January 21, 2010

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 – SAFETY EVALUATION REGARDING BULLETIN 2003-02, "LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY" (TAC NO. MD6713)

Dear Mr. Bhatnagar:

By letter dated September 7, 2007 (Agencywide Document and Access Management System Accession No. ML072570676) and supplemented on July 24, 2008 (ML082100451), the Tennessee Valley Authority (TVA) submitted a response to Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," for Watts Bar Nuclear Plant, Unit 2.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed TVA's response. Enclosed is the NRC staff's safety evaluation; this completes the staff's efforts for TAC No. MD6713.

Sincerely,

/RA/

Patrick Milano, Acting Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosure: As stated

cc w/encl: Distribution via Listserv

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ADAMS ACCESSION NO: ML093631325 *via memo

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SAFETY EVALUATION BY THE

OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO BULLETIN 2003-02,

"LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND

REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-391

1.0 INTRODUCTION

In a letter dated September 7, 2007 (Agencywide Document and Access Management System Accession No. ML072570676), as supplemented on July 24, 2008 (Accession No. ML082100451), the Tennessee Valley Authority (TVA) submitted responses to U.S. Nuclear Regulatory Commission (NRC) Bulletin (BL) 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," that are applicable for Watts Bar Nuclear Plant (WBN), Unit 2.

2.0 REGULATORY EVALUATION

The general design criteria (GDC) establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems and components important to safety. The applicable GDC for BL 2003-02 include GDC 14, "Reactor Coolant Pressure Boundary (RCPB)," GDC 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," and GDC 32, "Inspection of Reactor Coolant Pressure Boundary." GDC 14 specifies that the RCPB be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the probability of rapidly propagating fracture of the RCPB be minimized. GDC 32 specifies that components that are part of the RCPB have the capability of being periodically inspected to assess their structural and leaktight integrity.

NRC regulations in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a state that American Society of Mechanical Engineers (ASME) Class 1 components, which include the RCPB, must meet the requirements of ASME Code, Section XI. ASME Code, Section XI provides examination requirements that include visual examinations (VT-2) during system leakage testing of all pressure-retaining components of the RCPB and reference IWB-3522 for acceptance standards. IWB-3522.1(c) and (e) specify that conditions requiring correction include the detection of leakage from insulated components and discoloration or accumulated

residues on the surfaces of components, insulation, or floor areas that may be evidence of borated water leakage, with leakage defined as the through-wall leakage that penetrates the pressure-retaining membrane. Therefore, 10 CFR 50.55a, by reference to the ASME Code, does not permit through-wall degradation of the reactor pressure vessel (RPV) lower head penetrations.

3.0 TECHNICAL EVALUATION

The purpose of the TVA's RPV lower head inspection program, submitted in response to BL 2003-02, is to ensure that adequate inspection is performed on the RPV lower head and its penetrations. The results of the inspections will ensure that the RPV lower head is fully meeting the intent of the applicable regulatory and ASME code requirements.

3.1 RPV Lower Head Penetration Inspection Program

The information requested by BL 2003-02 was divided into four categories; however, since WBN Unit 2 has not been operated and intends to comply with the specified inspection requirements, only the following two categories apply.

> *(1) A Description of the RPV lower head penetration inspection program that will be implemented at the plant during the next and subsequent refueling outages which should include: (a) type of inspections; (b) extent of inspections; (c) process used to resolve the source of findings of any boric acid deposits; (d) documentation of inspections and (e) basis for concluding that the RPV lower head penetrations meet the regulatory criteria.*

TVA stated that a baseline bare metal visual (BMV) inspection using VT-2 examination techniques of all 58 RPV lower head penetrations at WBN Unit 2 will be conducted prior to the initial fuel load and during the first refueling outage (RFO). Specifically, the inspections will be 100-percent BMV examinations of all 58 RPV lower head penetrations that will include 360° around each penetration to ensure that any reactor coolant system (RCS) leakage will be identified. The inspections will be performed by inspectors who have working knowledge of the design and operation of the inspection equipment and have their inspection techniques certified to the requirements specified in American Society for Nondestructive Testing Standards. The VT-2 inspections will be performed through direct visual inspection or with remote equipment. The video recordings of the inspections as well as the inspection reports will be archived for future reference.

In a letter dated September 22, 2003 (ML032671210), TVA committed to revising the Corrosion Control Program to require the performance of a BMV examination of the lower head penetrations during each WBN Unit 1 RFO until ASME Code changes or regulatory action justify change in this frequency. TVA stated, in a letter dated September 7, 2007 (ML 072570676), that WBN Unit 2 will also conform to the Corrosion Control Program and commit to performing a BMV examination of the 58 RPV lower head penetrations during each RFO.

The NRC staff finds the program acceptable because the type and extent of inspection as well as documentation complies with the regulatory requirements and ASME Code Section XI requirements. The NRC staff finds that the above program, when implemented as described,

provides reasonable assurance that leakage at the RPV lower head penetrations will be identified.

TVA stated that it has a corrective action program (CAP) for monitoring corrosion of the RPV lower head and its penetrations. If any evidence of corrosion is identified during the VT-2 examinations, TVA will use the CAP and identify the cause of corrosion and take corrective action to prevent corrosion. A periodic review of the CAP findings and trends will be used to identify broader issues related to corrosion of the RPV lower head and its penetrations. TVA provided information regarding the cleaning method used for the RPV lower head at WBN Unit 1 and stated that it will adopt the same method for WBN Unit 2.

The NRC staff reviewed the cleaning method and concluded that it will adequately provide a sound baseline for future inspections. The process to resolve the source of findings of any boric acid deposits has been reviewed by the NRC staff and found to be acceptable. The NRC staff finds that TVA's CAP provides reasonable assurance that the licensee will take appropriate corrective actions to effectively monitor the corrosion issues of the RPV lower head and its penetrations.

> *(2) If the licensee cannot perform BMV inspections of each RPV lower head penetration, it must provide a plan which should include engineering, procurement of materials, and implementation of inspection during the subsequent outages.*

TVA stated that if any of the RPV lower head penetrations cannot be inspected due to access limitations, then these penetrations will be documented. The documentation will consist of the degree to which inspection cannot be performed and the cause of the inaccessibility of these penetrations. TVA confirmed that it will take appropriate steps to ensure that 360° inspection around each penetration of the RPV lower head will be conducted during the scheduled examination program.

The NRC staff finds TVA's response acceptable because it provides reasonable assurance that the extent of examinations will be sufficient to identify leakage in RPV lower head penetrations and provides the information requested by BL 2003-02.

4.0 CONCLUSION

The NRC staff finds that TVA's response to the Bulletin 2003-02 is acceptable based on TVA adequately addressing the two applicable attributes related to the BMV examinations of the WBN Unit 2 RPV lower head penetrations and their response provides reasonable assurance that they will effectively identify the source of RCS leakage. Also, TVA stated that WBN Unit 2 will conform to the WBN Unit 1 Corrosion Control Program and perform future BMV examinations of the RPV lower head penetrations during each WBN Unit 2 RFO until ASME Code changes or regulatory action justify a change in this frequency. The NRC staff has previously accepted this response for WBN Unit 1 in its letter, dated October 6, 2004 (ML042590422), and concludes that it is acceptable for WBN Unit 2.

The NRC staff also concludes that TVA's compliance with the regulatory requirements, the ASME Code, Section XI inspection requirements, and its commitment to continue performing BMV examinations using a VT-2 technique during each RFO provides reasonable assurance that the reactor coolant pressure boundary integrity at the RPV lower head penetrations at WBN Unit 2 will be maintained.

Principal Contributors: Ganesh Cheruvenki and Justin Heinly

Date: January 21, 2010