VERMONT YANKEE
NUCLEAR POWER CORPORATION

Proposed Change No. 133

RD 5, Box 169, Ferry Road, Brattleboro, VT 05301

REPLY TO
ENGINEERING OFFICE
1671 WORCESTER ROAD
FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

April 25, 1986
FVY 86/34

United States Nuclear Regulatory Commission
Washington, DC 20555

Attention: Office of Nuclear Reactor Regulation
Mr. K. R. Denton, Director

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, USNRC to VYNPC, Amendment No. 37, dated September 15, 1977

Subject: Proposed Technical Specification Change for Spent and New Fuel Storage

Dear Sir:

Pursuant to Section 50.59 of the Commission's Rules and Regulations, Vermont Yankee Nuclear Power Corporation hereby proposes the following change to Appendix A of the operating license.

Proposed Change

Replace Page 189 of the Vermont Yankee Technical Specifications with the enclosed revised Page 189. This proposed change will revise Section 5.5, "Spent and New Fuel Storage," of the Vermont Yankee Technical Specifications to increase the number of spent fuel assemblies allowed to be stored in the spent fuel pool.

Reason for Change

Vermont Yankee's (VY) spent fuel storage pool was originally designed and licensed on the basis that a fuel cycle would be in existence that would only require storage of spent fuel for a year or two prior to shipment to a reprocessing facility. As the reactor core for VY contains 368 fuel assemblies with approximately 92 being replaced on an annual refueling schedule, a fuel storage capacity of 600 assemblies was considered adequate.

In September 1977 (Reference (b)), VY received a license amendment allowing for the phased increase of its spent fuel storage pool capacity from 600 to 2,000 assemblies. This would have permitted VY to operate and maintain full core reserve discharge capability until 1990. At the time this license

A001
9/40 w/check $150.00
#012886

amendment was granted, it was fully anticipated that away-from-reactor storage would be available during the 1980's to compliment reactor pool storage. Thus, VY anticipated shipping spent fuel off-site to maintain full core reserve discharge capability. However, in 1981, the federal government announced that it intended to discontinue funding the away-from-reactor storage program, and utilities were given a clear mandate by the Department of Energy to develop their own storage programs.

This policy was not affected by the passage of the Nuclear Waste Policy Act of 1982. Although the Act provides for limited away-from-reactor storage, it states that all other alternatives must be exploited before federal storage will be made available. However, the Act did stipulate that a spent fuel repository will be available by 1998. Since the Act does not require a repository before this date, it is very doubtful that there will be any place to ship spent fuel in the 1980's or early to mid-1990's. Therefore, VY has decided to further expand its existing spent fuel storage capacity in order to maintain full core reserve discharge capability beyond 1990. Because Section 5.5 of VY's Technical Specifications currently limits the number of spent fuel assemblies allowed to be stored in the spent fuel pool, an amendment to this licensed storage capacity is required.

Basis for Change

VY evaluated the available alternatives to augment its current storage capacity within the context of the Nuclear Waste Policy Act of 1982. In pertinent part, Section 131 of the Act states that, "The persons owning and operating civilian nuclear power reactors have the primary responsibility for providing interim storage of spent nuclear fuel from such reactors, by maximizing, to the extent practical, the effective use of existing storage facilities at the site of each civilian nuclear power reactor, and by adding new on-site storage capacity in a timely manner where practical." Further, Section 132 of the Act states that, "The Secretary (USDOE), the Commission (USNRC) and other authorized Federal officials shall each take such actions as such official considers necessary to encourage and expedite the effective use of available storage, at the site of each civilian nuclear power reactor..."

The following alternatives to increasing spent fuel storage capacity at VY were considered:

1. Shipment to another reactor site or Away-From-Reactor (AFR) storage facility;

2. Modifying the plant fuel management plan to reduce the spent fuel generation rate; and

3. Increasing on-site storage.

The option of off-site shipment of fuel to another reactor site or an AFR storage facility was considered, but determined not to be feasible due to the unavailability of an off-site storage site or facility. Further, the provision of the Nuclear Waste Policy Act of 1982 which sets a target date of 1998 for operation of a waste repository precludes any consideration of shipping VY spent fuel off-site to a repository prior to maximizing on-site storage.

The currently proposed fuel management plan at VY is to increase design fuel burnup beginning in 1988, thereby slightly decreasing the number of spent fuel assemblies discharged per year to the SFP. However, this plan will not alleviate the need for additional storage capacity.

The following methods for increasing on-site storage were considered:

1. Pin Consolidation;
2. Independent Dry (Cask, Drywell and Concrete Silo) Storage;
3. Independent Wet (Water Pool) Storage Pool;
4. Independent Air-Cooled Vault Storage; and
5. Reracking With High Density Storage Racks.

With the exception of Reracking, the above alternatives have not previously been fully licensed for commercial power plants by the NRC. Since additional spent fuel storage has to be in place at VY by 1987, it is not considered prudent to select a storage option that has not been previously licensed due to uncertainties in the ability to license such methods and uncertainties concerning the licensing schedule. In addition, the above unlicensed options have, in general, not been demonstrated on other than a theoretical or prototype basis, adding to the uncertainty concerning the schedule for design and construction. Also, the Act requires that reactor licensees utilize previously licensed technologies for maximization of on-site storage.

In view of the above considerations and schedular constraints, increasing on-site storage capacity by replacing existing freestanding racks with a similar proven design to allow closer spacing of the fuel assemblies was concluded to be the only practical alternative for VY. Therefore, in order to maintain full core reserve discharge capability until the federally mandated repository is available in 1998, VY chose to replace all existing fuel racks with high density racks. The new racks are capable of storing 2,870 assemblies which is sufficient capacity to maintain full core reserve discharge until 1999.

Safety Considerations

This proposed change does not present an unreviewed safety question, as defined in 10CFR50.59.

VY's spent fuel pool storage expansion method consists of replacing existing racks with a proven design to allow closer spacing of the fuel assemblies. Only proven, well developed, and demonstrated technology is utilized in both the construction process and in the analytical techniques applied to the expansion. We have evaluated the physical and mechanical processes which may create potential hazards such as criticality considerations, seismic and mechanical loading, pool cooling, long-term corrosion and oxidation of fuel cladding, and probabilities and consequences of various postulated accidents and failures of decayed spent fuel. Also, the neutron poison and rack structural materials were evaluated.

No facility modifications other than the replacement of the spent fuel storage racks and the shortening of the two cooling water return sparger lines were determined to be necessary. The design of Vermont Yankee's spent fuel pool is such that no fuel in the spent fuel storage racks can be uncovered in the event of a failure of the reactor cavity seal or the failure of piping associated with the spent fuel storage system or the reactor vessel.

In general, potential safety hazards associated with spent fuel pool expansions are not as large as those associated with reactor operation because the purpose of the expansion is to allow longer term storage of aged spent fuel. The VY expansion request is to allow continued storage of spent fuel that has decayed over a decade along with the normal discharge of relatively new spent fuel for which the pool was originally designed. After a year of storage, the majority of both the initial radioactivity and heat load have decayed.

The design of the spent fuel storage racks provides for a subcritical multiplication factor (k_{eff}) which was analytically demonstrated to be less than the criticality criterion of 0.95 for both normal and abnormal storage conditions. Normal conditions exist when the fuel storage racks are located at the bottom of the pool covered with a normal depth of water for radiation shielding and with the maximum number of fuel assemblies in their design storage position. Abnormal conditions may result from external events (such as an earthquake) or failure of an engineered system (such as the accidental dropping of an assembly).

Criticality calculations were performed using a two-dimensional, four-group, diffusion theory code with a water temperature of 68°F. Water temperatures of 150°F and 200°F were analyzed to assure that 68°F was the more reactive temperature under normal conditions. Monte Carlo calculations demonstrated the adequacy of the diffusion theory representation.

Analyses were performed to verify that the existing spent fuel pool cooling system can maintain fuel pool temperatures within the required range under all postulated fuel pool loading conditions and that natural circulation is sufficient to remove decay heat and prevent local boiling in the high density racks.

Calculated stress in a fully loaded rack will not exceed the specified requirements of the Standard Review Plan Section 3.8.4 when subjected to seismic loadings. Each rack module is a free-standing module that satisfies the seismic design requirements without mechanical dependence on neighboring modules or fuel pool walls for support. The rack modules are classified as Seismic Category I equipment. Racks of similar desig. have been licensed for other nuclear facilities.

The capacity of the existing fuel pool structure is well above the load imposed by the fully loaded racks. Both the design condition specified by Standard Review Planning Section 3.8.4 and the design requirements of ACI 349-80 were used in the calculation of fuel pool capacity.

All materials used in the construction of the racks are specified in accordance with the applicable ASME or equivalent ASTM specifications, and all welds in accordance with written procedures which meet the requirements of Section IX of the ASME code. Materials selected are corrosion-resistant.

This proposed change was previously reviewed and approved by the VY Nuclear Safety Audit and Review Committee.

Significant Hazards Consideration

The standards used to arrive at a determination that a request for amendment involves no significant hazards consideration are included in the Commission's regulations. Specifically, 10CFR50.92 states that a proposed amendment will involve a no-significant hazards consideration if the proposed amendment does not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. In addition, the Commission has provided guidance concerning the application of standards for determining whether a significant hazards consideration exists by providing certain examples of amendments that are considered likely, and not likely, to involve significant hazards considerations. These examples were republished in the Federal Register on March 6, 1986 (51 FR 7744, "Final Procedures and Standards on No Significant Hazards Considerations," Final Rule), and included the following new example of an amendment which the Commission considered not likely to involve significant hazards considerations, "an expansion of the storage capacity of a spent fuel pool when all of the following are satisfied: (1) the storage expansion method consists of either replacing existing racks with a design which allows closer spacing between stored spent fuel assemblies or placing additional racks of the original design on the pool floor if space permits; (2) the storage expansion method does not involve rod consolidation or double tiering; (3) the K_{eff} of the pool is maintained less than or equal to 0.95 and (4) no new technology or unproven technology is utilized in either the construction process or the analytical techniques necessary to justify the expansion."

The discussion below addresses the three 10CFR50.92 standards and summarizes VY's technical evaluation of the proposed increase in spent fuel storage capacity in relation to each. Our evaluation of the proposed plant modifications and operations in support of the amendment request is contained in the enclosed Vermont Yankee Spent Fuel Storage Rack Replacement Report.

First Standard

Vermont Yankee has determined that the proposed change to increase the spent fuel pool capacity does not involve a significant increase in the probability or consequences of an accident previously evaluated. VY's safety analysis of the proposed reracking has been accomplished using current NRC Staff-accepted codes and standards. The results of the safety analysis demonstrated that the proposal meets the specified acceptance criteria set forth in these standards. In addition, VY has reviewed NRC Staff Safety Evaluation Reports for prior spent fuel pool rerackings involving spent fuel

pool rack replacements to ensure that there are no identified concerns not fully addressed in this submittal. VY has identified no such concerns. VY's proposed storage expansion method consists of replacing existing freestanding racks with a similar proven design to allow closer spacing of fuel assemblies within the existing pool. No new technology or unproven technology is utilized in either the construction process or in the analytical techniques applied to the expansion. Vermont Yankee has performed nuclear, thermal-hydraulic, mechanical, structural and radiological analyses of normal and abnormal conditions which could create potential hazards. These include criticality considerations, seismic and mechanical loading, pool cooling, long-term corrosion and oxidation of fuel cladding, and the probabilities and consequences of postulated accidents and failures of decayed spent fuel. Additionally, the neutron poison and rack structural materials were evaluated and shown to be compatible with the pool environment. The probability and occurrence of potential abnormal conditions and accident scenarios initiated either by external events (such as a seismic event) or by failure of an engineered system (such as dropping a fuel assembly) are not affected by the racks themselves; thus, the reracking does not increase the probability of these conditions and accidents. The radiological consequences of these events, as well as the probability and radiological consequences of criticality or installation accidents, were evaluated and all previously analyzed accidents and consequences were found to be conservatively bounded.

Second Standard

VY has determined that the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated. VY has evaluated the proposed rack replacement in accordance with the NRC position paper, "NRC Position for Review and Acceptance of Spent Fuel Storage and Handling Application," as well as appropriate NRC Regulatory Guides, appropriate NRC Standard Review Plan sections and appropriate industry codes and standards. In addition, VY has reviewed the NRC Safety Evaluation Report for the previous VY spent fuel rack replacement application and for other prior spent fuel pool reracking. The proposed storage expansion method consists of replacing existing racks with a previously approved and proven design which allows closer spacing between stored spent fuel assemblies. Additionally, the storage expansion method does not involve rod consolidation or double tiering and no new technology or unproven technology is utilized in either the construction process or the analytical techniques necessary to justify the expansion. Further, the basic reracking technology to be used has been developed and demonstrated in numerous applications for fuel pool capacity increases which have previously received NRC staff approval. All credible accidents and consequences evaluated have been found to be conservatively bounded and no new categories or types of accidents have been identified.

Third Standard

VY has determined that the proposed change does not involve a significant reduction in a margin of safety. The issue of "margin of safety" when applied to a reracking modification, includes the following considerations:

a. Nuclear criticality considerations,

b. Thermal-hydraulic considerations,

c. Mechanical, material and structural considerations.

The margin of safety that has been established for nuclear criticality considerations is that the effective neutron multiplication factor (k_{eff}) in the spent fuel pool is to be less than or equal to 0.95, including all reasonable uncertainties and under all postulated conditions. The criticality analysis for the proposed modification, described in the enclosed Reracking Report, concluded that for all bounding normal and abnormal storage conditions analyzed, the subcritical multiplication factor (k_{eff}) was verified to be less than the criticality criterion of 0.95. The techniques used to calculate k_{eff} have been benchmarked against experimental data and are considered very reliable. The NRC Staff determined in 1976 that as long as the maximum value of the effective neutron multiplication factor k_{eff} was less than or equal to 0.95, then any change in pool reactivity would not significantly reduce the margin of safety, regardless of the storage capacity of the pool. The methods used in the criticality analysis for the reracking conform to the applicable portions of Codes, Standards and Specifications listed in the Reracking Report, including ANSI N210-1976, "Design Objectives for LWR Spent Fuel Storage Facilities at Nuclear Power Stations," ANSI N16.9-1975, "Validation of Calculation Methods for Nuclear Criticality Safety," the NRC guidance document, "NRC Position for Review and Acceptance of Spent Fuel Storage and Handling Applications," and Regulatory Guide 1.13, "Spent Fuel Facility Design Basis," proposed Revision 2. The computer programs, data libraries and benchmarking data used in the evaluation have been used in previous spent fuel reracking applications and have been reviewed and approved by the NRC. The criticality analysis for the reracking assumed operation of the spent fuel storage facilities consistent with the proposed Technical Specifications. The results of these analyses indicate that k_{eff} is less than 0.95 at 95/95 probability/confidence level under all postulated conditions, including a margin for uncertainties in reactivity calculations and mechanical tolerances. Thus, in meeting the acceptance criteria for criticality, the proposed reracking does not involve a significant reduction in the margin of safety for nuclear criticality.

The margin of safety that has been established for the thermal-hydraulic considerations is that fuel pool cooling be capable of maintaining spent fuel pool water temperatures below the boiling point for any postulated pool heat load. The thermal-hydraulic evaluation is described in the enclosed report. Analyses performed verify that the installed fuel pool cooling can maintain spent fuel pool temperatures within the design limit. The maximum heat load predicted for a full pool with the proposed reracking remains within the design capacity of existing equipment. It has also been demonstrated that if the Spent Fuel Pool Cooling System is lost for any reason, there is sufficient time and make-up capacity available to maintain pool water level. Thus, the proposed reracking does not involve a significant reduction in any thermal-hydraulic margins of safety.

The mechanical, material, and structural considerations of the proposed rack replacement are also analyzed in the enclosed report. The racks are designed in accordance with applicable NRC Regulatory Guides, Standard Review Plans, position papers and appropriate industry codes and standards, as well as to Seismic Category I requirements. All materials selected are corrosion-resistant. The materials utilized are compatable with the spent fuel pool and the spent fuel assemblies. The conclusion of the analysis is that the margin of safety is not significantly reduced by the proposed reracking. The main function of the spent fuel pool and the racks is to maintain the spent fuel assemblies in a stable configuration through all normal and abnormal loadings, such as an earthquake and under accident conditions. Nuclear criticality, thermal-hydraulic, material and structural considerations of the proposed new racks are described in the enclosed report. The neutron poison and rack materials are compatible with materials used for the spent fuel pool liner and the spent fuel assemblies. The rack structural considerations address adequate margins of safety of critical items during seismic motion and the racks are seismically qualified. Further, the load of the fully loaded racks has been analytically demonstrated to be well within the fuel pool's structural capacity. Thus, the proposed increase in the storage capacity of the spent fuel pool does not involve any significant reductions in existing design limitations or safety margins. Therefore, VY's existing margins of safety are not significantly reduced by the proposed expansion of pool storage capacity.

In summary, VY's request to expand the spent fuel storage pool capacity satisfies the following conditions:

1. The storage expansion method consists of replacing existing racks with a design which allows closer spacing between stored spent fuel assemblies.

2. The storage expansion method does not involve rod consolidation or double tiering.

3. The k_{eff} of the pool is maintained less than or equal to 0.95.

4. No new technology or unproven technology is utilized in either the construction process or the analytical techniques necessary to justify the expansion.

On the basis of the above, VY has determined that operation of the facility in accordance with the proposed amendment does not involve a significant hazards consideration as defined in 10CFR50.92(c), in that it: (1) does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) does not involve a significant reduction in a margin of safety.

Fee Determination

In accordance with the provisions of 10CFR170.12, an application fee of $150.00 is enclosed.

Schedule of Change

We request that your review and approval of this proposed change be completed no later than November 15, 1986 in order to insure that the change is incorporated in the Vermont Yankee Technical Specifications prior to loss of full core reserve. This change will be incorporated into the Vermont Yankee Technical Specifications as soon as practicable following receipt of your approval.

We trust that the information above adequately supports our request; however, should you have any questions in this matter, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Warren P. Murphy
Vice President and Manager of Operations

WPM/dps
Enclosure
cc: U. S. Nuclear Regulatory Commission
Document Control Desk (40 copies)

Vermont Department of Public Services
120 State Street
Montpelier, Vermont 05602
Attention: Mr. Gerald Tarrant, Chairman

STATE OF VERMONT)
)ss
WINDHAM COUNTY)

Then personally appeared before me, Warren P. Murphy, who, being duly sworn, did state that he is a 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.

DIANE M. McCUE
NOTARY
PUBLIC
WINDHAM COUNTY, VERMONT

Diane McCue Notary Public
My Commission Expires