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EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225E

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

GUIDELINES FOR LONG TERM COOLING

APPROVED BY: Procedure Owner

D. Jones for Len Chewitt
(SIGNATURE ON FILE)

DATE: 3/21/00

PROCEDURE OWNER: Manager, Nuclear Plant Operations

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1.0 PURPOSE

The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team for maintaining long term core cooling post LOCA.

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 Babcock and Wilcox Topical Report BAW-10103A, Rev. 3, ECCS Analysis of B&W's 177-FA Lowered-Loop NSS

2.1.2 Calculation M90-0021, Building Spray and Decay Heat Pump NPSH a/r

2.1.3 Calculation I97-0008, LPI Crossover Flow Loop Accuracy Calculation

2.1.4 Calculation I91-0001, DH (LPI) Flow Indication and Control Loop Error Calculation

2.1.5 Calculation M98-0003, TSC Guidance For LPI Cross-Connect (Framatome Technologies Document 51-5001075-01)

2.1.6 Framatome Technologies Document 74-1152414, Emergency Operating Procedures Technical Bases Document

2.1.7 Calculation I90-0021, Decay Heat Removal Heat Exchanger Outlet Temperature Loop Accuracy Calculation

2.1.8 Calculation I88-0011, Containment Sump and Building Flood Level Indication

2.1.9 Calculation I91-0012, BWST Level Accuracy

2.1.10 Calculation M94-0053, Allowable MUT-1 Indicated Overpressure vs. Indicated Level

2.1.11 Calculation M95-0005, Minimum BWST Level to Prevent Vortexing during Drawdown

2.1.12 MAR 90-06-10-02, Reactor Building Instrument and Valve Relocation

2.1.13 Calculation M90-0023, Reactor Building Flooding

2.1.14 Calculation F98-0015, Minimum HPI flow for CR-3 at 72 hours post-LOCA

2.1.15 EEM98-001, MU/HPI Pump Qualification

2.1.16 Calculation I89-0036, Make-up/HPI Flow Loop Accuracy (High Range)

2.1.17 Calculation I89-0037, Make-up/HPI Flow Loop Accuracy (Low Range)

2.1.18 EEI98-001, HPI Total Flow Uncertainty

3.0 PERSONNEL INDOCTRINATION

3.1 DEFINITIONS

- Emergency Core Cooling Systems (ECCS) - Active components (i.e., High Pressure Injection, Low Pressure Injection, associated flow paths), combined with the passive systems (i.e., Core Flood Tanks (CFT) and the Borated Water Storage Tank), required to be operable to ensure the initial condition assumptions of the accident analysis are met.

- ECCS Suction Transfer - This necessary operator action involves manual alignments to allow the active ECCS, and Reactor Building Spray components to take suction from the Reactor Building sump.

- Onset of Long Term Core Cooling - The time after a LOCA, when operator action is required to ensure the ECCS systems are properly aligned, and the minimum performance requirements are met.

- End of ECCS Cooling - The time after a LOCA, when the core has been removed from the Reactor Vessel or other permanent means of core cooling has been established.

- Duration of Long Term Core Cooling - The time period between the Onset of Long Term Core Cooling, and the End of ECCS Cooling.

- Long Term Cooling Modes - There are three methods that may be available for long term core cooling. The three methods in their order of preference are:

  - Both LPI trains operating and providing flow through their respective injection lines.

  - One LPI train operating and providing flow through its respective injection line, and providing a suction source for the associated HPI pump.

  - One LPI train operating and providing flow through both LPI injection paths through the discharge cross-tie line.

3.2 RESPONSIBILITIES

- The TSC Accident Assessment Team is responsible for the following:

  - Monitoring ECCS system performance and providing recommendations to the EC regarding changes in the established flow paths.

  - Provide input to recovery plans for failed equipment, placing emphasis on the need for at least two ECCS injection paths before, during, and after required maintenance activities.

  - Assess plant conditions and equipment availability to determine the safest and most effective method to achieve LPI injection through both injection paths.

3.3 LIMITS AND PRECAUTIONS

- To ensure adequate NPSH is maintained, total actual decay heat pump flow from RB sump must be maintained ≤ 2986 gpm. This is derived from the following:
  - 2200 gpm indicated LPI flow (plus instrument uncertainties)
  - 600 gpm HPI flow (derived from hydraulic analysis)
- Total HPI flow must be limited 72 hours post accident to ensure long term mission time requirements are met.
- Any changes to the flow limits associated with Enclosures 4 through 10 must consider the following:
  - LPI pump NPSH
  - Instrumentation uncertainty
  - Required LPI flow
  - Required HPI flow
  - HPI pump mission time limitations
- Do not perform LPI crosstie during boron precipitation mitigation activities.
- Due to MOV considerations, limit bumps (motor starts) of the HPI valves to 5 consecutive times.
  - If more than 5 consecutive bumps are required, 1 bump may be performed every 7 minutes.
  - After a cooling period of 1.5 hours, 5 consecutive bumps may again be performed.

3.3 LIMITS AND PRECAUTIONS (Cont'd)

- If piggyback operations are in progress, do not perform LPI crosstie until one of the following is met:
  - DHHE outlet temperature ≤ 130°F AND > 32 hours since shutdown.
  - DHHE outlet temperature > 130°F to ≤ 175°F AND > 81 hours since shutdown.
- Prior to starting equipment, ensure adequate EDG load margin is available per EOP-13, Rule 5, "EDG Control".
- For work located in the Radiation Control Area, due consideration must be given to the ALARA program. This will likely result in special precautions and preparations.
- If indicated RB water level exceeds 6.0 feet, instrumentation may be lost.
- The HPI pump mission time study has qualified the pumps for a two month period. This analyzed mission time, relative to previous operational time, should be considered during decisions related to alignment changes.

4.0 INSTRUCTIONS

4.1 EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

- IF HPI piggyback operations are required,
  AND multiple failures result in the inability to align the ECCS systems for piggyback operation,
  THEN obtain EC concurrence and perform Enclosure 10, Emergency LPI Crosstie.

- IF only HPI pumps are taking suction from the BWST,
  THEN level can be lowered to 2.5 feet (actual) or 3.5 feet (indicated).

4.2 LONG TERM COOLING REQUIREMENTS

- The most desired long term cooling mode of operation is to supply LPI injection through both injection lines. Review plant conditions for the safest method for achieving this alignment

NOTE: Adequate SCM may be lost during HPI flow reduction. Analysis has shown the flow rates listed below will ensure continued core cooling. Loss of adequate SCM during establishment of the flow rates below is acceptable.

If adequate SCM does not exist, the flow limits below supersede the EOP requirement for full HPI.

The flow limits below are only valid when the flow path is limited to the HPI valves. Other configurations (recirc, seal injection, normal makeup) must be individually evaluated.

- IF total HPI flow is > 500 gpm,
  THEN provide direction to the Control Room to maintain HPI flow within the following limits (balanced between available digital low range indicators):

	≤ 64 hours	> 64 hours and < 72 hours	≥ 72 hours without Adequate SCM	≥ 72 hours with Adequate SCM
1 HPI pump	Per EOP-13, Rule 2	Control HPI flow within applicable ≥ 72 hour limit.	> 440 gpm < 500 gpm	< 500 gpm
2 HPI pumps 4 indicators	Per EOP-13, Rule 2	Control HPI flow within applicable ≥ 72 hour limit.	> 440 gpm < 760 gpm	< 760 gpm
2 HPI pumps 3 indicators	Per EOP-13, Rule 2	Control HPI flow within applicable ≥ 72 hour limit.	> 440 gpm < 560 gpm	< 560 gpm

- After the EOP has been completed, request Control Room trending of the operating components by performance of:
  - Enclosure 1, ECCS Flow Log, every 24 hours
  - Enclosure 2, Long Term Cooling Equipment Log, every 12 hours

4.3 RB WATER LEVEL CONTROL

- Monitor and maintain the RB water level in the appropriate level limits. Consult with engineering personnel for the minimum and maximum levels for current plant conditions.

- If RB water level is lowering, perform walk downs of accessible areas to determine leakage location. If the AB is not accessible, the Control Room radiation monitoring reading may be helpful in determination.

- If RB water level is lowering and no AB leakage exists consider the following:

  - Inadvertent pumping, i.e., RB sump pumps, RCDT pumps

  - Leaking ECCS flow path isolation valves, i.e., DHP recirc to BWST, DHP recirc to SF pools, HPI pump recirc to MUT, RB spray recirc to BWST, etc.

  - Possible SGTR

- If the leaking component is found, review available equipment to determine possible Long Term Core Cooling alignments to allow faulted equipment isolation.

- Reduction in RB sump boron concentration may be indicative of the need to perform boron precipitation mitigation.

- Rising RB water level and lowering boron concentration may be indicative of unborated water leaking to containment. The following are possible sources of unborated water:

  - SW system
  - CI system
  - DW system
  - FW systems (AFW, EFW, MFW)
  - DC system via DHHEs

- RB sump boron concentration must be maintained to ensure the Rx remains shutdown. If unborated water is leaking to the RB, attempt isolation efforts.

- IF RB sump water must be drained/pumped to prevent exceeding RB flood plane,
  THEN the storage location must be evaluated to prevent excessive dose rates and releases.

4.4 LONG TERM CORE COOLING MODE ALIGNMENT CHANGES

- The most desired long term cooling mode of operation is to supply LPI injection through both injection lines.

- Enclosure 3 describes the "Functional Goals" of the alternate cooling modes established by Enclosures 4 through 10 of this procedure.

- If power failures exist, using OP-700 series procedures ensure required equipment is energized.

- During transitions to LPI crosstie mode of operation, the Control Room will ask for TSC assistance for HPI termination. Ensure all the following exist prior to allowing HPI pump shutdown:

  - Stable LPI crosstie flow with in the limits of the applicable enclosure.

  - Tincore is NOT rising.

  - RCS pressure is NOT rising.

- If the above conditions are not observed, direct the Control Room to re-establish HPI injection flow by performing the following:

  1. Throttle the injection valves until total injection flow is > minimum pump flow.

  2. Close the recirc valves.

  3. Establish maximum allowable injection flow.

- During LPI crosstie operations, if stable LPI flow within the limits of the applicable enclosure can not be maintained, provide direction to the Control Room to establish HPI piggyback.

  - If Enclosures 8 or 9 are used to establish piggyback, the status statement will not be met. The two status statements regarding LPI system alignment are intended for normal transitions with adequate core cooling.

  - Provided the associated LPI train indicated flow is ≤ 2200 gpm, adequate NPSH margin exists for HPI pump operation.

4.5 MAINTENANCE DURING LONG TERM COOLING

- Prior to performing maintenance activities, any necessary temporary shielding must be installed, and the associated piping flushed.
- Storage location for draining and flushing operations must be evaluated to prevent excessive dose rates and releases.
- A possible flushing activity may be to drain or pump water from the BWST or SF pools to a suitable storage location.

4.6 LONG TERM COOLING TERMINATION

- WHEN the End of ECCS Cooling occurs,
  THEN exit this procedure.

ECCS FLOW LOG

Time Note 1	HPI flow Notes 2 and 3	A LPI flow Note 2	B LPI flow Note 2	LPI Crosstie flow Note 2

1) Suggested minimum time interval is 24 hours.

2) If an increasing trend is noted without a corresponding decrease in RCS pressure or increase in valve position, notify the TSC.

3) HPI flows must be maintained within the limits of Section 4.2

LONG TERM COOLING EQUIPMENT LOG

DHP-1A Computer Points (See Note 1)									
R250									
X318									
X319									
X320									

DHP-1B Computer Points (See Note 1)									
R251									
X321									
X322									
X323									

MUP-1A Computer Points (See Note 1)									
X324									
X326									
X325									
X070									
X366									
T217									
S292									
S294									

MUP-1B Computer Points (See Note 1)									
X327									
X329									
X328									
X071									
X367									
T253									
S311									
S295									

MUP-1C Computer Points (See Note 1)									
X330									
X332									
X331									
X072									
A298									
T236									
T216									
S296									

LONG TERM COOLING EQUIPMENT LOG (CONT'D)

BSP-1A Computer Points (See Note 1)									
X313									
X312									
X314									

BSP-1B Computer Points (See Note 1)									
X316									
X315									
X317									

Note 1: These instruments are not safety related or EQ qualified. However, this data may be useful for trending equipment condition.

OPERATOR ENCLOSURE FUNCTIONAL GOALS

Enclosure	Functional Goal
4	To provide LPI flow through both injection lines using DHP-1A. This alignment allows maintenance on the following equipment: • All HPI pumps • DHP-1B, provided the recirculation fluid down stream of DHV-111 does not result in excessive dose rates. The only alignment that should be performed from this alignment is starting the opposite LPI train.
5	To provide LPI flow through both injection lines using DHP-1B. This alignment allows maintenance on the following equipment: • All HPI pumps • DHP-1A, provided the recirculation fluid down stream of DHV-110 does not result in excessive dose rates. The only alignment that should be performed from this alignment is starting the opposite LPI train.
6	To provide LPI flow through A Train LPI using DHP-1A. Provided DHP-1B is operating, this alignment allows maintenance activities on all HPI pumps.
7	To provide LPI flow through B Train LPI using DHP-1B. Provided DHP-1A is operating, this alignment allows maintenance activities on all HPI pumps.
8	To provide HPI injection using the A Train ES selected HPI pump. This alignment allows maintenance on the following equipment: • Secured HPI pumps • DHP-1B
9	To provide HPI injection using the B Train ES selected HPI pump. This alignment allows maintenance on the following equipment: • Secured HPI pumps • DHP-1A
10	To provide emergency alignments should Piggyback alignments fail.

A LPI TRAIN CROSSTIE

ACTIONS DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1A is operating.**
- **A Train ES selected MUP is operating in piggyback.**
- **BSP-1B is shutdown.**
- **LPI crosstie NOT in progress.**
- **DHHE outlet TEMP is ≤ 130°F AND > 32 hours have elapsed since Rx shutdown.**

  OR

  DHHE outlet TEMP is > 130°F to ≤ 175°F AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

4.1 ___ Ensure B ES selected MUP is stopped.

___ MUP-1B
___ MUP-1C

4.2 ___ IF both LPI pumps are running, THEN stop DHP-1B.

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
4.3 ___ Isolate B LPI Train.	• Ensure the following valves closed: ___ DHV-35 ___ DHV-40 ___ DHV-43 ___ DHV-211 ___ DHV-12 • ___ Select BSV-4 to "MAN" and closed. • ___ Select DHV-111 to "MAN" and closed.

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS		DETAILS
4.4	___ Adjust DHV-110 setpoint to 1600 gpm.	

NOTE

During crosstie DHV-111 must remain in manual.

4.5	___ Establish LPI crosstie.	1 ___ Ensure DHV-6 is open. 2 Open LPI crosstie valves: ___ DHV-8 ___ DHV-7 3 ___ Throttle DHV-111 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI 4 ___ Adjust DHV-110 setpoint to obtain A Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI1

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
4.6 ___ Stop HPI flow.	1 ___ IF HPI flow is > 300 gpm, THEN throttle HPI flow to 300 (200 to 400) gpm. 2 Open all HPI recirc to sump valves: ___ MUV-543 ___ MUV-544 ___ MUV-545 ___ MUV-546 3 Close all HPI valves: ___ MUV-23 ___ MUV-24 ___ MUV-25 ___ MUV-26
4.7 ___ WHEN the TSC directs termination of the MUP, THEN stop the operating MUP.	1 Stop the A ES selected MUP: ___ MUP-1A ___ MUP-1B 2 ___ Close DHV-11

A LPI TRAIN CROSSTIE (CONT'D)

ACTIONS			DETAILS
		NOTE **During crosstie DHV-111 must remain in manual.**	
4.8	___	Increase LPI flow.	1 ___ Throttle DHV-111 to obtain LPI crosstie flow of 1250 (1150 to 1350) gpm on DH-38-FI 2 ___ Adjust DHV-110 setpoint to achieve A Train LPI flow 2700 (2600 to 2800) gpm on DH-1-FI1
4.9	___	Close all HPI recirc to sump valves.	___ MUV-543 ___ MUV-544 ___ MUV-545 ___ MUV-546

B LPI TRAIN CROSSTIE

ACTIONS DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1B is operating.**
- **B Train ES selected MUP is operating in piggyback.**
- **BSP-1A is shutdown.**
- **LPI crosstie NOT in progress.**
- **DHHE outlet TEMP is ≤ 130°F AND > 32 hours have elapsed since Rx shutdown.**

  OR

  DHHE outlet TEMP is > 130°F to ≤ 175°F AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

5.1 ___ Ensure A ES selected HPI pump is stopped.

___ MUP-1A
___ MUP-1B

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS		DETAILS
5.2	___ IF both LPI pumps are running, THEN stop DHP-1A	
5.3	___ Isolate A LPI Train.	• Ensure the following are closed: ___ DHV-34 ___ DHV-39 ___ DHV-42 ___ DHV-210 ___ DHV-11 • ___ Select BSV-3 to "MAN" and closed. • ___ Select DHV-110 to "MAN" and closed.

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS		DETAILS
5.4	___ Adjust DHV-111 setpoint to 1600 gpm.	

NOTE

During crosstie DHV-110 must remain in manual.

5.5	___ Establish LPI crosstie.	1 ___ Ensure DHV-5 is open. 2 Open LPI crosstie valves: ___ DHV-8 ___ DHV-7 3 ___ Throttle DHV-110 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI 4 ___ Adjust DHV-111 setpoint to achieve B Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI2

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.6 ___ Stop HPI flow.	1 ___ IF HPI flow is > 300 gpm, THEN throttle HPI flow to 300 (200 to 400) gpm.
	2 Open all HPI recirc to sump valves:
	___ MUV-543
	___ MUV-544
	___ MUV-545
	___ MUV-546
	3 Close all HPI valves:
	___ MUV-23
	___ MUV-24
	___ MUV-25
	___ MUV-26

B LPI TRAIN CROSSTIE (CONT'D)

ACTIONS	DETAILS
5.7 ___ WHEN the TSC directs termination of the MUP, THEN stop the operating MUP.	1 Stop the B ES selected MUP: ___ MUP-1B ___ MUP-1C 2 ___ Close DHV-12

NOTE

During crosstie DHV-110 must remain in manual.

5.8 ___ Increase LPI flow.	1 ___ Throttle DHV-110 to achieve LPI crosstie flow of 1250 (1150 to 1350) gpm on DH-38-FI 2 ___ Adjust DHV-111 setpoint to achieve B Train LPI flow of 2700 (2600 to 2800) gpm on DH-2-FI2

5.9 ___ Close all HPI recirc to sump valves.

___ MUV-543
___ MUV-544
___ MUV-545
___ MUV-546

STARTING A TRAIN LPI PUMP

ACTIONS DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1B is operating.**
- **B Train ES selected MUP is operating in piggyback.**

OR

LPI crosstie in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

6.1 ___ Ensure proper alignment for the A Train LPI system.

1 Ensure the following valves are closed:

___ DHV-34

___ DHV-39

___ DHV-11

2 ___ IF LPI crosstie is NOT in progress, THEN close DHV-110

3 ___ Ensure DHV-42 is open.

4 ___ Ensure DHV-5 is open.

STARTING A TRAIN LPI PUMP (CONT'D)

ACTIONS	DETAILS
6.2 ___ Start A Train LPI. [Rule 5, EDG Control]	1 Ensure required cooling pumps are operating: ___ DCP-1A ___ RWP-3A 2 ___ Start DHP-1A 3 ___ Ensure DHV-210 is open.
6.3 ___ IF LPI crosstie operations are in progress, THEN stop crosstie flow.	• Close LPI crosstie valves: ___ DHV-8 ___ DHV-7
6.4 ___ Ensure LPI flow is properly controlled.	• Ensure LPI control valves are in "AUTO" and set for 2000 gpm: ___ DHV-110 ___ DHV-111

STARTING A TRAIN LPI PUMP (CONT'D)

	ACTIONS	DETAILS
6.5 ___	WHEN all the following exist: ___ A Train LPI flow > 1400 gpm ___ B Train LPI flow > 1400 gpm THEN stop HPI.	1 Stop B ES selected MUP: ___ MUP-1B ___ MUP-1C 2 ___ Close DHV-12
6.6 ___	Increase LPI flow.	• Adjust LPI control valve setpoint to 2700 gpm: ___ DHV-110 ___ DHV-111

STARTING B TRAIN LPI PUMP

ACTIONS | DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **DHP-1A is operating.**
- **A Train ES selected MUP is operating in piggyback.**

  OR

- **LPI crosstie in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

7.1 ___ Ensure proper alignment for the B Train LPI system.

1 Ensure the following valves are closed:

___ DHV-35

___ DHV-40

___ DHV-12

2 ___ IF LPI crosstie is NOT in progress, THEN close DHV-111

3 ___ Ensure DHV-43 is open.

4 ___ Ensure DHV-6 is open.

STARTING B TRAIN LPI PUMP (CONT'D)

ACTIONS	DETAILS
7.2 ___ Start B Train LPI. [Rule 5, EDG Control]	1 Ensure required cooling pumps are operating: ___ DCP-1B ___ RWP-3B 2 ___ Start DHP-1B 3 ___ Ensure DHV-211 is open.
7.3 ___ IF LPI crosstie operations are in progress, THEN stop crosstie flow.	• Close LPI crosstie valves: ___ DHV-8 ___ DHV-7
7.4 ___ Ensure LPI flow is properly controlled.	• Ensure LPI control valves in "AUTO" and set for 2000 gpm: ___ DHV-110 ___ DHV-111

STARTING B TRAIN LPI PUMP (CONT'D)

	ACTIONS	DETAILS
7.5 ___	WHEN all the following exist: ___ A Train LPI flow > 1400 gpm ___ B Train LPI flow > 1400 gpm THEN stop HPI.	1 Stop A ES selected MUP: ___ MUP-1A ___ MUP-1B 2 ___ Close DHV-11
7.6 ___	Increase LPI flow.	• Adjust LPI control valve setpoint to 2700 gpm: ___ DHV-110 ___ DHV-111

ESTABLISHING A TRAIN PIGGYBACK

ACTIONS | DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **Both LPI trains are operating and providing flow.**
- **LPI crosstie NOT in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

8.1 ___ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

___ MUV-53

___ MUV-257

2 HPI recirc to sump valves closed:

___ MUV-543

___ MUV-544

___ MUV-545

___ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

___ MUV-23

___ MUV-24

___ MUV-25

___ MUV-26

ESTABLISHING A TRAIN PIGGYBACK (CONT'D)

	ACTIONS	DETAILS
8.2	___ Align DHP-1A discharge to MUP suction.	• ___ Open DHV-11
8.3	___ Ensure DHP-1A flow is within limits.	• ___ Ensure DHV-110 in "AUTO" and set for 2000 gpm.
8.4	___ Start A Train HPI. [Rule 5, EDG Control]	• Start the A ES selected MUP and required cooling pumps: ___ MUP-1A ___ MUP-1B
8.5	___ Stop B Train ECCS pumps.	1 Ensure the B ES selected MUP stopped: ___ MUP-1B ___ MUP-1C 2 ___ Ensure DHP-1B is stopped. 3 ___ Close DHV-12 4 ___ Close DHV-6

ESTABLISHING A TRAIN PIGGYBACK (CONT'D)

	ACTIONS	DETAILS
8.6	___ IF ≥ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN throttle HPI flow to 470 gpm (440 to 500 gpm). • ___ IF adequate SCM exists, THEN throttle HPI flow to < 500 gpm.
8.7	___ IF < 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN establish full HPI. • ___ IF adequate SCM exists, THEN throttle HPI to maintain minimum adequate SCM.

ESTABLISHING B TRAIN PIGGYBACK

ACTIONS | DETAILS

STATUS

- **ECCS suction transfer has been completed.**
- **Both LPI trains are operating and providing flow.**
- **LPI crosstie NOT in progress.**

NOTE

Tincore should be closely monitored while changing ECCS alignments.

9.1 ___ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

___ MUV-53

___ MUV-257

2 HPI recirc to sump valves closed:

___ MUV-543

___ MUV-544

___ MUV-545

___ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

___ MUV-23

___ MUV-24

___ MUV-25

___ MUV-26

ESTABLISHING B TRAIN PIGGYBACK (CONT'D)

	ACTIONS	DETAILS
9.2	___ Align DHP-1B discharge to MUP suction.	• ___ Open DHV-12
9.3	___ Ensure DHP-1B flow is within limits.	• ___ Ensure DHV-111 in "AUTO" and set for 2000 gpm.
9.4	___ Start B Train HPI. [Rule 5, EDG Control]	• Start the B ES selected MUP and required cooling pumps: ___ MUP-1B ___ MUP-1C
9.5	___ Stop A Train ECCS pumps.	1 Ensure the A ES selected MUP is stopped: ___ MUP-1A ___ MUP-1B 2 ___ Ensure DHP-1A is stopped. 3 ___ Close DHV-11 4 ___ Close DHV-5

ESTABLISHING B TRAIN PIGGYBACK (CONT'D)

		ACTIONS	DETAILS
9.6	___	IF ≥ 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN throttle HPI flow to 470 gpm (440 to 500 gpm). • ___ IF adequate SCM exists, THEN throttle HPI flow to < 500 gpm.
9.7	___	IF < 72 hrs post accident, THEN ensure HPI flow is within limits (use digital low range).	• ___ IF adequate SCM does NOT exist, THEN establish full HPI. • ___ IF adequate SCM exists, THEN throttle HPI to maintain minimum adequate SCM.

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

ACTIONS	DETAILS

STATUS

- **At least 1 LPI pump is operating.**
- **Multiple failures have resulted in the inability to establish Piggyback.**

10.1 ___ IF all the following exist:

___ LPI flow exists

___ Only 1 LPI train is operating

THEN crosstie LPI trains.

1 Ensure DHP isolation valve on idle train is closed:

___ DHV-210 (A Train)

___ DHV-211 (B Train)

2 Ensure LPI block valve on idle train is open:

___ DHV-5 (A Train)

___ DHV-6 (B Train)

3 Ensure LPI control valve on idle train is closed:

___ DHV-110 (A Train)

___ DHV-111 (B Train)

4 Open LPI crosstie valves:

___ DHV-8

___ DHV-7

5 Establish the following flows using DHV-110 and DHV-111:

___ LPI crosstie flow
1250 (1150 to 1350) gpm
on DH-38-FI

___ Operating LPI train flow
2700 (2600 to 2800) gpm

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS (CONT'D)

	ACTIONS	DETAILS
10.2 ___	IF RCS PRESS prevents LPI flow, THEN establish alternate piggyback alignment.	• Open the necessary valves: ___ DHV-11 ___ DHV-12 ___ MUV-62 ___ MUV-69