Florida Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72

April 20, 2000
3F0400-12

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Response to Request for Additional Information RE: Individual Plant Examination of External Events Submittal (TAC NO. M83612)

References:
1. NRC to FPC Letter 3N0100-04, dated January 13, 2000, "Crystal River Unit 3 - Request for Additional Information RE: Individual Plant Examination of External Events Submittal (TAC NO. M83612)"
2. FPC to NRC Letter 3F0698-04, dated June 30, 1998, "Crystal River Unit 3 Individual Plant Examination of External Events Seismic Summary Report (TAC NO. M83612)"

Dear Sir:

Florida Power Corporation (FPC) is submitting this letter in response to the request for additional information (RAI) provided in Reference 1. This letter is intended to answer the questions proposed in the RAI and bring this issue to closure.

The RAI requests responses to two questions concerning FPC's Individual Plant Evaluation of External Events (IPEEE) Seismic Summary Report, that was submitted to the NRC in Reference 2. The analysis of seismic adequacy for safe shutdown was based on the USI A-46 response. As such, the performance goals, assumptions, and acceptance criteria are derived from the A-46 methodology not the IPEEE methodology.

This submittal contains no new commitments. If you have any questions regarding this submittal, please contact Mr. Sid Powell, Manager, Nuclear Licensing at (352) 563-4883.

Sincerely,

Ted E. Williams for
Thomas H. Taylor
Director, Nuclear Engineering and Projects

THT/pei

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Attachment A: List of Acronyms
Attachment B: Response to Request for Additional Information
Attachment C: Success Path Logic Diagram, Figures 1 through 5

cc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NO. 50-302/LICENSE NO. DPR-72

Response to Request for Additional Information RE: Individual Plant Examination of External Events Submittal

ATTACHMENT A
List of Acronyms

List of Acronyms:

AI	Administrative Instruction
ADV	Atmospheric Dump Valve
AP	Abnormal Procedure
BWST	Borated Water Storage Tank
CRD	Control Rod Drive System
CR-3	Crystal River Unit 3
DC	Decay Heat Closed Cooling Water System
DCHE	Decay Heat Closed Cooling Heat Exchanger
DCV	Decay Heat Closed Cooling Water Valve
DH	Decay Heat Removal System
DHHE	Decay Heat Heat Exchanger
DHP	Decay Heat Pump
DHT	Borated Water Storage Tank (Decay Heat Tank)
DHV	Decay Heat Valve
ECCS	Emergency Core Cooling System
EFW	Emergency Feedwater System
EFWP	Emergency Feedwater Pump
EOP	Emergency Operating Procedure
FPC	Florida Power Corporation
HPI	High Pressure Injection
IA	Instrument Air
IB	Intermediate Building
IPEEE	Individual Plant Examination of External Events
LOCA	Loss of Coolant Accident
LOOP	Loss of Offsite Power
LPI	Low Pressure Injection
MU or MUP	Makeup and Purification System
MTMC	Auxiliary Electrical Power Motor Control Center
MTSW	Auxiliary Electrical Power Switchgear
NRC	Nuclear Regulatory Commission
OBE	Operation Basis Earthquake
OTSG	Once Through Steam Generators
PORV	Power Operated Relief Valve
RAI	Request for Additional Information
RCS	Reactor Coolant System
RCP	Reactor Coolant Pump
RW	Decay Heat Seawater System (Raw Water)
SBLOCA	Small Break Loss of Coolant Accident
SEWS	Screening Evaluation Worksheets
SPLD	Success Path Logic Diagram
SRB	Senior Review Board
SRV	Safety Relief Valve
SSE	Safe Shutdown Earthquake
USI	Unresolved Safety Issue

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NO. 50-302/LICENSE NO. DPR-72

Response to Request for Additional Information RE: Individual Plant Examination of External Events Submittal

ATTACHMENT B
Response to Request for Additional Information

NRC RAI Question 1:

In accordance with NUREG-1407, please provide an SPLD that clearly identifies the trains of the systems selected for the four safety functions in each success path and describe the systems selected for the safety functions, as well as the procedures and operator actions involved in the success path.

Florida Power Corporation (FPC) Response to NRC Question 1:

As requested by the staff, Attachment C to this document contains a more legible Success Path Logic Diagram (SPLD), Figure 1. Additionally, Attachment C contains logic diagrams for the four performance goals discussed below (Figures 2 through 5). Figures similar to these were included in the Unresolved Safety Issue (USI) A-46 report (Reference 1).

The plant operators use Abnormal Procedures (APs) and Emergency Operating Procedures (EOPs) to achieve safe shutdown of the plant in the event of an earthquake. To ensure operators can perform all required actions, procedures are verified to ensure that adequate measures exist. FPC procedure, Administrative Instruction (AI) 402C, "AP and EOP Verification and Validation Plan" requires that AP and EOP steps be validated. Through the validation process, operators ensure that the AP and EOP procedure step(s) can be performed and are adequate to manage the emergency situation.

The four performance goals, briefly described below, are achieved using multiple redundant and diverse success paths such as the "A" and "B" trains of the low pressure injection (LPI) system, high pressure injection (HPI) system, and the emergency feedwater (EFW) system. Each train of this equipment is powered from separate power sources. A more detailed discussion on the redundancy of the four performance goals was included in the USI A-46 submittal (Reference 1). Further information can also be found in FPC's response to a USI A-46 Request for Additional Information (RAI#3, in Reference 2).

Following a seismic event, operators follow AP-961, "Earthquake," the plant seismic event response procedure. The reactor is placed in a safe shutdown condition using EOP-02, "Vital System Status Verification." Other plant conditions may require branching from AP-961, or EOP-02 to other APs and EOPs.

Reactivity Control:

Operators enter into EOP-02, immediately following the initiation of a manual or automatic reactor trip. The Control Rod Drive (CRD) System, as designed, provides redundant and reliable means to insert sufficient negative reactivity to provide adequate shutdown margin. An immediate action per EOP-02, is to verify that the control rod drive groups 1 through 7 are fully inserted. The CRD groups would have been fully inserted by either an automatic or manual trip of the reactor. The reactor trip would have de-energized the CRD latching mechanism, thereby allowing the control rods to insert by gravity into the core. If a situation

occurs that the trip circuit did not function properly and the control rods did not fully insert, then compensatory action would be taken to de-energize CRDs by opening the breakers feeding the CRDs using the control board switches. This action would remove all power to the CRD system. If the reactor is still not shutdown, EOP-02 procedural guidance requires emergency boration from either the borated water storage tank (BWST) or concentrated boric acid via the normal make-up tank using site approved procedures. EOP-09, "Natural Circulation Cooldown," further requires the reactor coolant system (RCS) to be adequately borated to ensure adequate shutdown margin is maintained during cooldown.

Reactor Coolant Pressure Control:

RCS Pressurizer heaters and/or the makeup and purification (MUP) System are credited as the means to raise reactor system pressure. RCS pressure can be reduced using the pressurizer spray valves or the power operated relief valve (PORV). During performance of EOP-02, operators monitor RCS parameters including RCS pressure, temperature and subcooling margin. The operators maintain the RCS within the allowable operating limits using the pressurizer heaters, makeup system, pressurizer spray, high pressure auxiliary spray or the PORV. High pressure auxiliary spray, using the makeup pumps as the driving head, is utilized when reactor coolant pumps (RCPs) are not operating. The pressurizer safety relief valves are also available to prevent the RCS from becoming overpressurized.

The normal methods of RCS pressure control following a loss of offsite power (LOOP) condition utilize the high pressure auxiliary pressurizer spray to reduce pressure, and the pressurizer heaters to increase or maintain pressure. Both of these control methods require local operator actions for alignment or reposition. These actions are not critical and adequate time is available to perform these operator actions. Action to restore pressurizer heaters is directed by AP-770, "Emergency Diesel Generator Actuation," which is referenced from EOP-02. Adequate pressurizer heater capacity can be loaded onto either train emergency diesel generator.

Reactor Coolant Inventory Control:

The MUP System is the primary method of RCS inventory control. The MUP System is composed of two portions, the makeup portion and purification portion. The purification portion removes water from the RCS to be purified and stored in the makeup tank or RCS bleed tanks. The purification portion allows the RCS inventory to be reduced as necessary to compensate for RCS parameter changes. The makeup portion increases the RCS inventory by taking the water from the makeup tank and delivering it into the RCS. Makeup is required to compensate for RCS fluid discharged through the RCS letdown line into the purification system, discharge from relief valves, reactor coolant pump (RCP) seal leakoff or other flowpaths that allow for RCS losses. The BWST, which is the emergency water supply, can be used if an adequate water supply is not available from the makeup system. Under emergency situations which require a larger quantity of water within a short period of time, the makeup system functions as the HPI system. The HPI system has redundant initiating signals and three pumps (an "A" Train pump, a "B" Train pump, and a swing standby pump, all 100

percent capacity) to ensure that at least one train of HPI is available for all situations. The LPI system has two redundant pumps and can also be used to increase the RCS inventory at low RCS pressure using water from the BWST or the reactor building sump.

Decay Heat Removal:

The core decay heat is initially removed from the RCS using the once through steam generators (OTSGs) and main steam system. The heat transferred to the OTSGs is released to the atmosphere using the main steam safety valves and/or atmospheric dump valves (ADVs) when the main condenser is not available. There are several layers of assurance that the ADVs will be available. The ADVs utilize station instrument air (IA) to open. The IA system is backed up with air bottles and a non safety-related diesel powered air compressor to ensure air is available under most scenarios. If the IA system fails to maintain pressure, the ADVs can be operated by manually aligning local air accumulators. If the accumulators are also unavailable, the ADVs can be manually controlled by an operator locally. AP-470, "Loss of Instrument Air," contains the instructions for local and manual ADV operations. AP-961, "Earthquake," contains actions to manually open the Intermediate Building (IB) doors in the event the ADVs require manual actuation. This action decreases IB temperature and allows operators access to the area where the ADV manual controls are located. If the atmospheric dump valves can not control main steam pressure, then the main steam safety valves will lift at a setpoint that will prevent the main steam system from becoming overpressurized.

The EFW system supplies feedwater to the OTSGs to replace the water that is being steamed off to the atmosphere and also to raise the water level in the OTSGs to promote natural circulation of the RCS. The EFW system has redundant trains and redundant water supplies to ensure that adequate feedwater is available to remove decay heat from the RCS. The EFW system includes a safety-related diesel driven pump ("A" Train), a safety-related turbine-driven pump ("B" Train), and a safety-grade motor driven pump (backup for "A" Train). In addition, a non safety-related motor driven auxiliary feedwater pump, backed by a non-safety related diesel generator, is available. EFW water supplies include a dedicated seismically qualified emergency feedwater tank (150,000 gallons), an A-46 qualified condensate storage tank (120,000 gallons), an A-46 qualified condenser hotwell (150,000 gallons) and two non-seismic fire storage tanks (300,000 gallons each). Operators manage EFW water inventory using EOP-14, Enclosure 7, "EFWP Management" and Enclosure 22, "Secondary Inventory Management." Transferring between EFW water sources requires simple local valve position changes and verification. Adequate time is available to perform these actions.

Once the RCS has been depressurized, the decay heat removal system (DH) can be used to remove the decay heat from the reactor core. The decay heat is transferred to the Decay Heat Closed Cooling Water System (DC), then the Nuclear Services and Decay Heat Seawater System (RW) through heat exchangers. The RW system carries the decay heat into the Gulf of Mexico (ultimate heat sink). The EOPs direct operators to monitor primary and secondary parameters to ensure adequate decay heat is being removed and to maintain these systems within their operating limits.

NRC RAI Question 2:

Please provide sufficient information to show that there is a sufficient borated water supply for a small break LOCA with a combined leakage equivalent to a 1-Inch diameter break (per Section 3 of EPRI-6041-SL). If sources of water other than that from the borated water storage tank (BWST) are required, please discuss the procedures and operator actions involved in the process of connecting these sources and confirm that these sources, as well as the BWST, are seismically qualified.

FPC Response to NRC Question 2:

The BWST does not have sufficient inventory to accommodate the 72-hour analysis requirements of SBLOCA. Therefore, the Reactor Building (RB) sump will be required to provide recirculation. When the BWST is depleted through a break in the RCS (LOCA conditions) or the PORV (abnormal pressure control and cooling) into the RB sump, the LPI pump suction can be transferred to the RB sump. This alignment allows the RB sump water to be recirculated to the core for long term cooling. The LPI pumps also act as booster pumps for the HPI pumps (piggyback operation) to allow the HPI pumps to use the RB sump water as a suction source. The operators use the EOP guidance to control reactor coolant inventory and maintain the RCS parameters within the allowable operating limits. EOP-14, "Emergency Operating Procedure Enclosures," Enclosure 19, "ECCS Suction Transfer," contains instructions for aligning LPI to the sump. All actions required to transfer suction sources can be performed from the control room.

The following table contains a list of equipment that may be utilized while LPI is recirculating water from the RB sump to the core. The components listed in this table have been verified to be seismically adequate. These components are listed as Seismic Class I components in the CR-3 Configuration Control System. These components were determined to be qualified using USI A-46 walkdowns and existing seismic qualification documentation. None of the components in this table were listed as outliers during the USI A-46 review of these components. Therefore, the components needed to perform RB sump recirculation will be available for accident mitigation following a seismic event.

References:

1. FPC to NRC letter 3F1295-18, dated December 31, 1995, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46, Generic Letter 87-02"

2. FPC to NRC letter 3F0398-16, dated March 30, 1998, "Request for Additional Information Regarding Summary Report on the Verification of Seismic Adequacy of Mechanical and Electrical Equipment dated December 31, 1995"

Table of Components that May Be Used During RB Sump Recirculation

Tag #	Component Description	Seismic Evaluation	Position
DC-5-PT	DCP-1A Discharge Pressure	Enveloped by the USI A-46 seismic evaluations.	Energized
DC-6-PT	DCP-1B Discharge Pressure	Enveloped by the USI A-46 seismic evaluations.	Energized
DC-50-LT	DCT-1A Surge Tank Level	Enveloped by the USI A-46 seismic evaluations.	Energized
DC-54-LT	DCT-1B Surge Tank Level	Enveloped by the USI A-46 seismic evaluations.	Energized
DCHE-1A	Decay Heat Closed Cycle Cooling Heat Exchanger	Enveloped by the USI A-46 seismic evaluations.	Available
DCHE-1B	Decay Heat Closed Cycle Cooling Heat Exchanger	Enveloped by the USI A-46 seismic evaluations.	Available
DCP-1A	Decay Ht Closed Cycle Cooling Pump	Enveloped by the USI A-46 seismic evaluations.	Energized
DCP-1B	Decay Ht Closed Cycle Cooling Pump	Enveloped by the USI A-46 seismic evaluations.	Energized
DCV-186	Nitrogen Supply to DCT-1A	Enveloped by the USI A-46 seismic evaluations.	Closed
DCV-188	Nitrogen Supply to DCT-1B	Enveloped by the USI A-46 seismic evaluations.	Closed
DCV-190	DCT-1A Overpressure Control Valve	Enveloped by the USI A-46 seismic evaluations.	Operable
DCV-191	DCT-1B Overpressure Control Valve	Enveloped by the USI A-46 seismic evaluations.	Operable
DH-7-LT	BWST Level	Enveloped by the USI A-46 seismic evaluations.	Energized
DH-7-LT1	BWST Level	Enveloped by the USI A-46 seismic evaluations.	Energized
DH-37-LT	BWST Level	Enveloped by the USI A-46 seismic evaluations.	Energized
DHHE-1A	Decay Heat Removal Heat Exchanger A	Enveloped by the USI A-46 seismic evaluations.	Available
DHHE-1B	Decay Heat Removal Heat Exchanger B	Enveloped by the USI A-46 seismic evaluations.	Available
DHP-1A	Decay Heat Pump A	Enveloped by the USI A-46 seismic evaluations.	On
DHP-1B	Decay Heat Pump B	Enveloped by the USI A-46 seismic evaluations.	On
DHT-1	BWST	Enveloped by the USI A-46 seismic evaluations.	Available
DHV-3	DH Removal Outlet Isolation Valve At RC	Based on existing design basis verification of seismic adequacy of component.	closed
DHV-11	Decay Heat to Makeup Pump Isolation	Based on existing design basis verification of seismic adequacy of component.	Open/Closed
DHV-12	Decay Heat to Makeup Pump Isolation	Based on existing design basis verification of seismic adequacy of component.	Open/Closed
DHV-21	DHP-1A Suction Isolation	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-32	DHP-1B Suction Isolation	Based on existing design basis verification of seismic adequacy of component.	Open

Table of Components that May Be Used During RB Sump Recirculation

Tag #	Component Description	Seismic Evaluation	Position
DHV-34	DHT-1 Supply To DHP-1A And BSP-1A Isolation	Based on existing design basis verification of seismic adequacy of component.	Closed
DHV-35	DHT-1 Supply To DHP-1B And BSP-1B Isolation	Based on existing design basis verification of seismic adequacy of component.	Closed
DHV-37	RB Sump Discharge Relief To Sump	Based on existing design basis verification of seismic adequacy of component.	Closed
DHV-38	RB Sump Discharge Relief To Sump	Based on existing design basis verification of seismic adequacy of component.	Closed
DHV-42	RB Sump To DHP-1A Suction Isolation	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-43	RB Sump To DHP-1B Suction Isolation	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-75	A Decay Heat Purification Return Isolation	Based on existing design basis verification of seismic adequacy of component.	Open/Closed
DHV-76	B DH Purification Return Isolation	Based on existing design basis verification of seismic adequacy of component.	Open/Closed
DHV-110	A LPI Flow Control Valve	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-111	B Flow Control Valve	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-210	A LPI Injection Valve	Based on existing design basis verification of seismic adequacy of component.	Open
DHV-211	B LPI Injection Valve	Based on existing design basis verification of seismic adequacy of component.	Open
MTMC-3	480v Engineered Safeguards MCC-3A1	Enveloped by the USI A-46 seismic evaluations.	Energized
MTMC-4	480v Engineered Safeguards MCC-3A2	Enveloped by the USI A-46 seismic evaluations.	Energized
MTMC-5	480v Engineered Safeguards MCC-3B1	Enveloped by the USI A-46 seismic evaluations.	Energized
MTSW-2C	4160v ES Bus 3A (North Section)	Enveloped by the USI A-46 seismic evaluations.	Energized
MTSW-2D	4160v ES Bus 3A (South Section)	Enveloped by the USI A-46 seismic evaluations.	Energized
MTSW-2E	4160v ES Bus 3B (North Section)	Enveloped by the USI A-46 seismic evaluations.	Energized
MTSW-2F	4160v ES Bus 3B (South Section)	Enveloped by the USI A-46 seismic evaluations.	Energized
Sump Screens	RB Sump Screens	Based on existing design basis verification of seismic adequacy of component.	Available

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NO. 50-302/LICENSE NO. DPR-72

Response to Request for Additional Information RE: Individual Plant Examination of External Events Submittal

ATTACHMENT C
Success Path Logic Diagram, Figures 1 through 5

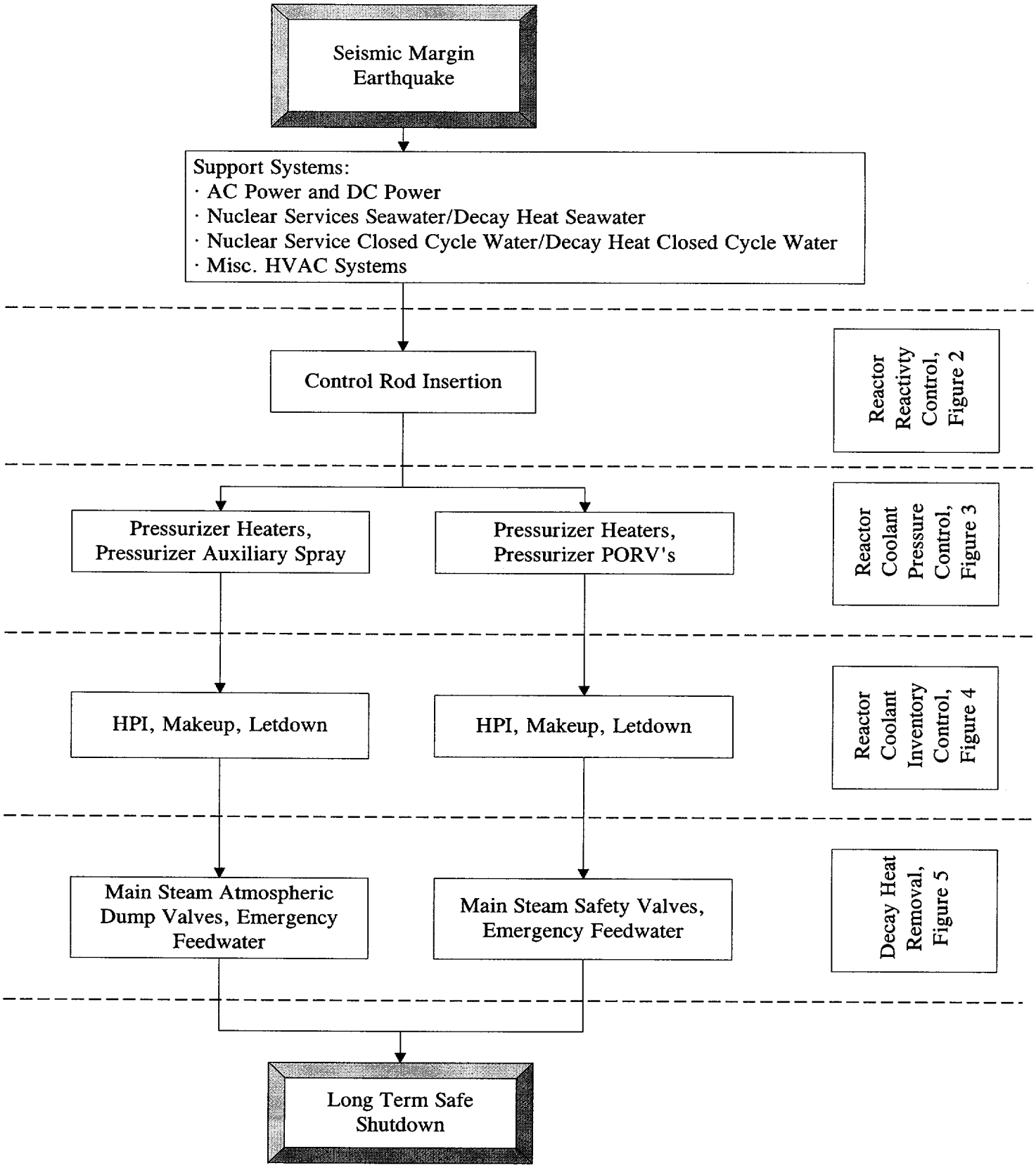

Figure 1: FPC CR-3 IPEEE Success Path Logic Diagram

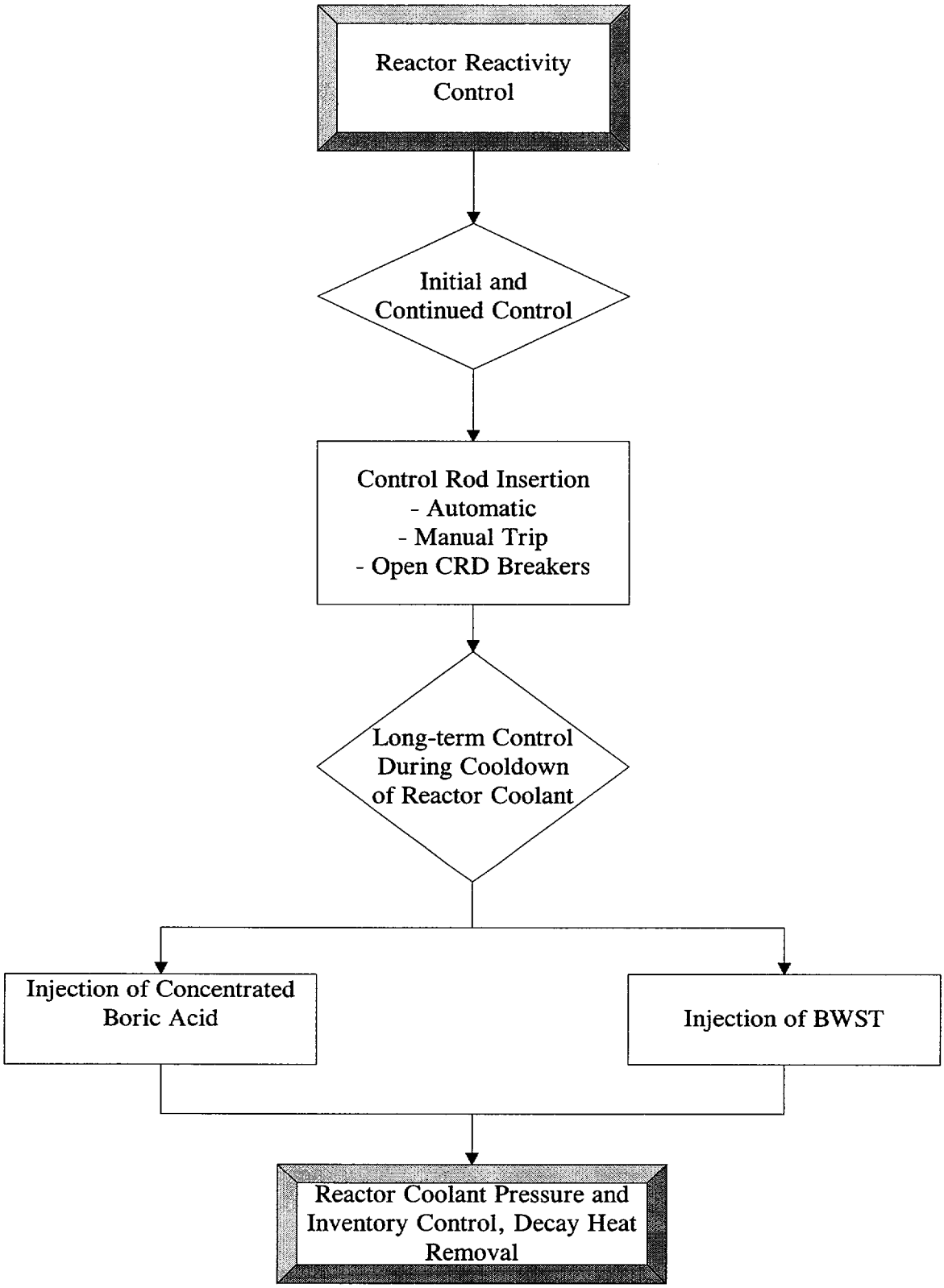

Figure 2: Safe Shutdown Alternatives for Reactor Reactitivty Control

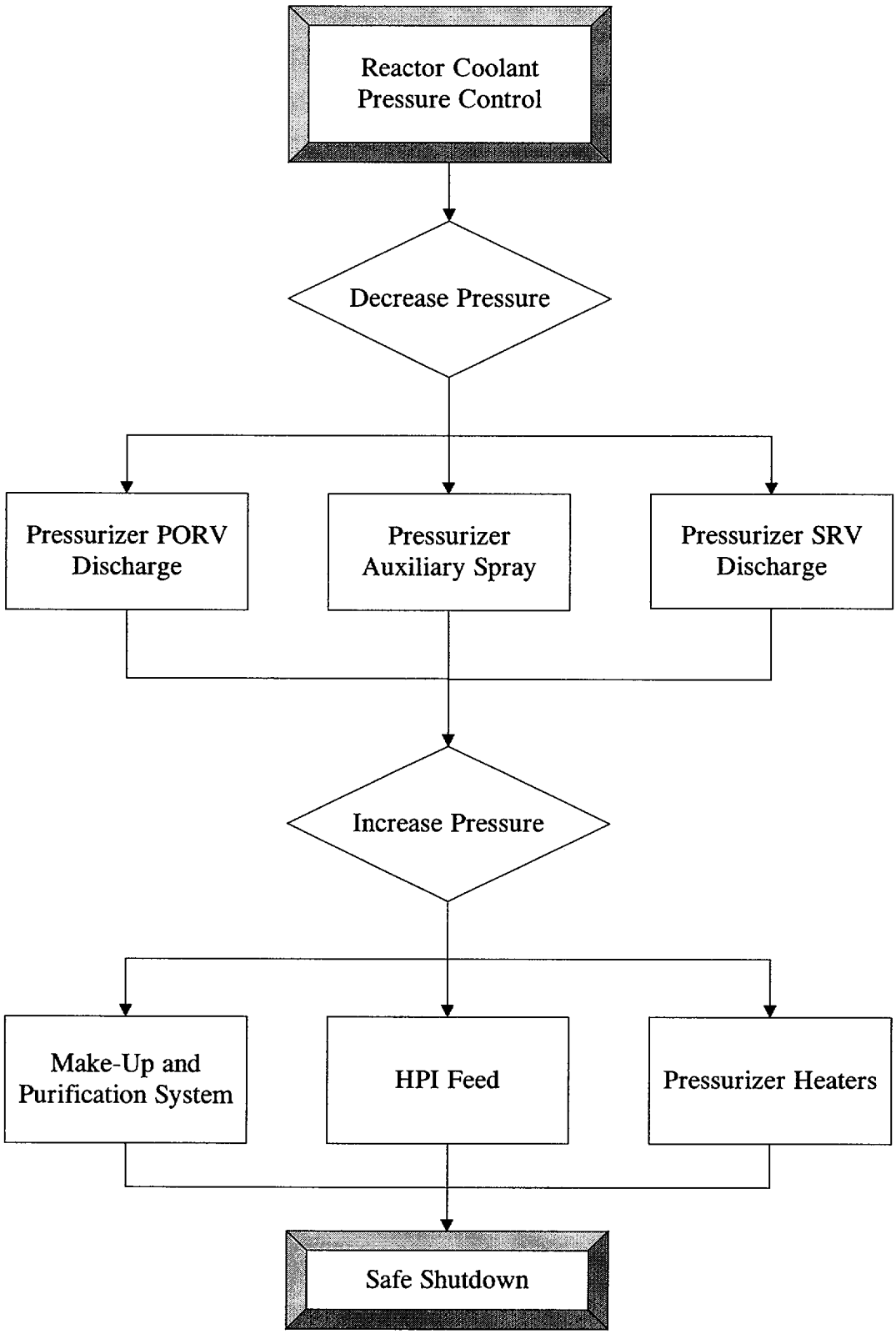

Figure 3: Safe Shutdown Alternatives for Reactor Coolant Pressure Control

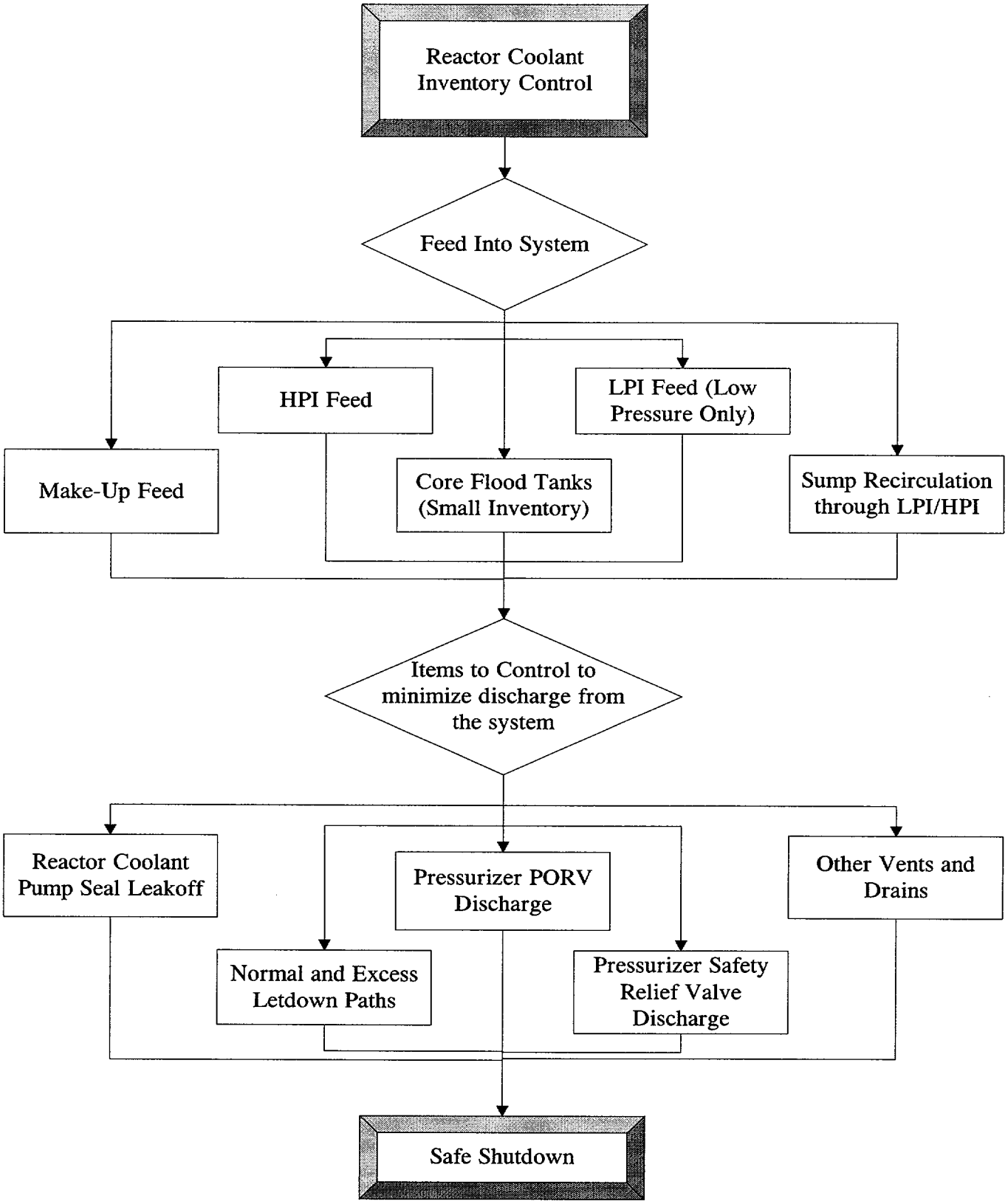

Figure 4: Safe Shutdown Alternatives for Reactor Control Inventory Control

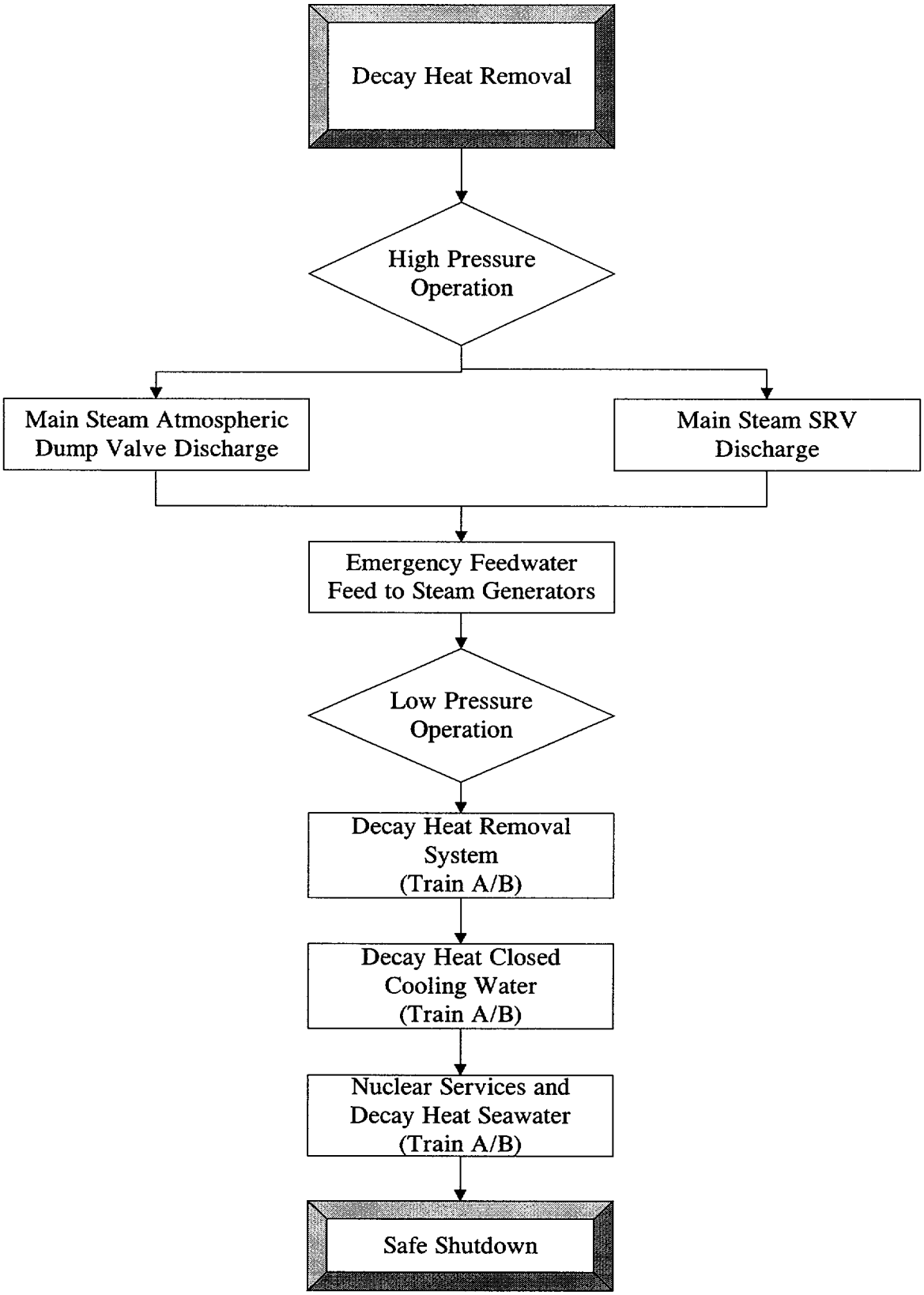

Figure 5: Safe Shutdown Alternatives for Decay Heat Removal