UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 3, 2009

Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
P.O. Box 250
Governor Hunt Road
Vernon, VT 05354

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION – SAFETY EVALUATION RE: SPENT FUEL MANAGEMENT PROGRAM AND PRELIMINARY DECOMMISSIONING COST ESTIMATE (TAC NOS. MD8035 AND MD8051)

Dear Sir or Madam:

The Nuclear Regulatory Commission (NRC) staff has completed its review of Vermont Yankee Nuclear Power Station's (VY) submittals dated March 21, 2007, titled "Report Pursuant to [Title 10 of the *Code of Federal Regulations*] (10 CFR) 50.54(bb)," February 6, 2008, titled "Report Pursuant to 10 CFR 50.75(f)(3)," April 24, 2008, titled "Response to Request for Additional Information," and October 14, 2008, titled "Revised Spent Fuel Management Plan Pursuant to 10 CFR50.54(bb)." These submittals address how VY will meet the requirements set forth in 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3).

The NRC staff finds that VY's program for the long-term storage of spent fuel and the preliminary decommissioning cost estimate for VY is adequate and provides sufficient details associated with the funding mechanisms. The staff, therefore, concludes that the VY spent fuel management program complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the staff finds that the preliminary cost estimate for VY pursuant to 10 CFR 50.75(f)(3) is reasonable.

The NRC staff notes that the spent fuel management program analysis is based on a reported DTF balance that can fluctuate over time. Should there be a material decline in the DTF balance, the staff's analysis and preliminary findings may no longer be valid, and the licensee would be under an obligation under 10 CFR 50.9 to update the DTF balance as well as any changes in projected costs. The NRC staff would expect a licensee to update its spent fuel management program to provide any adverse material changes, in conjunction with the filing of the licensee's required report on the status of its decommissioning funding.

If you have any questions regarding this letter, please contact James Kim at 301-415-4125.

Sincerely,

James Kim, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SPENT FUEL MANAGEMENT PROGRAM AND

THE PRELIMINARY DECOMMISSIONING COST ESTIMATE

ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

On March 21, 2007, the licensee, Entergy Nuclear Northeast (ENN), submitted "Report Pursuant to 10 CFR 50.54(bb)," (Accession No. ML070860696), and on February 6, 2008, ENN submitted "Report Pursuant to 10 CFR 50.75(f)(3)," (Accession No. ML080430658), related to Vermont Yankee Nuclear Power Station (VY). In response to an NRC staff request for additional information, on April 24, 2008, ENN submitted "Response to Request for Additional Information," (Accession No. ML081200753), and on October 14, 2008, ENN submitted "Revised Spent Fuel Management Plan Pursuant to 10 CFR 50.54(bb)", (Accession No. ML082910294).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(bb), licensees for nuclear power reactors must submit 5 years before expiration of their operating license a spent fuel management and funding program to the NRC for review and preliminary approval. The program should discuss the means by which the licensee intends to manage and provide funding for the management of spent fuel until the spent fuel is transferred to the Department of Energy (DOE) for permanent disposal.

10 CFR 50.75(f)(3) requires the licensee, at or about 5 years prior to the projected end of operation, to submit a preliminary cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to decommission the reactor. The Nuclear Regulatory Commission (NRC) staff's review is based on the four submittals cited above.

2.0 BACKGROUND

VY is a single unit facility located near the town of Vernon, Vermont. The site is located in Windham County on the western shore of the Connecticut River, immediately upstream of the Vernon Hydroelectric Station. The boiling-water reactor (BWR) and supporting facilities are owned by Entergy Vermont Yankee and operated by Entergy Nuclear Operations, Inc.

The station is comprised of a single BWR, designed and fabricated by General Electric, producing steam for direct use in the steam turbine.

The reactor vessel and the recirculation system are contained within the drywell of a pressure suppression system housed within the reactor building. The system consists of a drywell, a pressure suppression chamber that stores a large volume of water, and a connecting submerged vent system between the drywell and water pool, isolation valves, containment cooling systems, and other service equipment. The reactor building encloses the pressure suppression primary containment thereby providing a secondary containment.

In September 2003, Entergy VY requested an amendment to its facility operating license to increase the maximum authorized power level from 1593 Megawatts-thermal (MWt) to 1912 MWt. The request was subsequently approved and the unit is operating at the higher level.

3.0 REGULATORY REQUIREMENTS AND CRITERIA

3.1 Regulatory Requirement (10 CFR 50.54(bb))

Pursuant to 10 CFR 50.54(bb), "For nuclear power reactors licensed by the NRC, the licensee shall, within 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever occurs first, submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository."

3.1.1 Criteria to Support 10 CFR 50.54(bb) Review

For the NRC to evaluate and provide preliminary approval of the spent fuel management and funding program, the submittal should include:

- Estimated cost to isolate the spent fuel pool and fuel handling systems, or the cost to construct an Independent Spent Fuel Storage Installation (ISFSI) or a combination of wet/dry storage;
- Estimated annual cost for the operation of the selected option (wet or dry storage or a combination of the two) until DOE takes possession of the fuel;
- Estimated cost for the preparation, packaging, and shipping the fuel to DOE;
- Estimated cost to decommission the spent fuel storage facility; and
- A brief discussion of each of the areas identified and the estimated time for these activities.

3.2 Regulatory Requirement (10 CFR 50.75(f)(3))

10 CFR 50.75(f)(3) requires that a licensee "...shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to decommission." Section 50.75(f)(5) requires a licensee to include plans to adjust funding levels to demonstrate a reasonable level of financial assurance, if necessary, in the preliminary cost estimate.

The preliminary cost estimate should include a comparison to the minimum decommissioning funding amount based on the formulas in 10 CFR 50.75(c), and an assessment of the major factors that could affect the preliminary cost estimate.

If necessary, as required by 10 CFR 50.75(f)(5), the preliminary cost estimate shall also include plans for adjusting levels of funds assured for decommissioning to demonstrate a reasonable level of assurance that funds will be available to cover the cost of decommissioning.

3.2.1 Criteria to Support the 10 CFR 50.75(f)(3) Review

NUREG-1713, entitled "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," provides additional guidance on the information that is to be addressed in the preliminary cost estimate. The principal factors to be addressed are:

- Decommissioning option/method anticipated;
- Potential for known or suspected contamination of the facility or site;
- Low-level radioactive waste (LLW) disposition plan;
- Preliminary schedule of decommissioning activities; and
- Any other factors that could significantly affect the cost to decommission.

The cost estimate should provide costs for each of the following:

- Pre-decommissioning engineering and planning-decommissioning engineering and planning prior to completion of reactor defueling;
- Reactor deactivation - deactivation and radiological decontamination of plant systems to place the reactor into a safe, permanent shutdown condition;
- Safe storage - safe storage monitoring of the facility until dismantlement begins (if storage or monitoring of spent fuel is included in the cost estimate, it should be shown separately);
- Dismantlement - radiological decontamination and dismantlement of systems and structures required for license termination (if demolition of uncontaminated structures and site restoration activities are included in the cost estimate, they should be shown separately);
- LLW disposition-LLW packaging, transportation, vendor processing, and disposal; and
- Radiological Costs - separate the cost for radiological decommissioning from non-radiological costs.

4.0 EVALUATION

4.1 Evaluation of the Program to Manage and Provide Funding of all Irradiated Fuel

As required by 10 CFR 50.54(bb), the licensee estimated the total costs associated with the long-term management of spent fuel at $219.0 million in 2007 dollars. The long-term management of the spent fuel for VY is divided between an initial storage of the fresh core as well as the most recent fuel cycles for estimated 5.0 years following shutdown to 2017 (if VY ceases operation in 2012) to provide the cooling for the final core, and transfer to an ISFSI. After shutdown, the initial period will be used for preparation of placing the plant and fuel into long-term storage. During the period 2015 to 2017, the fuel will be transferred to the ISFSI. At

the end of this period, the fuel will be stored in the ISFSI until the fuel is transferred to DOE; the licensee's estimated completion date of the fuel transfer to DOE is 2042. Following transfer of the fuel to DOE, decommissioning preparation will begin, with decommissioning starting in 2067 and completing in 2072, after which the license will be terminated.

The $219.0 million estimate includes an estimated cost to isolate the spent fuel pool and supporting fuel-handling system. The estimated ISFSI expenditures include the cost of for the dormancy period, 2012 - 2024, and the capital cost for ISFSI construction, multipurpose storage containers, packaging and handling and transfer from the pool to the ISFSI and from the ISFSI to DOE. In addition, a cost of approximately $68.0 million has been estimated for maintaining the fuel in the ISFSI from 2018 to 2042 (i.e., approximately $2.5 - $3.0 million per year). The licensee has also stated that decommissioning of the ISFSI will take place along with that of the nuclear plant.

Entergy reaffirmed the commitment to seek licensee renewal for VY. If VY ceases operation in 2012, Entergy will be required to comply with existing NRC's licensing requirements, including operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool. VY costs also include the cost of constructing an ISFSI having storage capacity to store all spent fuel.

The NRC staff finds the spent fuel management program estimates to be reasonable, based on a cost comparison with similar decommissioning reactors, while acknowledging that there are large uncertainties and potential site-specific variances.

The licensee reported that it had $439.56 million in the decommissioning trust fund (DTF) as of December 31, 2007. The staff applied a real rate of return of 2.0 percent identified in the licensee's October 14, 2008, submittal to project a future balance from assumed long-term earnings, and found that the DTF would provide sufficient funding to cover the cost of decommissioning and spent fuel management with a planned cash contribution by the licensee of $60.0 million in 2026. In VY submittal dated October 14, 2008, Entergy acknowledged the necessity to apply for and be granted an exemption in accordance with 10 CFR 50.12, from the requirements of 10 CFR 50.82(a)(8)(i)(A) in order to use the decommissioning trust funds for spent fuel management expenses, since the rule allows withdrawals for decommissioning only, as defined in 10 CFR 50.2. The NRC staff finds that the licensee's spent fuel program addresses the principal areas related to the management and funding of the spent fuel and preliminarily approves the VY's spent fuel management program conditioned upon the filing and granting of an exemption.

The NRC staff notes that the preceding analysis is based on a reported DTF balance that can fluctuate over time. Should there be a material decline in the DTF balance, the staff's analysis and preliminary findings may no longer be valid, and the licensee would be under an obligation under 10 CFR 50.9 to update the DTF balance as well as any changes in projected costs. The NRC staff would expect a licensee to update its spent fuel management program to provide any adverse material changes, in conjunction with the filing of the licensee's required report on the status of its decommissioning funding.

4.2 Evaluation of the Preliminary Decommissioning Cost Estimate

In Entergy's required submittal dated October 14, 2008, the licensee estimated that the total amount to decommission VY is $875.12 million (2007 dollars) and includes $656.1 million to

cover the cost of radiological decommissioning, and $219.0 million for spent fuel management. In addition, Entergy's submittal dated February 6, 2008, estimated the site restoration cost at approximately $40.0 million.

Prior to starting the detailed review of the decommissioning cost estimate, the NRC staff reviewed the estimate to confirm that radiological and non-radiological decommissioning costs were separated and that the support systems/structures necessary to support the safe operation had been identified in the estimate. The validity of the cost estimate is based on a reasonable estimate of the cost to decommission the supporting systems and structures, as well as the cost of disposal of the LLW. The staff also confirmed that the licensee identified that the possible site remediation costs included the removal and disposition of 135,000 cubic feet of potentially contaminated soil located on the Entergy VY site at an estimated cost of $9.1 million. The licensee stated that the extent of the soil contamination and the costs of removal and disposal are based on a preliminary assessment, and a detailed characterization was not conducted at this time, but would be included as part of the license termination plan.

The licensee has divided the estimated total radiological cost of $656.1 million into the following principal categories: radioactive component removal, decontamination and dismantlement, packaging, management and engineering (staffing) support, low-level waste disposal, and administrative costs. In addition, the licensee has included a time line and annual cost projection that identifies when these activities will take place, and the cost associated with each of these items. The cost estimate developed for VY applied an average weighted contingency factor for the major activities of 17.9 percent. The contingency factors were as high as 75 percent for reactor segmentation, and 50 percent for decontamination.

In addition, the NRC staff reviewed the work difficulty factors used for the TLG Services, Inc. (TLG) cost estimate and found they were reasonable. The staff reviewed Appendix A and Appendix B of TLG's cost estimate which listed the unit cost factors that were used to develop the decommissioning cost and concluded the unit cost factors were consistent with other cost estimates. The staff also recognized that a significant uncertainty exists regarding the low-level waste disposal cost due to Barnwell no longer accepting waste from Non-Atlantic members as well as the uncertainty of the preliminary assessment of the potentially contaminated soil.

The staff finds the preliminary cost estimate to decommission VY is reasonable.

5.0 CONCLUSION

The NRC staff finds that VY's program for the long-term storage of spent fuel and the preliminary cost estimate for VY is adequate and provides sufficient details associated with the funding mechanisms. The staff, therefore, concludes that the VY spent fuel management program complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the staff finds that the preliminary decommissioning cost estimate pursuant to 10 CFR 50.75(f)(3) for VY is reasonable.

Principal Contributor: Clayton Pittiglio

Date: February 3, 2009

If you have any questions regarding this letter, please contact James Kim at 301-415-4125.

Sincerely,

/RA/

James Kim, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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Accession No.: ML083390193 *See memo dated November 21, 2008

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