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To:
Richard Ennis

*** YELLOW ***

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STATE OF VERMONT
DEPARTMENT OF PUBLIC SERVICE

June 8, 2004

RE: Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)
Technical Specification Proposed Change No. 263
Extended Power Uprate - State of Vermont Comments

Richard Ennis, Project Manager
U.S. Nuclear Regulatory Commission
Washington, D.C., 20555

Dear Mr. Ennis,

The state of Vermont, through its NRC state liaison officer, makes the requests identified below of the Nuclear Regulatory Commission staff (NRC) with regard to its review of the proposed Vermont Yankee power uprate. Vermont asks that NRC perform independent calculations in three areas to confirm the adequacy of the proposed uprate: 1) the adequacy the steam dryer with power uprate flow rates, 2) credit for containment overpressure for net positive suction head (NPSH) adequacy, and 3) flow-induced vibration adequacy of the main steam and feedwater systems. This request is consistent with NRC's Review Standard for Extended Power Uprates (RS-001).

Background

On March 15, 2004, the Vermont Public Service Board requested the NRC perform an *independent engineering assessment*[1] of Vermont Yankee related to its proposed 20% power uprate. NRC responded on May 4, 2004, stating it would perform a new engineering assessment inspection at Vermont Yankee. In its May 4, 2004, letter, NRC also identified that its power uprate review consisted of a comprehensive assessment of engineering, design and safety analyses comprising about 4000 staff-hours.

[1] The PSB created the term, *independent engineering assessment*, which it defined within its March 15, 2004 request as a level of effort of four persons for four weeks.

Also, in December 2003, the NRC issued Revision 0 of RS-001. In response to comments from the Advisory Committee on Reactor Safeguards (ACRS), NRC included the following statement regarding independent calculations:

> *Perform audits and/or independent calculations as deemed necessary and appropriate to support review of the licensee's application. In determining the need for performing audits and/or independent calculations, consider the following:*
>
> - *confidence of the NRC staff in the models and/or methods used by the licensee*
> - *confidence of the NRC staff in the analysis results*
> - *familiarity of the NRC staff with the models and/or methods used by the licensee*
> - *prior use of the models and/or methods for similar plant designs and operating conditions and the NRC staff's experience related to such use*
> - *NRC staff experience with the impact of proposed changes on analysis results*
> - *available margin versus level of uncertainty in analysis results*
> - *efficiency gains that may result from performing audits and/or independent calculations*
>
> RS-001, Section 2.1, page 2.1-3.

Accordingly, we believe that independent calculations should be performed by NRC as part of the new engineering assessment inspection, together with the power uprate review, in the three areas identified below.

Steam Dryer Analysis

Despite licensee and industry analysis, significant, power uprate related failures of steam dryers have occurred at four units - Quad Cities 1 & 2 and Dresden 2 & 3.Of three types of steam dryers, square, curved and slanted, Vermont Yankee has the same squared-design steam dryer as Quad Cities and Dresden, determined to be the most susceptible to power uprate related cracking.

In NRC's letter of May 4, 2004, it was stated that outside technical experts are assisting NRC staff on steam dryer issues. In addition, we are aware that Entergy has performed an analysis of its steam dryer and has completed modifications for power uprate in its Spring 2004 refueling outage. In addition, Entergy discovered and dispositioned numerous cracks in the steam dryer.

We believe the analysis for the adequacy of the steam dryer meets the criteria for independent calculation stated in RS-001, Section 2.1. Therefore, we request that NRC verify by independent calculation the adequacy of Vermont Yankee's steam dryer, with modifications, for power uprate as part of its new engineering assessment inspection, together with the power uprate review. Further, we request that Vermont Yankee not be allowed to operate above original licensed thermal power (OLTP) until the NRC verification analysis of the steam dryer is completed.

Credit for Containment Overpressure

Centrifugal pumps required to perform safety actions must have adequate NPSH in order to function properly. For power uprate situations, available NPSH is reduced because water temperatures are warmer than at original power because more heat is produced in the reactor. To compensate for decreased NPSH because of hotter water temperatures, Entergy requests credit for the elevated pressure in containment (containment overpressure). In Section 4.2.6 of the *Safety Analysis Report for Vermont Yankee Nuclear Power Station Constant Pressure Power Uprate (PUSAR)*, NEDC-33090, September 2003, Entergy requests containment overpressure credit for either one or two sets of pumps for four different situations:

- On loss of coolant accidents (LOCAs), for the residual heat removal (RHR) and core spray (CS) pumps
- On an anticipated transient without scram (ATWS), for the RHR pumps
- On station black outs (SBOs), for the RHR pumps
- On Appendix R fire events, for the RHR and CS pumps

In our letter of December 8, 2003[2], we asked NRC questions about granting containment overpressure credit, which represents both a change in Vermont Yankee's design basis and a change in NRC's regulatory policy. It does not appear that granting containment overpressure credit is *necessary* in the context of Draft Regulatory Guide DG 1107, at 7, and it appears that the design can be *practicably altered* in the context of DG 1107, at 16, by operation at OLTP. Therefore, pending response to our December 8, 2003 letter, we do not believe containment overpressure credit should be allowed.

Notwithstanding, and without waiving our belief that containment overpressure credit should not be allowed, if such credit is allowed, we believe the NRC should perform the following independent calculations.

[2] We are awaiting response to our letter of December 8, 2003.

The four situations for which containment overpressure credit is requested are fundamentally different. Two situations, LOCA and ATWS pressurize the drywell first and then the torus. The other situations, SBO and Appendix R events, pressurize only the torus. The analysis of each situation consists of a containment response analysis and an NPSH calculation. Finally, the single failure criteria effects are not the same for each situation.

Because of the importance of the RHR and CS pumps for the situations in question, and because of the controversial nature of the change in NRC's regulatory policy, we believe these situations meet the requirements of RS-001, Section 2.1 for independent calculations. Therefore, we request that NRC verify by independent calculation the adequacy of the claimed containment overpressure credit for power uprate as part of its new engineering assessment inspection, together with the power uprate review. The containment response for each situation where credit is requested should be independently verified by NRC analysis. A single failure mode and effects analysis should be performed by NRC for each situation and sufficient calculations should be performed to assure the most limiting single failure is identified[3]. The water temperature and available NPSH should be determined for each situation, again assuming the most limiting single failure, to verify the calculated containment overpressure provides sufficient NPSH.

Flow-Induced Vibration Adequacy

In *PUSAR* Section 3.4.1, it is stated that Entergy will demonstrate the adequacy of increased flow-induced vibration of the main steam system and feedwater system piping only through a piping startup testing program. However, since power uprate related, vibration failures have occurred for an electromatic releif valve, small piping in main steam and feedwater lines, and a feedwater instrument probe, we believe the flow-induced adequacy of the main steam and feedwater lines, including branch lines connected to the main steam and feedwater systems, should be confirmed by analysis wherever possible.

[3] With regard to the single failure mode and effects analysis, we believe the guidance from Regulatory Guide 1.183, Section C.5.1.4, albeit for a different subject - *alternative source term*, is sound and should be applied for the review of *containment overpressure credit*. In summary, Section C.5.1.4 states that, since a request for *alternative source term* is a change to a plant's historical licensing basis, the review of its adequacy may consider current, rather than historical, licensing requirements for other affected aspects of the request. Since *containment overpressure credit* is a change to Vermont Yankee's historical licensing basis, its adequacy should be evaluated using the single failure criteria applicable to current-day license evaluations.

Since failures have occurred in this area, we believe the area of flow-induced vibrations meet the requirement of RS-001, Section 2.1 for independent calculations. Therefore we request that NRC verify by independent calculation the adequacy of increased flow-induced vibration of the main steam and feedwater systems, including branch lines, as part of its new engineering assessment inspection, together with the power uprate review.

Conclusion

RS-001, Section 2.1 identifies either audits or independent calculations as appropriate actions for the conditions identified on page 2.1-3. We believe that independent calculations by the NRC should be performed for the three areas identified above. However, we would be pleased to discuss with the NRC whether audits of any of these areas is more appropriate than independent calculations. We welcome the opportunity to provide these comments and look forward to resolving these issues in a satisfactory manner. If you have questions about these items, please call me at 802-828-2321, or Mr. William Sherman of my staff at 802-828-3349.

Sincerely,

David O'Brien, Commissioner
State Liaison Officer

cc: Mario V. Bonaca, Chairman, ACRS
J. Thayer, Entergy
Sen. Patrick Leahy
Sen. James Jeffords
Rep. Bernard Sanders