CATEGORY 1

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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 95-003-00:on 951120,TS 3.5.2 not met during ECCS on-line maint.Caused by personnel error.Precautions added warning not to clear safety injection pump coincident w/RHRP w/o verification.W/951221 ltr.

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December 21, 1995

PG&E Letter DCL-95-274

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Docket No. 50-323, OL-DPR-82
Diablo Canyon Unit 2
Licensee Event Report 2-95-003-00
Technical Specification 3.5.2 not Met During Emergency Core Cooling System On-Line Maintenance Due to Personnel Error

Gentlemen.

Pursuant to 10 CFR 50.73(a)(2)(i)(B), PG&E is submitting the enclosed Licensee Event Report concerning Technical Specification 3.5.2 not being met during emergency core cooling system on-line maintenance due to personnel error.

The event did not adversely affect the health and safety of the public.

Sincerely,

Gregory M. Rueger

cc: Steve Bloom
L.J. Callan
Jennifer Dixon-Herrity
Kenneth E. Perkins
Michael T. Tschiltz
Diablo Distribution
INPO

Enclosure

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1394S/WEC/2246

IE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Diablo Canyon Unit 2	0 5 0 0 0 3 2 3	1 OF 11

TITLE (4) Technical Specification 3.5.2 not Met During Emergency Core Cooling System On-Line Maintenance Due to Personnel Error

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MON	DAY	YR	YR	SEQUENTIAL NUMBER	REVISION NUMBER	MON	DAY	YR	FACILITY NAMES	DOCKET NUMBER (S)
11	20	89	95	- 0 0 3 -	0 0	12	21	95		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)
1	X 10 CFR 50.73(a)(2)(i)(B)
POWER LEVEL (10) 1 0 0	OTHER - (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

Donald H. Behnke - Senior Regulatory Services Engineer	TELEPHONE NUMBER AREA CODE	805 545-2629

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[X] NO				

ABSTRACT (16)

On November 20, 1989, at 1131 PST, with Unit 2 in Mode 1 (Power Operation) at 100 percent power, Technical Specification 3.5.2 was not met when licensed operators removed safety injection (SI) pump 1 from service for valve maintenance concurrent with residual heat removal (RHR) pump 2 which was already out of service for maintenance. On November 22, 1995, at 1600 PST, engineering personnel discovered that the above condition made both SI pumps inoperable for the post loss-of-coolant-accident recirculation mode. On November 22, 1995, at 1656 PST, a 4-hour non-emergency report was conservatively made in accordance with 10 CFR 50.72(b)(2)(iii). On December 14, 1995, an evaluation determined that the above occurrence did not prevent adequate long-term core cooling. Therefore, this condition is not reportable under 10 CFR 50.72(b)(2)(iii).

The root cause of the event was cognitive personnel error, in that licensed operators failed to recognize the interdependency of cold leg recirculation suction flowpaths between the emergency core cooling system (ECCS) trains.

Operating and surveillance test procedures affecting operability of the SI and RHR systems are being revised to prohibit making SI and RHR pumps simultaneously inoperable, thereby ensuring containment recirculation capability with the remaining ECCS components.

I. Plant Conditions

Unit 2 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Problem

A. Summary:

On November 20, 1989, at 1131 PST, with Unit 2 in Mode 1 (Power Operation) at 100 percent power, Technical Specification (TS) 3.5.2 was not met when licensed operators removed safety injection (SI) pump (BQ)(P) 1 from service for valve (BQ)(V) maintenance concurrent with residual heat removal (RHR) pump (BP)(P) 2 being out of service for maintenance. On November 22, 1995, at 1600 PST, while evaluating an Institute of Nuclear Power Operations (INPO) Operating Experience (OE) Report, engineering personnel discovered that the above condition made both SI pumps inoperable for the post loss-of-coolant-accident (LOCA) recirculation mode. On November 22, 1995, at 1656 PST, a 4-hour non-emergency report was conservatively made in accordance with 10 CFR 50.72(b)(2)(iii), as a condition that alone could have prevented the fulfillment of a safety function of a system that is needed to remove residual heat or mitigate the consequences of an accident. On December 14, 1995, an evaluation determined that the above occurrence did not prevent adequate long-term core cooling. Therefore, this condition is not reportable under 10 CFR 50.72(b)(2)(iii). However, this condition remained reportable under 10 CFR 50.73(a)(2)(i)(B) as a failure to meet the requirements of TS 3.5.2.

B. Background:

The emergency core cooling system (ECCS)(BP)(BQ) components at Diablo Canyon Power Plant (DCPP) are divided into two trains, A and B, based on the solid state protection system (SSPS) that supplies the safeguards actuation signal for a component. The following table lists the various pumps in the ECCS and their assignments to safeguards trains.

Train A	Train B
Safety Injection Pump 1	Safety Injection Pump 2
Residual Heat Removal Pump 2	Residual Heat Removal Pump 1
Centrifugal Charging Pump 1	Centrifugal Charging Pump 2

TS 3.5.2, "ECCS Systems - Tave Greater Than or Equal to 350 Degrees Fahrenheit," requires that two ECCS subsystems shall be operable with an operable flow path capable of taking suction from the refueling water storage

tank on a SI signal and manually transferring suction to the containment sump during the recirculation phase of operation.

Administrative Procedure C-6, Supplement 4 (AP C-6S4), "Control of Equipment Required by the Plant Technical Specifications," which was the procedure in effect at the time of the event, allowed components of the same train to be removed from service concurrently.

Operating Procedures (OP) B-3A:III, "Safety Injection System - Shutdown and Clearing" and OP B-2:III, "RHR - Clearing Equipment," provided guidance in removing the ECCS components from service.

Emergency Procedure (EP) E-1.3, "Transfer to Cold Leg Recirculation," provides guidance for manual transfer from the injection phase to the cold leg recirculation phase. (Refer to Figure 2 for component and flow path alignment.) The basic ECCS realignment steps of EP E-1.3 are as follows:

1. Split Residual Heat Removal (RHR) Train discharge headers by closing motor operated valves (MOVs) 8716A and 8716B.
2. Align RHR PUMP suction to the containment recirculation sumps.
3. Align RHR PUMP discharge to supply the SI and CC pumps suction by opening MOVs 8804A, 8804B, and SI/CC pumps suction cross-tie MOVs 8807A and 8807B.

With all components operable and normally aligned, either RHR pump would have provided suction to both centrifugal charging (CC) pumps through the suction cross-tie MOVs 8807A and 8807B because the SI pumps suction MOVs 8923A and 8923B would have been open.

The ECCS is shown on the attached Figure 1, "ECCS Composite Drawing - Normal Injection Phase," and Figure 2, "ECCS Composite Drawing - Cold Leg Recirculation Phase."

C. Event Description:

On November 20, 1989, at 0431 PST, RHR PUMP 2, a train A component, was declared inoperable and cleared (tagged out) for electrical maintenance in accordance with OP B-2:III. The 4.16kV motor breaker was opened and associated piping was isolated as part of the clearance.

On November 20, 1989, at 1131 PST, SI pump 1, also a train A component, was declared inoperable and cleared in accordance with OP B-3A:III for electrical maintenance on MOV 8923A. The MOV was closed, its 480 volt

supply breaker was opened, and the 4.16 kV motor breaker for SI pump 1 was opened as part of the clearance.

On November 21, 1989, at 0201 PST, the clearance tags on MOV 8923A were removed and the valve was made available.

On November 21, 1989, at 1246 PST, SI pump 1 was declared operable and returned to service.

On November 22, 1989, at 0413 PST, RHR PUMP 2 was declared operable and returned to service.

On October 12, 1995, DCPP engineering personnel reviewed INPO OE 7486 concerning Tennessee Valley Authority's (TVA) Sequoyah Nuclear Plant Unit 2. The report described an event in which closure of a SI pump suction valve rendered portions of both trains of the ECCS inoperable and placed the Sequoyah Unit in TS 3.0.3.

DCPP engineering personnel evaluated the OE and found aspects of the TVA event that were applicable to DCPP. Engineering personnel then commenced an investigation of past ECCS clearances to determine if any similar events had occurred at DCPP. Engineering personnel discovered the event of November 1989 in which concurrent maintenance was performed on the train A SI and RHR pump.

On November 22, 1995, a Technical Review Group (TRG) determined that the inoperability of SI pump 1 and RHR pump 2 caused by the concurrent maintenance along with procedural alignment requirements for recirculation could have prevented the fulfillment of the safety function to remove residual heat during the recirculation mode. If a LOCA had occurred during the 14 hour and 30 minute period from 1131 PST on November 20, 1989, until 0201 PST on November 21, 1989, neither SI pump 1 nor SI pump 2 would have been available for cold leg recirculation. On November 22, 1995, at 1600 PST, PG&E determined that the event represented a condition that alone could have prevented the fulfillment of a safety function of a system that is needed to remove residual heat or mitigate the consequences of an accident. On November 22, 1995, at 1656 PST, a 4-hour non-emergency report was conservatively made in accordance with 10 CFR 50.72(b)(2)(iii).

Following is the sequence that would have occurred if a LOCA had occurred in the 14 hours and 30 minutes of the event. (Refer to Figure 3 "ECCS Composite Drawing - Event Scenario - Cold Leg Recirculation Phase.")

1. SI pump 1 was cleared and therefore out-of-service (OOS).
2. RHR PUMP 2 was cleared (OOS) and therefore unable to supply SI pump 2 suction.
3. Because MOV 8923A was cleared and closed (OOS), RHR pump 1 would not have been able to supply SI pump 2 through the SI/CC pump suction cross-tie MOVs 8807A and 8807B.
4. RHR pump 1 would not have been able to supply flow to SI pump 2 through MOV 8804B because RHR cross-tie MOVs 8716A and 8716B would have been closed in accordance with EP E-1.3 as described above in II.B (Background).

Therefore, SI pump 2 would have been available only for the injection phase. Only RHR pump 1 and the two CC pumps would have been available for transferring to cold leg recirculation. This condition constituted operation outside of TS 3.5.2 since neither SI pump 1 nor SI pump 2 were capable of being transferred to cold leg recirculation.

On December 14, 1995, further evaluation determined that the above occurrence did not prevent adequate long-term core cooling. Therefore, this condition was not reportable under 10 CFR 50.72(b)(2)(iii). However, this condition remained reportable under 10 CFR 50.73(a)(2)(i)(B) as a failure to meet the requirements of TS 3.5.2.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

E. Dates and Approximate Times for Major Occurrences:

From November 20, 1989, at 1131 PST, until November 21, 1989, at 0201 PST:	Event Date: Cold leg recirculation path from RHR pump 1 to SI pump 2 was unavailable.
November 22, 1995, at 1600 PST:	Discovery Date: A TRG determined that the concurrent maintenance placed the plant outside TS 3.5.2.
November 22, 1995, at 1656 PST:	PG&E made a 4-hour non-emergency report in accordance with 10 CFR 50.72(b)(2)(iii).

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

PG&E engineers performed an investigation prompted by INPO OE 7486. The engineers searched past clearances and discovered one instance in 1989 where concurrent maintenance on a SI and RHR pump would have precluded cold leg recirculation.

H. Operator Actions:

None.

I. Safety System Responses:

None.

III. Cause of the Problem

A. Immediate Cause:

The immediate cause of failure to comply with TS 3.5.2 was the closure and clearing of MOV 8923A concurrent with RHR PUMP 2 being out of service.

B. Root Cause:

The root cause of the event was cognitive personnel error in that licensed operators failed to recognize the interdependency of cold leg recirculation suction flowpaths between the ECCS trains.

C. Contributory Cause:

The operating procedures did not contain sufficiently detailed guidance regarding the removal of specific ECCS components from service and the possible effect on recirculation flow paths.

IV. Analysis of the Event

The event described in this LER challenged the long term cooling capability of the ECCS. In order to determine if this condition could have adversely affected the health and safety of the public, PG&E and the nuclear steam supply system vendor,

Westinghouse, evaluated post-LOCA scenarios where the only ECCS flow would have been from one RHR PUMP and two CC PUMPs.

PG&E and Westinghouse concluded from the evaluation that following a large-break LOCA, where system pressure drops quickly to below the shutoff head of the RHR PUMP, one RHR PUMP would have provided adequate long-term core cooling during both the cold leg and hot leg recirculation phases.

For small-break LOCAs, there may have been a break size or a range of break sizes in which system depressurization would have stalled at a pressure above the RHR PUMP discharge pressure before transfer to cold leg recirculation. PG&E and Westinghouse calculated that two CC PUMPs would have provided sufficient flow to match the core boiloff rate at the expected system pressures.

Thus, for the plant configuration described in this LER, there would have been sufficient ECCS flow to provide long-term cooling for the full range of LOCAs.

Based on the above findings, the health and safety of the public were not adversely affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

1. Operations licensed personnel were notified of the event and instructed to prohibit removing like trains of RHR and SI pumps from service.

2. Maintenance scheduling personnel were likewise informed to ensure no concurrent RHR and SI pump maintenance would be planned.

B. Corrective Actions to Prevent Recurrence:

1. PG&E added precautions to Units 1 and 2 OP B-3A:III, "Safety Injection System - Shutdown and Clearing," and OP B-2:III, "RHR - Clearing Equipment." For Modes 1 through 4, the precautions warn operating personnel not to clear a SI pump coincident with an RHR component unless a verification of containment recirculation capability has been performed.

2. PG&E is adding precautions to the following Unit 1 and 2 RHR and SI system valve exercising surveillance test procedures (STPs) to prohibit test performance that would result in concurrent SI and RHR train inoperability.

STP V-2D2	"Exercising and Position Verification of Valves 8700A and 8700B"
STP V-2H	"Miscellaneous Auxiliary Building Valves"
STP V-3M4	"Exercising RHR Pump Suction Valves 8700A and 8700B"
STP V-3L3	"Exercising Valves SI-8807A and SI 8807B, Safety Injection Charging Pump Suction Crosstie"
STP V-3L10	"Exercising valves SI-8923A and SI-8923B, Safety Injection Pump Suction Valves"

VI. Additional Information

A. Failed Components:

None.

B. Previous LERs on Similar Problems:

None.

ECCS COMPOSITE DRAWING

NORMAL INJECTION PHASE

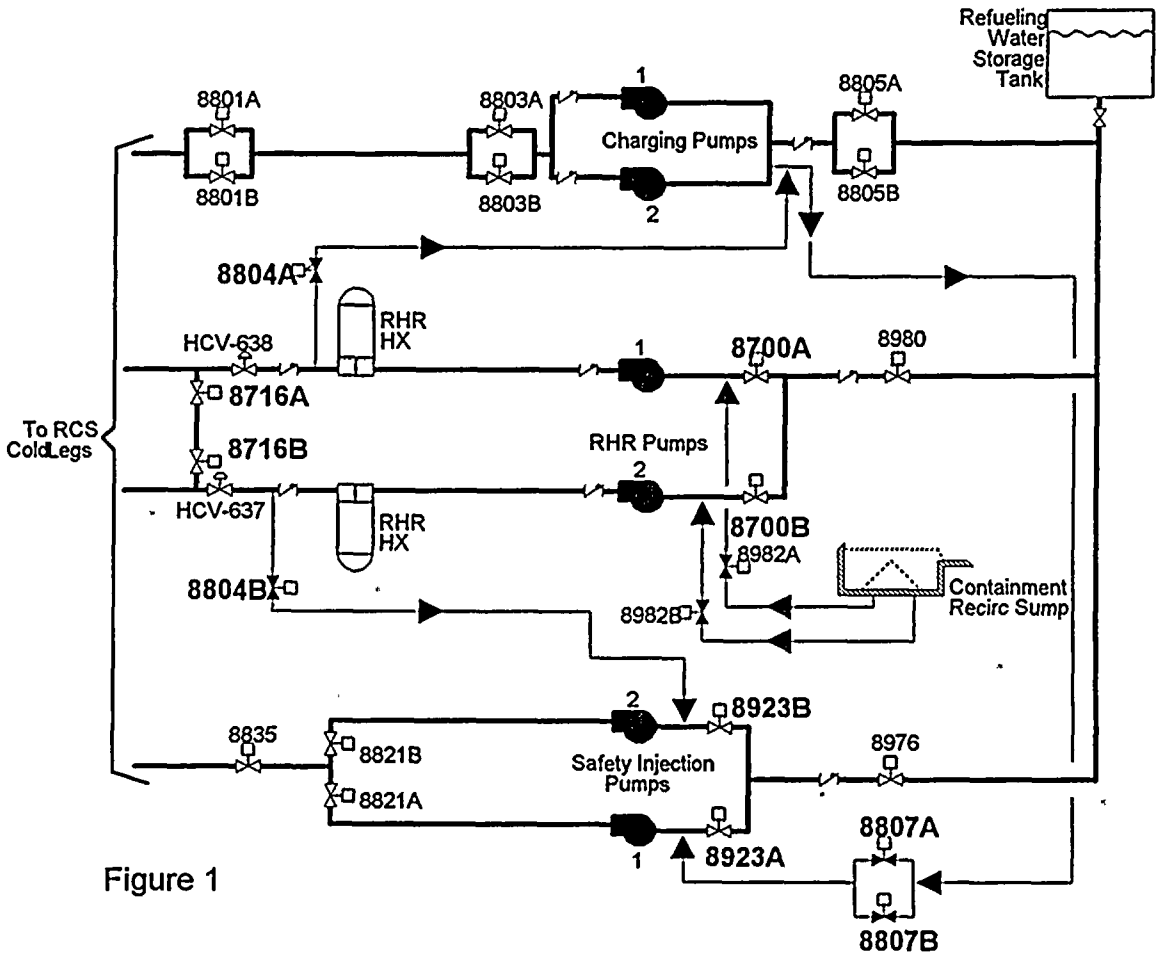

Figure 1

ECCS COMPOSITE DRAWING

NORMAL COLD LEG RECIRCULATION PHASE

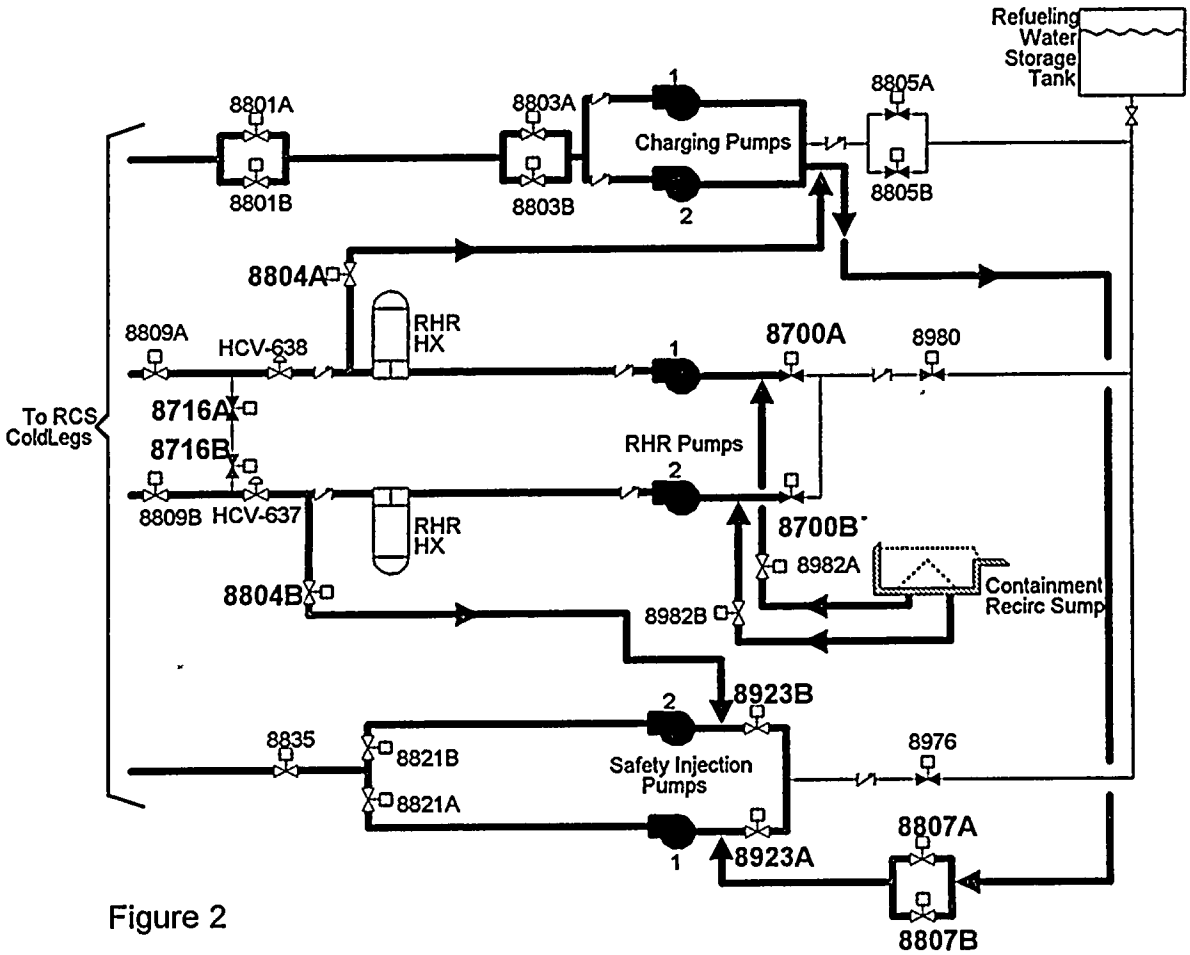

Figure 2

ECCS COMPOSITE DRAWING

EVENT SCENARIO
COLD LEG RECIRCULATION PHASE

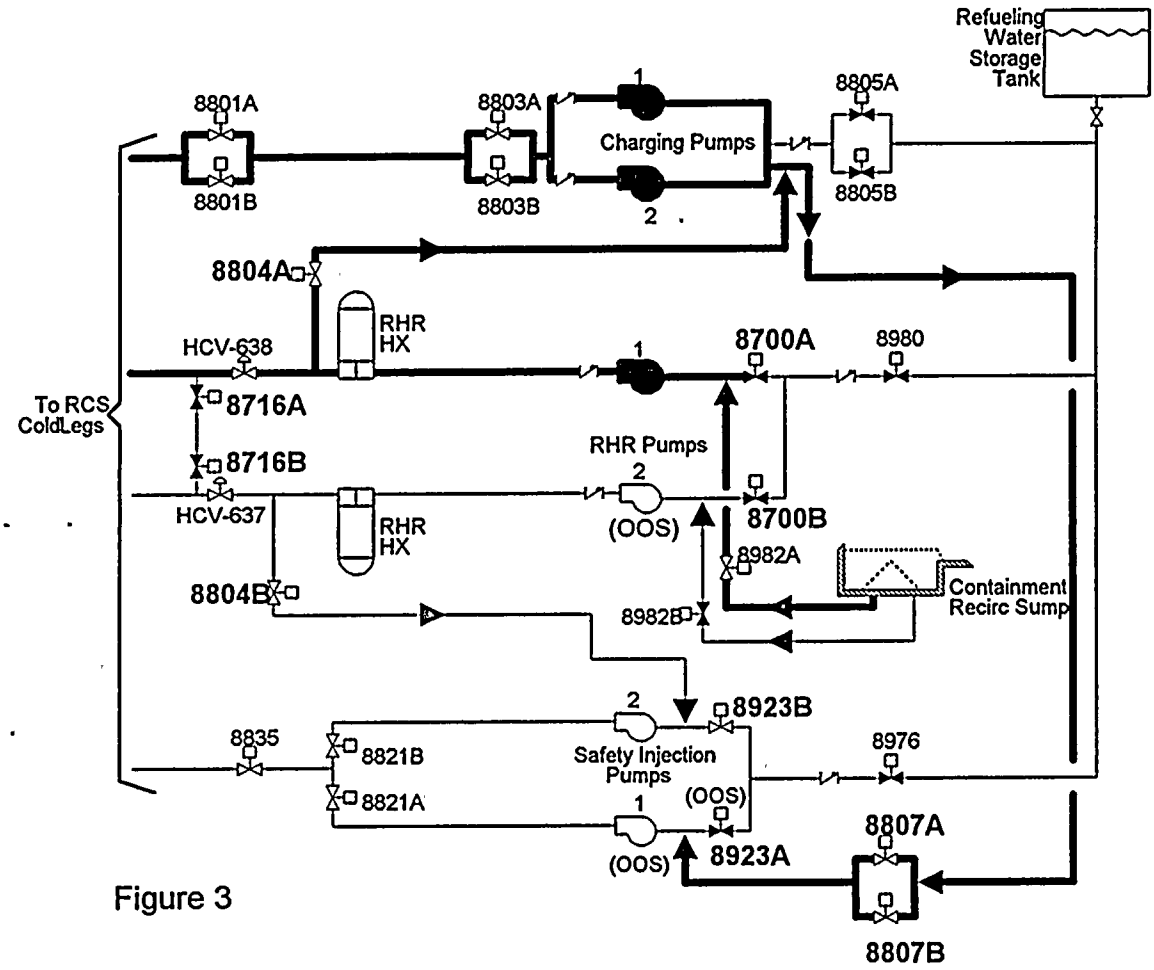

Figure 3