEQUATE CORE COOLING (Cont.)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25	Verify Low-head SI Flow: a. [Enter plant specific steps]	a. Manually start pumps and align valves as appropriate. Do not proceed until at least intermittent low-head SI flow is verified.
26	Isolate All Accumulators: a. Close all accumulator isolation valves	a. For any accumulator that can not be isolated, vent accumulator gas to less than <u>(1)</u> psig. Do not proceed until the venting is completed.
27	Check RCS Hot Leg Temperatures: a. At least two temperatures – LESS THAN 350°F	a. <u>IF NOT</u> less than 350°F, <u>THEN</u> do not proceed until at least two temperatures less than 350°F.
28	Stop All RCPs.	
29	Verify Low-head SI Flow: a. [Enter plant specific steps]	a. <u>IF</u> continuous low-head SI flow cannot be verified, <u>THEN</u> return to step 22. <i>OBSERVE NOTES to PRIOR TO STEP 22.</i>
30	Check Core Cooling: a. Core exit TCs – LESS THAN 400°F b. RVLIS narrow range indication – GREATER THAN <u>(2)</u>	a. Do not proceed until core exit TCs less than 400°F. b. Do not proceed until RVLIS narrow range greater than <u>(2)</u> .
31	Go To E-1, LOSS OF REACTOR COOLANT, STEP 13.	

— END —

(1) Refer to background document.

(2) Enter plant specific value which is top of core plus instrument uncertainties.

Number: FR-C.2	Symptom/Title: RESPONSE TO DEGRADED CORE COOLING	Revision No./ Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution If RWST level reaches ⁽¹⁾, align SI system for cold leg recirculation per ES-1.3, **TRANSFER TO COLD LEG RECIRCULATION FOLLOWING LOSS OF REACTOR COOLANT.**

- | | | |
|--|--|--|
| 1 | <p>Reestablish High Pressure SI Flow To RCS:</p> <p>a. Charging/SI flow:
1) [Enter plant specific steps]</p> <p>b. High-head SI flow:
1) [Enter plant specific steps]</p> | <p>IF High Pressure SI flow cannot be reestablished, THEN continue attempts to reestablish High Pressure SI flow and go to step 2.</p> |
| 2 | <p>Check Accumulator Isolation Valve Status:</p> <p>a. Power available to isolation valves</p> <p>b. Isolation valves - OPEN</p> | <p>a. Restore power to isolation valves.</p> <p>b. Open isolation valves.</p> |
| <p>NOTE Normal conditions for running RCPs are desired but RCPs should not be tripped if normal conditions cannot be established or maintained.</p> | | |
| 3 | <p>Check RCP Support Conditions:</p> <p>a. Conditions available for the operating RCPs - [Enter plant specific list]</p> | <p>a. Try to establish conditions for the operating RCPs.</p> |

Caution Alternate water sources for AFW pumps will be necessary if CST level is low.

FR-C.2

RESPONSE TO DEGRADED CORE COOLING (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4

Check Steam Generator Levels:

- a. Narrow range level – **GREATER THAN** (1) %
- b. Throttle AFW flow to maintain narrow range level at (2) %

- a. IF less than (1) %, THEN maintain full AFW flow until narrow range level is greater than (1) %.

5

Check Containment Conditions:

- a. Containment pressure – **NORMAL**
- b. Containment radiation – **NORMAL**
- c. Containment recirculation sump level – **NORMAL**
- d. IF all containment conditions normal, THEN go to E-O, REACTOR TRIP OR SAFETY INJECTION, STEP 18

- a. IF high, THEN go to step 6.
- b. IF high, THEN go to step 6.
- c. IF high, THEN go to step 6.

6

Check RVLIS Narrow Range Indication:

- a. RVLIS narrow range – **LESS THAN** (3)
- b. RVLIS narrow range – **STABLE OR DECREASING**

- a. IF greater than (3), THEN go to E-1, LOSS OF REACTOR COOLANT, STEP 1.
- b. IF increasing, THEN return to step 1.

7

Check RCP Status:

- a. Any RCP – **STOPPED**

- a. IF all RCPs running, THEN stop RCP in loop (4).

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter plant specific value corresponding to no-load steam generator level including allowances for post-accident transmitter errors and reference leg process errors.

(3) Enter plant specific value corresponding to status free transition with RCPs running.

(4) Enter loop designation for loop connected to pressurizer surge line.

Number: FR-C.2	Symptom/Title: RESPONSE TO DEGRADED CORE COOLING (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8	<p>Check Pressurizer PORV Block Valves:</p> <p>a. Power available to block valves</p> <p>b. PORVs - CLOSED</p> <p>c. Block valves - OPEN</p>	<p>a. Restore power to block valves.</p> <p>b. Manually close PORVs. <u>IF</u> any valve cannot be closed, <u>THEN</u> manually close its block valve.</p> <p>c. Open block valve unless it was closed to isolate a faulty PORV.</p>
9	<p>Slowly Decrease Steam Generator Pressure To <u>(1)</u> PSIG:</p> <p>a. Maintain cooldown rate - LESS THAN 50°F/HR</p> <p>b. Dump steam to condenser: 1) [Enter plant specific steps]</p>	<p>b. Dump steam with steam generator PORVs. <u>IF</u> steam generator PORVs <u>NOT</u> available, <u>THEN</u> dump steam by [other plant specific means].</p>
10	<p><u>WHEN</u> Steam Generator Pressure Decreased To <u>(1)</u> PSIG, <u>THEN</u> Check RCS Hot Leg Temperatures:</p> <p>a. At least two temperatures - LESS THAN 400°F</p>	<p>a. <u>IF NOT</u> less than 400°F, <u>THEN</u> return to step 9.</p>
11	<p>Isolate All Accumulators:</p> <p>a. Close all accumulator isolation valves</p>	<p>a. For any accumulator that can not be isolated, vent accumulator gas to less than <u>(2)</u> psig. Do not proceed <u>until</u> the venting is completed.</p>
12	<p>Check Low-head SI Pump Status:</p> <p>a. Low-head SI pump breaker indicator lights - LIT</p> <p>b. SI valves - PROPER EMERGENCY ALIGNMENT - [Enter plant specific list]</p>	<p>a. Manually start pumps.</p> <p>b. Manually open or close valves as appropriate.</p>

(1) Enter plant specific value which is 200 psig plus instrument uncertainties
(2) Refer to background document.

Number: FR-C.2	Symptom/Title: RESPONSE TO DEGRADED CORE COOLING (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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13 Stop All RCPs.

Caution IF core exit TCs increase above 1200°F during subsequent steps, THEN go to FR-C.1.

14 Slowly Decrease Steam Generator Pressure To Atmospheric Pressure:

a. Maintain cooldown rate - LESS THAN 50°F/HR

b. Dump steam to condenser:
1) [Enter plant specific steps]

b. Dump steam with steam generator PORVs. IF steam generator PORVs NOT available, THEN dump steam by any other means.

15 Verify Low-head SI Flow:

a. [Enter plant specific means]

a. Manually start pumps and align valves as appropriate.

16 Check Core Cooling:

a. Core exit TCs - LESS THAN 400°F

b. RVLIS narrow range indication - GREATER THAN (1)

a. Do not proceed until core exit TCs less than 400°F.

b. Do not proceed until RVLIS narrow range greater than (1).

17 Go To E-1, LOSS OF REACTOR COOLANT, STEP 13.

— END —

(1) Enter plant specific value which is top of core plus instrument uncertainties.

FR-C.3

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

1

Verify SI Pumps Running:

- | | |
|--|--|
| <ul style="list-style-type: none"> a. Charging/SI pump breaker indicator lights - LIT b. High-head SI pump breaker indicator lights - LIT c. <u>IF</u> RCS pressure is less than <u>(1)</u> psig, <u>THEN</u> check low-head SI pump breaker indicator lights - LIT | <ul style="list-style-type: none"> a. Manually start pumps. b. Manually start pumps. c. Manually start pumps, if necessary. |
|--|--|

2

Verify SI Flow:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Charging/SI pump flow indicator - CHECK FOR FLOW b. <u>IF</u> RCS pressure is less than <u>(2)</u> psig, <u>THEN</u> check high-head SI pump flow indicators - CHECK FOR FLOW c. <u>IF</u> RCS pressure is less than <u>(1)</u> psig, <u>THEN</u> check low-head SI flow indicators - CHECK FOR FLOW | <ul style="list-style-type: none"> a. Manually start pumps and align valves as appropriate. b. Manually start pumps and align valves as appropriate. c. Manually start pumps and align valves as appropriate. |
|---|--|

3

Verify SI Valve Alignment:

- | | |
|--|--|
| <ul style="list-style-type: none"> a. SI valves - PROPER EMERGENCY ALIGNMENT <u>(3)</u> | <ul style="list-style-type: none"> a. Manually open or close valves as appropriate. |
|--|--|

(1) Enter plant specific shutoff pressure of low-head SI pumps.

(2) Enter plant specific shutoff pressure of high-head SI pumps.

(3) Enter plant specific list.

Number:

Symptom/Title:

Revision No., Date

FR-C.3

**RESPONSE TO POTENTIAL LOSS
OF CORE COOLING (Cont.)**

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

4

Check Containment Conditions:

a. Containment pressure - NORMAL

b. Containment radiation - NORMAL

c. Containment recirculation sump
level - NORMAL

a. IF high, THEN go to E-1, LOSS
OF REACTOR COOLANT.

b. IF high, THEN go to E-1, LOSS
OF REACTOR COOLANT.

c. IF high, THEN go to E-1, LOSS
OF REACTOR COOLANT.

5

Return To Guideline In Effect.

- END -

FR-C.4

RESPONSE TO SATURATED CORE COOLING CONDITIONS

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	<p>Verify SI Pumps Running:</p> <p>a. Charging/SI pump breaker indicator lights - LIT</p> <p>b. High-head SI pump breaker indicator lights - LIT</p> <p>c. <u>IF</u> RCS pressure is less than <u>(1)</u> psig, <u>THEN</u> check low-head SI pump breaker indicator lights - LIT</p>	<p>a. Manually start pumps.</p> <p>b. Manually start pumps.</p> <p>c. Manually start pumps, if necessary.</p>
2	<p>Verify SI Flow:</p> <p>a. Charging/SI pump flow indicator - CHECK FOR FLOW</p> <p>b. <u>IF</u> RCS pressure is less than <u>(2)</u> psig, <u>THEN</u> check high-head SI pump flow indicators - CHECK FOR FLOW</p> <p>c. <u>IF</u> RCS pressure is less than <u>(1)</u> psig, <u>THEN</u> check low-head SI flow indicators - CHECK FOR FLOW</p>	<p>a. Manually start pumps and align valves as appropriate.</p> <p>b. Manually start pumps and align valves as appropriate.</p> <p>c. Manually start pumps and align valves as appropriate.</p>
3	<p>Verify SI Valve Alignment:</p> <p>a. SI valves - PROPER EMERGENCY ALIGNMENT <u>(3)</u></p>	<p>a. Manually open or close valves as appropriate.</p>
4	<p>Return To Guideline In Effect.</p>	
<p>-- END --</p>		

(1) Enter plant specific shutoff pressure of low-head SI pumps.

(2) Enter plant specific shutoff pressure of high-head SI pumps.

(3) Enter plant specific list.

Number: FR-H.1	Symptom/TITLE: RESPONSE TO LOSS OF SECONDARY HEAT SINK	Revision No. / Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	<p><i>Caution</i> ● If RCS pressure and temperature start to increase due to loss of secondary heat sink while doing steps 1 through 11, go immediately to step 13.</p> <p>● A faulted or ruptured steam generator should remain isolated throughout further restoration actions.</p>	
1	<p>Check If Secondary Heat Sink Is Required:</p> <p>a. RCS pressure - GREATER THAN ANY INTACT STEAM GENERATOR PRESSURE</p>	<p>a. IF less than all intact steam generator pressures, THEN go to E-1, LOSS OF REACTOR COOLANT, STEP 1.</p>
2	<p>Establish AFW Flow To Intact Steam Generators:</p> <p>a. Align AFW valves for proper emergency alignment ⁽¹⁾</p> <p>b. Start AFW pumps:</p> <ul style="list-style-type: none"> • Motor-driven pumps • Turbine-driven pump <p>c. Check CST level - GREATER THAN ⁽²⁾ %</p>	<p>a. Locally align valves, if possible.</p> <p>b. Locally start pumps, if possible.</p> <p>c. IF CST level low, THEN switch to alternate AFW water supply.</p>
3	<p>Check AFW Flow To Intact Steam Generators:</p> <p>a. Total AFW flow to intact steam generators - GREATER THAN ⁽³⁾ GPM</p> <p>b. IF greater than ⁽³⁾ gpm, THEN return to guideline in effect</p>	<p>a. IF less than ⁽³⁾ gpm, THEN go to step 4.</p>
	<p>(1) Enter plant specific list.</p> <p>(2) Enter plant specific low level setpoint.</p> <p>(3) Enter plant specific flow equal to at least one motor-driven AFW pump at design pressure.</p>	

Number:	Symptom/Title:	Revision No./Date:
FR-H.1	RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4	<p>Check Feedwater Isolation:</p> <p>a. [Enter plant specific means]</p> <p><u>IF</u> feedwater isolation is actuated, <u>THEN</u> reset SI and feedwater isolation</p>	
5	<p>Establish Main Feedwater Flow To Intact Steam Generators:</p> <p>a. [Enter plant specific means]</p>	<u>IF</u> main feedwater cannot be established, <u>THEN</u> go to step 7.
6	<p>Check Intact Steam Generator Levels:</p> <p>a. Narrow range level in at least one intact steam generator - GREATER THAN (1) %</p> <p>b. <u>IF</u> greater than (1) %, <u>THEN</u> return to guideline in effect</p>	a. <u>IF</u> less than (1) %, <u>THEN</u> go to step 7.
7	Check Condensate System - AVAILABLE	<u>IF NOT</u> available, <u>THEN</u> go to step 12.
8	Rapidly Depressurize At Least One Intact Steam Generator(s) To (2) PSIG.	
9	<p>Check Feedwater Isolation:</p> <p>a. [Enter plant specific means]</p> <p><u>IF</u> feedwater isolation is actuated, <u>THEN</u> reset SI and feedwater isolation</p>	
10	<p>Establish Condensate Flow To At Least One Depressurized Intact Steam Generator(s):</p> <p>a. [Enter plant specific means]</p>	<u>IF</u> condensate flow cannot be established, <u>THEN</u> go to step 12.

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter plant specific pressure below shutoff head of condensate pumps.

Number: FR-H.1	Symptom/Title: RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	Revisor: No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11	<p>Check Intact Steam Generator Levels:</p> <p>a. Narrow range level in at least one depressurized intact steam generator - GREATER THAN (1) %</p> <p>b. IF greater than (1) %, THEN return to guideline in effect</p>	<p>a. IF less than (1) %, THEN go to step 12.</p>
12	<p>Check For Loss Of Secondary Heat Sink:</p> <p>a. RCS temperature:</p> <p>1) Wide range temperatures - INCREASING</p> <p style="text-align: center;">-OR-</p> <p>2) Core exit TCs - INCREASING</p> <p>b. RCS pressure - INCREASING</p>	<p>a. IF stable or decreasing, THEN return to step 1.</p> <p>b. IF stable or decreasing, THEN return to step 1.</p>
<p><i>Caution</i> Steps 13 through 17 must be performed quickly in order to establish RCS heat removal by RCS bleed and feed.</p>		
13	<p>Verify SI Initiated.</p>	<p>IF NOT initiated, THEN:</p> <p>a. Manually initiate SI.</p> <p>b. Verify SI automatic actuations while continuing in this guideline.</p> <ul style="list-style-type: none"> • Implement steps 5 through 15 of E-O, REACTOR TRIP OR SAFETY INJECTION.

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

Number: FR-H.1	Symptom/Title: RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
14	<p>Check RCS Feed Path:</p> <p>a. Check charging/SI valve alignment - PROPER EMERGENCY ALIGNMENT</p> <p>b. Check charging/SI pump running - AT LEAST ONE BREAKER INDICATOR LIGHT LIT</p>	<p>a. Manually open or close valves, as appropriate.</p> <p>b. Manually start pumps. <u>IF</u> at least one charging/SI pump cannot be started, <u>THEN</u> DO NOT ESTABLISH RCS BLEED PATH. Continue attempts to start charging/SI pumps.</p>
<p><i>Caution</i> DO NOT proceed to step 15 until RCS feed path is established.</p>		
15	<p>Establish RCS Bleed Path:</p> <p>a. Verify power available to pressurizer PORV block valves</p> <p>b. Verify pressurizer block valves - OPEN</p> <p>c. Open all pressurizer PORVs</p>	<p>a. Restore power to block valves.</p> <p>b. Open block valves.</p>
16	<p>Check RCS Bleed Path:</p> <p>a. Pressurizer PORVs - AT LEAST TWO OPEN</p>	<p>a. <u>IF</u> two pressurizer PORVs <u>NOT</u> <u>open</u>, <u>THEN</u>:</p> <ol style="list-style-type: none"> 1) Start one RCP (preferably in an intact loop). 2) Open steam generator PORV for at least one intact steam generator(s). 3) Depressurize intact steam generator(s) to atmospheric pressure. 4) Align low pressure water source to depressurized intact steam generator(s). 5) Go to step 18.

Number: FR-H.1	Symptom/Title: RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	<p><i>Caution</i> Seal injection flow should be maintained to all RCPs.</p>	
17	<p>Maintain RCS Heat Removal:</p> <ul style="list-style-type: none"> a. Maintain SI flow b. Maintain AT LEAST TWO pressurizer PORVs open c. Stop all RCPs 	
	<p><i>Caution</i> If RWST level reaches ⁽¹⁾, align SI system for cold leg recirculation per ES-1.3, TRANSFER TO COLD LEG RECIRCULATION FOLLOWING LOSS OF REACTOR COOLANT.</p>	
18	<p>Prepare For Switchover To Cold Leg Recirculation While Continuing In This Guideline:</p> <ul style="list-style-type: none"> a. Implement steps 13 through 17 of E-1, LOSS OF REACTOR COOLANT 	
19	<p>Continue Attempts To Establish Secondary Heat Sink:</p> <ul style="list-style-type: none"> • AFW flow • Main feedwater flow • Condensate flow • Other low pressure flow 	
20	<p>Check RCS Temperatures:</p> <ul style="list-style-type: none"> a. Core exit TCs - DECREASING b. Wide range temperatures - DECREASING 	<ul style="list-style-type: none"> a. <u>IF NOT</u> decreasing, <u>THEN</u> return to step 19. b. <u>IF NOT</u> decreasing, <u>THEN</u> return to step 19.

(1) Enter plant specific value corresponding to RWST switchover alarm in plant specific units.

No. and Short FR-H.1	Symptom/Title RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
21	Check For Adequate Secondary Heat Sinks: a. Narrow range level in at least one intact steam generator - GREATER THAN <u>(1)</u> % b. RCS subcooling based on core exit TCs - GREATER THAN <u>(2)</u> °F	a. <u>IF</u> less than <u>(1)</u> %, <u>THEN</u> return to step 19. b. <u>IF</u> less than <u>(2)</u> °F, <u>THEN</u> return to step 19.
22	Isolate RCS Bleed Path: a. Monitor and record core exit TC baseline temperatures b. Close all pressurizer PORVs c. Compare core exit TC temperature increase to baseline - INCREASE LESS THAN 15°F	c. <u>IF</u> increase greater than 15°F, <u>THEN</u> reopen all pressurizer PORVs and return to step 19.
<p>NOTE <i>It may be necessary to modify subsequent diagnostic and recovery guidance to account for plant conditions resulting from actions performed in this guideline.</i></p>		
23	Check If SI Can Be Terminated: a. RCS pressure - INCREASES BY AT LEAST 200 PSIG b. Pressurizer level - GREATER THAN 50% c. RCS subcooling - GREATER THAN <u>(2)</u> °F	a. DO NOT TERMINATE SI. Go to E-0, REACTOR TRIP OR SAFETY INJECTION, STEP 29. b. DO NOT TERMINATE SI. Go to E-0, REACTOR TRIP OR SAFETY INJECTION, STEP 29. c. DO NOT TERMINATE SI. Go to E-0, REACTOR TRIP OR SAFETY INJECTION, STEP 29.

(1) Enter plant specific value showing level just in narrow range including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

(2) Enter sum of temperature and pressure measurement system errors translated into temperature using saturation tables.

Number: FR-H.1	Symptom/Title: RESPONSE TO LOSS OF SECONDARY HEAT SINK (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24	Terminate SI: a. Go to ES-2.1, SI TERMINATION FOLLOWING LOSS OF SECONDARY COOLANT	
	-- END --	

Number: FR-H.2	Symptom/TITLE: RESPONSE TO STEAM GENERATOR OVERPRESSURE	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution Steam generator pressure greater than (1) psig may result in failure of affected steam generator.

NOTE Throughout this guideline, "affected" refers to a steam generator in which pressure has exceeded (1) psig.

- | | | |
|---|--|---|
| 1 | <p>Identify Affected Steam Generator:</p> <p>a. Steam generator pressure –
GREATER THAN <u>(1)</u> PSIG</p> | <p>a. <u>IF</u> less than <u>(1)</u> psig in ALL steam generators, <u>THEN</u> return to guideline in effect.</p> |
| 2 | <p>Dispatch Personnel To Inspect Affected Steam Generator Safety Valves.</p> | |
| 3 | <p>Verify Feedwater Isolation:</p> <p>a. Flow control valves – CLOSED</p> <p>b. Flow control bypass valves – CLOSED</p> <p>c. Feedwater isolation valves – CLOSED</p> | <p>a. Manually close valves.</p> <p>b. Manually close valves.</p> <p>c. Manually close valves.</p> |
| 4 | <p>Release Steam From Affected Steam Generator Using PORV:</p> <p>a. Open affected steam generator PORV</p> <p>b. Check affected steam generator pressure – DECREASING</p> <p>c. WHEN affected steam generator pressure is less than <u>(2)</u> psig, THEN close PORV</p> | <p>a. <u>IF</u> PORV cannot be opened, <u>THEN</u> go to step 6.</p> |

(1) Enter plant specific pressure for highest steamline safety valve setpoint, including allowances for accumulation.
(2) Enter plant specific pressure for lowest steamline safety valve setpoint.

Number:

Symptom/Title:

Revision No./Date

FR-H.2

RESPONSE TO STEAM GENERATOR OVERPRESSURE (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

5

Check Affected Steam Generator Pressure:

- a. Affected steam generator pressure - LESS THAN (1) PSIG
- b. IF less than (1) psig, THEN return to guideline in effect

a. IF greater than (1) psig, THEN return to step 4.

6

Release Steam From Affected Steam Generator To Main Steam System:

- a. Open affected steam generator main steam isolation bypass valve
- b. Check affected steam generator pressure - DECREASING
- c. WHEN affected steam generator pressure is less than (2) psig, THEN close affected steam generator bypass valve

a. IF bypass valve cannot be opened, THEN go to step 8.

7

Check Affected Steam Generator Pressure:

- a. Affected steam generator pressure - LESS THAN (1) PSIG
- b. IF less than (1) psig, THEN return to guideline in effect

a. IF greater than (1) psig, THEN return to step 6.

8

Check Affected Steam Generator Level:

- a. Narrow range level - LESS THAN 100%

a. IF greater than 100%, THEN go to step 11.

(1) Enter plant specific pressure for highest steamline safety valve setpoint, including allowances for accumulation.

(2) Enter plant specific pressure for lowest steamline safety valve setpoint.

Number:

FR-H.2

Symptom/Title:

RESPONSE TO STEAM GENERATOR OVERPRESSURE (Cont.)

Revision No./Date

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

9

Release Steam From Affected Steam Generator To Turbine-Driven AFW Pump:

- a. Open affected steam generator steam supply isolation valves to turbine-driven AFW pump
- b. Check affected steam generator pressure - DECREASING
- c. WHEN affected steam generator pressure is less than (1) psig, THEN close steam supply isolation valves

- a. IF affected steam generator does not have a steam supply to turbine-driven AFW pump OR if isolation valves cannot be opened, THEN go to step 11.
- b. IF NOT decreasing, THEN go to step 11.

10

Check Affected Steam Generator Pressure:

- a. Affected steam generator pressure - LESS THAN (2) PSIG
- b. IF less than (2) psig, THEN return to guideline in effect

- a. IF greater than (2) psig, THEN return to step 8.

11

Isolate AFW Flow To Affected Steam Generator:

- a. [Enter plant specific steps]

(1) Enter plant specific pressure for lowest steamline safety valve setpoint.

(2) Enter plant specific pressure for highest steamline safety valve setpoint, including allowances for accumulation.

Number: FR-H.2	Synopses/Titles RESPONSE TO STEAM GENERATOR OVERPRESSURE (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution AFW flow should be reestablished to affected steam generator if level is in the narrow range and a steam release path is established.

12 Continue Attempts To Release Steam From Affected Steam Generator:

- Steam generator PORV
- Steam generator main steam isolation bypass valve
- Steam generator steam supply to turbine-driven AFW pump

13 Return To Guideline In Effect.

— END —

Number:

Symptom/Title:

Revision No./Date

FR-H.3

RESPONSE TO STEAM GENERATOR HIGH LEVEL

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE Throughout this guideline, "affected" refers to a steam generator in which narrow range level has exceeded (1) %.

- | | | |
|---|---|--|
| 1 | <p>Identify Affected Steam Generator:</p> <p>a. Narrow range level – GREATER THAN <u>(1)</u> %</p> | <p>a. <u>IF</u> less than <u>(1)</u> % in ALL steam generators, <u>THEN</u> return to guideline in effect.</p> |
| 2 | <p>Verify Feedwater Isolation:</p> <p>a. Flow control valves – CLOSED</p> <p>b. Flow control bypass valves – CLOSED</p> <p>c. Feedwater isolation valves – CLOSED</p> | <p>a. Manually close valves.</p> <p>b. Manually close valves.</p> <p>c. Manually close valves.</p> |
| 3 | <p>Decrease Affected Steam Generator Level:</p> <p>a. Check narrow range level – LESS THAN 100%</p> <p>b. Throttle AFW flow to decrease level to <u>(2)</u> %</p> | <p>a. <u>IF</u> greater than 100%, <u>THEN</u> go to step 5.</p> |
| 4 | <p>Check Affected Steam Generator Level:</p> <p>a. Check narrow range level – LESS THAN <u>(1)</u> % AND DECREASING</p> <p>b. <u>IF</u> less than <u>(1)</u> % and decreasing, <u>THEN</u> return to guideline in effect</p> | <p>a. <u>IF</u> greater than <u>(1)</u> % or increasing, <u>THEN</u> return to step 3.</p> |
| 5 | <p>Isolate AFW Flow To Affected Steam Generator:</p> <p>a. [Enter plant specific steps]</p> | |

(1) Enter plant specific value corresponding to steam generator Hi-Hi level feedwater isolation setpoint.

(2) Enter plant specific value corresponding to no-load steam generator level, including allowances for post-accident transmitter errors and reference leg process errors.

FR-H.3

RESPONSE TO STEAM GENERATOR HIGH LEVEL (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- 6 Isolate Affected Steam Generator Steam Supply To Turbine-Driven AFW Pump:
- a. Close steam supply valve
- 7 Isolate Affected Steam Generator Main Steamline:
- a. Close main steam isolation valve
 - b. Close main steam isolation bypass valve

Caution *DO NOT unisolate or release steam from affected steam generator prior to a complete overfill status evaluation.*

- 8 **Verify That Affected Steam Generator Is NOT RUPTURED:**
- a. Check steam generator radiation level:
 - Steam generator blowdown - NORMAL
 - 1) [Enter plant specific steps for opening blowdown lines sequentially to check radiation]
 - Steam generator sample - NORMAL
 - Steam generator steamline - NORMAL
 - a. **IF** radiation is high, **THEN** affected steam generator is ruptured.
 - **IF** an E-3, STEAM GENERATOR TUBE RUPTURE, series guideline is in effect, **THEN** return to guideline in effect.
 - **IF NOT** in effect, **THEN** go to E-3, STEAM GENERATOR TUBE RUPTURE, STEP 1.

NOTE *Steam generator blowdown should be used to decrease an overfilled steam generator level into narrow range.*

- 9 Return To Guideline In Effect.

— END —

Number: FR-H.4	Symptom/TITLE: RESPONSE TO STEAM GENERATOR LOW LEVEL	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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NOTE Throughout this guideline, "affected" refers to a steam generator in which narrow range level has fallen below (1) %.

1 Identify Affected Steam Generator:

- a. Narrow range level - LESS THAN (1) %
- a. IF greater than (1) % in ALL steam generators, THEN return to guideline in effect.

Caution DO NOT establish AFW flow to a faulted steam generator.

2 Verify That Affected Steam Generator Is NOT FAULTED:

- a. Check steam generator pressures:
 - 1) Affected steam generator pressure-APPROXIMATELY EQUAL TO OTHER STEAM GENERATOR PRESSURES
 - a. IF pressure is 100 psi lower in affected steam generator than the others, THEN evaluate cause of unequal pressures:
 - 1) IF unequal pressures result from operator controlled steam release, THEN go to step 3.
 - 2) IF unequal pressures result from an uncontrolled steam release, THEN affected steam generator is faulted.
 - IF an E-2, LOSS OF SECONDARY COOLANT, series guideline is in effect, THEN return to guideline in effect.
 - IF not in effect, THEN go to E-2, LOSS OF SECONDARY COOLANT, STEP 1.

(1) Enter plant specific value showing level just in narrow range, including allowances for normal channel accuracy, post-accident transmitter errors and reference leg process errors.

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

Caution DO NOT establish AFW flow to a dry steam generator.

- 3 **Verify That Affected Steam Generator Is NOT DRY:**
- a. Wide range level – GREATER THAN APPROXIMATELY 0%
 –OR–
 RCS hot leg/cold leg loop ΔT – NOT APPROXIMATELY 0°F
- a. IF level is approximately 0% AND cold leg temperature equals hot leg temperature, THEN affected steam generator is dry. Return to guideline in effect.
- 4 **Check AFW Flow To Affected Steam Generator:**
- a. Check AFW flow – CHECK FOR FLOW
- a. IF AFW flow NOT verified, THEN establish AFW flow to affected steam generator:
- 1) Align AFW valves, as appropriate.
 - 2) Start AFW pumps, as appropriate.
 - 3) Check AFW flow – CHECK FOR FLOW.
- IF AFW flow established, THEN go to step 4b. IF NOT established, THEN continue trying to establish AFW flow prior to steam generator dry out. Return to step 3.
- b. Continue filling affected steam generator to restore level to the narrow range
- 5 **Return To Guideline In Effect.**

– END –

Number:

FR-H.5

Symptom/Title:

**RESPONSE TO LOSS OF STEAM GENERATOR PORVs
AND CONDENSER DUMP VALVES**

Revision No./Date

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

NOTE *If steam release is required, alternate steam release paths include the steam supply to the turbine-driven AFW pump [enter other plant specific means].*

- | | | |
|---|--|--|
| 1 | Restore Availability Of Intact Steam Generator PORVs:
a. [Enter plant specific steps] | <u>IF</u> availability cannot be restored, <u>THEN</u> go to step 2. |
| 2 | Evaluate Need For Steam Dump To Condenser:
a. <u>IF</u> condenser steam dump <u>NOT</u> needed, <u>THEN</u> return to guideline in effect
b. <u>IF</u> condenser steam dump is needed, <u>THEN</u> continue with step 3 | |
| 3 | Check Condenser Status:
• [Enter plant specific means] - AVAILABLE | <u>IF</u> condenser <u>NOT</u> available, <u>THEN</u> <u>try to</u> restore condenser per [enter plant specific procedure]. <u>IF</u> condenser cannot be restored, <u>THEN</u> return to guideline in effect. |
| 4 | Check Condenser Steam Dump Valve Status:
• Electrical power supply - AVAILABLE
• Pneumatic power supply - AVAILABLE
• [Enter plant specific means] - AVAILABLE | <u>IF</u> steam dump valves <u>NOT</u> available <u>THEN</u> try to restore steam dump valves:
a. [Enter plant specific steps.]
<u>IF</u> steam dump valves cannot be restored, <u>THEN</u> return to guideline in effect. |

Number:

FR-H.5

Symptom/Title:

**RESPONSE TO LOSS OF STEAM GENERATOR PORVs
AND CONDENSER DUMP VALVES (Cont.)**

Revision No./Date

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

- 5 Check Main Steamline Isolation Bypass Valve Status For Intact Steam Generators:
- [Enter plant specific means] - AVAILABLE

IF bypass valves NOT available, THEN try to restore bypass valves:
a. [Enter plant specific steps]

- 6 Return To Guideline In Effect.

— END —

Number: FR-Z.1	Symptom/Title: RESPONSE TO HIGH CONTAINMENT PRESSURE	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	Check Containment Isolation:	
	a. All containment isolation valves - CLOSED	a. Justify reason why valves not closed.
		-OR-
		Attempt to position valves correctly.
	<i>Caution</i> If RWST level reaches "EMPTY" level setpoint, containment spray system must be switched to sump recirculation.	
2	Check Containment Spray System:	
	a. Containment pressure - ABOVE HI-3 SETPOINT	a. Go to step 3.
	b. Containment spray pump breaker indicator light - LIT	b. Start spray pumps. [Enter plant specific steps.]
	c. Containment spray system valves - PROPER EMERGENCY ALIGNMENT [Enter plant specific list for injection and recirculation phases]	c. Manually open or close valves as appropriate.
3	Check Containment Fan Cooler System: [See footnote (1)]	
	a. All fan coolers - OPERATING IN EMERGENCY MODE	a. Start fan coolers. [Enter plant specific steps.]
	b. Service water or component cooling water for the cooling units - AVAILABLE	b. Attempt to restore water to the fan coolers.
4	Check If Containment Hydrogen Likely:	
	a. Guideline FR-C.1, RESPONSE TO INADEQUATE CORE COOLING - PREVIOUSLY IMPLEMENTED	a. IF FR-C.1 not previously implemented THEN return to guideline in effect.
<i>(1) Step 3 may not be applicable to plants without emergency fan coolers or plants whose fan coolers are not qualified for post-accident conditions.</i>		

Number: FR-Z.1	Symptom/Title: RESPONSE TO HIGH CONTAINMENT PRESSURE (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5	Check Hydrogen Concentration:	
	a. Obtain a current hydrogen concentration measurement	
	b. Hydrogen concentration – LESS THAN 6.0% IN DRY AIR	b. Go to step 7.
	c. Hydrogen concentration – LESS THAN 0.5% IN DRY AIR	c. Turn on hydrogen recombiner system.
6	Return To Guideline In Effect.	
7	Notify TSC of Hydrogen Concentration Inside Containment	
	<i>Caution</i> TSC may recommend steps to deal with the hydrogen situation. Their steps should be done immediately.	
8	Determine If Hydrogen Concentration Is Increasing:	
	a. Obtain a current hydrogen concentration measurement	
	b. Hydrogen concentration – STABLE OR DECREASING	b. Attempt to isolate source of hydrogen.
	c. Keep TSC informed of hydrogen concentration	

Number: FR-Z.1	Symptoms/Times RESPONSE TO HIGH CONTAINMENT PRESSURE (Cont.)	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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Caution Hydrogen recombiners should not be turned on if the hydrogen concentration is greater than (1).

- | | | |
|----|--|-------------------------------------|
| 9 | Check Hydrogen Recombiner System: | |
| | a. Recombiner system - IN OPERATION | a. Start all available recombiners. |
| 10 | Return to Guideline In Effect. | |

- END -

(1) Enter plant specific value corresponding to limits of operability of hydrogen recombiners.

Number: FR-Z.2	Symptom/Titles RESPONSE TO HIGH CONTAINMENT SUMP LEVEL	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	Notify TSC of Sump Level.	
2	Attempt To Identify Unexpected Source Of Water To Sump:	
	a. Service water: 1) Components served by service water – NORMAL TEMPERATURE [Enter plant specific list]	a. Isolate service water to abnormal component.
	b. Component cooling water: 1) Components served by component cooling water – NORMAL TEMPERATURE [Enter plant specific list]	b. Isolate component cooling water to abnormal component.
	c. RWST and CST – NORMAL DEPLETION	c. Justify abnormal depletion.
3	Sample Sump Water [Enter plant specific list].	
4	Notify TSC Of Sump Level And Results Of Sample To Obtain Recommended Action.	
5	Transfer Only Enough Water To Bring Level Below <u>(1)</u> per TSC Instructions.	
6	Return To Guideline In Effect.	
	— END —	

(1) Enter level corresponding to RWST + Accumulators + RCS + 1/2 CST.

Number: FR-Z.3	Symptom/Title: RESPONSE TO HIGH CONTAINMENT RADIATION LEVEL	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	<p>Check Ventilation Penetrations Through Containment:</p> <p>a. Verify indicated position - CLOSED [Enter plant specific list]</p>	a. Isolate containment ventilation.
<p>NOTE Level GREATER THAN 10 R/HR indicates fuel failure.</p>		
2	<p>Check Radiation Level in Containment Via Post Accident [see footnote (1)] Monitor:</p>	a. Return to guideline in effect.
	a. GREATER THAN (2)	
3	Check Phase A/B Isolation:	
	a. Phase A or Phase B isolation - ACTUATED	a. Go to step 4.
	b. All containment isolation valves - CLOSED	<p>b. Justify reason why valves not closed -OR- Attempt to position valves correctly</p>
4	Return To Guideline In Effect	
<p>- END -</p>		

(1) Enter plant specific identifier for monitor to be used.
(2) Enter plant specific value.

Number: FR-I.1	Symptom/Title: RESPONSE TO PRESSURIZER FLOODING	Revision No./Date
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	Verify SI Actuated: a. [Enter plant specific means] b. Go to E-O, REACTOR TRIP OR SAFETY INJECTION, STEP 18	a. <u>IF NOT</u> actuated, <u>THEN</u> go to step 2.
2	Check RCS Pressure: a. Pressure - LESS THAN <u>(1)</u> b. Pressure - GREATER THAN <u>(2)</u>	a. <u>IF NOT</u> , verify at least one pressurizer PORV open. <u>IF</u> no PORV is open, <u>THEN</u> open one PORV until pressure LESS THAN <u>(1)</u> . b. <u>IF</u> less than <u>(2)</u> , <u>THEN</u> go to step 5.
3	Check If Letdown Has Been Established: a. Letdown line containment isolation valves - OPEN b. Letdown line isolation valves - OPEN c. Verify minimum charging flow d. Letdown orifice isolation valve - OPEN	a. Open containment isolation valves. b. Open letdown line isolation valves. c. Establish minimum charging. <u>IF</u> minimum charging cannot be established, <u>THEN</u> establish excess letdown and go to step 4. d. Open orifice isolation valve.
4	Adjust Charging Or Letdown Flow As Necessary To Decrease RCS Pressure: a. RCS Pressure - LESS THAN <u>(2)</u>	a. Return to step 2.
5	Check Pressurizer PORVs: a. PORVs - CLOSED	a. Manually close PORVs. <u>IF</u> any valve cannot be closed, <u>THEN</u> manually close its block valve.

(1) Pressurizer PORV Setpoint
 (2) Normal Pressurizer Spray Setpoint

Number:

Symptom/Title:

Revision No./Date

FR-I.1

RESPONSE TO PRESSURIZER FLOODING (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

6

Energize Pressurizer Heaters.

7

Verify Pressurizer Sprays Are Off:

a. Normal spray valves - CLOSED

a. Manually close spray valves. IF any valve cannot be closed, THEN stop RCPs in loops with spray line connection.

b. Auxiliary spray valves - CLOSED

b. Manually close auxiliary spray valve. IF valve cannot be closed, THEN isolate auxiliary spray line.

8

Check If Charging Flow Has Been Established:

a. At least one charging pump - RUNNING

a. Start one charging pump.

b. Charging line isolation valve - OPEN

b. IF CLOSED, THEN:

1) Close charging flow control valve.

2) Open charging line isolation valve.

c. Charging flow control valve - OPEN

c. Open charging flow control valve to establish desired flow. IF minimum charging cannot be established, THEN establish excess letdown and go to step 10.

9

Check If Letdown Has Been Established:

a. Letdown line containment isolation valve - OPEN

a. Open containment isolation valve.

b. Letdown line isolation valves - OPEN

b. Open letdown line isolation valves.

c. Letdown orifice isolation valve - OPEN

c. Open orifice isolation valve. IF letdown cannot be established, THEN establish excess letdown.

Number:

Symptom/Titles

Revision No./Date

FR-1.1

RESPONSE TO PRESSURIZER FLOODING (Cont.)

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

10 **Adjust Charging Or Letdown Flow As Necessary To Maintain RCS Pressure Constant.**

11 **Check Pressurizer Level:**
a. Level - LESS THAN (1)

a. IF GREATER THAN (1), THEN return to step 10.

12 **Return To Guideline In Effect.**

— END —

(1) Pressurizer High Level Alarm Setpoint

FR-1.2

RESPONSE TO LOW SYSTEM INVENTORY

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1	<p>Verify SI Is Actuated:</p> <p>a. [Enter plant specific means]</p> <p>b. Go to E-O, REACTOR TRIP OR SAFETY INJECTION, STEP 18</p>	<p>a. <u>IF NOT</u> actuated, <u>THEN</u> go to step 2.</p>
2	<p>Check If Charging Flow Has Been Established:</p> <p>a. At least one charging pump - RUNNING</p> <p>b. Charging line isolation valve - OPEN</p> <p>c. Charging flow control valve - OPEN</p>	<p>a. Start one charging pump.</p> <p>b. <u>IF CLOSED</u>, <u>THEN</u>:</p> <p>1) Close charging flow control valve.</p> <p>2) Open charging line isolation valve.</p> <p>c. Open charging flow control valve to establish desired flow.</p>
3	<p>Verify All Letdown Paths Are Isolated:</p> <p>a. Letdown orifice isolation valve - CLOSED</p> <p>b. Letdown line isolation valves - CLOSED</p>	<p>a. Close orifice isolation valve.</p> <p>b. Close letdown line isolation valves.</p>
4	<p>Check Pressurizer Level:</p> <p>a. Level - LESS THAN OR EQUAL TO <u>(1)</u></p> <p>b. Level - INCREASING</p> <p>c. <u>WHEN</u> level GREATER THAN <u>(1)</u>, <u>THEN</u> go to step 6</p>	<p>a. <u>IF</u> greater than <u>(1)</u>, <u>THEN</u> go to step 6.</p> <p>b. <u>IF NOT</u> increasing, <u>THEN</u> go to step 5.</p>

(1) Pressurizer Low-Level Setpoint

FR-1.2

RESPONSE TO LOW SYSTEM INVENTORY (Cont.)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5	<p>Adjust Charging Flow:</p> <p>a. Start additional charging pumps as necessary</p> <p>b. Open charging flow control valve to increase charging flow</p>	<p>b. <u>IF</u> charging flow is at maximum, <u>THEN</u> manually operate SI pumps, as required. <u>IF</u> pressurizer level can <u>NOT</u> be maintained, <u>THEN</u> manually reinitiate SI and return to E-O, REACTOR TRIP OR SAFETY INJECTION, STEP 5.</p>
	c. Return to step 4	
6	<p>Energize Pressurizer Heaters As Necessary To Maintain RCS Pressure Constant.</p>	
7	<p>Check Reactor Vessel Level:</p> <p>a. Level - Indicated FULL</p>	<p>a. <u>IF</u> less than FULL, <u>THEN</u> go to FR-1.3, RESPONSE TO VOID IN REACTOR VESSEL.</p>
8	<p>Return To Guidelines In Effect.</p>	

— END —