VERMONT YANKEE NUCLEAR POWER CORPORATION

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February 9, 1998
BVY 98-19

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

References:
(a) Letter, USNRC to VYNPC, Generic Letter 96-06 Supplement 1, Assurance of Equipment Operability and Containment integrity During Design Basis Accident Conditions, dated November 13, 1997
(b) Letter, USNRC to VYNPC, Generic Letter 91-18 Revision 1, Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions, dated October 8, 1997
(c) NRC/NEI Workshop on GL 96-06, held December 4, 1997
(d) Letter, VYNPC to USNRC, VY 30-day Response to GL 96-06, BVY 96-136, dated October 30, 1996
(e) Letter, VYNPC to USNRC, VY 120-day Response to GL 96-06, BVY 97-17, dated January 28, 1997
(f) EPRI NP-6766, Water Hammer Prevention, Mitigation and Accommodations, Volume 5, Part 1, July 1992

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Schedule Extension for Resolving Generic Letter 96-06

In Reference (e) Vermont Yankee provided requested information on the susceptibility of Vermont Yankee systems to the conditions identified in Generic Letter 96-06.

Vermont Yankee has installed modifications that will preclude over-pressurization of isolated piping at VYNPS and has concluded that there is reasonable assurance that water hammer will not occur upon restoration of containment cooling following a Design Basis Loss of Coolant Accident (DBA-LOCA) with a coincident Loss of Off-site Power (LOOP). Additionally, in the event of a main steam line break (MSLB) inside containment, Vermont Yankee has determined that containment operability would be maintained.

The purpose of this letter is to notify you of a schedule extension for permanently resolving the remaining water hammer and piping thermal expansion issues until startup from the Fall 1999 refueling outage.

Attachment 1 provides our justification for the schedule extension.

Should you have any questions or concerns with this change in schedule, please contact this office.

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Sincerely,

VERMONT YANKEE NUCLEAR POWER CORP.

Donald A. Reid
Senior Vice President, Operations

Attachment

CC USNRC Region 1 Administrator
USNRC Project Manager - VYNPS
USNRC Resident Inspector - VYNPS
Vermont Department of Public Service

SALLY A. SANDSTRUM NOTARY PUBLIC WINDHAM COUNTY VERMONT

STATE OF VERMONT)
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WINDHAM COUNTY)

Then personally appeared before me, Donald A. Reid, who, being duly sworn, did state that he is Senior Vice President, 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.

Sally A. Sandstrum, Notary Public
My Commission expires February 10, 1999

ATTACHMENT 1

Vermont Yankee has applied significant resources in addressing the issues raised in Generic Letter 96-06. As discussed in previous correspondence (Reference e), overpressure protection equipment was installed during the Fall 1996 refueling outage to address the concern of containment penetration overpressure. Reference (e) also provided requested information demonstrating that the Reactor Building Closed Cooling Water (RBCCW) system is operable. The RBCCW system at Vermont Yankee provides cooling water to the containment air coolers (RRUs).

The RBCCW cooling water enters the drywell through a single penetration and is then distributed to the four containment cooling units, the cooling coils for each recirculation pump and the drywell equipment drain sump cooling coil. The water exits the drywell through another single penetration. The RBCCW system also supplies cooling water to other components and systems within the Reactor Building. The cooling water is circulated by a full capacity pump, with a redundant pump in a standby mode which starts automatically on low system pressure. None of the equipment served by the RBCCW system is required to function following a Design Basis Accident (DBA). A more detailed description of the RBCCW system can be found in the Vermont Yankee Updated Final Safety Analysis Report (UFSAR), Section 10.9.

RBCCW cooling water circulates continuously through each RRU during normal operation. Power for the RBCCW pumps is from 480v buses that receive backup electrical power from the Emergency Diesel Generators (EDGs). In the event normal electrical power is lost, the RBCCW pumps are automatically restarted 60 seconds after emergency power is restored to the bus. Under DBA conditions, the RBCCW pump would restart approximately 73 seconds after the initiation of the accident. However, as previously described, the RBCCW system is not required to mitigate the consequences of a DBA. The pumps are automatically restarted upon restoration of emergency power as an operator convenience and to minimize the potential negative impact of the loss of cooling water flow to non-essential systems (e.g. recirculation pump seal coolers).

The containment cooling units at Vermont Yankee do not perform a design basis post accident containment cooling function. In fact, an accident signal (high drywell pressure or low-low reactor water level with low reactor pressure) will trip the RRU fan motors. However, the portion of the RBCCW system that is within the drywell is considered a closed system in accordance with 10CFR50, Appendix A, General Design Criterion 57. This part of the system is considered an extension of the containment and as such is maintained as a Seismic Class I, Safety Class 2 system. The RBCCW piping inside the drywell is credited as one of the two required containment barriers; the isolation valves on the supply and return lines constitute the second barrier. Therefore, a water hammer induced load has been evaluated at Vermont Yankee because of its potential to affect the integrity of one of the two containment barriers.

The RBCCW system is a closed system which is vented to atmosphere via a vent off the RBCCW Surge Tank. The surge tank elevation provides a static head of water which will prevent boiling in the RRUs for temperatures ≤272°F.

The driving force for heat transfer to the cooling water is the ambient conditions in the drywell following a LOCA. The DBA-LOCA, a guillotine break of a recirculation line (UFSAR 14.6.3.3) with a coincident loss of offsite power (LOOP), is expected to cause drywell temperature to exceed 272°F for approximately 15 seconds (UFSAR Figure 14.6-6). Drywell temperature is expected to drop below 272°F 16 seconds into the event and remain below 272°F thereafter. A preliminary heat transfer study has shown that the cooling water temperature will lag the increase in containment temperature. Since the containment temperature will be decreasing below 272°F when the cooling water temperature is still rising towards saturation, boiling of the containment cooling water is not expected to occur. Therefore, for the DBA-LOCA there is reasonable assurance that water hammer will not occur when RBCCW flow through the containment coolers is restored 73 seconds into the event.

Vermont Yankee has also considered a main steam line break (MSLB) with a coincident LOOP. Analysis was performed on a number of steam line breaks ranging in size from 0.02 ft^2 to 0.5 ft^2. The analysis concluded that drywell temperature would remain below the saturation temperature of the containment cooling water for the first 73 seconds of the accident, when flow is expected to be re-established. Therefore, for this spectrum of break sizes, containment cooling water flow would be restored prior to the onset of void formation within the containment coolers, providing reasonable assurance that water hammer would not occur for these scenarios.

Vermont Yankee does not have a plant-specific analysis for MSLB >0.5 ft^2 and therefore has conservatively assumed that voiding could occur for such an event. In attempting to quantify the anticipated water hammer loads, Vermont Yankee has used EPRI guidelines (Reference f) for estimating loads for water filling a voided line and/or water column rejoining. The expected water hammer induced loads on containment cooling piping are less than piping failure limits and operability is maintained. Hot water on either side of the void would slow down the condensation rate of the steam voids and thus reduce the pressure differential for accelerating flow. Additionally, the pressure in the steam region would not drop below the saturation pressure of the heated water. Any air in the water would come out of solution and provide a cushioning effect. Thus, any resulting water hammer force is expected to be much smaller than that predicted from the EPRI guidelines.

Vermont Yankee has also evaluated the effects of heating the RBCCW piping to accident temperatures from a piping thermal expansion perspective. The results of this evaluation conclude that the closed loop RBCCW piping within containment is capable of withstanding the postulated elevated environmental temperatures without pressure boundary failure.

We are evaluating a number of possible modifications and analytical solutions for resolving the potential piping expansion, water hammer and two phase flow issues. At this time we believe that the optimum final solution may be analytical using ASME Code Section III, Appendix F type criteria. The intent of the Appendix F criteria is to assure that the pressure retaining boundary will remain structurally intact during or following a specified event. For systems evaluated by elastic analysis methods, Appendix F permits a stress value allowable limit of seventy percent of the ultimate material strength.

We are also considering a number of system modifications such as:

- Elevating the RBCCW Surge Tank
- Pressurizing the RBCCW system
- Restart time adjustment of the RBCCW pumps after emergency power restored
- Automatic isolation of RBCCW flow to the drywell

Resolution of this issue requires significant resources to ensure that the method implemented does not create other unforseen issues. All of the potential hardware modifications listed above have potential negative issues which must be further evaluated. At this time we have not reached a consensus on any modification or analytical solution that would best resolve the issue. If a hardware modification is determined to be necessary, extensive engineering would be required to develop the design, prepare specifications, produce engineering change documentation and purchase equipment that may not be readily available.

Vermont Yankee has followed industry activities on this issue and attended the NEI/NRC workshop (Reference c) held in December. At this time, there does not appear to be a clear choice in the industry as to what modification(s) best resolves the issue generically. We believe that, in light of the very narrow range of events for which water hammer in this system is a potential and the relatively low peak loads expected should water hammer occur, the analytical solution may offer the best long term resolution.

In summary, Vermont Yankee has implemented modifications to resolve the containment penetration overpressure issue and determined that the RBCCW system is operable. Final resolution of the potential RBCCW piping expansion and water hammer issues require extensive engineering resources to fully investigate and resolve the remaining issues. We believe that the risk of piping expansion or water hammer damaging equipment or piping in the primary containment is very low. Accordingly, in accordance with guidance provided at the workshop and in the Generic Letter 96-06 Supplement 1, we are notifying you of a schedule extension to startup from the Fall 1999 refueling outage to fully resolve these issues.