VERMONT YANKEE
NUCLEAR POWER CORPORATION

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FVY 88-84

REPLY TO
ENGINEERING OFFICE
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September 29, 1988

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

References:
a) License No. DPR-28 (Docket No. 50-271)
b) Letter, USNRC to All Holders of Operating Licenses for Nuclear Power Reactors, NVY 88-125, NRC Bulletin No. 88-08, dated 6/22/88
c) Letter, USNRC to All Holders of Operating Licenses for Nuclear Power Reactors, NVY 88-126, NRC Bulletin No. 88-08, Supplement 1, dated 6/24/88
d) Letter, USNRC to All Holders of Operating Licenses for Nuclear Power Reactors, NVY 88-158, NRC Bulletin No. 88-08, Supplement 2, dated 8/4/88

Dear Sir:

Subject: Vermont Yankee Response to NRC Bulletin No. 88-08: Thermal Stresses in Piping Connected to Reactor Coolant Systems

By letter dated June 22, 1988 [Reference b)], the NRC's Office of Nuclear Reactor Regulation requested that licensees: 1) review their Reactor Coolant System (RCS) to identify any connected, unisolable piping that could be subjected to temperature distribution which would result in unacceptable thermal stresses; and 2) take action where such piping is identified to ensure that the piping will not be subjected to unacceptable thermal stresses.

In accordance with the subject Bulletin, as supplemented by letters dated June 24, 1988 and August 4, 1988 [References c) and d)], the following information is provided.

BACKGROUND

NRC Information Notice No. 88-01, "Safety Injection Pipe Failure," identified an unisolable leak on Emergency Core Cooling System (ECCS) piping at an operating Pressurized Water Reactor (PWR). The NRC subsequently issued NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems (RCS)", which addressed the possible cause of the leakage at the affected plant, and identified required actions and documentation from all light water-cooled power reactors.

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NRC Bulletin No. 88-08 required all operating plants to 1) review systems connected to the RCS to determine whether unisolable sections of piping could be subjected to stresses from temperature stratification or temperature oscillations induced by valve leakage, and were not evaluated in the design analysis of the piping; and 2) take action where such piping is identified to ensure that the piping will not be subjected to unacceptable thermal stresses. This letter documents the results of the required review for Vermont Yankee.

DISCUSSION

The leak identified in Bulletin No. 88-08 is believed to have been caused by thermal fatigue of unisolable piping connected to the RCS. The fatigue possibly occurred because the piping was isolated from the RCS by a leaking block valve. The pressure upstream from the block valve was higher than RCS pressure, and the temperature upstream was significantly cooler than RCS temperature. These adverse conditions of temperature stratification and fluctuations is believed to have resulted in crack initiation and leakage at an operating PWR.

To evaluate the effect of Bulletin No. 88-08 as it applies to Vermont Yankee, a review was conducted to identify all applicable systems connected to the RCS. Criteria used in this evaluation were:

- pressure available to allow leakage across valve to RCS; and
- temperature differential between two systems.

Also considered in the evaluation was the fact that the affected plants identified in NRC Bulletin No. 88-08 all used dual purpose charging pumps, which are used for charging the RCS with coolant during normal operation, and injecting emergency coolant at high pressure following an accident. This condition is consistent with PWR operation and is not prevalent in BWR plants. However, as stated in the Bulletin, valve leakage could occur in any power reactor and susceptibility to this condition should be determined.

During normal operation, the following systems at Vermont Yankee can inject to the RCS and could have the required temperature and pressure differentials of concern identified in Bulletin No. 88-08:

System	Line Number
Reactor Water Clean-up	4"-CUW-55
Control Rod Drive	2-½"-CRD-9
High Pressure Coolant Injection	14"-HPCI-15B
Reactor Core Isolation Cooling	4"-RCIC-8B
Standby Liquid Control	1-1½"-SLC-11
Feedwater	16"-FDW-15

The following is a discussion of each of these systems:

o Reactor Water Clean-Up

The Reactor Water Clean-Up (RWCU) System normally operates at a pressure equal to or higher than reactor pressure, and at a slightly lower temperature. However, this system is in continuous operation and its return water enters the RCS through the Feedwater System via a thermal sleeve. This thermal sleeve has been designed to accommodate, without excessive stresses, the maximum temperature differential that could occur between the two fluid streams under any mode of plant operation. Therefore, this system is not subjected to the unanalyzed stresses of concern identified in Bulletin No. 88-08.

o Control Rod Drive

The Control Rod Drive (CRD) System operates at high pressure and also at somewhat lower temperatures than the reactor. However, this system is normally operating and injects into the RCS through the RWCU System and the thermal sleeve identified above and the CRD mechanisms at the bottom of the vessel. Therefore, because this system has been designed to inject cool water into the reactor, the CRD System is not subjected to the unanalyzed stresses of concern identified in the subject Bulletin.

o High Pressure Coolant Injection

The High Pressure Coolant Injection (HPCI) is a high pressure system which can be connected to the RCS through feedwater piping at Vermont Yankee. However, during normal operation, feedwater pump discharge pressure is maintained up to a testable valve in this system, while upstream of this valve is kept filled the pressure is insufficient to overcome RCS pressure and inject water into the RCS. Additionally, although these systems are tested monthly, any leakage during testing would inject into the Feedwater System upstream of two check valves and one manually operated valve, causing considerable mixing prior to reaching any portion of the feedwater lines which would not be isolable from the RCS. Therefore, the HPCI System is not subjected to the stresses of concern identified in the subject Bulletin.

o Reactor Core Isolation Cooling

The Reactor Core Isolation Cooling (RCIC) System is a high pressure system which is connected to the RCS through feedwater piping similar to HPCI. As in the case of HPCI, any leakage from the RCIC System would inject into an operating Feedwater System thereby causing considerable fluid mixing prior to reaching any unisolable sections of feedwater lines. Therefore, the RCIC System is not subjected to the stresses of concern identified in the subject Bulletin.

o Standby Liquid Control

The Standby Liquid Control (SLC) System is connected to the RCS directly through a 1-1½ inch line which is isolated during normal operation by explosive squib valves. Upstream of these valves is depressurized during normal operation and would be pressurized only during monthly pump discharge testing. However, leakage through these "zero leakage" valves during testing is an unlikely event since these valves are designed such that no leakage will occur. Therefore, this system is not subjected to the stresses of concern identified in the subject Bulletin.

o Feedwater

Feedwater Line 16"-FDW-15 injects into the RCS directly through the continuation of the Feedwater System. This system is designed to continuously inject make-up water into the RCS and is isolated from the RCS by dual containment isolation valves; therefore, this part of the Feedwater System is not subjected to the stresses of concern identified in the subject Bulletin.

SUMMARY

The above systems were evaluated for normal operation and hot standby conditions when reactor pressure is high. Vermont Yankee also evaluated low pressure systems to ensure that unanalyzed temperature gradients which could result in unacceptable thermal stresses are not possible during cold shutdown. The two systems evaluated were 1) Core Spray; and 2) Low Pressure Coolant Injection.

o Core Spray

The Core Spray (CS) System is a low pressure system and would only be in operation during testing. Leakage past the CS injection valve could only occur when reactor pressure is lower than the CS pump discharge line pressure. This could occur only during cooldown and shutdown of the reactor when the pressurizing line keeps the pump discharge piping pressurized to approximately 75 to 85 psig. However, the temperature differentials at the time are much smaller than identified in the Bulletin. Additionally, these injection valves, MOV-14-12A and MOV-14-12B, are currently included in Type C leak-rate testing during each reactor shutdown for refueling.

An evaluation has been conducted to analyze the effect of leakage of "cool" water through the CS Injection Valves MOV-14-12A and MOV-14-12B, during cold shutdown on the CS piping downstream of the Check Valve V12-13A/B. This evaluation has determined that no unacceptable thermal stresses occur durng cold shutdown.

o Low Pressure Coolant Injection

The Low Pressure Coolant Injection (LPCI) System is a subsystem of the Residual Heat Removal System at Vermont Yankee. Leakage past the LPCI

injection valves could only occur when reactor pressure is lower than the RHR pump discharge line pressure. This could occur during cooldown and shutdown conditions due to pressurizing the pump discharge piping as in the CS System. During this condition, the temperature differentials are much smaller than those of concern in the Bulletin.

As for the CS System, an evaluation was completed to analyze the effect of the LPCI Injection Valves MOV-10-27A and MOV-10-27B, leaking "cool" water through the Check Valve V10-46A/B. The evaluation showed no unacceptable thermal stresses occur during cold shutdown.

CONCLUSION

In accordance with NRC Bulletin No. 88-08, Vermont Yankee has reviewed the Reactor Coolant Systems at Vermont Yankee to identify any connected, unisolable piping that could be subjected to temperature distribution that would result in unacceptable thermal stresses. As a result of this review, Vermont Yankee has determined that during normal operation, hot standby and cold shutdown conditions there are no unisolable sections of piping connected to the RCS which could be subjected to stresses from temperature stratification or temperature oscillations induced by valve leakage, and which were not evaluated in the design analysis of the piping.

We trust that the information provided is responsive to the subject Bulletin; however, should you have any questions or require additional information, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Warren P. Murphy
Vice President and
Manager of Operations

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cc: USNRC Regional Administrator, Region I
USNRC Resident Inspector, VYNPS

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WINDHAM COUNTY)

Then personally appeared before me, Warren P. Murphy, who, being duly sworn, did state that he is Vice President and Manager of Operations of Vermont Yankee Nuclear Power Corporation, that he is duly authorized to execute and file the foregoing document in the name and on the behalf of Vermont Yankee Nuclear Power Corporation and that the statements therein are true to the best of his knowledge and belief.

NOTARY PUBLIC WINDHAM COUNTY, VERMONT

Diane M. McCue Notary Public
My Commission Expires February 10, 1991