May 21, 2003

Mr. Jay K. Thayer
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P.O. Box 0500
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SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - REQUEST FOR ADDITIONAL INFORMATION RE: ARTS/MELLLA (TAC NO. MB8070)

Dear Mr. Thayer:

The Nuclear Regulatory Commission (NRC) staff is reviewing Entergy's application dated March 20, 2003, regarding implementation of the Average Power Range Monitor, Rod Block Monitor Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA).

In order for the staff to complete its review, further clarification is required of several items. As agreed with your staff, your prompt response to this request within 30 days would help the staff meet its schedule for completion of this review. If there are any questions, please call me at (301) 415-3016.

Sincerely,

/RA/

Robert M. Pulsifer, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosures: Request for Additional Information

cc w/encls: See next page

Vermont Yankee Nuclear Power Station

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

ARTS/ MELLLA IMPLEMENTATION

General Discussion

It is not clear to the NRC staff, from the licensee's March 20, 2003 submittal regarding implementation of the Average Power Range Monitor, Rod Block Monitor Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA) how Vermont Yankee Nuclear Power Station (VYNPS) achieved the current thermal analysis basis, Extended Load Line Limit Analysis (ELLLA) from their original licensing basis.

Related to the above, it is not clear how the implementation of the proposed partial ARTS improvement interacts with the proposed MELLLA implementation to replace the current ELLLA power flow map, with the increased core flow (ICF) condition.

The following questions will help the staff evaluate the ARTS/MELLLA submittal:

1) Attachment - 1, Supporting Information and Safety Assessment

Page 11, second paragraph:

The maximum standby liquid control system (SLCS) pump discharge pressure during the limiting anticipated trip without scram (ATWS) event is 1320 pounds per square inch gage (psig). The pressure regulator failure - open (PRFO) event was identified as the limiting event in Section 9.3 of the ARTS/MELLLA safety analysis report (A/MSAR), as giving a peak reactor pressure vessel (RPV) bottom pressure of 1367 psig at 38.9 sec decreasing to 1290 pounds per square inch absolute (psia) at the time of SLCS initiation (152.7 sec). Confirm the units of psig and psia and the delta psi pump margin available.

2) Attachment - 2, Determination of No Significant Hazards

Discuss how the ARTS changes "improve plant instrumentation and accuracy." Is this primarily due to the flow control trip reference (FCTR) card upgrade?

3) Attachment - 5, GENE Report NEDC-33089P (A/MSAR)

Section 1.0 Introduction

A limited discussion of the VYNPS currently licensed APRM, RBM and ELLLA operating map restrictions is provided. Please elaborate with regard to the proposed partial implementation of the ARTS improvements in conjunction with the proposed MELLLA operating map. Specifically, why is the partial ARTS implementation required, and why is it complementary to the MELLLA mode?

It is stated that the VYNPS ARTS application will not include modification from a flow to a power dependent system and, therefore, the existing RBM setpoint is relaxed so that "interference" when in MELLLA can be avoided or minimized. The current ELLLA boundary corresponds to the 108% APRM Rod Block setpoint. ARTS/MELLLA expands the domain along the 120.8% rod line. Does this removal of "interference" contribute to

unintended operation above the MELLLA line? Would the operational flexibility resulting from the new RBM setpoints allow operation above the MELLLA line?

Please provide references for the bases for the current APRM/RBM/ELLLA restrictions.

Since VYNPS has been previously analyzed for ELLLA/ICF, is the implementation of MELLLA equivalent to the Maximum Extended Operating Domain (MEOD)? Are there other implications to this combination?

4) Section 1.2.2, APRM High Flux (Flow Bias) Scram and Rod Block Design Bases

"Analytical limit calculations were performed using current GE ARTS/MELLLA methodology". Please provide the methodology reference?

5) Section 1.3, APRM Improvements

Please provide a reference to the "original" minimum critical heat flux ratio (MCHFR) thermal limits and the "current" General Electric Thermal Analysis Basis (GETAB) basis.

6) Section 3.1, Limiting Core-Wide Anticipated Operational Occurrence (AOO) Analyses

Loss-of-feedwater heating (LFWH)/High Pressure Coolant Injection (HPCI) were not analyzed at the MELLLA conditions. What is the basis for the conclusion that there is a large margin to other events? LFWH/HPCI can occur at normal power operations. Why is this event not considered in the determination and validation of the off-rated limits?

It is stated "—IRLS [idle recirculation loop startup] and RFI [recirculation flow increase] events were not considered for the MELLLA application." Please discuss the AOO analyses conclusions and confirm that they are based on actual plant-specific MELLLA analyses.

It is stated that extensive transient analyses were performed during the original development of the ARTS improvement program and that these evaluations are applicable to MELLLA operation. Please provide a reference to these analyses and how it was confirmed they were applicable to MELLLA.

As discussed with Entergy at a meeting on April 29, 2003, it would be useful to construct a table showing the events and the dependence on generic, plant specific, or reload evaluations and analyses.

There is a reference to the GEXL-PLUS correlation. Confirm that this correlation is valid over the range of power/flow conditions for the ARTS/MELLLA/ICF operating map.

7) Section 5.0, Thermal-Hydraulic Stability

Please describe the calculation used to obtain "the procedure core decay ratio," and provide the Cycle 23 conditions including core design, power level, axial power shape, and other relevant parameters.

Also, clarify that the results in the report are conservative and generic in nature, based on the approved Boiling Water Reactor Owners Group position, and will be revised on a cycle-specific basis.

8) Section 9.0, Anticipated Transient Without Scram

The maximum SLCS pump discharge pressure during the limiting ATWS event is 1320 psig. Main steam isolation valve closure (MSIVC) and PRFO events were "re-evaluated" and PRFO was identified as the limiting event, giving a peak RPV bottom pressure of 1367 psig at 38.9 sec decreasing to 1290 psia at the time of SLCS initiation (152.7 sec). It was stated that LOOP and inadvertent opening of a relief valve (IORV) were "considered but found to be non-limiting." How were they considered, and how were they determined to be non-limiting?

Table 9-2

Please discuss why the peak neutron flux is substantially higher at the end-of-cycle for the PRFO event.

9) Technical Specification (TS) Section 2.1.A.1.a, "Limiting Safety System Setting" for Fuel Cladding Integrity has listed the neutron flux trip setting for APRM flux scram trip setting (run mode) as:

Two Loop Operation
$S \leq 0.4W + 64.4\%$ for $0\% < W \leq 31.1\%$
$S \leq 1.28W + 37.0\%$ for $31.1\% < W \leq 54.0\%$
$S \leq 0.66W + 70.5\%$ for $54.0\% < W \leq 75.0\%$
With a maximum of 120.0% power for $W > 75.0\%$

Single Loop Operation
$S \leq 0.4W + 61.2\%$ for $0\% < W \leq 39.1\%$
$S \leq 1.28W + 26.8\%$ for $39.1\% < W \leq 61.9\%$
$S \leq 0.66W + 65.2\%$ for $61.9\% < W \leq 83.0\%$
With a maximum of 120.0% power for $W > 83.0\%$

The licensee has also listed the same equations in TS Table 3.1.1, "Reactor Protection System (Scram) Instrument Requirements," and for Function 4, "APRM High Flux (flow bias)" trip setting. The licensee's justification for these changes is based on GE Report NEDC-33089, Section 1.2.2. However, the GE Report lists these values as an analytical limit. Based on this, the staff is unable to determine whether these values have been calculated as an analytical limit, Trip setting, or limiting safety system setting and raises the question how the instrument uncertainties have been accounted for. This issue further raises the question about the instrument setpoint methodology used by the licensee. Therefore, in order for the staff to determine the adequacy of the setpoint determination, provide the setpoint methodology and calculation performed to determine the trip setpoint and limiting safety system setting, or verify that you used an approved setpoint methodology.

10) On the bottom of page 10, of Attachment 1, the licensee stated that the physical changes to the plant to accommodate the expanded operating region include FCTR cards and a SSV. GE Report NEDC- 33089 provides a reference to GE licensing topical report NEDC -32339P-A, Supplement 2, Revision 1. The staff's acceptance of NEDC -32339P-A, Supplement 2, Revision 1 is based on the licensee meeting certain design and installation guidance. Please confirm that VYNPS meets that guidance. If VYNPS does not meet this guidance, then justify the acceptability of these cards to establish the expanded operating region.