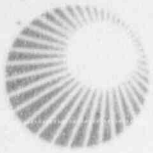


North Atlantic

North Atlantic Energy Service Corporation
P.O. Box 300
Seabrook, NH 03874
(603) 474-9521, Fax (603) 474-2987

The Northeast Utilities System

Ted C. Feigenbaum
Senior Vice President &
Chief Nuclear Officer

NYN-94084

July 26, 1994

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Reference: Facility Operating License No. NPF-86, Docket No. 50-443

Subject: Voluntary Licensee Event Report (LER) 94-009-00: Potential Safety Injection Pump Run-Out Condition

Gentlemen:

Enclosed please find voluntary Licensee Event Report (LER) No. 94-009-00 for Seabrook Station.

Should you require further information regarding this matter, please contact Mr. James M. Peschel, Regulatory Compliance Manager at (603) 474-9521 extension 3772.

Very truly yours,

Ted C. Feigenbaum

TCF:JES/jes

Enclosures: NRC Forms 366/366A

IE22
1/1

cc: Mr. Thomas T. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. Albert W. De Agazio, Sr. Project Manager
Project Directorate I-4
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Antone C. Cerne
NRC Senior Resident Inspector
P.O. Box 1149
Seabrook, NH 03874

INPO
Records Center
700 Galleria Parkway
Atlanta, GA 30339-5957

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Seabrook Station	05000443	1 OF 5

TITLE (4)
Voluntary LER for Potential Safety Injection Pump Run-out Condition

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	04	94	94	009	00	07	26	94		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	6	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Mr. James M. Peschel, Regulatory Compliance Manager	(603) 474-9521 Ext. 3772

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 (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

This voluntary LER is submitted to document a condition where the Safety Injection pumps (SIP) had the potential to exceed their run-out flow rate, hence resulting in the SIPs becoming degraded or inoperable. This condition could only have existed following a LOCA after hot leg recirculation had been initiated where the SIPs are receiving suction boost via both Residual Heat Removal pumps (RHRPs) [BP] and the Reactor Coolant System (RCS) had been depressurized. This condition could not have occurred for the small break LOCAs where the resultant RCS pressure would have precluded SIP run-out.

There are no adverse safety consequences as a result of this condition. This condition could only have caused the SIPs to experience run-out at a point in an accident scenario after they had fulfilled their intended safety function. The SIPs constitute the intermediate head portion of the Emergency Core Cooling System (ECCS) and are explicitly relied upon during the injection phase. The SIPs are not, however, explicitly relied upon during the recirculation phase of core cooling following RCS depressurization. For a depressurized RCS one Train of RHR is capable of providing adequate flow to ensure core cooling and mitigation of boron precipitation.

This condition does not represent a deviation from the single failure criteria since it only occurs after the SIPs have performed their intended safety function. The ECCS was always in compliance with 10 CFR 50.46 and GDC 35. North Atlantic has rebalanced the SI hot leg flow to ensure that the SIP run-out flow rate, provided by the vendor, is not exceeded.

Description of Condition

This voluntary LER is submitted to document a condition where the Safety Injection pumps (SIP) had the potential to exceed their run-out flow rate, hence resulting in the SIPs becoming degraded or inoperable. This condition could only have existed following a LOCA after hot leg recirculation had been initiated where the SIPs are receiving suction boost via both Residual Heat Removal pumps (RHRPs) [BQ] and the Reactor Coolant System (RCS) had been depressurized. This condition could not have occurred for the small break LOCAs where the resultant RCS pressure would have precluded SIP run-out.

Background

In October 1991, Westinghouse informed Public Service Company of New Hampshire (currently North Atlantic) of discrepancies found in information regarding the pump run-out limits (i.e., margin available beyond the design run-out flow rate) of Emergency Core Cooling System (ECCS) pumps manufactured by Dresser/Pacific Pumps. Specifically, this information stated, in part, that the run-out flow rate for the SIPs was 675 GPM when they were provided with suction boost from the discharge of the RHRPs. Subsequently, North Atlantic performed a calculation that indicated that the SIPs had the potential to slightly exceed this run-out limit, with a worst case flow rate of 678 GPM. In response, North Atlantic performed an operability determination and concluded that this condition would not adversely affect the intended function of the SIPs and that the ECCS was fully operable. On May 4, 1994, during the third refueling outage, North Atlantic performed a test of the SIPs with the suction boost provided from the discharge of the RHRPs, and determined that the Train A and B flow rates were 681 and 646 GPM, respectively. Therefore, only the Train A SIP exceeded the 675 GPM limit recommended by Westinghouse. Notwithstanding this, the Train A SIP performance was stable during this testing and no degradation was observed. North Atlantic subsequently rebalanced the SI hot leg flow to ensure that the run-out flow rate limit of 675 GPM is not exceeded.

System Operation

The SIPs constitute the intermediate head portion of ECCS. Upon receipt of an "S" signal they inject water into the RCS as do the Charging Pumps (CCPs) [BP], RHRPs, and accumulators. The point at which these various injection modes commence operating is controlled by the rate at which the reactor coolant is lost and system pressure drops. The Refueling Water Storage Tank (RWST) supplies the borated water used for the injection phase of the ECCS. When the RWST water level drops to the low-low level alarm point, the injection phase is discontinued and the cold leg recirculation phase is initiated. Recirculation provides long term core cooling.

During cold leg recirculation, the RHRPs take suction on the containment sump and discharge to the RCS cold legs and to the suction of the SIPs and CCPs. The RHRPs discharge to the SIPs and CCPs to provide additional suction boost needed to satisfy net positive suction head (NPSH) requirements under certain conditions. At this time, the CCPs and SIPs are aligned to the RCS cold legs.

After approximately 18 hours, cold leg recirculation is terminated and hot leg recirculation is initiated. The hot leg recirculation mode of core cooling provides mixing in the core to prevent boron precipitation and to terminate any boiling in the core should there be a break in one of the RCS cold legs. During this phase of core cooling, the discharge of each SIP is aligned to supply water to two RCS hot legs, and the RHRPs discharge is aligned to supply water to RCS hot legs 1 and 4. The CCPs do not have the capability to supply water to the hot legs and continue to supply the cold legs. It is in this configuration that the potential existed for SIP run-out. A simplified Engineered Safety Features flow diagram is provided as Figure 1.

Design Basis and Safety Consequences

The primary function of the Emergency Core Cooling System (ECCS) following an accident is to remove the stored heat and fission product decay heat from the reactor core so that fuel rod damage, to the extent that it would impair effective cooling of the core, is prevented. The SIPs constitute the intermediate head portion of the ECCS and are explicitly relied upon during the injection phase. The SIPs are not, however, explicitly relied upon during the recirculation phase of core cooling following RCS depressurization. If the RCS is depressurized one of the RHRPs is capable of providing adequate flow to cool the core. At this point in an accident it is not reasonable to assume that the break that caused the LOCA and depressurization of the RCS suddenly becomes blocked such that the resultant RCS pressure exceeds the RHRP head, hence requiring the additional head of the SIPs.

Additionally, loss of the SIPs during hot leg recirculation would not adversely affect the ability to mitigate boron precipitation. As described above, during this phase of recirculation, each SIP discharges into two hot legs, the RHRPs discharge into hot legs 1 and 4, and the CCPs discharge into all four cold legs. The worst case LOCA would be in either hot legs 1 or 4 such that only the flow from one of the RHRPs is discharged into the reactor vessel. In this case, however, a single RHRP would provide approximately 1600 GPM into the intact RCS hot leg, which is greater than the 185 GPM required to ensure adequate cooling.

This condition does not affect the ability of the ECCS to satisfy the single failure criteria, GDC 35, or 10 CFR 50.46. As stated above, this condition could only manifest itself after the SIPs have performed their intended safety function. The ECCS has sufficient redundancy to ensure long term core cooling.

Notwithstanding the above, the existing design documentation assumes that the SIPs would be available during long term cooling. In this regard, this condition is outside the design detail of the plant. However, a condition outside of the design detail of the existing design documentation does not meet the reportability threshold since it lacks the requisite level of significance implicit with the reporting criteria. In this case, significance is minimized since the balance of the ECCS is capable of providing adequate core cooling should this condition cause the SIPs to run-out. Additionally, this condition does not create a single failure of the ECCS.

Corrective Actions

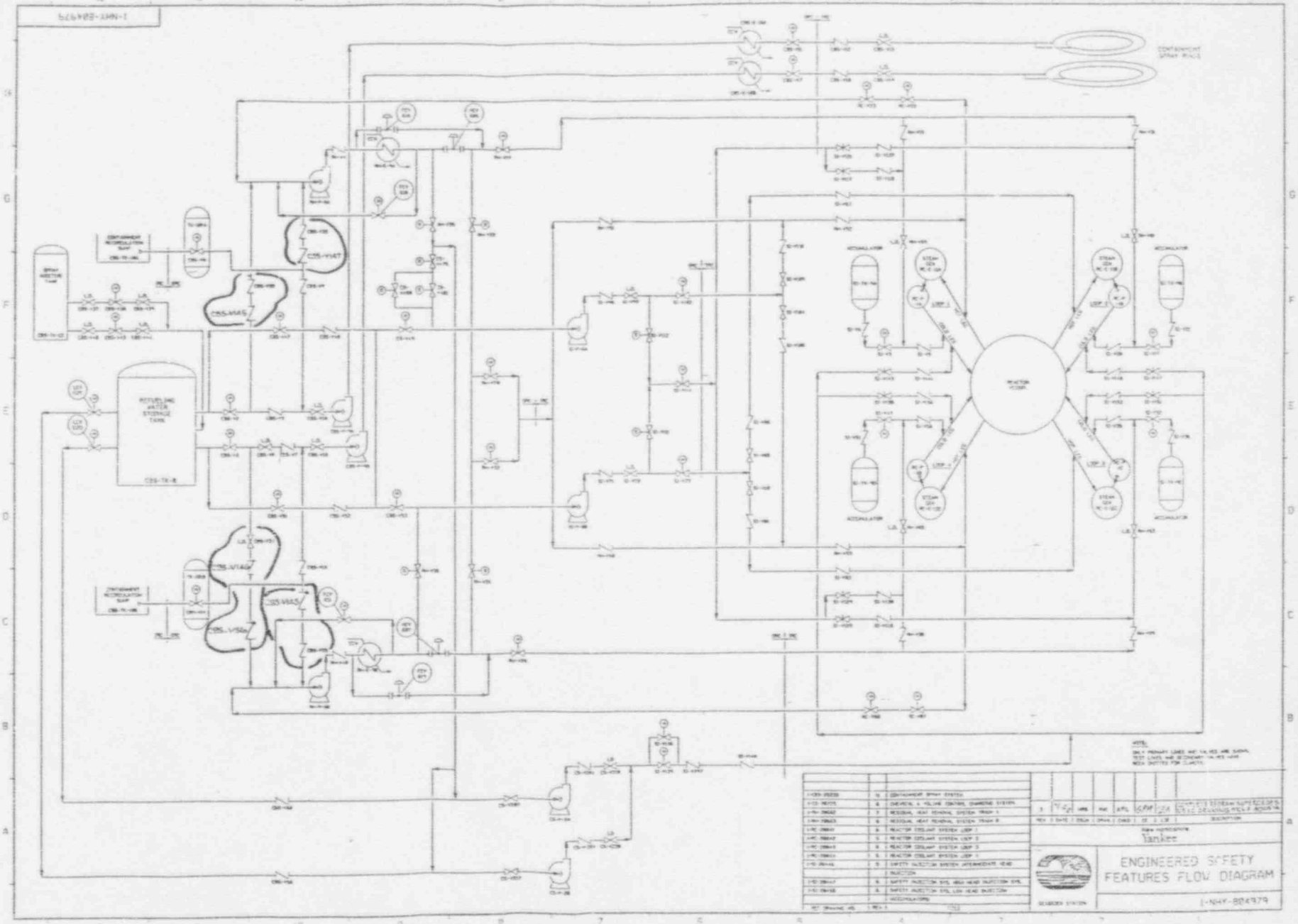
North Atlantic has rebalanced the hot leg recirculation flow to eliminate this potential run-out condition.

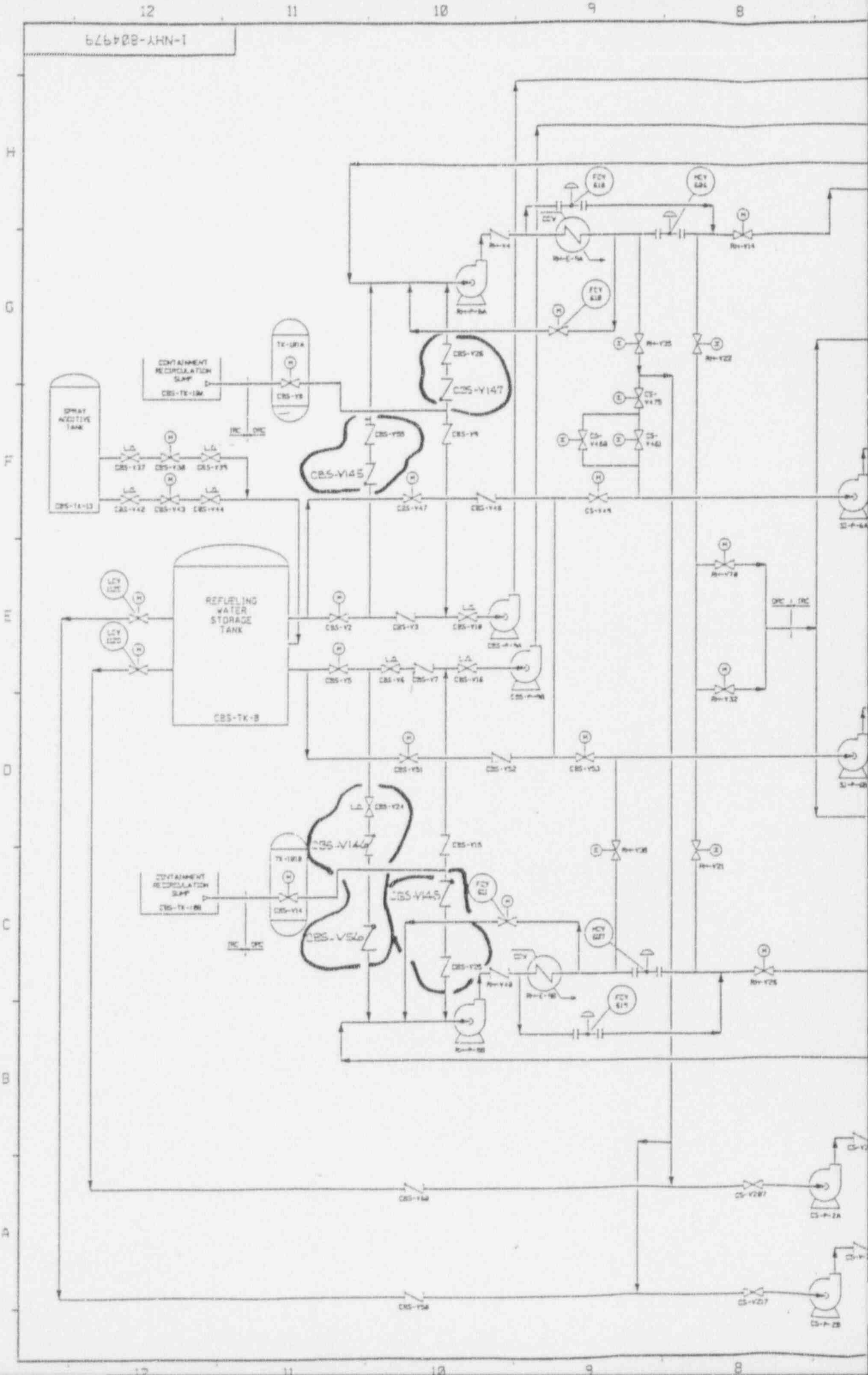
Previous Occurrences

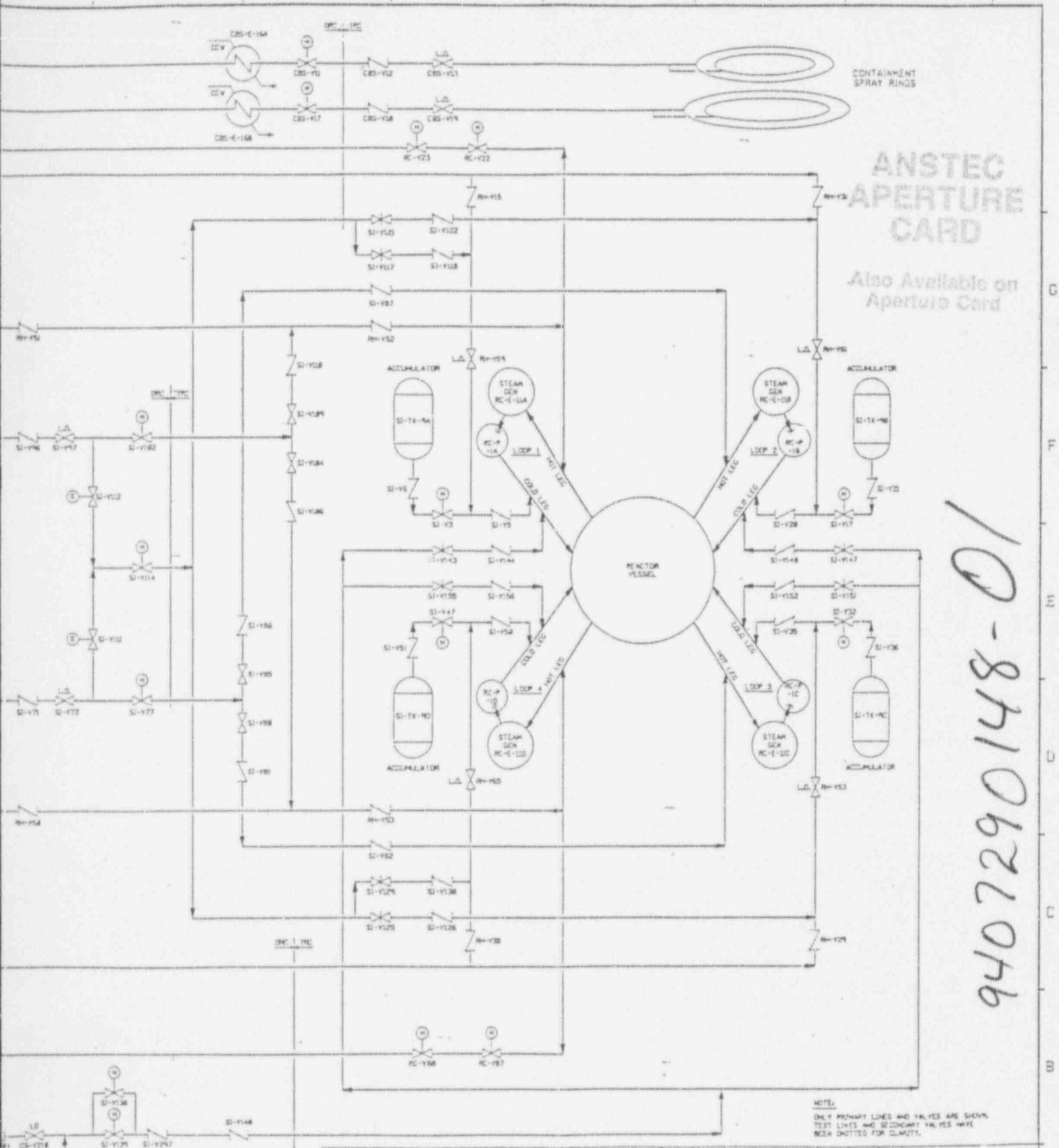
This is the first event of this type at Seabrook Station.

Plant Conditions

At the time that the SIP flow rates were tested the plant was in Mode 6, defueled.


ENGINEERED SAFETY FEATURES FLOW DIAGRAM
Yankee
1-NH-804979


1-NHY-804979
12
11
10
9
8
H
G
F
E
D
C
B
A
SPRAY ADDITIVE TANK
CBS-TK-13
CONTAINMENT RECIRCULATION SUMP
CBS-TK-18A
CONTAINMENT RECIRCULATION SUMP
CBS-TK-18B
REFUELING WATER STORAGE TANK
CBS-TK-8
CBS-V147
CBS-V145
CBS-V146
CBS-V145
CBS-V56
CBS-V26
CBS-V2
CBS-V5
CBS-V51
CBS-V52
CBS-V53
CBS-V47
CBS-V48
CBS-V60
CBS-V58
CS-V207
CS-V217
CS-P-2A
CS-P-2B
ORC | TRC
TRC | ORC



9407290148-01

NOTE:
ONLY PRIMARY LINES AND VALVES ARE SHOWN. TEST LINES AND SECONDARY VALVES HAVE BEEN DELETED FOR CLARITY.

1-CBS-2812D3	11	CONTAINMENT SPRAY SYSTEM
1-CBS-2807D5	6	CHEMICAL & VOLUME CONTROL CHARGING SYSTEM
1-RH-2866Z	7	RESIDUAL HEAT REMOVAL SYSTEM TRAIN A
1-RH-2866J	8	RESIDUAL HEAT REMOVAL SYSTEM TRAIN B
1-RC-2864I	6	REACTOR COOLANT SYSTEM LOOP 1
1-RC-2864Z	5	REACTOR COOLANT SYSTEM LOOP 2
1-RC-2864J	6	REACTOR COOLANT SYSTEM LOOP 3
1-RC-2864K	6	REACTOR COOLANT SYSTEM LOOP 4
1-SI-2844A	5	SAFETY INJECTION SYSTEM INTERMEDIATE HEAD INJECTION
1-SI-2844T	6	SAFETY INJECTION SYS. HIGH HEAD INJECTION SYS.
1-SI-2845B	6	SAFETY INJECTION SYS. LOW HEAD INJECTION ACCUMULATORS

REF. DRAWING NO. | REV # | TITLE

REV	DATE	DSGN	DRWN	CHKD	QE	LDE	DESCRIPTION
3	4/26	MRB	RWC	APL	GPM	GEA	COMPLETE REDRAW SUPERCEDES UE&C DRAWING 9763-F-80879A

New Hampshire
Yankee

SEABROOK STATION

ENGINEERED SAFETY FEATURES FLOW DIAGRAM

1-NHY-804979