September 20, 2011

Mr. Ashok Bhatnagar
Senior Vice President
Nuclear Generation Development
and Construction
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – REVIEW OF INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS DESIGN REPORT (TAC NO. ME4482)

Dear Mr. Bhatnager:

In a letter dated April 30, 2010 (see Agencywide Documents Access and Management System Accession No. ML101240992), as supplemented by letters dated December 17, 2010, and April 1, 2011 (ML103540561 and ML110960019, respectively), the Tennessee Valley Authority (TVA) submitted its Individual Plant Examination of External Events (IPEEE) for Watts Bar Nuclear Plant (WBN), Unit 2. The IPEEE report was submitted in response to Supplement 4 of Generic Letter (GL) 88-20 "Individual Plant Examination for Severe Accident Vulnerabilities." The external events specified in the GL include internal fires, seismic events, high winds, external floods, and nearby transportation and facility accidents.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the IPEEE report for WBN Unit 2. Enclosures 1 and 2 provide Letter Reports prepared by the NRC's contractors, Sandia National Laboratories (SNL) and Brookhaven National Laboratory (BNL), regarding the review of TVA's IPEEE design report. In this regard, SNL reviewed the internal fire portion and BNL reviewed the seismic and other external events (i.e., high winds, external floods, and nearby transportation facility accidents) portion of the IPEEE design report.

In its review of the WBN Unit 2 IPEEE design report and other information from TVA provided in response to the NRC staff's requests for additional information (RAIs), the staff focused strictly on whether the intent of Supplement 4 to GL 88-20 had been met. Specifically, the intent of Supplement 4 to GL 88-20 is for the licensee or construction permit holder to perform a

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systematic examination of the plant to identify any plant-specific vulnerabilities. In this regard, the review was limited to verifying that the critical elements of each analysis (i.e., internal fire, seismic events, high winds, external floods, and nearby transportation facility accidents) were addressed such that the approach used and implemented by the licensee or permit holder would be capable of meeting the GL's intent. Because this review is primarily focused on assessing the procedural application of the guidance by the licensee, an in-depth evaluation of the various inputs, assumptions, and calculations has not been performed. The review process consisted of the following steps:

- A review of the licensee's IPEEE design report and directly relevant available documentation,
- Development of RAIs to supplement or clarify the licensee's IPEEE design report,
- A review of the licensee's responses to the RAIs, and
- Final assessment of the licensee's IPEEE design report, as supplemented by the RAI responses, and development of conclusions as to whether or not the licensee's analysis methods are adequate to meet the intent of Supplement 4 to GL 88-20.

Because the construction of WBN Unit 2 is not yet complete, TVA performed the WBN Unit 2 IPEEE based on the assumption that the WBN Unit 2 plant will be identical to the WBN Unit 1 plant. In addition, TVA provided a list of validation activities that it plans to perform to confirm the results of the WBN Unit 2 IPEEE. As such, it is expected that TVA's evaluation of WBN Unit 2 should include, but not be limited to, determinations of whether the assumptions in the analysis represent:

- Actual components comprising a given system,
- Actual spatial layout of equipment,
- Normal and emergency configurations of the plant,
- Normal, emergency, and test and maintenance procedures and practices as performed by WBN Unit 2 personnel, and
- Engineering aspects of the plant design.

This evaluation should reveal any differences between the assumptions in the analysis and the as-built and as-operated configuration of WBN Unit 2. Moreover, the evaluation should assess the impact of those changes needed to match the Unit 2 and Unit 1 as-built configurations, and those changes should be qualified by the degree of the impact on the IPEEE results. Consequently, the NRC staff's findings and conclusions rely on the following assumptions:

1. The validation activities that were provided in the IPEEE design report dated April 30, 2010, will be incorporated into TVA's program for managing and performing these validation activities,

2. TVA will complete the planned validation activities as described in the IPEEE design report, and

3. Any deviations between the as-designed and the as-built plant conditions will not substantially impact the findings of the TVA's IPEEE analyses.

TVA used different criteria to define the term vulnerability for each external event as follows:

- For internal fire, TVA defined a vulnerability as any fire area with a resultant fire-induced core damage frequency (CDF) (as determined by the sum of the CDFs from the individual fire scenarios associated with a particular fire area) of $1x10^{-6}$/reactor-year (ry) or greater. This definition is consistent with previous definitions used by licensees in assessing IPEEE internal fire analysis results.

  TVA found no fire areas that met this criterion for WBN Unit 2 and, as a result, concluded that no internal fire vulnerabilities exist at WBN Unit 2. No plant improvements were identified for WBN Unit 2 based on the IPEEE internal fire analysis.

- For seismic events, TVA defined a seismic vulnerability as any component identified on the Safe Shutdown Equipment List (SSEL) for which the high confidence of low probability of failure (HCLPF) capacity is computed as being less than 0.3g. This definition is based on the Electric Power Research Institute's (EPRI's) methodology for Seismic Margins Assessment, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin" (EPRI NP-6041-SL), with enhancements as specified in NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events for Severe Accident Vulnerabilities."

  TVA found no SSEL components that met this criterion for WBN Unit 2 and, as a result, concluded that no seismic vulnerabilities exist for WBN Unit 2. No plant improvements were identified for WBN Unit 2 based on the IPEEE seismic analysis.

- For the other external events (i.e., high winds, external floods, and transportation and nearby facility accidents) portion of the IPEEE submittal, TVA looked for vulnerabilities using the 1975 Standard Review Plan (SRP). TVA defined a vulnerability to external events as any identified structure, system, or component (SSC) that is not in compliance with the 1975 SRP.

  TVA found no SSC that met this criterion for WBN Unit 2 and, as a result, concluded that no vulnerabilities from other external events exist for WBN Unit 2. TVA did identify one plant improvement that involves the modification of an auxiliary building concrete canopy to provide additional protection against tornado missiles.

Based on TVA's definitions (as noted above) for vulnerability, if the validation activities reveal any inconsistencies between WBN Unit 1 and WBN Unit 2, TVA needs to:

- Determine whether any previously unidentified higher-risk configurations exist (e.g., fire areas with a resultant fire-induced CDF greater than $1x10^{-6}$/ry, SSEL components with an HCLPF capacity greater than or equal to 0.3g, or an SSC that is not in compliance with the 1975 SRP) and, therefore vulnerabilities. TVA should identify proposed improvements for addressing those vulnerabilities.

- Reassess whether any plant improvements that would help prevent or mitigate severe accidents are warranted.

Based on the NRC staff's review and discussions with TVA during the IPEEE review process, the staff recognized that TVA will perform validation activities and a final IPEEE analysis of the potential impact of the external events risk at WBN Unit 2. Through these activities, TVA should be able to better its (1) overall understanding of severe accidents that could occur at WBN Unit 2, (2) understanding of the most likely severe accident sequences, (3) qualitative understanding of core damage and fission product release, and (4) ability to implement safety improvement opportunities that would help prevent or mitigate severe accidents.

Based on its review, the NRC staff finds TVA's definitions of vulnerability and its conclusion that no severe accident vulnerabilities exist at WBN Unit 2 to be reasonable. Consequently, the NRC staff finds the WBN Unit 2 IPEEE to be consistent with the intent of GL 88-20 subject to the completion of the validation activities as discussed above. This review is not intended to validate the correctness of the licensee's findings that stemmed from the examination. Therefore, this technical evaluation does not constitute NRC approval or endorsement of any IPEEE material for purposes other than those associated with meeting the intent of GL 88-20.

It should be noted that the IPEEE submitted by TVA in its April 30, 2010, letter is a "design report." That is, since construction of WBN Unit 2 is not yet complete, the IPEEE does not represent an analysis of the actual as-built WBN Unit 2, but rather an analysis of the expected as-built WBN Unit 2. TVA has assumed that WBN Unit 2 will be identical to WBN Unit 1 and has based the IPEEE analysis on this assumption. Moreover, in its April 30, 2010, letter, TVA states that "corrective action programs for WBN Unit 1 are being implemented for WBN Unit 2 and thorough follow-up confirmatory actions are included in the WBN Unit 2 IPEEE program." TVA also states in their list of commitments that "Prior to fuel load, a final report will be submitted following certain validation activities as described in the IPEEE Design Report."

If you have any questions regarding the NRC staff review, please contact Patrick Milano at (301) 415-1457.

Sincerely,

/RA/

Stephen J. Campbell, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosures:
1. IPEEE Internal Fire Design Report
2. IPEEE (Seismic Portion and Other External Events)

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Non-Public Enclosures ML111960249 and ML111960265
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