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

December 3, 2008

Mr. William R. Campbell, Jr.
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 – REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS" (TAC NO. MC4730)

Dear Mr. Campbell:

By letter dated March 31, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML081090500), Tennessee Valley Authority (TVA or the licensee) submitted a supplemental response to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," for the Watts Bar Nuclear Plant (WBN), Unit 1.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal. The process involved detailed review by a team of approximately 10 subject-matter experts, with a focus on the review areas described in the NRC's "Content Guide for Generic Letter 2004-02 Supplemental Responses" (ADAMS Accession No. ML073110389). Based on these reviews, the NRC staff has determined that additional information is needed in order to conclude there is reasonable assurance that GL 2004-02 has been satisfactorily addressed for WBN, Unit 1. The enclosed document describes these requests for additional information (RAIs).

The NRC staff requests that TVA respond to these RAIs within 90 days of the date of this letter. However, the NRC staff would like to receive only one response letter for all RAIs with exceptions stated below. If TVA concludes that more than 90 days are required to respond to the RAIs, the licensee should request additional time, including a basis for why the extension is needed.

If TVA concludes, based on its review of the RAIs, that additional corrective actions are needed for GL 2004-02, the licensee should request additional time to complete such corrective actions as needed. Criteria for such extension requests are contained in SECY-06-0078 (ADAMS Accession No. ML053620174), and examples of previous requests and approvals can be found on the NRC's sump performance website, located at: http://www.nrc.gov/reactors/operating/ops-experience/pwr-sump-performance.html.

Any extension request should also include results of contingency planning that will result in near term identification and implementation of any and all modifications needed to fully address GL 2004-02. The NRC staff strongly suggests that the licensee discuss such plans with the staff before formally transmitting an extension request.

The exception to the above response timeline is RAI 9 in the enclosure. The NRC staff considers in-vessel downstream effects to not be fully addressed at WBN, Unit 1, as well as at other pressurized-water reactors. TVA's submittal refers to draft WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous, and Chemical Debris in the Recirculating Fluid." At this time, the NRC staff has not issued a final safety evaluation (SE) for WCAP-16793.

TVA may demonstrate that in-vessel downstream effects issues are resolved for WBN, Unit 1, by showing that the licensee's plant conditions are bounded by the final WCAP-16793 and the corresponding final NRC staff SE, and by addressing the conditions and limitations in the final SE. TVA may also resolve RAI 9 by demonstrating, without reference to WCAP-16793 or the NRC staff SE, that in-vessel downstream effects have been addressed at WBN, Unit 1. The specific issues raised in RAI 9 should be addressed regardless of the approach the licensee chooses to take.

TVA should report how it has addressed the in-vessel downstream effects issue and the associated RAI referenced above within 90 days of issuance of the final NRC staff SE on WCAP-16793. The NRC staff is currently developing a Regulatory Issue Summary to inform licensees of the staff's expectations and plans regarding resolution of this remaining aspect of Generic Safety Issue 191, "Assessment of Debris Accumulation on PWR Sump Performance."

If you have any questions, please contact me at 301-415-3100.

Sincerely,

John G. Lamb, Senior Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

SUPPLEMENTAL RESPONSE TO GENERIC LETTER (GL) 2004-02

DATED MARCH 31, 2008

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

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The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal. The process involved detailed review by a team of approximately 10 subject matter experts, with a focus on the review areas described in the NRC's "Content Guide for Generic Letter 2004-02 Supplemental Responses" (ADAMS Accession No. ML073110389). Based on these reviews, the NRC staff has determined that additional information is needed in order to conclude there is reasonable assurance that GL 2004-02 has been satisfactorily addressed for WBN, Unit 1. Below are the questions.

1. Please provide a summary description of the reports for the tests conducted that justified the zone of influence reductions for banded Min-K and the 3M-M20C fire barrier material. This information should include the materials used in the testing, geometries of the targets, and materials used for banding and jackets. Provide information that compares the sizes of the test targets and the potential targets in the plant, and how any differences in sizing affect the ability of the insulation systems to resist damage from steam impingement. Please state whether the testing in WCAP-16783, "Jet Impingement Testing to Determine the Zone of Influence (ZOI) of Min-K and 3M M20C Fire Barrier Insulation for Watts Bar Nuclear Plant," was specific to the WBN Unit 1 insulation systems. If not, please provide information that shows that the WBN Unit 1 banding systems are at least as structurally robust as the system that was used in the testing.

2. Based upon the information provided for the audit review, the 3M M20C radiant energy barrier material was considered to be a fiberglass-type material. The supplemental response revises this information, identifying that the 3M M20C material actually contains a significant fraction of vermiculite particulate. Based on the properties of vermiculite, which contains silicon dioxide, as does Min-K and Microtherm insulation materials, the staff believes that debris from the 3M M20C material could have a significant impact on strainer head loss, rather than behaving predominately as fibrous insulation material. Please provide a basis to support the conclusion that the revisions made to the assumed characteristics of 3M M20C do not affect the conclusions of the strainer performance analysis.

3. Please provide a technically defensible head loss evaluation for the strainer that is based on NRC-accepted testing or analysis techniques. The licensee should reference the NRC staff's WBN Unit 1 audit report (ADAMS Accession No. ML062120461) for specific issues with WBN Unit 1 head loss testing. Further, the licensee should reference the NRC staff's review guidance for head loss and vortexing (ADAMS Accession No. ML080230038) for acceptable testing procedures.

4. For one small break loss-of-coolant accident (SBLOCA) case, the tall strainer modules are not expected to be fully submerged in the sump pool. Please provide an evaluation that shows that vortexing or air ingestion will not occur when strainer modules are not fully submerged.

5. Please provide information that shows that the clean strainer head loss (CSHL) correlation used to determine the WBN Unit 1 CSHL is valid. The licensee's testing organization relied on a CSHL correlation based on prototype boiling-water reactor (BWR) strainer testing, although BWR strainers have a significantly different geometry from pressurized-water reactor (PWR) strainers.

6. Please provide an updated maximum postulated strainer head loss (debris and clean strainer) based on recent re-calculations which may result from consideration of this RAI set. Please provide the assumptions that support the updated maximum postulated head loss value. As appropriate, please provide a revised evaluation of flashing across the debris bed and strainer.

7. Please verify whether Nukon thermal insulation material or Interam fire barrier material was used during testing. If Nukon was used as a surrogate for fire barrier material, please justify such use as being prototypical or conservative.

8. The SBLOCA water level calculation credits a significant volume of water from the reactor coolant system (RCS), 42,810 gallons, as contributing to the containment pool. The NRC staff questions whether this assumption envelops the most limiting SBLOCA conditions, with respect to both break location and timing during the accident response sequence. For example, although outflow from a break near the top of the pressurizer would contribute to the formation of the containment pool, as time passes, the inflow into the RCS from the emergency core cooling system could meet and/or exceed the outflow in many possible SBLOCA scenarios, particularly as operators cool down and depressurize the plant. As a result, for such SBLOCA conditions, shrinkage of the RCS inventory and refill of the pressurizer steam space could actually lead to the net result of the RCS holding up inventory from the containment pool, rather than contributing to it. Since the depletion of the refueling water storage tank could occur over an extended period of time for a SBLOCA, the RCS may act as a net hold up volume at switchover to recirculation or at subsequent times during the recirculation phase of the loss-of-coolant accident (LOCA). Please provide the technical basis for considering a contribution from the RCS of 42,810 gallons in determining a conservative minimum water level for analyzing sump performance under SBLOCA conditions.

9. The NRC staff considers in-vessel downstream effects to not be fully addressed at WBN Unit 1, as well as at other PWRs. The WBN Unit 1 fuel and vessel downstream effects analysis is based on WCAP-16406-P-A, Rev.1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191," and a comparison of the WBN Unit 1 plant conditions to the conditions evaluated in draft WCAP-16793-NP, Revision 0, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous, and Chemical Debris in the Recirculating Fluid." The fuel cladding temperature analysis is based on the sample LOCADM calculation in draft WCAP-16793-NP. However, Condition and Limitation No. 13 of the NRC staff's draft safety evaluation (SE) on WCAP-16793-NP, Revision 0, requires that the aluminum release rates used in the LOCADM spreadsheet be increased by a factor of two for the initial portion of the LOCA. Therefore, the sample calculation contained in Revision 0 of the WCAP may not reflect maximum cladding temperature. Further, core inlet blockage issues at WBN Unit 1 have not been resolved through application of WCAP-16793-NP, Revision 0. The NRC staff has not issued a final SE for WCAP-16793-NP. The licensee may demonstrate that in-vessel downstream effects issues are resolved for WBN Unit 1 by showing that the WBN Unit 1 plant conditions are bounded by the final WCAP-16793-NP and the corresponding final NRC staff SE on WCAP-16793-NP, and by addressing the conditions and limitations in the final SE. The licensee may alternatively resolve this item by demonstrating, without reference to WCAP-16793-NP or the NRC staff SE, that in-vessel downstream effects have been addressed at WBN Unit 1. In any event, the licensee should report how it has addressed the in-vessel downstream effects issue within 90 days of issuance of the final NRC staff SE on WCAP-16793-NP. The NRC staff is developing a Regulatory Issue Summary to inform the industry of the staff's expectations and plans regarding resolution of this remaining aspect of GSI-191.

10. Please indicate what aspects of the plant's licensing basis has changed and/or what new information will be added and considered to be part of the plant's licensing basis. Please provide a schedule for establishing a revised licensing basis.

The exception to the above response timeline is RAI 9 in the enclosure. The NRC staff considers in-vessel downstream effects to not be fully addressed at WBN, Unit 1, as well as at other pressurized-water reactors. TVA's submittal refers to draft WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous, and Chemical Debris in the Recirculating Fluid." At this time, the NRC staff has not issued a final safety evaluation (SE) for WCAP-16793.

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If you have any questions, please contact me at 301-415-3100.

Sincerely,

/RA/

John G. Lamb, Senior Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Request for Additional Information
cc w/encl: Distribution via Listserv

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ADAMS Accession No.: ML083370033

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