Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

May 17, 2012

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant Unit 2
Docket No. 50-391

Subject: **Watts Bar Nuclear Plant (WBN) Unit 2 – Additional Information to Generic Letter 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (TAC No. MD6726)**

References:
1. TVA to NRC letter dated March 4, 2011, "Watts Bar Nuclear Plant (WBN) Unit 2 - Response to Generic Letter (GL) 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"

2. TVA to NRC letter dated April 29, 2011, "Watts Bar Nuclear Plant (WBN) Unit 2 – Response to Requests for Additional Information (RAIs) Regarding Generic Letter 2004-02, Potential Impact of Debris Blockage of Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (TAC No. MD6726)"

3. Transmittal of GSI-191 Resolution Criteria for "Low Fiber" Plants, NEI, dated December 22, 2011

The purpose of this letter is to provide information to support U.S. Nuclear Regulatory Commission (NRC) verification that the corrective actions to address Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," for WBN Unit 2 are adequate.

References 1 and 2 provided the initial sump evaluation responses for WBN Unit 2. Reference 3 provided the industry criteria for consideration of a plant to be classified as "Low Fiber."

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Enclosure 1 documents that WBN Unit 2 meets the criteria for a low fiber plant. This additional information should support NRC closure of the sump issue for WBN Unit 2.

There are no new regulatory commitments contained in this letter. If you have any questions, please contact Gordon Arent at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 17th day of May, 2012.

Respectfully,

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Enclosure:

1. Evaluation of WBN Unit 2 Against NEI Low Fiber Plant Criteria

cc (Enclosure):

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ENCLOSURE 1
Evaluation of WBN Unit 2 Against NEI Low Fiber Plant Criteria

The following low fiber plant criteria are extracted from "Transmittal of GSI Resolution Criteria for 'Low Fiber' Plants", NEI, dated December 22, 2011. (Reference 3)

Criteria

A. Strainer Head Loss criterion is satisfied if one of the following two conditions is met:

1. *If quantity of fiber transported to strainer will result in 1/16" theoretical debris bed or less, a head loss test will not be required based on the following assumptions:*

   - *No problematic debris materials transported to strainer (e.g., calcium silicate, microTherm, MinK)*
   - *Measures have been taken to prevent problem materials from entering debris source term (e.g., double banding)*
   - *Credit full strainer area (i.e., total of all trains) in determining whether 1/16" debris bed criterion is met*
   - *Consideration of paint chip impact on available strainer area for strainers in pits*
   - *1/16" applies to strainer area after reductions accounting for materials like tags.*

2. *An NRC accepted strainer head loss test can be used to meet this criterion*

B. In-vessel Downstream Effect Criterion is satisfied if one of the following two conditions is met:

1. *In vessel downstream effects do not need to be explicitly addressed if the total amount of fiber within the Zone of Influence (ZOI), available for transport, plus latent fiber is 20 lbm or less with the following assumption:*

   - *This is based on a fuel fiber limit of 15 gm/assembly. The 20 lbm criterion is calculated assuming 75% debris transport, 45% strainer bypass and 200 fuel assemblies (i.e., [(20lb*.75*.45*453.6 gm/lb)/200] = ~15 gm/assembly).*
   - *Plant specific values for # of assemblies should be used to determine appropriate fiber limit.*
   - *Criterion can be relaxed for plants with upper plenum injection*

2. *An NRC accepted bypass test in combination with supportable plant specific fuel debris limit can be used to meet this criterion.*

A. Strainer Head Loss Criterion

The strainer head loss criterion is met by testing for WBN Unit 2. References 1 and 2 provided the WBN Unit 2 results for strainer head loss. WBN Unit 2 differs from Unit 1 in that no Min-K insulation is used inside containment and no 3-M fire wrap will be used inside Unit 2 containment. Similar to Unit 1, the insulation system inside containment is metal reflective insulation.

Clean strainer head loss for Unit 2 was based on analysis of the WBN Unit 2 strainer configurations. The dirty head loss was based on test results from the WBN Unit 1 strainer testing corrected for WBN Unit 2 specifics. After performing a statistical analysis, the upper limit head loss was 5.76 ft of water. The strainer showed no signs of vortex formation. A thin bed was observed. The recorded head loss data displayed an increase after the fourth and fifth fiber batches were introduced. The head loss slightly increased after the chemical batches were introduced. After performing a statistical analysis, the thin bed debris loaded head loss is 1.88 ft of water (clean strainer removed). The temperature corrected debris loaded head loss is 1.09 ft of water. The flow rate and water level were reduced to SBLOCA conditions, and no vortexing was observed. A flow sweep, reducing flow to approximately 50% of design, was completed to verify bore holes were not present. The head loss performed as expected indicating there were no bore holes. This test matched the design basis conditions and established the design basis performance for the strainers. These tests showed acceptable performance of the strainer assembly under design basis loadings.

B. In-vessel Downstream Effect Criterion

Latent Debris and Fiber

The Reference 2 assumptions concerning latent debris in the WBN containment building involved (1) latent debris types, (2) latent debris physical characteristics and (3) total quantities of latent debris.

Consistent with the guidance provided in the NRC SER for NEI-04-07, the latent debris characteristics were assumed to be as follows:

- fiber contributes 15% of the mass of the total latent debris inventory with particulate contributing the remaining 85%;
- latent fiber material has an average density of 94 pound/ft3;
- latent particulate material has a nominal density of 169 pound/ft3;
- latent fiber material has an as-manufactured density (dry bed bulk density) of 2.4 pound/ft3; and
- latent fiber has the same diameter as commercial fiberglass (7 μm for Nukon per NUREG/CR-6224).

Based on Section 3.5.2.2 of NEI-04-07, the maximum quantity of latent debris inside containment would be 200 pounds. This value was reduced by 50% to be more representative of the WBN containment conditions while still bounding the Unit 1 walkdown results. The 100 pounds result is used for Unit 2. Of the 100 pounds, 85 pounds were assumed to be dirt/dust and the remaining 15 pounds were assumed to be fiber. The 15 pounds of fiber is conservative for WBN as discussed below.

The latent debris walkdown on Unit 1 found small quantities of particulate debris such as dust, dirt, paint chips, wood chips, concrete chips, metal shavings, metal washers, nails, screws, wire powder, tape and miscellaneous artifacts. The quantity found projects to a total containment quantity of 69.2 pounds. Only a few latent fibers and string material were found. A 1% fiber loading was estimated from the samples which equates to approximately 0.7 pounds of fiber. The latent debris survey results for Unit 1 confirmed that the assumptions above are conservative with respect to both composition and quantity of the actual latent debris in the WBN containment buildings. Since Unit 1 and Unit 2 containments are of the same design and similar procedural controls will be used on both units for cleanliness, the results are equally applicable to Unit 2.

In-vessel Downstream Fiber Effect Conclusion

The WBN Unit 2 fuel fiber content is calculated assuming 15 pounds of fiber, 75% debris transport, 45% strainer bypass and 193 fuel assemblies (i.e., [(15 lb*.75*.45*453.6 gm/lb)/193] = 11.9 gm/assembly). The estimate uses NEI generic values except for the plant-specific number of fuel assemblies as suggested by the NEI criteria. The fuel fiber content of 11.9 gm/assembly is less than the 15 gm/assembly target value. Thus, in vessel downstream effects do not need to be explicitly addressed.

In conclusion, WBN Unit 2 may be considered a low fiber plant as WBN Unit 2 satisfies both NEI criteria for strainer head loss and in-vessel downstream effect.