May 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT YANKEE, LLC and ENTERGY NUCLEAR OPERATIONS, INC.	)	Docket No. 50-271-OLA
	)	ASLBP No. 04-832-02-OLA
	)	
(Vermont Yankee Nuclear Power Station)	)	

NRC STAFF'S INITIAL STATEMENT OF POSITION CONCERNING NEC CONTENTION 3

The NRC Staff ("Staff") submits this "Initial Statement of Position" pursuant to 10 C.F.R. § 2.1207(a)(1), and the Atomic Safety and Licensing Board's "Revised Scheduling Order" ("Scheduling Order") dated April 13, 2006, at 3. The Staff is filing, simultaneously herewith, the "NRC Staff Testimony of Richard B. Ennis, Steven R. Jones, Robert L. Pettis, Jr., George Thomas, and Zeynab Abdullahi Concerning NEC Contention 3" ("Large Transient Testing Testimony"). For the reasons set forth herein and in the Staff's Large Transient Testing Testimony filed herewith, the Staff submits that a careful evaluation of New England Coalition ("NEC") Contention 3 demonstrates that this contention is wholly lacking in merit. Accordingly, the Staff respectfully submits that NEC Contention 3 should be resolved in favor of issuance of the extended power uprate ("EPU") license amendment requested by Entergy Nuclear Vermont Yankee LLC and Entergy Nuclear Operations Inc., (collectively referred to herein as "Entergy" or "Applicant") for the Vermont Yankee Nuclear Power Station ("Vermont Yankee").

INTRODUCTION

This proceeding concerns the application filed by Entergy for an amendment to the Vermont Yankee operating license, to authorize an increase in the maximum power level by approximately 20%. Petitions for leave to intervene and contentions were subsequently filed by the State of Vermont Department of Public Service and NEC. Among the contentions filed by NEC was its Contention 3.[1] On November 22, 2004, the Licensing Board, admitted NEC Contention 3, which, as admitted and restated by the Licensing Board, stated as follows: "the license amendment should not be approved unless Large Transient Testing is a condition of the Extended Power Uprate." *Entergy Nuclear Vermont Yankee, L.L.C., and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), LBP-04-28, 60 NRC 548, 580 (2004). The Board has ruled that the scope of NEC Contention 3 is limited to two large transient tests: the main steam isolation valve ("MSIV") closure test and the turbine generator load rejection test. Memorandum and Order, "Clarifying the Scope of NEC Contention 3," April 17, 2006, slip op. at 2.

In admitting NEC Contention 3, the Licensing Board relied on the August 30, 2004 declaration of Arnold Gunderson ("Gunderson Declaration"). LBP-04-28, 60 NRC at 571-72. Mr. Gundersen argued that Entergy's plan to not perform large transient testing at EPU conditions "cannot be justified as good engineering practice nor is it in accord with staff positions interpreting NRC regulation." Gundersen Declaration at 3. Specifically, Mr. Gundersen asserted that: (1) the Applicant's citation of operational experience in the nuclear industry does not justify taking an exception to performing large transient testing for

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[1] "New England Coalition's Request for Hearing, Demonstration of Standing, Discussion of Scope of Proceeding and Contentions," dated August 30, 2004, at 11. The basis for this contention was identified as "the Declaration of Arnold Gunderson under Exception to Large Transient Testing [Exhibit D] and further testimony to be provided at the hearing . . ." *Id; see also* "Declaration of Arnold Gunderson in Support of Petitioners' Contentions," dated August 30, 2004, at 3-5.

Vermont Yankee at EPU conditions; (2) Vermont Yankee's own experience with generator load rejections at 100% of the original licensed power level does not demonstrate that there will be adequate plant performance during transients at EPU conditions; (3) periodic testing of SSCs during steady-state plant operation does not confirm performance characteristics of the SSCs required for appropriate transient response; and (4) "Entergy ignores the NRC staff's decision in the case of the Duane Arnold EPU application." Gundersen Declaration at 3-5.

Additionally, in its December 23, 2005 Answer to Entergy's Motion for Summary Disposition, NEC included a declaration of Dr. Joram Hopenfeld ("Hopenfeld Declaration"), which questioned whether the transient analysis code relied upon by Entergy in its application was properly benchmarked for EPU conditions.[2] Finally, Administrative Judge Baratta requested testimony regarding qualification of the "ODYN" code and mechanical stress calculations with respect to transients experienced during EPU operations. Tr. at 899-904.

The NRC Staff has carefully considered each of the allegations made in the Gunderson declaration, as well as issues raised in the Hopenfeld declaration, in support of this contention. The Staff's detailed evaluation of those matters is set forth in the Staff's Large Transient Testing Testimony attached hereto. For the reasons set forth therein, as summarized below, the Staff submits that those allegations are entirely lacking in merit.

DISCUSSION

A. Legal and Regulatory Requirements

The Commission's requirements with respect to the need to perform large transient testing as part of the testing program for the Vermont Yankee EPU are described in the Staff's testimony filed herewith. Specifically, as set forth in the Staff's Final SE for the Vermont Yankee EPU amendment, the applicable legal standard for review of the NRC Staff's approval

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[2] During the April 20, 2006 teleconference, Administrative Judge Baratta specifically requested that the parties address this issue. Tr. at 899-903.

of Entergy's "Justification for Exception to Large Transient Testing" for the Vermont Yankee EPU is Criterion XI, "Test Control," of Appendix B to 10 C.F.R. Part 50, which states:

> A test program shall be established to assure that all testing required to demonstrate that structures, systems, and components ("SSCs") will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The test program shall include, as appropriate, proof tests prior to installation, preoperational tests, and operational tests during nuclear power plant or fuel reprocessing plant operation, of structures, systems, and components. Test procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions. Test results shall be documented and evaluated to assure that test requirements have been satisfied.

10 C.F.R. Part 50, Appendix B. Criterion XI. Therefore, the applicable legal basis against which the exception to large transient testing should be evaluated is the regulatory requirement that the test program demonstrate that SSCs will perform satisfactorily in service. *See* Staff's Large Transient Testing Testimony at 8.

The NRC's Review Standard RS-001, "Review Standard for Extended Power Uprates," Revision 0 (December 2003) (NRC Staff Exhibit A) references Standard Review Plan ("SRP") Section 14.2.1, "Generic Guidelines for Extended Power Uprate Testing Programs" (NRC Staff Exhibit B), for plant-specific reviews of EPU testing plans. The Staff's review of an applicant's justification for an exception from large transient testing utilizes the criteria set forth in subsection III.C.2 of SRP Section 14.2.1. Those criteria include: previous operating experience; introduction of new thermal-hydraulic phenomena or identified system interactions; facility conformance to limitations associated with analytical analysis methods; plant staff familiarization with facility operation and trial use of operating and emergency operating procedures; margin reduction in safety analysis results for anticipated operational occurrences;

guidance contained in vendor topical reports; and risk implications. SRP Section 14.2.1 at 7-10. The Staff's decision regarding large transient testing is one aspect of its finding, pursuant to subsection IV of SRP Section 14.2.1, of reasonable assurance that the test program satisfies the requirements of Criterion XI, of Appendix B to 10 C.F.R. Part 50. *Id.* at 8-9.

B. Staff Witnesses

The NRC Staff's Large Transient Testimony presents the opinions of a panel of five highly qualified witnesses, as follows: (1) Richard B. Ennis, a Senior Project Manager in the Division of Operating Reactor Licensing, NRC Office of Nuclear Reactor Regulation ("NRR"); (2) Steven R. Jones, a Senior Reactor Systems Engineer in the Division of Systems Safety, NRR; (3) Robert L. Pettis, Jr., a Senior Reactor Systems Engineer in the Division of Engineering; (4) George Thomas, a Senior Reactor Systems Engineer in the Division of Safety Systems, NRR; and (5) Zeynab (Zena) Abdullahi, a Senior Reactor Systems Engineer in the Division of Safety Systems. *Id.* at 1-2.

As described in his testimony, Mr. Ennis serves as the Staff's Project Manager for the Vermont Yankee EPU license amendment. As part of his official responsibilities, Mr. Ennis coordinated the Staff's evaluation of the Vermont Yankee EPU application, and coordinated the Staff's preparation of the Final SE and the EPU license amendment, which the Staff issued on March 2, 2006. *Id*. at 4.

As described in his testimony, Mr. Jones is responsible for evaluating the functional requirements, design, and performance of auxiliary, support and balance-of-plant systems (main steam and turbine, feedwater and condensate, diesel generator support, auxiliary feedwater, spent fuel pool cooling, circulating water, open and closed cycle cooling water, and reactor coolant leakage detection systems) for both current and planned nuclear plants. He also evaluates design features and methods for protection of essential systems and

components from the effects of internal and external flooding, internally and externally generated missiles, and postulated pipe breaks outside containment. *Id*. at 2. With respect to the Vermont Yankee EPU application, Mr. Jones supervised the Staff's safety review of balance-of-plant systems, including the Staff's technical evaluation of the effects of the proposed EPU on balance-of-plant systems. These technical reviews are described in Sections 2.5 and 2.12 of the Staff's Draft SE and Final SE.[3] *Id.*

As described in his testimony, Mr. Pettis is responsible for the technical review of EPU and license renewal amendment requests. *Id*. at 2. With respect to the Vermont Yankee EPU application, Mr. Pettis coordinated the NRC Staff's review of the overall power uprate testing program, including preparation of Section 2.12 in the Staff's Draft SE and Final SE. *Id.*

As described in his testimony, Mr. Thomas is responsible for reviewing and evaluating design, process design parameters, and performance of reactor thermal-hydraulic systems for boiling water reactor ("BWR") designs, including advanced reactor designs and combined operating licenses associated with the reactor coolant system and normal and emergency core cooling systems under steady-state, transient, and accident conditions. He is also responsible for reviewing the analysis of anticipated operational occurrences, postulated accidents, and actual operating experience from the viewpoint of systems operation and transient dynamics. *Id*. at 3. With respect to the Vermont Yankee EPU application, Mr. Thomas conducted the reactor systems review of the transient analyses submitted by the Applicant for the Vermont

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[3] *See* "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 229 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" (March 2, 2006) (ADAMS Accession No. ML060050028) (non-proprietary version). The Staff intends to offer the non-proprietary version of the Final SE into evidence during the hearing, inasmuch as NEC's representative has declined to execute a non-disclosure affidavit as required to obtain proprietary information in the proceeding. The Staff may also offer into evidence a proprietary version of the Final SE, with distribution limited to the Licensing Board and parties entitled to receive proprietary information.

Yankee EPU, including preparation of Section 2.8.5 in the Staff's Draft SE and Final SE. *Id.* at 4.

As described in her testimony, Ms. Abdullahi is responsible for evaluating the technical merits of applications requesting changes to the operation of nuclear power plants, and evaluating the impacts of the proposed changes on reactor response during steady state, transient and accident conditions. *Id*. at 3. With respect to the Vermont Yankee EPU application, Ms. Abdullahi conducted the Staff's review of the analytical methods used to perform the reactor neutronic and thermal/hydraulic analysis. This review is discussed in Section 2.8.7 in the Staff's Draft SE and Final SE. *Id.* at 5.

C. The Concerns Raised in NEC Contention 4 are Without Merit

The Staff's testimony presents its conclusion that the Vermont Yankee test program provides reasonable assurance that SSCs will perform satisfactorily in service under EPU conditions. *Id*. at 24. The bases for this conclusion are described in detail in the testimony.

General Electric Licensing Topical Report ELTR-1, issued in 1999, provided generic guidelines for GE BWR EPUs. ELTR-1 required an MSIV Closure test for EPUs to be performed for uprates of more than 10% above any previously recorded MSIV closure data. It also required a generator load rejection test for uprates of more than 15% above any previous generator load rejection transient data. The approach described in ELTR-1 was based on the assumption that the maximum reactor operating pressure would be increased under EPU conditions. *Id*. at 9.

GE subsequently sought and received NRC approval of a newer EPU approach that does not increase the maximum reactor operating pressure. GE Licensing Topical Report NEDC-3300P-A, Revision 4, dated July 2003, "Constant Pressure Power Uprate."[4] *Id*. at 10.

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[4] "Safety Evaluation by the Office of Nuclear Reactor Regulation, GE Nuclear Energy Licensing Topical Report, NEDC-33004P, Revision 1," (March 31, 2003). NRC Staff Exhibit C includes §§ 3.4 and 10.5.

The Vermont Yankee EPU is based upon the CPPU approach. GE provided a generic justification for not performing large transient testing as part of the CPPU approach. The NRC Staff approved the CPPU approach, but stated that exceptions from large transient testing would be considered on a plant-specific basis. *Id*. at 10. Consistent with the guidance provided in SRP 14.2.1, the Staff found that the performance of large transient tests was not necessary to demonstrate that SSCs important to safety would perform acceptably in service. *Id*. at 11.

Industry operating experience supports the conclusion that power uprates are unlikely to produce new or unexpected phenomena in response to anticipated transients. These plants experienced large transient events following EPU implementation and no anomalies were recorded in the plant's response. This outcome supports the conclusion that EPUs at facilities of similar design are unlikely to produce new or unexpected phenomena in response to anticipated transients. *Id*. at 12. The facts show that Entergy's description of industry operating experience provides reasonable assurance that SSCs will perform satisfactorily in service.[5]

Vermont Yankee's own experience also supports the conclusion that the plant will respond as designed in response to transients at EPU conditions. Vermont Yankee experienced a generator load reject in 2004, after many of the physical modifications for the EPU had been implemented. No significant anomalies were seen in the plant's response. The Vermont Yankee operating experience supports the conclusion that the plant will respond as designed to transients at EPU conditions. *Id*. at 12-13. The facts show that Entergy's description of Vermont Yankee's operating experience provides reasonable assurance that SSCs will perform satisfactorily in service.

Periodic testing of SSCs during steady-state plant operation can confirm performance characteristics of SSCs required for appropriate transient response. *Id*. at 15. Technical

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[5] This discussion is relevant to the first criterion described in subsection III.C.2 of SRP Section 14.2.1, "previous operating experience."

Specification ("TS") surveillance testing conducted pursuant to 10 C.F.R. § 50.36(c)(3) assures that TS limiting conditions for operation ("LCOs") are met. A TS LCO must be established for each item meeting four criteria, including:

> Criterion 2: A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
>
> Criterion 3: A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

10 C.F.R. § 50.36(c)(2)(ii). When an LCO is met, the associated SSC is considered to be operable and provides assurance that the SSC is capable of performing its specified function, as assumed in the plant's safety analysis (which includes transient analysis). *Id*. at 14. Therefore, the facts demonstrate that periodic testing of SSCs can provide reasonable assurance that they will perform satisfactorily in service.

The methodology used to evaluate mechanical stresses on various components subject to increased loading under EPU conditions is included in the Staff SE for the CPPU topical report, dated March 31, 2003. *See* note 4 above. *Id*. at 15. Specifically, Section 3.2 of the CPPU SE discusses reactor pressure vessel and its internals and Section 3.4 discusses piping systems and associated components. The VY EPU Final SE discusses details regarding how stresses were analyzed for the reactor pressure vessel and its internals (other than the steam dryer) in Section 2.2.3, for the steam dryer in Section 2.2.6, and for piping systems and components in Section 2.2.2. *Id*. at 15.

Contrary to NEC's assertion, requests for additional information ("RAIs") associated with the Staff's review of the Duane Arnold EPU application are not relevant to this procedure. The Duane Arnold EPU application was based on the General Electric licensing topical report (ELTR-1), which requires an MSIV closure test and a generator load rejection test as part of the

EPU test program. The Vermont Yankee EPU is based on GE's Constant Pressure Power Uprate ("CPPU") topical report, which included a generic determination to not require large transient testing. The NRC's safety evaluation of the CPPU approach did not approve the CPPU's generic determination to not require large transient testing, however, it indicates that the NRC will examine these requests on a plant-specific basis. *Id*. at 16. This plant-specific review of the justification for exception to large transient testing is performed through analysis of the criteria listed in subsection III.C.2 of SRP Section 14.2.1, in order to reach the conclusion that the Vermont Yankee test program provides reasonable assurance that SSCs will perform satisfactorily in service. *Id*. at 8-9.

As part of its justification for not performing large transient testing, Entergy stated that the MSIV closure pressurization transient analysis (that bounds the load reject without bypass pressurization event) had been performed at Vermont Yankee for the EPU conditions using the ODYN code. The results of this analysis showed the response of the plant to this bounding transient to be acceptable. *Id*. at 18. The One Dimensional DYNamic Core Transient model ("ODYN") code has been qualified by comparing its predicted response to actual data. *Id*. at 18-20. In response to Judge Baratta's inquiry, it should be noted that ODYN is a best estimate code. *Id*. at 21. The NRC Staff reviewed the integral test results and found that ODYN demonstrates good prediction against existing test data. *Id*. at 20-21. It was approved for application to transients including generator load reject and MSIV closure.[6] *Id*. at 17. Subsequent to the initial comprehensive assessment of the ODYN performance, GE incorporated improved analytical methods and revised specific models that provided input to

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[6] *See* "Safety Evaluation for the General Electric Topical Report Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors NEDO-24154 and NEDE-24154-P," (June, 1980).

ODYN. The revised ODYN code set comparison to PB-2 yielded closer predictions than the original comparison. *Id.* at 21.

Several boiling water reactors ("BWRs") that implemented EPUs have experienced transient events, specifically, Hatch Units 1 and 2, Liebstadt (KKL), and Dresden Unit 3. One licensee has reported that these plants responded as expected, without indicating significant changes in the fidelity of the analytical models and codes at EPU conditions. *Id*. at 21-23. Comparisons of ODYN against plant data at EPU conditions show reasonable assurance that it will simulate plant response. *Id*. at 23-24. The facts show that the ODYN code has been properly benchmarked for modeling EPU operations and is appropriate for use in demonstrating reasonable assurance that SSCs will perform satisfactorily in service.

CONCLUSION

In summary, NEC Contention 3, which contends that the Vermont Yankee EPU should not be granted without requiring large transient testing, (*i.e*, MSIV closure and turbine generator load rejection), is without merit. The test program meets the requirements of Criterion XI, "Test Control," of Appendix B to 10 C.F.R. Part 50. For the reasons discussed above, the two large transient tests addressed in NEC Contention 3 are not required to demonstrate that SSCs will perform satisfactorily in service.

Respectfully submitted,

/RA/

Steven C. Hamrick
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Counsel for NRC Staff

Dated at Rockville, Maryland
this 17th day of May, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT YANKEE LLC and ENTERGY NUCLEAR OPERATIONS, INC.	)	Docket No. 50-271-OLA
	)	ASLBP No. 04-832-02-OLA
	)	
(Vermont Yankee Nuclear Power Station)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of (1) "NRC STAFF'S INITIAL STATEMENT OF POSITION CONCERNING NEC CONTENTION 3," and (2) "NRC STAFF TESTIMONY OF RICHARD B. ENNIS, STEVEN R. JONES, ROBERT L. PETTIS, JR., GEORGE THOMAS, AND ZEYNAB ABDULLAHI CONCERNING NEC CONTENTION 3," in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class; or as indicated by an asterisk (*), by deposit in the Nuclear Regulatory Commission's internal mail system; and by e-mail as indicated by a double asterisk (**), this 17th day of May, 2006.

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