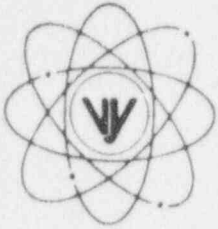


# VERMONT YANKEE NUCLEAR POWER CORPORATION



Ferry Road, Brattleboro, VT 05301-7002

REPLY TO  
ENGINEERING OFFICE  
580 MAIN STREET  
BOLTON, MA 01740  
(508) 779-6711

April 15, 1996  
BVY 96-48

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

- References:
- (a) License No. DPR-28 (Docket No. 50-271)
  - (b) Letter, USNRC to All Licensees, Generic Letter 94-03, NVCY 94-124, dated 7/25/94
  - (c) Letter, USNRC to VYNPC, NVCY 95-55, dated 4/27/95
  - (d) "Safety Evaluation by the Division of Reactor Licensing, U.S. Atomic Energy Commission, in the Matter of Vermont Yankee Nuclear Power Company, Vermont Yankee Nuclear Power Station, Docket 50-271", dated 6/1/71
  - (e) Letter, USNRC to VYNPC, NVCY 85-168, dated 8/12/85

Subject: Vermont Yankee Core Shroud Modification

## Background

In Reference (b), the NRC identified Intergranular Stress Corrosion Cracking (IGSCC) of BWR internal components as a technical issue of concern and requested each licensee to inspect their core shroud no later than the next scheduled refueling outage. Vermont Yankee inspected its core shroud during the Spring 1995 refueling outage and detected indications of possible IGSCC in several welds. As required by Reference (b), the results of those inspections, along with Vermont Yankee's engineering evaluation of the indications, were submitted to the NRC.

In Reference (c), the NRC concurred with Vermont Yankee's conclusion that there was adequate structural margin to allow operation for at least one additional fuel cycle and required that Vermont Yankee reinspect and/or repair the core shroud prior to startup from the 1996 refueling outage. Following extensive evaluation, Vermont Yankee has decided to proceed with a modification of the core shroud.

## Discussion

The Vermont Yankee core shroud modification is a full structural repair in that it is capable of fulfilling all safety and operational design bases of the core shroud, as defined in the Vermont

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Yankee FSAR, assuming the most adverse combination of any or all core shroud circumferential welds not performing their design function (see Figure 1).

The modification is an alternative to the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, and is being submitted for NRC approval under 10CFR50.55a(a)(3). An alternative repair concept is required since the typical method of repair under Section XI (removal of the flaw indication and rewelding) is not technically feasible for core shroud indications at this time.

The request consists of two parts. Enclosure 1 is a non-proprietary summary of the modification, prepared in the format agreed to between the NRC and the Boiling Water Reactor Vessel and Internals Project (BWRVIP). Enclosure 2 is a proprietary design report containing engineering drawings and detailed engineering calculations.

The design satisfies all Vermont Yankee FSAR requirements for the core shroud, as well as complying with the BWRVIP Core Shroud Repair Design Criteria. In addition to these requirements, Vermont Yankee has incorporated the following conservative criteria:

- Seismic Design Input - the design basis seismic design input for Vermont Yankee is the 1952 Taft earthquake anchored at 0.07g for the operating basis earthquake and 0.14g for the safe shutdown earthquake [Reference (d)]. To provide added conservatism, the shroud modification utilizes the NRC Regulatory Guide 1.60 earthquake response spectrum for the seismic analyses. The NRC has reviewed and accepted this alternative design approach for Vermont Yankee [Reference (e)]. The original analysis methodology assumed no vertical amplification in structures and applied a constant 0.05g acceleration for the operating basis earthquake and 0.10g for the safe shutdown earthquake. The core shroud modification analyses explicitly account for vertical structural amplification.
- Load Combination Methodology - The original design approach for Vermont Yankee was based on a two-dimensional load combination of one horizontal direction and the vertical direction. Absolute summation was utilized and the greater of the north-south/vertical or east-west/vertical was selected. The core shroud modification analyses are based on a three dimensional load combination using square root of the sum of the squares (SRSS) methods, as described in NRC Regulatory Guide 1.92.
- Structural Modeling - The structural model utilized in the core shroud modification analyses is a fully coupled model of the reactor building, drywell, reactor pressure vessel support, reactor pressure vessel and reactor internals. The model was first developed for the recirculation system piping replacement and is based on plant as-built drawings. The model is described in Appendix A.10 to the Vermont Yankee FSAR.
- Loss-of-Coolant Accident Loadings - In order to allow for possible future increases in core flow and/or plant licensed power, the pressure loadings on the core shroud resulting from

normal and accident conditions are increased 15 percent above the values documented in the Vermont Yankee FSAR. The pressure loadings in the FSAR are based on a reactor thermal power of 1665 MWt; the licensed plant power is 1593 MWt, which provides an additional conservatism.

- Design Reliant Weld Evaluations - Core shroud modifications generally assume conservatively that all circumferential welds are not performing their design function and rely on portions of the vertical welds to hold the shroud segments together as cylinders. These welds are called design reliant welds. The Vermont Yankee repair is designed and analyzed to eliminate reliance on any or all circumferential welds.

Previous shroud modifications have performed limited visual examinations of selected vertical welds to ensure that there was no unacceptable cracking of the vertical welds. While it is accepted that a properly performed visual examination can detect core shroud weld cracks, Vermont Yankee believes that greater assurance of weld integrity is assured by ultrasonic examinations. For this reason Vermont Yankee has decided to perform ultrasonic examinations of all design reliant welds during the 1996 refueling outage.

The welds to be ultrasonically inspected are the three segment welds in the top guide support ring, the vertical welds between Welds H3 and H4, the vertical welds between Welds H4 and H5, the three segments welds in the core plate support ring, the two vertical welds between Welds H6 and H7, Weld H8 and Weld H9 (see Figure 2).

Because of tooling limitations it is currently not practical to inspect the vertical welds between welds H1 and H2 or the segment welds in the top ring above weld H1 (those welds will be visually inspected). For this reason, portions of circumferential Welds H1 and H2 will be designated as design reliant welds. Since Welds H1 and H2 were ultrasonically inspected in 1995 those results will be used to ensure that sufficient design-reliant weld length exists. Even though Vermont Yankee is taking this conservative approach relative to weld inspections, all analyses for the repair design were performed assuming the potential failure of any or all circumferential welds, which is a more limiting condition for the repair design, and is consistent with BWRVIP guidance.

Vermont Yankee has evaluated the modification under 10CFR50.59 and concluded that the modification does not involve an unreviewed safety question. A copy of the safety evaluation will be submitted to the NRC within two weeks following resolution of any NRC comments on the modification design, thus ensuring that the submitted safety evaluation reflects the approved design.

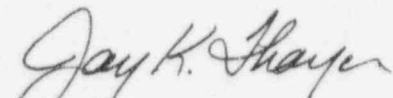
NRC approval of the core shroud modification as an alternative to the requirements of Section XI is requested by August 15, 1996.

Enclosure 2 is considered proprietary information by MPR Associates. In accordance with 10CFR2.790(b)(1), an affidavit attesting to the proprietary nature of the enclosed information is attached. As such, MPR Associates requests that Enclosure 2 be withheld from public disclosure.

We trust that the information provided is acceptable; however, should you have any questions, please contact this office.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION



Jay K. Thayer

Vice President, Engineering

Enclosure 1 - Core Shroud Repair Summary

Enclosure 2 - Core Shroud Repair Design Report (3 volumes) - PROPRIETARY

c: with Enclosures 1 and 2:

USNRC Project Manager - VYNPS

c: with Enclosure 1

USNRC Region I Administrator

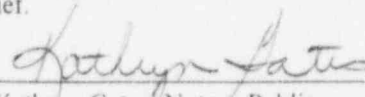
USNRC Resident Inspector - VYNPS

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Then personally appeared before me, Jay K. Thayer, who, being duly sworn, did state that he is Vice President-Engineering, 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.



Kathryn Gates, Notary Public

My Commission Expires 1/24/97

**WITHHOLD ENCLOSURE 2 FROM PUBLIC DISCLOSURE PER 10CFR2.790**

April 3, 1996

**Affidavit Pursuant to 10 CFR 2.790  
Relative to Core Shroud Repair for  
Vermont Yankee Nuclear Power Station**

MPR Associates, Inc.  
The Commonwealth of Virginia  
City of Alexandria

I, Noman M. Cole, depose and say that I am a Principal of MPR Associates, Inc. duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations in conjunction with Vermont Yankee Nuclear Power Corporation.

The information for which proprietary treatment is sought is contained in the attached report titled, "Vermont Yankee Nuclear Power Station Core Shroud Design Report," MPR-1730, Volumes 1, 2, and 3. This report contains information on the design of the shroud repair system for the Vermont Yankee Nuclear Power Station.

This document has been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by MPR Associates in designating information as a trade secret, privileged or as confidential commercial or financial information.

Pursuant to the provisions of paragraph (b) (4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

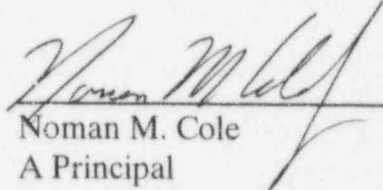
1. The information sought to be withheld from public disclosure, which is owned and has been held in confidence by MPR Associations, is the design of the shroud repair system for the Vermont Yankee Nuclear Power Station.
2. The information consists of design information or other similar data concerning a repair system, method or component, the application of which results in substantial competitive advantage to MPR Associates. MPR has a patent application pending for this shroud repair system.



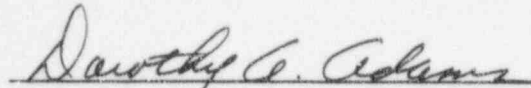
3. The information is of a type customarily held in confidence by MPR Associates and not customarily disclosed to the public. MPR Associates has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. This system was applied in determining that the subject document herein is proprietary.
4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the understanding that it is to be received in confidence by the Commission.
5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
6. Public disclosure of the information is likely to cause substantial harm to the competitive position of MPR Associates because:
  - a. Other repairs for similar purposes are performed and sold by major light water reactor competitors of MPR Associates.
  - b. Development of these repair designs by MPR Associates required thousands of manhours and hundreds of thousands of dollars. To the best of my knowledge and belief, a competitor would have to undergo similar expense in generating equivalent information.
  - c. In order to acquire such information, a competitor would also require considerable time and inconvenience to develop these repair designs.
  - d. The information consists of information related to repair of cracked shrouds in the Vermont Yankee Nuclear Power Station and other BWRs as well. The application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their designs to better compete with MPR Associates, take marketing or other actions to improve their position or impair the position of MPR Associates' design, and avoid developing similar data and analyses in support of their design methods or shroud repair system.
  - e. In pricing MPR Associates products and services, significant research, development, engineering, analytical, manufacturing, quality assurance and other costs and expenses must be included. The ability of MPR Associates' competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.

- f. Use of the information by competitors in the international marketplace would increase their ability to market such repair designs by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on MPR Associates' potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

  
Norman M. Cole  
A Principal

Sworn to before me  
this 3 day of April, 1996

  
Notary Public

My commission expires: March 31, 2000