



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

January 25, 2012

Mr. Joseph W. Shea
Manager, Corporate Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: TENNESSEE VALLEY AUTHORITY (TVA) LONG-TERM HYDROLOGY ISSUES FOR OPERATING NUCLEAR PLANTS – BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 (TAC NOS. ME5026, ME5027, AND ME5028); SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 (TAC NOS. ME5029 AND ME5030); AND WATTS BAR NUCLEAR PLANT, UNIT 1 (TAC NO. ME5031)

Dear Mr. Shea:

On February 19 - 22, 2008, as part of the review of Bellefonte Nuclear Plant (BLN), Units 3 and 4 combined license application (COLA), the Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Tennessee Valley Authority (TVA) facility in Chattanooga, Tennessee. The purpose of the NRC inspection was to verify that quality assurance (QA) processes and procedures are effectively implemented regarding TVA's simulated open channel hydraulics (SOCH) computer model for BLN, Units 3 and 4. The SOCH computer model was used to calculate the design basis flood presented in the Bellefonte Final Safety Analysis Report, Section 2.4.2, "Probable Maximum Flood on Streams and Rivers," and Section 2.4.4, "Potential Dam Failures." Specifically, the NRC inspectors reviewed the relevant QA procedures for design control, software verification, and validation, and QA records related to the SOCH model, and reviewed the 1998 Flood Reassessment for the Effects of Dam Safety Modifications calculation package.

The NRC inspection team found three violations of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations*, Part 50, which were identified with Notices of Violations Nos. 05200014/2008-001-01 and 05200015/2008-001-01; 05200014/2008-001-02 and 05200015/2008-001-02; and 05200014/2008-001-03 and 05200015/2008-001-03. These violations were associated with: 1) verifying and validating the SOCH model, 2) documenting the design inputs in the 1998 calculation GEN-CEB-CDQ0999-980001, "Flood Reassessment for the Effects of Dam Safety Modifications" (TVA RIMS # B45 980326 001), and 3) maintaining the above information as QA records. The NRC issued the inspection report along with these three violations to TVA on March 19, 2008 (Agencywide Document and Access Management System (ADAMS) Accession No. ML080640487). As part of its corrective action plan, TVA generated Problem Evaluation Report (PER) No. 138749. In addition, TVA generated PER Nos. 146998 for BFN, 146852 for SQN, and 147136 for WBN, to document an independent determination of the potential for impact on plant operability.

The generic calculation GEN-CEB-CDQ0999-980001, which determined the probable maximum flood (PMF) elevation levels for BLN, also recalculated the PMF values in 1998 for Browns Ferry

Nuclear Plant (BFN), Units 1, 2, and 3; Sequoyah Nuclear Plant (SQN), Units 1 and 2; and Watts Bar Nuclear Plant (WBN), Unit 1 (TVA Operating Nuclear Plants).

TVA revisited the design basis flood calculations for these operating nuclear plants, and noted that the calculations do not accurately reflect the design-basis input data (e.g., river cross-sections, modifications to the dams in the region, etc.). The preliminary updated calculations (February 3, 2009) by TVA indicated an increase in PMF elevation for SQN, thereby exceeding the current licensing basis. The affected equipment at SQN, due to an increased PMF level, are diesel generator sets and spent fuel pool cooling pumps. For WBN, the preliminary updated calculations by TVA indicated an increase in PMF elevation; however, TVA concluded that the safety margins provide assurance to meet the original licensing bases PMF protection requirements; therefore, no immediate concerns exist regarding the ability to mitigate the PMF event. Further, enough margin exists to protect the critical equipment at WBN. For BFN, the study runs have shown no increase to the original calculated PMF elevation. TVA concluded that SQN is the bounding plant among the operating plants based on the PMF levels and plant elevations.

Based on the preliminary updated calculations that indicated an increase in PMF elevation for SQN, TVA established interim compensatory measures through a standing order for an adequate flood protection of the affected diesel generator sets and spent fuel pool cooling pumps. TVA indicated that these interim compensatory measures will remain in place until the permanent modifications can be made. Further, TVA concluded that there are no short term operability concerns.

On December 30, 2009, the issuance of an updated PMF calculation revealed that the PMF elevation had increased from the 1998 calculated value of 719.6 feet to 722.0 feet for SQN. Prior to 1998, the original design basis PMF elevation was 722.6 feet. Based on the updated PMF calculation, TVA submitted a licensee event report (LER) 50-327(328)/2009-009, "Unanalyzed Condition Affecting Probable Maximum Flood Level," Revision 1, dated April 14, 2010, addressing the root cause and corrective actions to prevent recurrence. In this LER, TVA stated, "A design change has been initiated to permanently protect the diesel generator sets and spent fuel pool cooling pumps based on the increased PMF elevation."

From May 17 - 21, 2010, the NRC conducted an inspection at the TVA office in Chattanooga, Tennessee, to verify that the QA processes and procedures applied to the activities related to the COLA for BLN, Units 3 and 4 were effectively implemented. In addition, the NRC inspection reviewed the corrective actions associated with the three violations that were issued during the February 2008 NRC inspection. The results of the May 2010 inspection were issued on July 12, 2010, and documented in NRC Inspection Report Nos. 05200014/2010-201 and 05200015/2010-201. The NRC inspection team confirmed that TVA adequately addressed and corrected the violations identified during the February 2008 inspection.

To better understand the TVA's long-term plans to resolve the flooding issues on the operating nuclear plants, NRC invited TVA to a public meeting at the NRC on July 7, 2010. The purpose of this meeting was for TVA to present the history, ongoing actions, and planned actions associated with the flooding effects on the TVA operating nuclear plants. TVA indicated in its status summary that their long-term project to permanently resolve the flooding issues will extend into 2016, mostly to complete the dam modifications handled by the United States Army Corps of Engineers. TVA also mentioned that funding by the Federal Government for dam

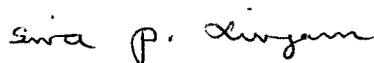
modifications can be a factor on the schedule. During the meeting, the NRC staff raised a number of questions to TVA, and requested TVA to formally respond in writing. The summary of this meeting was documented in ADAMS Accession No. ML101930171. By letter dated March 21, 2011 (ADAMS Accession No. ML110831047), which superseded earlier submittals dated January 14, 2011, and February 4, 2011, TVA provided responses to the staff's questions, including the schedule to resolve the long-term flooding issues. The March 21, 2011, letter indicated that the current lack of Federal Government funds to perform the dam modifications will cause schedule delays.

Based on our review of the licensee's documents (ADAMS Accession Nos. ML110831047, ML11112A137, ML11145A163, and ML111540463), the NRC staff finds that the sand baskets are not capable of resisting debris impact. These documents neither discuss the ability of sand baskets to withstand debris impact, or mention whether the baskets are designed for impact of debris loads. The NRC staff is unable to conclude that these sand baskets were designed to withstand impacts from large debris during a flood. If a design flood were to occur, there is a high likelihood that significant debris would accompany the flood waters which could impact the baskets. There is the potential for this debris to damage the baskets or push the individual baskets apart causing a breach. There would be no time to repair the baskets because the flood would already be in progress. Therefore, sand baskets that are not designed and constructed to withstand impacts from large debris are not acceptable as a long-term solution.

We opened the subject technical assignment control numbers (TAC Nos.) to track the progress of TVA's hydrology work on the operating plants. These TAC Nos. will be closed shortly after issuance of this letter. Because completion of the hydrology work, including complicated dam modifications, is scheduled to take several years, we request TVA to provide a status of this hydrology work at least once a year or after any major changes in your proposed plan to complete the hydrology work. We will open new TAC Nos. if NRC review is warranted.

If you have any questions regarding this matter, I may be reached at 301-415-1564.

Sincerely,



Siva P. Lingam, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, 50-296,
50-327, 50-328, and 50-390

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