Maine Yankee
RELIABLE ELECTRICITY FOR MAINE SINCE 1972

EDISON DRIVE • AUGUSTA, MAINE 04330 • (207) 623-3521

July 7,1988
MN-88-71 GDW-88-179

UNITED STATES NUCLEAR REGULATORY COMMISSION
Attention: Document Control Desk
Washington, D. C. 20555

References: (a) License No. DPR-36 (Docket No. 50-309)
(b) USNRC Bulletin No. 88-04: Potential Safety-Related Pump Loss

Gentlemen:

Subject: Response to NRC Bulletin No. 88-04

Reference (b) requested investigation and, as applicable, correction of two miniflow design concerns. Attachment A to this letter restates each requested action and provides Maine Yankee's response.

Based on our analysis, we conclude that the Maine Yankee plant design and operation and surveillance practices preclude problems with miniflow as identified in NRC Bulletin No. 88-04. As stated in Attachment A, we will follow up with the pump suppliers as final confirmation of this conclusion and report results to you.

Very truly yours,

John B. Randazza

John B. Randazza
President

JBR/bjp
Attachments
c: Mr. Richard H. Wessman
Mr. William T. Russell
Mr. Cornelius F. Holden
Mr. Patrick M. Sears
Mr. Clough Toppan

STATE OF MAINE

Then personally appeared before me, John B. Randazza, who being duly sworn did state that he is President of Maine Yankee Atomic Power Company, that he is duly authorized to execute and file the foregoing request in the name and on behalf of Maine Yankee Atomic Power Company, and that the statements therein are true to the best of his knowledge and belief.

Marcella J. Butler
Notary Public
MARCELLA J. BUTLER
NOTARY PUBLIC, MAINE
MY COMMISSION EXPIRES APRIL 21, 1994

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ATTACHMENT A

Response to NRC Bulletin No. 88-04: Potential Safety-Related Pump Loss

(In the following, each Action requested by the Bulletin is restated, followed by Maine Yankee's response).

NRC Bulletin Item #1

Promptly determine whether or not its facility has any safety-related system with a pump and piping system configuration that does not preclude pump-to-pump interaction during miniflow operation and could therefore result in deadheading of one or more of the pumps.

Maine Yankee Response

Maine Yankee has four sets of pumps that may be required for safe shutdown and accident mitigation and that have minimum recirculation systems. These are the:

1. High Pressure Safety Injection Pumps (HPSI/P-14A,B,S)
2. Low Pressure Safety Injection Pumps (LPSI/P-12A,B)
3. Containment Spray Pumps (CS/P-61A,B,S)
4. Emergency Feedwater Pumps (EFW/P-25A,C)

NOTE: The turbine driven Auxiliary Feedwater Pump (P-25B) is not run simultaneously with the Emergency Feedwater Pumps nor required to mitigate a design base accident. Therefore, it is not considered under this evaluation.

Maine Yankee's minimum recirculation (MR) systems do not deadhead pumps upstream of a common recirculation orifice, like the design discussed in the Bulletin does. Our MR systems minimize the probability of deadheading the associated pumps. A simplified diagram of the Maine Yankee MR designs and the Westinghouse design is attached along with selected pump information (Attachment B).

NRC Bulletin Item #2

If the situation described in Item 1 exists, evaluate the system for flow division taking into consideration (a) the actual line and component resistances for the as-built configuration of the identified system; (b) the head versus flow characteristics of the installed pumps, including actual test data for "strong" and "weak" pump flows; (c) the effect of test instrument error and reading error; and (d) the worst case allowances for deviation of pump test parameters as allowed by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, Paragraph IWP-3100.

Maine Yankee Response

Maine Yankee believes that our configuration will preclude pump-to-pump interaction during minimum flow operation and additional evaluation is not planned at this time.

NRC Bulletin Item #3

Evaluate the adequacy of the minimum flow bypass lines for safety-related centrifugal pumps with respect to damage resulting from operation and testing in the minimum flow mode. This evaluation should include consideration of the effects of cumulative operating hours in the minimum flow mode over the lifetime of the plant and during the postulated accident scenario involving the largest time spent in this mode. The evaluation should be based on best current estimates of potential pump damage from operation of the specific pump models involved, derived from pertinent test data and field experience on pump damage. The evaluation should also include verification from the pump suppliers that current miniflow rates (or any proposed modifications to miniflow systems) are sufficient to ensure that there will be no pump damage from low flow operation. If the test data do not justify the existing capacity of the bypass lines (e.g., if the data do not come from flows comparable to the current capacity) or if the pump supplier does not verify the adequacy of the current miniflow capacity, the licensee should provide a plan to obtain additional test data and/or modify the miniflow capacity as needed.

Maine Yankee Response

The HPSI pumps are used for normal makeup to the Reactor Coolant System (RCS). They are monitored by the plant computer and checked locally by plant personnel, at least 6 times a day. They are also tested each month (except during shutdowns). Pump temperatures, pressures, vibrations and inspections indicate that the pumps are in good operating condition. If MR was inadequate, we would have seen the affects over the last 16 years and corrected the condition.

The LPSI, CS and EFW pumps have been tested every month (except during shutdowns) for the last 16 years. They are run at minimum recirculation for approximately 15-30 minutes. The pump vibrations, temperatures and other operating parameters indicate that MR capacities are acceptable. Over the last 16 years of service, the total number of hours on MR has accumulated. However, 16 years of testing and preventative maintenance has also proven that the pumps are not being degraded by operation at MR.

The Nuclear Plant Reliability Data System was checked to determine if other utilities had experienced flow induced failures of pumps with similar model numbers. No failures were directly related to minimum recirculation.

Estimates are attached (Attachment C), which describe common scenarios and the times that pumps are at MR. The estimates are based on plant and simulator experiences, but they will not provide accurate totals because our procedures and operational demands have varied over the last 16 years. However, they do reflect current practices and provide insight as to the adequacy of our existing systems.

Maine Yankee will ask the pump suppliers to verify MR requirements by April 30, 1989. Maine Yankee plans to evaluate information from pump suppliers and notify the NRC of our findings, and any plans for additional testing or modifications by December 31, 1989.

NRC Bulletin Item #4

Within 60 days of receipt of this bulletin, provide a written response that (a) summarizes the problems and the systems affected, (b) identifies the short-term and long-term modifications to plant operating procedures or hardware that have been or are being implemented to ensure safe plant operations, (c) identifies an appropriate schedule for long-term resolution of this and/or other significant problems that are identified as a result of this bulletin, and (d) provides justification for continued operation particularly with regard to General Design Criterion 35 of Appendix A to Title 10 of the Code of Federal Regulations (10 CFR 50), "Emergency Core Cooling" and 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling System for Light Water Nuclear Power Reactors."

Maine Yankee Response

Maine Yankee's safeguards pumps do not share a common recirculation orifice and undesirable pump-to-pump interactions will not occur. Therefore, we believe that the first concern raised by NRC Bulletin No. 88-04 does not apply to Maine Yankee, and no further action is planned.

Our minimum recirculation systems were not intended for continuous service, and they are not used for continuous service. The second issue raised by this bulletin suggests that continuous operation at low flows may degrade some types of pumps. We recognize this concern but are also confident that our pumps will operate properly during transients and normal service. Our history and procedures indicate that undesirable shifts in previous trends are unlikely.

Maine Yankee plans to evaluate information from pump suppliers and notify the NRC of our findings, and any plans for additional testing or modifications by December 31, 1989.

NRC Bulletin Item #5

Within 30 days of completion of the long-term resolution actions, provide a written response describing the actions taken.

Maine Yankee Response

As stated in the response to Item 4 above, Maine Yankee will inform the NRC of additional findings and, if required, plans for additional testing or modification. Within 30 days of completing the long-term resolution actions, Maine Yankee will provide a written response describing the actions taken.

NRC Bulletin Item #6

An evaluation of your actions in response to this bulletin should be documented and maintained at the plant site for a minimum of two (2) years. That evaluation should, as a minimum, address the piping system configuration in accordance with Item 1 above, each of the four factors discussed in Item 2, pertinent test data and field experience on minimum flow operation, and verification of the adequacy of current miniflow capacity by the pump manufacturer.

Maine Yankee Response

Maine Yankee will maintain appropriate documentation to comply with this requested action.

ATTACHMENT B

Pump and Minimum Recirculation System Information

High Pressure Safety Injection (HPSI)

Bingham - Horizontal,	9 stage, Centrifugal
Rated Flow/Head	200 gpm @5,500 ft (TDH)
Shutoff Pressure	5,750 ft (TDH)
Minimum Flow	50 gpm
Minimum Flow Orifice	12 stage

Low Pressure Safety Injection (LPSI/RHR)

Bingham - Vertical,	2 stage, Centrifugal - 14 x 16 18B-VCR
Rated Flow/Head	3,000 gpm/365 ft (TDH)
Shutoff Pressure	430 FT (TDH)
Minimum Flow	350 gpm
Minimum Flow Orifice	1 stage 1 1/4 in dia
Min. Flow Disch. Pressures	180 to 184 psig (from tests)

Containment Spray (CS)

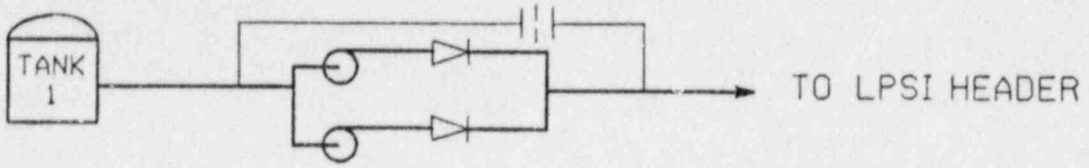
Byron Jackson - Vertical,	2 stage, Co-Axial Turbine - 18 CKXH
Rated Flow/Head	3,700 gpm/305 ft (TDH)
Shutoff Pressure	420 ft (TDH)
Minimum Flow	425 GPM
Minimum Flow Orifice	1 stage 1 1/16 in dia
Min. Flow Disch. Pressure	192 to 195 psig (from tests)

Emergency Feedwater (EFW)

Ingersoll-Rand - Horizontal,	8 stage, Centrifugal - 3HMTA - 8
Rated Flow/Head	525 gpm @1100 psig or 2,500 ft
Shutoff Pressure	3,200 ft (TDH)
Minimum Flow by IR	20 gpm
Minimum Flow Orifice by IR	6 stage 1/4" holes
Minimum Flow Disch. Pressure	1,400 to 1,450 psig (from tests)

SIMPLIFIED MINIMUM RECIRCULATION SYSTEMS

WESTINGHOUSE DESIGN - LPSI/RHR



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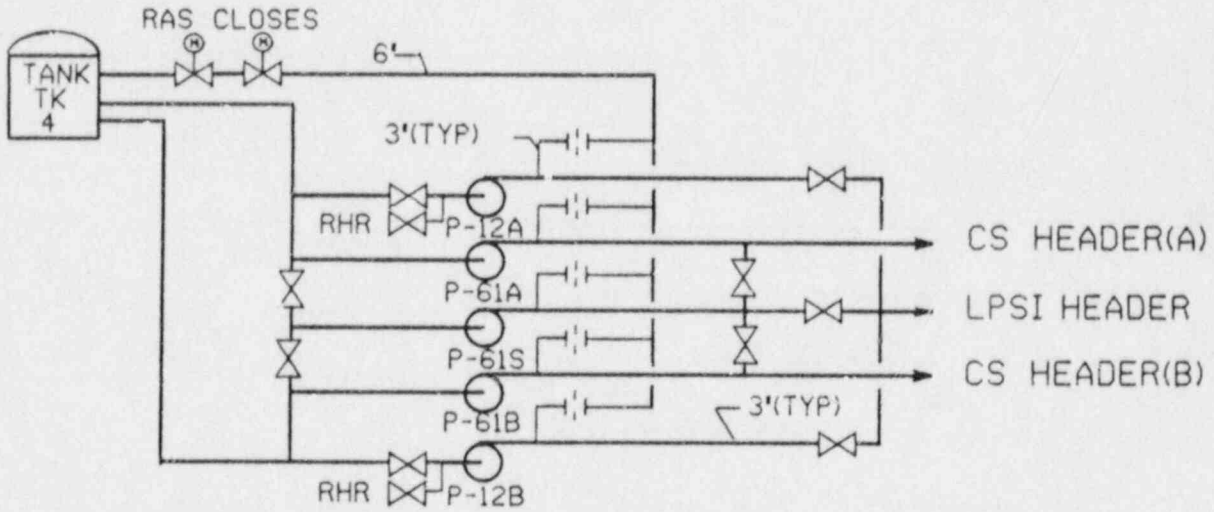
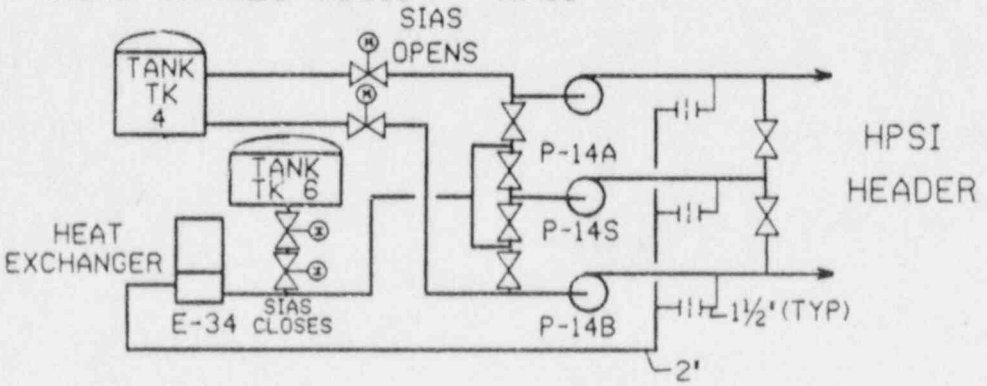
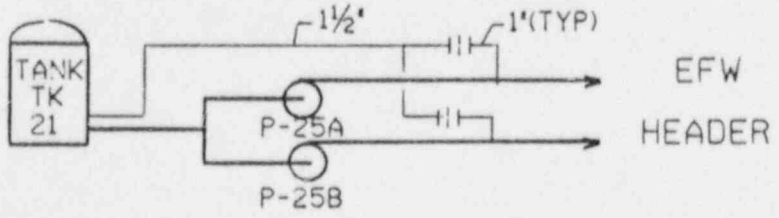
MAINE YANKEE DESIGN - LPSI(RHR)/CS



MAINE YANKEE DESIGN - HPSI



MAINE YANKEE DESIGN - EFW



ATTACHMENT C

Estimated Times at Minimum Flow

HPSI Pumps

° Normal Operation
Reference Procedure 1-11-6
Minimum Recirculation (MR) time is insignificant.

° Monthly Surveillance Tests
Reference Procedure 3.1.2, 3.17.6.6
Tests are performed with the pumps in their normal charging mode and they are not run at MR.

° Loop Fill and Vent
Reference Procedure 1-10-1
This operation may require up to 6 hours with 50 gpm MR plus 12-14 gpm of seal water. This is a rough estimate because there are several evolutions that place the pump at MR, MR with seal water, and MR with seal water and 75-100 gpm make up.

° Refueling Surveillance Tests
Reference Procedure 3.1.15.2 and 3.1.15.3
The tests do not place the pumps at MR.

° Emergency Core Cooling
Reference Procedure E-0, E-1, ES-1.1
One pump is normally charging and second pump starts on a SIAS. The discharge valves shift within 13 seconds to establish HPSI and terminate charging.

* The worst case is a loop fill and vent which may place a pump at MR intermittently for several hours.

LPSI (RHR) Pumps

° Normal Operation (Residual Heat Removal)
Reference Procedures 1-13-1 and 1-13-2
The pumps are not operated at minimum recirculation during RHR startup, operation or termination.

° Monthly Surveillances
Reference Procedure 3.1.2 and 3.17.6.6
The pumps are tested in the minimum recirculation mode for 15 to 30 minutes each.

° Refueling Surveillance Tests
Reference Procedure 3.1.15.2, 3.1.15.3
The tests do not place the pumps at MR.

° Emergency Core Cooling
Reference Procedure E-0, E-1, ES-1.1, ES-1.2, E-3
Both pumps start on a safety injection actuation signal (SIAS). They operate on minimum recirculation until the RCS pressure drops to 190 psig, or until they are secured by an operator.

* The worst case estimate is 2 hours at MR during a small break LOCA.

CS Pumps

° The containment spray pumps are only used during surveillance tests and emergency core cooling

° Monthly Surveillance Tests
Reference Procedure 3.1.2 and 3.17.6.6
The pumps are tested in the MR mode for 15 to 30 minutes each.

° Refueling Surveillance Tests
Reference Procedure 3.1.15.3
Some of the recirculation flow tests place the pumps at MR for brief periods.

° Emergency Core Cooling
Reference Procedure E-1, E-3, ES-1.1, ES-1.2
The pumps start on a SIAS and run on recirculation until the containment pressure exceeds 20 psig or an operator secures the pumps. The maximum time on MR is estimated to be 2 hours.

* The worst case estimate is 2 hours at MR during a small break LOCA.

EFW Pumps

° Normal Operation (Heatup, Cooldown, Standby)
Reference Procedure 1-1, 1-7
The procedures do not preclude operation at MR. One pump could be on MR for up to 30 minutes.

° Monthly Surveillances
Reference Procedure 3.1.5 and 3.17.6.6
The pumps are operated at MR for 15 to 30 minutes each.

° Post Trip Cooling
Reference Procedure E-0 and E-0.1
Pumps start on a low steam generator level (35%) and provide full flow. If the Feedwater (FW) pumps are not operating, the EFW pumps are throttled back to approximately 200 gpm per generator but not less than 490 gpm total flow to all three generators.

If a FW pump was in operation, the EFW pumps would provide 20 gpm per generator plus 20 gpm MR for less than 1 hour.

° Placing Steam Generators in Wet Lay-up.
Reference Procedure 1-104-14.
The EFW pumps are not run on recirculation.

° Refueling Surveillance Tests
Reference Procedure 3.1.22
The pumps may be at MR for less than 30 minutes.

* The worst case estimate is 30 minutes of operation during surveillance tests.