April 14, 2004

Mr. Michael Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - ISSUANCE OF AMENDMENT RE: IMPLEMENTATION OF ARTS/MELLLA (TAC NO. MB8070)

Dear Mr. Kansler:

The Commission has issued the enclosed Amendment No. 219 to Facility Operating License DPR-28 for the Vermont Yankee Nuclear Power Station (VYNPS), in response to your application dated March 20, 2003; as supplemented on March 31, April 17, June 11, July 21, and December 11, 2003; and January 20, February 10, and March 11, 2004.

The amendment revises the VYNPS Technical Specifications (TSs) to reflect an expanded operating domain resulting from the implementation of the Average Power Range Monitor, Rod Block Monitor TSs/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA).

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Richard B. Ennis, Senior Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosures: 1. Amendment No. 219 to License No. DPR-28
2. Safety Evaluation

cc w/encls: See next page

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ADAMS Accession Number: Letter - ML040920352; TS - ML ;
Package - ML040920355 * See previous concurrence.

OFFICE	PDI-1/PM	PDI-2/PM	PDI-2/LA	SRXB/SC*	EEIB/SC*	IROB/SC*	OGC	PDI-2/SC
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Vermont Yankee Nuclear Power Station

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ENTERGY NUCLEAR VERMONT YANKEE, LLC

AND ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 219
License No. DPR-28

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (the licensees) dated March 20, 2003; as supplemented on March 31, April 17, June 11, July 21, and December 11, 2003; and January 20, February 10, and March 11, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B of Facility Operating License No. DPR-28 is hereby amended to read as follows:

   (B) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 219, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented prior to the start of operating Cycle 24.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: April 14, 2004

ATTACHMENT TO LICENSE AMENDMENT NO. 219

FACILITY OPERATING LICENSE NO. DPR-28

DOCKET NO. 50-271

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
6	6
7	7
11	11
14	14
----	14a
18	18
20	20
21	21
22	22
24	24
27	27
28	28
33a	33a
52	52
77	77
84	84
85	85
90	90
92	92
97	97
98	98
120	120
224	224
226	226
227	227
----	227a
228	228
259	259

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 219 TO FACILITY OPERATING LICENSE NO. DPR-28

ENTERGY NUCLEAR VERMONT YANKEE, LLC

AND ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated March 20, 2003 (Reference 1); as supplemented on March 31, April 17, June 11, July 21, and December 11, 2003; and January 20, February 10, and March 11, 2004, (References 2 through 9, respectively) Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy or the licensee) submitted a request to amend the Vermont Yankee Nuclear Power Station (VYNPS) Technical Specifications (TSs). The proposed changes would allow additional startup and operating flexibility and an expanded operating domain resulting from the implementation of the Average Power Range Monitor, Rod Block Monitor Technical Specifications improvement program (ARTS) concurrently with the implementation of the Maximum Extended Load Line Limit Analysis (MELLLA) operating power-flow map. The proposed changes include modification of the trip setpoint (TSP) and allowable values for the average power range monitor (APRM).

To support these proposed changes, the licensee's submittal provided a VYNPS plant-specific ARTS/MELLLA safety analysis report (A/MSAR), NEDC-33089P (Reference 10), prepared by the Nuclear Steam Supply System (NSSS) vendor, General Electric Nuclear Energy (GENE).

The April 17, 2003, letter (Reference 3) supplied supporting information in the form of the Supplemental Reload Licensing Report (SRLR) for the VYNPS current operating Cycle 23 (Reference 11), prepared by the current nuclear fuel vendor, Global Nuclear Fuel - Americas, LLC (GNF). A public meeting was held between the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff and the licensee on April 29, 2003, to discuss the licensee's submittal and to address general NRC staff questions. An NRC staff request for additional information (RAI), was transmitted to Entergy by letter dated May 21, 2003 (Reference 12). The licensee's responses, dated June 11 (Reference 4), July 21 (Reference 5), and December 11, 2003 (Reference 6), and the supplemental submittals dated January 20 (Reference 7), February 10 (Reference 8), and March 11, 2004 (Reference 9), provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on April 15, 2003 (68 FR 18276).

The VYNPS is a boiling water reactor (BWR), 4-series reactor with a 205-inch diameter vessel and Mark I containment. The current licensed thermal power (CLTP) is 1593 megawatts-thermal (MWt). Since VYNPS has not taken a "stretch" power uprate (of up to 5%), this is also the original licensed thermal power (OLTP), and the nominal pressure vessel dome pressure of 1010 pounds per square inch-gauge (psig) is maintained. The initial rated core flow (RCF) was 48 million pounds-mass per hour (Mlb/hr); however, VYNPS is currently analyzed for and operates under increased core flow (ICF) operation at 107% (51.36 Mlb/hr) of the RCF. The currently analyzed limiting power/flow point for Single Loop Operation (SLO) is an absolute value of 1239 MWt. This value will not change for the proposed MELLLA implementation because SLO is not extended into the MELLLA operating region.

The operational flexibility of a BWR during power ascension from the low-power, low-flow core condition to the rated high-power, high-flow core condition is restricted by several factors. Factors currently restricting plant flexibility at VYNPS in efficiently achieving and maintaining rated power include:

1) the currently licensed allowable power/flow operating map; and,

2) the current APRM flow-biased flux scram and flow-biased rod block setdown requirements.

The current Extended Load Line Limit Analysis (ELLLA) operating upper boundary, corresponding to the 108% APRM Rod Block setpoint, allows operation up to approximately the 108% CLTP rod line, as shown in Figure 1-1 of the A/MSAR. The proposed MELLLA upper boundary defines an increase in the current operating domain above the current boundary, to include an extended operating region bounded by the rod line from the minimum pump speed line at 64% CLTP and 36% RCF, passing through the 100% CLTP point at 75% RCF and continuing along the rated power line to intersect the rated load (rod) line at 100% RCF (see Fig. 1-1, A/MSAR). Operation in the MELLLA region will enhance both the plant operational flexibility and increase the plant capacity factor.

The current APRM and Rod Block Monitor (RBM) flow-biased rod block trips restrict the power ascension capability of the VYNPS. The power ascension restrictions are further exacerbated by the existing setdown requirements for these trips. These operating restrictions, resulting from the existing APRM and RBM systems, can be relaxed or eliminated by the proposed implementation of the series of ARTS improvements consistent with NRC-approved methodologies. These proposed ARTS improvements will increase plant operating efficiency by updating the thermal limits administration to the level of the currently approved GENE power-dependent and flow-dependent thermal analysis basis, while providing more direct protection of plant safety.

Also, once rated power is achieved, periodic adjustments to core flow and control rod positions must be made to compensate for the reactivity changes due to Xenon buildup and decay, with fuel and burnable poison burnup.

The NRC staff also notes that the licensee has submitted an amendment application that, if approved, would allow implementation of an extended power uprate (EPU) to the VYNPS facility. That application is being reviewed separately by the NRC staff and is not addressed in

this NRC staff Safety Evaluation (SE). This SE is specifically limited to implementation of ARTS/MELLLA at VYNPS' CLTP.

2.0 REGULATORY EVALUATION

The construction permit for VYNPS was issued by the Atomic Energy Commission (AEC) on December 11, 1967. The plant was designed and constructed based on the proposed General Design Criteria (GDC) published by the AEC in the *Federal Register* (32 FR 10213) on July 11, 1967 (hereinafter referred to as "draft GDC"). The AEC published the final rule that added Appendix A to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "General Design Criteria for Nuclear Power Plants," in the *Federal Register* (36 FR 3255) on February 20, 1971 (hereinafter referred to as "final GDC").

Differences between the draft GDC and final GDC included a consolidation from 70 to 64 criteria. As discussed in the NRC's Staff Requirements Memorandum for SECY-92-223, dated September 18, 1992 (Agencywide Document Access and Management System (ADAMS) Accession No. ML003763736), the Commission decided not to apply the final GDC to plants with construction permits issued prior to May 21, 1971. At the time of promulgation of Appendix A to 10 CFR Part 50, the Commission stressed that the final GDC were not new requirements and that the GDC were promulgated to more clearly articulate the licensing requirements and practice in effect at that time. Each plant licensed before the final GDC were formally adopted was evaluated on a plant-specific basis, determined to be safe, and licensed by the Commission. Because the VYNPS construction permit was issued prior to May 21, 1971, the requirements applicable to VYNPS are those of the draft GDC.

The regulatory requirements that the staff considered in its review of this amendment application included those contained in 10 CFR 50.36, "Technical Specifications," the draft GDC, and NRC Regulatory Guide (RG) 1.105, "Setpoints for Safety-Related Instrumentation."

2.1 Requirements of 10 CFR 50.36

Part 50.36 of 10 CFR provides the regulatory requirements for the content of licensee TSs. Particularly, 10 CFR 50.36 requires that the TSs will include surveillance requirements (SRs) to assure that the limiting conditions for operation (LCOs) will be met. Additionally, paragraph (c)(1)(ii)(A) of 10 CFR 50.36, "Technical Specifications," states, in part, that where a limiting safety system setting (LSSS) is specified for a variable on which a safety limit (SL) has been placed, the setting must be so chosen that an automatic protective action will correct the abnormal situation before an SL is exceeded. The analytical limit (AL) is the limit on the process variable at which the instrument loop protective action occurs as assumed in the plant's safety analysis. Protective action at the AL ensures that the SL is not exceeded. The AL, however, does not account for uncertainties associated with the instrument loop. The instrument loop uncertainty is accounted for during calculation of an instrument loop's TSP.

The proposed TS changes would revise SRs and the LCO actions and completion times for each applicable operating condition. The NRC staff examined the following sections of the VYNPS Custom Technical Specifications for applicability to the proposed ARTS/MELLLA implementation:

Technical Specification	Section	Title
TS 1.1	SAFETY LIMIT	FUEL CLADDING INTEGRITY
TS 1.2	SAFETY LIMIT	REACTOR COOLANT SYSTEM
TS 2.1.A.1.A	LIMITING SAFETY SYSTEM SETTING	FUEL CLADDING INTEGRITY, Trip Settings, APRM Flux Scram Trip Setting (Run Mode)
TS 2.2	LIMITING SAFETY SYSTEM SETTING	REACTOR COOLANT SYSTEM
TABLE 2.2.1		Primary System Relief and Safety Valve Settings
TS 3.1.B	LIMITING CONDITIONS FOR OPERATION	REACTOR PROTECTION SYSTEM
TS 4.1.B	SURVEILLANCE REQUIREMENTS	REACTOR PROTECTION SYSTEM
TABLE 3.2.5		NOTES
TS 3.3.B.6	LIMITING CONDITIONS FOR OPERATION	PROTECTIVE INSTRUMENTATION SYSTEM
TS 4.3.B.6	SURVEILLANCE REQUIREMENTS	PROTECTIVE INSTRUMENTATION SYSTEM
TS 3.4.A	LIMITING CONDITIONS FOR OPERATION	REACTOR STANDBY LIQUID CONTROL SYSTEM, Normal Operation
TS 4.4.A	SURVEILLANCE REQUIREMENTS	REACTOR STANDBY LIQUID CONTROL SYSTEM, Normal Operation
TS 3.6.D	LIMITING CONDITIONS FOR OPERATION	Safety and Relief Valves
TS 4.6.D	SURVEILLANCE REQUIREMENTS	Safety and Relief Valves

TS 3.11.A	LIMITING CONDITIONS FOR OPERATION	REACTOR FUEL ASSEMBLIES, Average Planar Linear Heat Generation Rate (APLHGR)
TS 4.11.A	SURVEILLANCE REQUIREMENTS	REACTOR FUEL ASSEMBLIES, Average Planar Linear Heat Generation Rate (APLHGR)
TS 3.11.C	LIMITING CONDITIONS FOR OPERATION	REACTOR FUEL ASSEMBLIES, Minimum Critical Power Ratio (MCPR)
TS 4.11.C	SURVEILLANCE REQUIREMENTS	REACTOR FUEL ASSEMBLIES, Minimum Critical Power Ratio (MCPR)

The NRC staff is also aware that VYNPS is concurrently seeking other TS amendments to achieve more consistency with the improved Standard Technical Specifications (STS), (NUREG 1433, Rev. 2), in the area of instrumentation requirements. The review of TS changes in this SE was performed solely to evaluate the changes that are required to support the ARTS/MELLLA implementation at VYNPS for operation at the CLTP condition. Additional TS changes requested as part of a proposed EPU of up to 20% are also being reviewed separately, and are not part of this NRC evaluation for ARTS/MELLLA implementation at VYNPS.

2.2 Requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K

Section 50.46 of 10 CFR provides acceptance criteria for emergency core cooling systems (ECCS) for light-water power reactors. Appendix K to Part 50 of 10 CFR provides requirements and acceptable features of ECCS evaluation models. Although the proposed amendment to the VYNPS license for implementation of ARTS/MELLLA does not explicitly involve changes to the VYNPS ECCS, the requirements of 10 CFR 50.46(b) are pertinent to the evaluation of acceptability of the proposed amendment. The requirements of 10 CFR 50.46 (b) for maximum fuel element cladding temperature, maximum cladding oxidation, and maximum hydrogen generation during a design-basis loss-of-coolant accident (LOCA) must still be satisfied.

2.3 Requirements of 10 CFR 50.62

Section 50.62 of 10 CFR provides requirements for reduction of risk from anticipated transient without scram (ATWS) events for light-water-cooled nuclear power plants. These include requirements for ATWS Recirculation Pump Trip, an Alternate Rod Insertion (ARI) system, and an adequate Standby Liquid Control System (SLCS) injection rate. The March 20, 2003, application provided the A/MSAR that includes a discussion of the plant-specific ATWS analysis performed by the licensee to demonstrate compliance with 10 CFR 50.62 after ARTS/MELLLA implementation. By letter dated March 11, 2004, the licensee submitted a revised ATWS evaluation (Reference 9) to: 1) correct certain design input discrepancies, and 2) incorporate a

design change to install one additional SSV and increase the capacity of the two existing SSVs that will be implemented prior to Cycle 24 operation. The NRC staff's technical evaluation of the licensee's ATWS analysis is discussed further in Section 3.9 of this SE.

2.4 Requirements of the Draft GDC

Draft GDC 6 specifies that the reactor core and the associated control and instrumentation systems shall be designed with appropriate margins to assure that the acceptable fuel damage limits (AFDLs) are not exceeded during normal operation, including anticipated operational occurrences (AOOs). Draft GDC 7 requires that the reactor core and associated coolant, control, and protection systems shall be designed to assure that power oscillations which can result in conditions exceeding the AFDLs are not possible or can be reliably and readily detected and suppressed.

2.5 Requirements of RG 1.105

RG 1.105 is used to endorse Part 1 of the American National Standards Institute/Instrument Society of America (ANSI/ISA) Standard S67.04, "Setpoints for Nuclear Safety-Related Instrumentation used in Nuclear Power Plants," (ISA-S67.04-1994), and describes a method acceptable to the staff for complying with NRC's regulations for ensuring that safety-related instrumentation setpoints are initially within, and remain within, the TS limits. The RG lists four exceptions to the standard in regard to crafting an acceptable setpoint methodology. The two exceptions which were taken into consideration for this license amendment were that the LSSS is being specified as a TS-defined limit in order to satisfy the requirements of 10 CFR 50.36 (Exception # 3) and that the allowable value's relationship to the setpoint methodology and testing requirements in the TSs must be documented (Exception # 4).

3.0 TECHNICAL EVALUATION

3.1 Background

One function of the licensed allowable power/flow operating map is to define the normal operating condition of the reactor core used in determining the operating SLs. The current approved operating domain for VYNPS is the ELLLA map (Reference 13), with ICF to 107% RCF also implemented (Reference 14). The proposed TS change reflects operation of VYNPS in a region which is above the current rated rod line. The current ELLLA operating envelope, allowing operation up to approximately the 108% CLTP rod line, also corresponds to the current 108% APRM Rod Block setpoint. This domain would be modified to include an extended operating region bounded by the rod line (approximately the 120.8% CLTP rod line) that passes through the 100% CLTP / 75% RCF statepoint, the rated power line and the rated load line. This domain is defined in Figure 1-1 of the A/MSAR (Reference 10). This extended operating domain is called the Maximum Extended Load Line Limit (MELLL). The analyses for the specific operating limits associated with the MELLL region, referred to as MELLLA, are to be performed as part of the GENE/GNF standard cycle-specific reload analysis.

The function of the RBM is to prevent fuel damage in the event of erroneous rod withdrawal from locations of high power density during high-power level operation. It does this by blocking control rod movement which could result in violating a thermal limit (the safety limit minimum critical power ratio (SLMCPR) or the 1% cladding plastic strain limit) in the event of a Rod Withdrawal Error (RWE) event.

The functions of the APRM system include:

- generation of a trip signal to scram the reactor during core-wide neutron flux transients before exceeding the safety analysis design basis,

- blocking control rod withdrawal whenever operation exceeds set limits in the operating map, prior to approaching the scram level, and

- providing an indication of the core average power level in the power range.

The flow-biased rod block setdown and APRM flow-biased flux scram trip and alarm functions are provided to achieve these requirements.

The proposed partial implementation of the ARTS improvement program will increase the plant operating efficiency by: (a) updating the thermal limit requirements to be consistent with current General Electric (GE) methodology, and (b) making improvements in plant instrumentation accuracy and response that result from replacement of the original analog flow control trip reference (FCTR) cards with digital cards.

The ARTS improvement program includes changes to the current APRM system, which requires the TS changes described in Section 3.12 below. The current VYNPS TS requires that the flow-referenced APRM scram and rod block trips be lowered (setdown) when the core Maximum Total Peaking Factor exceeds the Design Total Peaking Factor. An alternative to an actual "setdown" is accomplished by adjusting the APRM gain upwards to achieve the desired equivalent result. The basis for the current APRM trip setdown requirement corresponds to the now obsolete Hench-Levy Minimum Critical Heat Flux Ratio (MCHFR) thermal limit criteria (Reference 15). A subsequent update to the thermal limit requirements, which decreases the dependence on the local thermal-hydraulic conditions, including the core peaking factors, was developed by GE. The resulting General Electric Thermal Analysis Basis critical power ratio (CPR) correlation model (Reference 16), which relies on bundle boiling length and exit quality, was reviewed and approved by the staff, by a letter dated October 24, 1974.

The objective of the APRM improvements is to justify removal of the APRM trip setdown and the Design Total Peaking Factor requirement. Since the elimination of the APRM gain and setpoint requirement can potentially affect the fuel thermal-mechanical integrity and the ECCS LOCA performance, the staff reviewed the acceptability of these changes. The GENE safety analysis applied the following criteria to assure satisfaction of the applicable licensing requirements and to demonstrate acceptability of eliminating the APRM trip setdown requirement:

1) The SLMCPR shall not be violated as a result of any AOOs,
2) All fuel thermal-mechanical design bases shall remain within the licensing limits described in the GE generic fuel licensing report (GESTAR-II), and,
3) The peak cladding temperature and the maximum cladding oxidation fraction following a LOCA shall remain within the limits defined in 10 CFR 50.46.

The ARTS-specific changes are:

1) The requirement for setdown of the APRM scrams and rod blocks is deleted,
2) New power-dependent MCPR adjustment factors, MCPR(p), are added,
3) New flow-dependent MCPR adjustment factors, MCPR(f), replace the K_f multiplier,
4) New power-dependent linear heat generation rate (LHGR) adjustment factors, LHGRFAC(p), are added,
5) New flow-dependent LHGR adjustment factors, LHGRFAC(f), are added, and,
6) The affected TS SRs, LCOs, and the associated Bases are modified or deleted, as required to incorporate the above changes.

The NRC staff reviewed the safety analyses and systems response evaluations performed by GENE to justify VYNPS operation in the expanded MELLLA region, as discussed in Reference 10. The plant-specific, fuel independent analyses, such as containment response, were performed based on the current plant configuration and applicable plant geometry for VYNPS. The fuel dependent analyses, such as the limiting AOOs, the MCPR calculations, and the reactor vessel overpressure protection analysis, were performed using a representative VYNPS core design of GE14 and GE13 fuel, based on the current operating condition (Cycle 23) at the CLTP. The March 20, 2003, application states that these analyses will be performed each operating cycle as part of the GENE/GNF standard reload design process, outlined in the current version of GESTAR-II (Reference 17). Additionally, the NRC staff notes that the GESTAR-II methodology is explicitly listed in VYNPS TS 6.6.C as part of the VYNPS licensing basis.

Plant modifications are planned for the next refueling outage (prior to Cycle 24 operation) to accommodate the MELLLA expanded operating region, including an upgrade to the FCTR cards and installation of an additional Spring Safety Valve (SSV).

3.2 Method of Analysis

The analyses that the licensee used to justify operation with the ARTS improvement and the MELLLA power/flow operating map are based on NRC-approved computer codes, methodologies, and applicable industry standards, which are discussed in the A/MSAR and associated references. The NRC staff notes that the BILBO code, referenced in Section 1.2.2 of the VYNPS A/MSAR, has not been explicitly reviewed and approved by the NRC. However, this is not a safety analysis code. Rather, the BILBO computer code, described in NEDE-23504, dated February 1977, is used in analysis of the reactor recirculation system to determine the bounding delta-W (the difference between the recirculation drive flow (W) for two-loop operation and single-loop operation), which is not affected by the implementation of ARTS/MELLLA. Hence, because ARTS/MELLLA implementation does not affect the parameter determined by the BILBO code and because it is not a safety analysis code, NRC approval of the BILBO code is not required for this amendment application. Table 1-1 of the VYNPS A/MSAR lists the NSSS computer codes used in the safety analyses. The table indicates that all of the applicable codes have been reviewed and approved by the NRC.

The ARTS thermal limits are expected to be fuel cycle-independent and the GENE ARTS transient analyses were performed at the CLTP plant conditions for the current Cycle 23 core configuration, using the GENE standard reload licensing methodology described in the GESTAR-II documentation (Reference 17). These VYNPS plant-specific analyses were

performed to establish plant-unique, flow-dependent MCPR, LHGR, and maximum average planar linear heat generation rate (MAPLHGR) limits. Added conservatisms were included which are expected to allow future reloads of GE fuels (through the GE14 fuel design), utilizing the GEXL-PLUS correlation and the GEMINI analysis methods described in GESTAR-II. GENE has incorporated limitations and restrictions discussed in the NRC SEs applicable to the GEXL-PLUS and GEMINI methodologies into the associated GENE procedures and technical instructions. These have been verified in previous vendor audits.

The NRC staff finds the methods used to be acceptable, since approved methods are used and the example calculations provided demonstrate the application of the methods to the proposed ARTS/MELLLA implementation at the CLTP condition.

3.3 Fuel Thermal Limits

Draft GDC 6 requires that the reactor core and the associated control and instrumentation systems be designed with appropriate margins to assure that the AFDLs are not exceeded during normal operation, including AOOs. Operating limits are established to assure that regulatory and/or SLs are not exceeded for a range of postulated events (transients and accidents).

The NRC staff reviewed the effects of operation along the higher MELLLA rod line at the CLTP on the thermal limits and the thermal limits management with the ARTS power and flow dependent limits, which are covered in the A/MSAR. The potentially limiting AOOs and accident analyses were evaluated by GENE to support VYNPS operation with the ARTS off-rated limits, as well as operation in the MELLLA region for the current operating Cycle 23.

The original ARTS improvement program generic off-rated limits development considered and evaluated the following events to be potentially limiting:

1) Generator Load Rejection with No Bypass (LRNBP) event;
2) Turbine Trip with No Bypass (TTNBP) event;
3) Feedwater Controller Failure (FWCF) maximum demand event;
4) Loss of Feedwater Heating (LFWH) event;
5) Inadvertent High Pressure Coolant Injection (HPCI) startup event;
6) Idle Recirculation Loop Start-up (IRLS) event; and
7) Recirculation Flow Increase (RFI) event.

The staff's examination of these evaluations for the expanded power/flow map conditions concluded that the generic limiting events are still applicable to operation in the MELLLA region.

The first three events (LRNBP, TTNBP, and FWCF) were analyzed by GENE for VYNPS MELLLA operation using the current operating Cycle 23 configuration. The results of that analysis are reported in the A/MSAR (Reference 10).

The LFWH event is not limiting for VYNPS and the effect of MELLLA is not significant. Also, since the event becomes less limiting at lower powers, the event is not considered in the determination and validation of off-rated limits. This event is analyzed on a cycle-specific basis.

The GENE HPCI evaluation also showed a large margin for the operating limit minimum critical power ratio (OLMCPR), and at low powers the subcooling due to FWCF bounds the HPCI value. Therefore, the HPCI event is not considered in the determination and validation of the off-rated limits. The IRLS and RFI events are most limiting at off-rated conditions; however, they are less limiting than the fast pressurization events (TTNBP, LRNBP, and FWCF) based on the generic evaluations performed during the original development of the ARTS flow-dependent limits. Since the current VYNPS licensing basis analysis considers an atypical two recirculation pump flow runout event, a VYNPS-specific RFI analysis was performed by GENE to generate flow-dependent MCPR, LHGR, and MAPLHGR limits.

Extensive transient analyses performed by GENE at a variety of power and flow conditions, for the original ARTS improvement program, established a database of limiting transients that were representative of a variety of plant configurations and key parameters designed to be applicable to all BWRs. These generic evaluations determined power-dependent trends for two operating ranges. The first range is between the 100% rated thermal power and the power level [30% of CLTP for VYNPS] where the reactor scram on turbine stop valve closure or turbine control valve fast closure is bypassed (P_{bypass}). The second range is from P_{bypass} (30%) down to 25% of the CLTP. The current VYNPS TS 3.11 does not require thermal limit monitoring below 25% of CLTP.

VYNPS-specific analyses were performed by GENE to confirm the applicability of the generic power-dependent limit multipliers [K(p), LHGR(p), and MAPLHGR(p)] above P_{bypass}. VYNPS-specific evaluations were also performed between P_{bypass} (30%) and 25% power to establish VYNPS-unique MCPR, LHGR, and MAPLHGR limits, which will apply to future reloads of GE fuel designs through the GE14 design.

The GENE AOO analyses were performed for the current operating Cycle 23 CLTP conditions with the MELLLA operating power/flow statepoints, generating operating limits for the current GE13 and GE14 fuel configuration. The GE9 fuel in the current (and any future) core is not limiting and is bounded by the GE13/GE14 off-rated limits.

The partial ARTS improvement implementation at VYNPS will not require the original ARTS hardware change to the RBM that provided protection for an off-rated RWE event. Therefore, evaluation of the VYNPS RWE event was performed by GENE without taking credit for the mitigating effect of the flow-biased RBM setpoints, and the resulting off-rated OLMCPR values are for the unblocked RWE event. Analyses will be performed by the licensee for VYNPS operating Cycle 24 and beyond to provide a VYNPS plant-specific, statistically-based, power-dependent RWE OLMCPR value.

Since the cycle-specific reload fuel analyses will determine the limits for rated and applicable off-rated conditions, and application of the methodology is demonstrated by the analyses performed for the current operating cycle, this approach is acceptable to the NRC staff.

3.4 Vessel Over-Pressure

The main steam isolation valve (MSIV) closure with a flux scram event is used to determine compliance to the industry standard American Society of Mechanical Engineers Pressure Vessel Code. As discussed in the A/MSAR, a reload cycle-specific calculation was performed, by GENE, at 102% of CLTP with the maximum licensed core flow (107% of rated). The implementation of ARTS/MELLLA does not affect this analysis since operation at the ICF is currently licensed.

3.5 Thermal-Hydraulic Stability

Draft GDC 7 requires that the reactor core and associated coolant, control, and protection systems shall be designed to assure that power oscillations that can result in conditions exceeding the AFDLs are not possible or can be reliably and readily detected and suppressed. Stability criteria are established in GESTAR-II to demonstrate compliance with the draft GDC 7 requirements in order to assure that acceptable fuel damage limits (i.e., SLMCPR) are not exceeded. The analysis and methods used to demonstrate compliance with the stability acceptance criteria are documented in NEDO-31960A (Reference 18). The ODYSY code was reviewed and approved by the NRC (Reference 19) to analyze core and hot-channel decay ratios to demonstrate compliance with the stability licensing limits.

The licensee has implemented long-term thermal-hydraulic stability solution Option I-D, which is applicable to plants that can demonstrate that core-wide mode instability is the predominant mode and that regional mode instability is not expected. Option I-D has prevention elements (the Exclusion and Buffer regions), and a detect and suppress (D&S) element (the SLMCPR protection function) provided by the flow-biased APRM flux trip for the dominant core-wide mode of coupled thermal-hydraulic/neutronic reactor instability. The exclusion region is both core and reload cycle-dependent and represents a curved line of constant stability margin. The APRM High Flux (flow Bias) trip protection is also reload cycle-dependent.

The following potential stability issues were identified in the GENE A/MSAR for VYNPS operation at MELLLA conditions:

1) The ODYSY (Reference 19) calculated channel decay ratio (DR) for VYNPS, Cycle 23 operation is higher than the criterion established for Solution I-D plants in Reference 18; and

2) Solution I-D plants have a D&S feature, the flow-biased APRM scram (Reference 20), which needs to be confirmed by analysis.

For the analysis required by Item 2 above, VYNPS proposed to use the generic core-wide Delta CPR over Initial MCPR Versus the Oscillation Magnitude (DIVOM) curve methodology of Reference 20. The applicability of the generic core-wide DIVOM methodology curve to GE14 fueled cores was the subject of a Part 21 Notification (References 21 and 22). Interim guidance, OG01-0228-01, has been provided by GENE, to be used until final resolution is reached by the Boiling Water Reactor Owners Group (BWROG).

The NRC staff reviewed these issues, by evaluating the VYNPS Cycle 23 calculations, which used NRC-approved methodologies, that were provided by the licensee in response to the staff RAIs. Based on its review, the NRC staff has found that the thermal-hydraulic stability analysis for VYNPS is acceptable because:

1) the ODYSY calculated decay ratios for VYNPS, Cycle 23, compared to the stability criterion from Figure 5-4 of Reference 18, indicates that the intercept of the calculated DRs is much lower than 0.56, which is clearly in the core-wide mode region, even though the channel DR is greater than the edge of the curved section of the stability criterion (from Figure 1-1 of Reference 21);

2) the generic DIVOM methodology is still applicable to VYNPS Cycle 23 operation because:

   (a) based on the calculated DRs in Item (1) above, instabilities at VYNPS in Cycle 23 are more likely to be in the core-wide mode,

   (b) the application of the generic DIVOM curve is mostly related to out-of-phase instabilities, like the VYNPS Cycle 23 results, not to in-phase instabilities, and

   (c) the additional guidance provided to the BWROG (OG01-0228-01) on determining a plant specific figure of merit, demonstrates that VYNPS does not exceed the interim Option I-D applicability threshold of 66 MWt/Mlbm/hr (power-to-flow ratio) described in Reference 22. As discussed in the A/MSAR, the calculated core average power-to-flow ratio for VYNPS is 58.0 MWt/Mlbm/hr.

   Therefore, VYNPS Cycle 23 at the CLTP condition with MELLLA implementation meets the applicable requirements for use of the generic core-wide mode DIVOM curve; and

3) NRC-approved methodologies were used for the thermal-hydraulic stability analysis.

Based on the analyses provided by the licensee and the fact that approved methodologies were used, the NRC staff concludes that the thermal-hydraulic stability characteristics of the VYNPS with the proposed ARTS/MELLLA implementation at the CLTP conditions is acceptable.

3.6 LOCA Analysis

The ECCS is designed to provide protection against postulated LOCAs caused by ruptures in the primary system piping. The ECCS performance under all LOCA conditions and the analysis models must satisfy the requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K. The MAPLHGR operating limit is based on the most limiting LOCA and ensures compliance with the ECCS acceptance criteria in 10 CFR 50.46.

For most BWRs, the full-spectrum ECCS-LOCA analyses were performed when the plants converted to the SAFER/GESTR analysis. For VYNPS, this analysis (Reference 23) was performed based on operation along the current ELLLA rod line up to the OLTP.

The current licensing basis SAFER/GESTR-LOCA analysis for the VYNPS is contained in Reference 23. The current basis also specifies the APRM setdown requirement of a maximum LHGR value as a function of drive flow. This requirement is proposed to be replaced with the direct core power and flow-dependent fuel thermal limits of the ARTS improvement program, which is not required for the LOCA analysis. The NRC staff reviewed the current licensing basis analysis to determine the ECCS performance effect of operation in the MELLLA domain at the CLTP. An evaluation was performed by GENE with GE14 and GE13 fuel to demonstrate compliance with the ECCS-LOCA acceptance criteria.

The licensee's previously calculated Licensing Basis (LB) peak fuel cladding temperature (PCT) from the VYNPS Cycle 23 GE14 new fuel introduction (NFI) analysis was 1950 °F. For MELLLA operation, an LB PCT value of 1960 °F was determined for GE14 fuel and 1910 °F for GE13 fuel, which also bounds the GE9 fuel. The licensee's January 20, 2004, supplemental submittal (Reference 7) provided a corrected value of 1900 °F for GE13 fuel. Justification for the elimination of the former 1600 °F Upper Bound PCT limit was provided in the GE14 NFI analysis, consistent with the conclusions of Reference 24. Also, the maximum local oxidation is less than 3%, and the core-wide metal-water reaction is less than 0.1%. The generic determination of compliance with the coolable geometry and long-term cooling acceptance criteria in Reference 27 is, therefore, still applicable.

Based on the above, the NRC staff has determined that no additional operating restrictions would be required for ARTS/MELLLA operation at the CLTP, since the determination of the sensitivity of the ECCS-LOCA evaluations to operation in the MELLLA domain shows compliance with the acceptance criteria.

3.7 Containment Response

Analyses of the short-term containment response to the design basis accident LOCA were previously performed by GENE covering the full extent of the MELLLA power/flow boundary for VYNPS (Reference 26) and are shown in the Updated Final Safety Analysis Report (Reference 27). Therefore, the current licensing basis is shown to bound the MELLLA conditions.

3.8 Reactor Internals

The increase in the reactor internal pressure difference across the fuel channels and other reactor internal components was demonstrated to be bounded by the ELLLA and ICF conditions shown in Reference 14, including the fuel bundle lift evaluation.

The acoustic and flow-induced loads in the MELLLA condition are slightly higher than in the current ELLLA condition due to increased subcooling in the downcomer. This increases the critical flow and the mass flux in a postulated recirculation suction line break (RSLB). The acoustic loads calculated by GENE for the jet pumps and core shroud were based on VYNPS specific plant geometry configuration and current operating conditions. The VYNPS specific geometry and fluid conditions were also used to calculate the flow-induced loads. For VYNPS, the most limiting subcooling condition was determined to be at the intersection of the minimum pump speed and the MELLLA flow control line.

The RSLB LOCA loads are also affected by the MELLLA conditions but, as discussed in the A/MSAR, an assessment showed the change to be about 2%, which is not significant.

The reactor internals vibration characteristics can be affected by the increased rod line associated with MELLLA operation, including the jet pump sensing lines. For the shroud and separator assembly and the steam dryer, the steam flow determines the vibrations. At the CLTP, MELLLA operation does not increase the steam flow and, thus, does not affect internals vibration characteristics.

3.9 Anticipated Transient without Scram (ATWS)

The current ATWS requirements are contained in 10 CFR 50.62. This regulation includes requirements for an ATWS Recirculation Pump Trip, an ARI system, and an adequate SLCS injection rate.

The NRC staff reviewed the VYNPS specific analysis, described in Section 9.0 of the A/MSAR, that was performed using the approved licensing methodology (Reference 28) to demonstrate compliance with 10 CFR 50.62 ATWS requirements. The analysis assumed the CLTP with the minimum MELLLA core flow (75% of RCF), which is the limiting operating condition. The loss of offsite power and inadvertently opened relief valve events were determined to be non-limiting. To support this application, GENE re-evaluated the limiting ATWS events, MSIV closure and pressure regulator failure open (PRFO) with ARI assumed to fail, requiring SLCS injection. The adequacy of the margin to the SLCS relief valve lifting, as described in NRC Information Notice 2001-13, “Inadequate Standby Liquid Control System Relief Valve Margin,” was included in this assessment. The analysis was based on current VYNPS Cycle 23 conditions, which has four safety/relief valves (SRVs) and two SSVs. Compliance with the applicable reactor vessel overpressure acceptance criterion requires a third SSV, which will be installed in the reload outage prior to the implementation of MELLLA, in order to still allow one SRV out of service (OOS).

The maximum SLCS pump discharge pressure requirement during the PRFO at the beginning of Cycle (BOC) event is 1320 psig, based on a peak reactor vessel lower plenum pressure of 1290 pounds per square inch absolute (psia) at the time of SLCS initiation. This required the proposed change in the TS 4.4.A.1 test pressure requirement from 1275 to 1320 psig. With a nominal SLCS relief valve setpoint of 1400 psig, there is an 80 pounds per square inch (psi) margin to the peak SLCS pump discharge pressure of 1320 psig.

Subsequently, the licensee submitted a revised ATWS evaluation (Reference 9) to: 1) correct certain design input discrepancies, and 2) incorporate the design change to install one additional SSV and increase the capacity of the two existing SSVs that will be implemented prior to Cycle 24 operation. The input changes result in a more accurate or realistic representation of the current actual plant configuration and the planned SSV modifications that will be in place when the proposed ARTS/MELLLA implementation would occur in Cycle 24.

As discussed in the revised analysis, the key input parameter changes are:

1) SLCS Liquid Transport Time changed to reflect the actual VYNPS piping length, with the assumption that the pipe segment between the storage tank and the pumps is not initially filled with the sodium pentaborate solution,

2) ATWS Recirculation Pump Trip Sensor Time Constant changed to reflect VYNPS plant-specific instrumentation,

3) Residual Heat Removal System Heat Exchanger Effectiveness changed based on VYNPS plant-specific heat exchange performance over the assumed suppression pool temperature range,

4) SSV capacity per valve changed to reflect planned modifications to be implemented prior to Cycle 24, and

5) SRV/SSV configuration changed from the current Cycle 23 condition (four SRVs/two SSVs) to three SRVs/three SSVs to reflect the planned Cycle 24 configuration with the assumption of one SRV OOS.

As noted in the revised analysis, there is a slight decrease in the maximum SLCS pump discharge pressure requirement during the BOC PRFO event (1320 to 1318.5 psig), based on a decrease in the peak reactor vessel lower plenum pressure (1290 to 1289.2 psia) at the time of SLCS initiation. The licensee will not change the original proposed TS 4.4.A.1 test pressure requirement of 1320 psig. Also, with the nominal SLCS relief valve setpoint of 1400 psig, there is a slight increase in the margin (80 to 81.5 psi) to the revised peak SLCS pump discharge pressure requirement of 1318.5 psig. These slight improvements do not affect the previous conclusions.

The staff concludes, based on its review of both the original and revised analyses, that VYNPS meets the requirements for ATWS mitigating features specified in 10 CFR 50.62 and that the results of the ATWS analyses for MELLLA operation at the CLTP would meet the ATWS acceptance criteria for the current operating Cycle 23. Since the ATWS analyses will be re-evaluated for the VYNPS Cycle 24 MELLLA operation at the CLTP, there are no unresolved issues.

3.10 Steam Dryer/Separator Performance

The NRC staff reviewed the evaluation of the performance of the steam dryer and separator during MELLLA operation at CLTP. For a constant reactor thermal power, MELLLA operation decreases the core flow rate, resulting in an increase in separator inlet quality. The evaluation shows that the moisture content remains less than, or equal to, 0.1 weight % for MELLLA operation at the CLTP. Additionally, as noted in Section 3.8, MELLLA operation at the CLTP does not affect reactor internals vibration characteristics and, thus, would not challenge the steam dryer integrity.

3.11 Testing

Standard pre-operational testing (APRM, recirculation flow calibrations) will be performed after installation of the new digital FCTR cards. The APRMs will be calibrated prior to MELLLA implementation. The APRM flow-biased scram and rod block setpoints will be consistent with the ARTS/MELLLA implementation, with all APRM trips and alarms tested. The flow-biased setpoints for the RBM will be confirmed.

The March 20, 2003 application stated that the initial MELLLA testing will be performed between the 50% RCF line and the 90% CLTP line, within 5% of the MELLLA boundary. Power will be increased along this constant flow control line to between 95% and 100% of CLTP, within 5% of the MELLLA boundary. At this point, steam separator and dryer performance will be evaluated by measuring the main steam line moisture content. The application stated further that acceptable performance will be confirmed prior to approaching the MELLLA boundary.

Since the APRMs will be calibrated and tested and the setpoints will be confirmed prior to exceeding the current ELLLA boundary, and the initial MELLLA tests will be performed below but within 5% of the MELLLA rod line, with confirmation of acceptable performance of the steam separator and dryer, the NRC staff finds this approach to be acceptable.

3.12 TS Changes for ARTS/MELLLA

Section 50.36 of 10 CFR, "Technical Specifications," provides the regulatory requirements for the content required in a licensee TS. Among those requirements, this section specifies that the TS will include SRs to assure that the LCOs will be met.

3.12.1 NRC Reactor Systems Branch Review of Proposed TS Changes:

The staff reviewed the proposed changes to the VYNPS TS that are identified in the licensee's submittal. The changes include deletion of the current setdown requirement, and new power and flow-dependent MCPR and MAPLHGR limits. The proposed TS changes are as follows:

1)	TS SR 2.1.A.1.a	revised to implement the multiple slope APRM Flow Biased Scram Function, including explicit function for SLO
2)	TS SR 2.1.A.1.a	revised to remove maximum fraction of limiting power density (MFLPD)/fraction of rated power (FRP), which is no longer needed
3)	TS FIGURE 2.1.1	replaced with revised figure to reflect the the multiple slope APRM Flow Biased Scram Function, consistent with TABLE 3.1.1
4)	TS SR 2.2, TABLE 2.2.1	revised to reflect three SSVs (addition of one)
5)	TS LCO 3.1.B	deleted to remove MFLPD/FRP requirement
6)	TS SR 4.1.B	deleted to remove MFLPD/FRP requirement
7)	TS TABLE 3.1.1	revised to implement multiple slope APRM Flow Biased Scram Function
8)	TS TABLE 3.1.1 NOTES	revised to remove delta-W for SLO, which is now defined explicitly
9)	TS TABLE 3.2.5 NOTES	revised to define delta-W for SLO to be 8%
10)	TS TABLE 3.2.5 NOTES	revised to delete reference to "limiting control rod pattern," which is no longer required
11)	TS LCO 3.3.B.6	deleted to reflect deletion of "limiting control rod pattern" requirement

12) TS SR 4.3.B.6	deleted to reflect deletion of “limiting control rod pattern” requirement
13) TS SR 4.4.A.1	revised to reflect increased pressure requirement from 1275 to 1320 psig for SLCS pump testing
14) TS LCO 3.6.D.1	revised to reflect requirement that all SSVs (three) shall be operable whenever reactor coolant pressure is >150 psig and temperature is > 350 °F
15) TS LCO 3.11.A	revised to reflect the power and flow dependence of the APLHGR limit
16) TS SR 4.11.A	revised to reflect the power and flow dependence of the APLHGR limit
17) TS LCO 3.11.C.1	revised to reflect the deletion of the K_f multiplier on the OLMCPR limit in the core operating limits report (COLR)
18) TS SR 4.11.C	revised to delete reference to power level and distribution restrictions for “limiting control rod pattern,” which is no longer required
19) TS Section 6.6.C.2	revised to delete requirement for reference in the COLR to the K_f flow adjustment for TS LCO 3.11.C, which is no longer required

These changes allow the implementation of the thermal limits portion of the GE ARTS improvement protection program and the MELLLA expanded operating domain. The safety analyses presented used methods that have been previously approved by the NRC and the results of the analyses fall within accepted limits. Based on the analyses reviewed, the NRC staff concludes that the results submitted by the licensee satisfy the appropriate acceptance criteria discussed in the preceding sections and, hence, justify the proposed changes to the VYNPS TSs for operation at the CLTP.

3.12.2 NRC Electrical and Instrumentation and Controls Branch Review of Proposed TS Changes

The NRC’s Electrical and Instrumentation and Controls Branch reviewed the proposed changes that would affect instrumentation maintenance or setpoint controls as discussed below:

Proposed Changes to TS 2.1.A.1.a:

1) The heading is changed from “APRM Flux Scram Trip Setting (Run Mode)” to “APRM Flux Scram Allowable Value (Run Mode).”

   Evaluation: The licensee has adopted the STS nomenclature of “allowable value” (AV) only for the APRM flux scram trip function. This change was made to clarify that the AV in the TS corresponds to the limiting value instrument channels may have for determining operability. Other trip functions in the TS utilize calculational

methods for determining limiting values that differ from that for determining the limiting value for the APRM flux scram trip function. The staff was concerned with the definition of AV in the licensee's submittal of December 11, 2003, because on page 61 of Appendix D to Attachment 1, AV is defined as "a limiting value that the trip setpoint may have when tested periodically, beyond which appropriate action will be taken .... For Vermont Yankee the periodic test is defined as the calibration. The limiting value that the trip setpoint may have for other periodic testing is administratively controlled." The staff's concern with this definition was that since calibration is generally performed during a refueling interval and a functional test is performed quarterly, operability of the APRM flux scram trip setpoints would not be controlled by TSs during functional testing. The licensee explained that for this function the functional test also includes calibration, and pointed to page 15 of the calculation package for this instrumentation (VYC-693A, Revision 2). However, the staff was still concerned since TS Table 4.1.1 lists functional test as a logic system functional test and not as a calibration test. The staff requested the licensee to clarify the discrepancy and by letter dated February 10, 2004, the licensee has proposed to revise TS Table 4.1.2 to add a requirement for calibrating the APRM trip unit every three months. The licensee has also revised the Bases to TS Section 4.1.A to clarify that the AV will be used to determine operability of the APRM High Flux Flow Bias trip units. The staff has determined that, with the proposed revision, the requirements of 10 CFR 50.36 and RG 1.105 are met and, therefore, the changes are acceptable.

2) The TS for this LSSS is changed from "When the mode switch is in the RUN position, the APRM flux scram trip setting shall be as shown on Figure 2.1.1 and shall be: $S \leq 0.66(W-\Delta W) + 54\%$" to "When the mode switch is in the RUN position, the APRM flux scram AV shall be:

Two loop operation:
$S \leq 0.4W + 61.10\%$ for $0\% < W \leq 31.1\%$
$S \leq 1.28W + 33.31\%$ for $31.1\% < W \leq 54.0\%$
$S \leq 0.66W + 67.28\%$ for $54.0\% < W \leq 75.0\%$
With a maximum of 117.0% power for W> 75%

Single loop operation:
$S \leq 0.4\ W + 58.09\%$ for $0\% < W \leq 39.1\%$
$S \leq 1.28\ W + 23.56\%$ for $39.1\% < W \leq 61.9\%$
$S \leq 0.66\ W + 62.10\%$ for $61.9\% < W \leq 83.0\%$
With a maximum of 117.0% power for W> 83.0%

Evaluation: In its submittal of March 20, 2003, the licensee stated that the analog FCTR cards are being replaced with digital FCTR cards. The current VY APRM flow-biased setpoints are implemented by an analog FCTR card installed in each of the APRM channels. These cards are able to accommodate a single flow-biased scram equation. Therefore, to implement the multiple APRM flow-biased equations, the licensee has replaced these cards with digital FCTR cards. In a letter dated May 21, 2003, the staff requested the licensee to justify the use of digital FCTR cards. The licensee in its letter of June 11, 2003, provided the basis of acceptance of these cards. The staff has previously accepted GE topical report NEDC-32339P-A, Supplement 2, Revision 1 on the condition that the licensee meets

certain design and installation guidance. The licensee addressed each of these conditions in its letter of June 11, 2003 and the staff finds the licensee's justification acceptable.

In its submittal of March 20, 2003, the licensee defined the algorithms for the flux trip setting the same as the algorithms listed as the AL in GE Technical Report NEDC-33089. By letter dated May 21, 2003, the staff requested that the licensee submit its setpoint methodology for staff review, and by letter dated June 11, 2003, the licensee submitted its response to the staff's request. The staff was still concerned that the licensee's response was not adequate to assure that the setpoint methodology meets the requirements of 10 CFR 50.36 with respect to establishing the LSSS. The staff had several conference calls with the licensee to discuss this issue, and by letter dated December 11, 2003, the licensee submitted the new setpoint methodology and calculation package for this function. The licensee's calculation uses method 1 of the ISA RP67.04.02 which the NRC staff considers acceptable for determining trip setpoints and operability limits for instrument channels by accounting for all instrument uncertainties not measured during the periodic channel functional test to assure that the instrument will perform its function prior to exceeding the AL. The staff has limited its review of setpoint methodology only with regard to this function. Acceptability of the setpoint methodology for other functions not covered by this change request was not determined by the staff. The licensee has calculated the TSP and AV for this trip function based on this methodology. The staff finds the licensee's proposed changes to include AV in this TS acceptable. With regard to deleting TS Figure 2.1.1, the staff considers this change to be an administrative change as TS Figure 2.1.1 does not provide any requirement not already included in the stated algorithms for this function and, therefore, finds it acceptable. This change is also consistent with the STS.

Proposed changes to TS Table 3.1.1

1) TS Table 3.1.1, Trip Function No. 4, "APRM (APRM A-F) High Flux (flow bias)":

The licensee has changed the algorithm consistent with the algorithm change described in Section 3.12.2.2 for TS 2.1.A.1.a. In addition, footnote 4 to TS Table 3.1.1 is changed to clarify the following statement: "The specified APRM High Flux scram (flow bias) Trip Setting is an Allowable value, which is the limiting value that the trip setpoint may have when tested periodically. The actual scram trip setting is conservatively set in relation to the Allowable Value." In addition, footnote 4 is modified to eliminate the statement: "ΔW is the difference between the two loop and single loop drive flow at the same core flow. This difference must be accounted for during single loop operation. $\Delta W = 0$ for two recirculation loop operation."

Evaluation: The algorithm is changed to adopt the allowable value for the ARTS/MELLLA function calculated using method 1 of the ISA RP67.04.02. The acceptability of this algorithm is discussed in Section 3.12.2.2 of this SE. The modification to footnote 4 was provided to emphasize that the specification of AV corresponds to the limiting value trip setpoint used to determine the operability of the instrument. This change is made to distinguish the trip setting for this function from other trip settings in other TSs that do not include allowable values. The deletion in footnote 4 is made because separate algorithm specifications are now provided for two-loop and single-loop recirculation operation.

Based on the above considerations, the NRC staff finds that the proposed changes to the TS meet the requirements of 10 CFR 50.36 and RG 1.105 and are, therefore, acceptable.

The licensee also provided the associated TS Bases that reflect the proposed TS changes as an attachment to its application. The TS Bases changes are consistent with the licensee's proposed plant-specific TS changes, and the NRC staff has no objections to the Bases changes presented in the licensee's application.

3.13 Summary

The NRC staff has reviewed the licensee's amendment application along with the supporting documentation, including responses from the RAIs.

The staff is aware that VYNPS is concurrently seeking other TS amendments to achieve more consistency with the improved STS, (NUREG 1433, Rev. 2) in the area of instrumentation requirements. In addition, the licensee currently plans to submit a license amendment to implement an EPU of up to 20% power during the same cycle as the ARTS/MELLLA implementation. The NRC staff will review the licensee's other instrumentation TS for consistency with the improved STS during the review of the VYNPS EPU license amendment request.

The review of TS changes in this SE is performed solely to evaluate the changes that would be required to support the ARTS/MELLLA implementation at VYNPS. This review covered the ARTS/MELLLA application for the CLTP. Further TS amendment requests, associated with the planned EPU, are expected to be submitted by the licensee and the NRC staff will review all applicable issues at that time.

Based on its review, the NRC staff concludes that the proposed TS changes are acceptable because the safety analysis supporting actual operation in the ARTS/MELLLA regimes at the CLTP demonstrates conformance to the applicable regulatory requirements and acceptance criteria.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Vermont State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendment involves no significant increase in amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (68 FR 18276). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Atomic Energy Act and the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: April 14, 2004

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