August 1, 2007

10 CFR 50.54(f)

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

Gentlemen:

In the Matter of) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - GENERIC LETTER 2004-02 - POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS - REQUEST FOR EXTENSION OF COMPLETION DATE FOR CORRECTIVE ACTIONS (TAC NO. MC4730)

References: 1) NRC Generic Letter 2004-02 dated September 13, 2004, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactor"

2) TVA Letter to NRC dated September 1, 2005, "Watts Bar Nuclear Plant (WBN) Unit 1- NRC Generic Letter (GL) 2004-02: Potential Impact of Debris blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors (PWR) - Second Response (TAC No. MC4730)"

3) TVA Letter to NRC dated April 11, 2006, "Watts Bar Nuclear Plant (WBN) Unit 1 - Generic Letter 2004-02 Potential Impact of Debris blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors (PWR) - Response to Request for Additional Information (TAC No. MC4730)"

4) TVA Letter to NRC dated July 3, 2006, "Watts Bar Nuclear Plant (WBN) Unit 1 - Generic Letter 2004-02 - Request for Additional Information Regarding the Nuclear Regulatory Commission Staff Audit on the Containment Sump Modifications (TAC No. MC4730)"

5) TVA Letter to NRC dated August 8, 2003, "Watts Bar Nuclear Plant (WBN) Unit 1 - Response to Bulletin 2003-01 - Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors"

NRC Generic Letter (GL) 2004-02 (Reference 1) requested that licensees provide information regarding the potential impact of debris blockage on emergency recirculation during design basis events. TVA provided the requested information in References 2, 3, and 4.

Item 2(b) of GL 2004-02 states that all actions should be completed by December 31, 2007; provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006, and describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.

During the fall 2007 outage for WBN Unit 1, corrective actions associated with GL 2004-01 were partially implemented. New sump strainers were installed with increased surface area, the orifice in the high head injection flow path was resized to allow the throttle valves in this flow path to be opened further, and the old Steam Generators were replaced with uncoated Steam Generators to reduce the amount of coating debris transported to the sump.

In response to question 1 of Reference 4, TVA stated that as a result of the revised debris generation analysis, some of the fiber quantities due to Min-K insulation and 3M fire wrap have increased with respect to that tested in the WBN strainer test and that WBN was looking at several options to reduce these quantities to within the tested configuration. These options include: credit for additional jet shielding due to robust barriers and large structures, material testing under jet impingement loading to reduce the zone of influence (ZOI) for encapsulated fiber, removal of material, and/or sump strainer re-testing. Based on additional jet impingement testing following the fall 2007 outage, TVA has determined that in

order to meet the fibrous debris loading for the tested sump configuration that some Min-K insulation needs to be replaced with reflective metal insulation and some will require installation of additional restraint bands to prevent damage.

As discussed with the WBN NRC Project Manager, the actions to replace the Min-K insulation and add additional restraint bands will be completed during the upcoming refueling outage (Unit 1 Cycle 8 Outage) that is scheduled to start early February 2008. Enclosure 1 provides the basis supporting TVA's conclusion that it is acceptable to extend the WBN Unit 1 completion date.

A list of regulatory commitments is provided in Enclosure 2. If you have any questions concerning this matter, please call me at (423) 365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 1st day of August 2007.

Sincerely,

Original signed by

J. D. Smith
Manager, Site Licensing
and Industry Affairs (Acting)

Enclosures
cc: See Page 4

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
GENERIC LETTER 2004-02 - POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS
REQUEST FOR EXTENSION OF COMPLETION DATE FOR CORRECTIVE ACTIONS

In Generic Letter (GL) 2004-02, dated September 13, 2004, the NRC staff summarized their bases for concluding that existing pressurized-water reactors (PWRs) could continue to operate through December 31, 2007, while implementing the required corrective actions for NRC Generic Safety Issue 191 (GSI-191), "Assessment of Debris Accumulation on PWR Sump Performance." In the following discussion TVA has addressed the "Criteria for Evaluating Delay of Hardware Changes," as described in SECY-06-0078, dated March 31, 2006. This discussion supports TVA's request for extension of the completion date for the corrective actions at WBN Unit 1 from December 31, 2007, to the completion of the spring 2008 refueling outage. The proposed extension of the GSI-191 implementation schedule by approximately 2-months for WBN Unit 1 does not alter the original conclusions summarized in GL 2004-02 in which the staff determined that it is acceptable for PWR licensees to operate until the corrective actions are completed.

SECY-06-0078 Criterion:

The licensee has a plant-specific technical/experimental plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties.

The licensee identifies mitigative measures to be put in place prior to December 31, 2007, and adequately describes how these mitigative measures will minimize the risk of degraded ECCS (emergency core cooling system) and CSS (containment spray system) functions during the extension period.

Reason for Request

In response to question 1 of Reference 4, TVA stated that as a result of the revised debris generation analysis, some of the fiber quantities due to Min-K insulation and 3M fire wrap have increased with respect to that tested in the WBN strainer test and that WBN was looking at several options to reduce these quantities to within the tested configuration. These options include: credit for additional jet shielding due to robust barriers and large structures, material testing under jet impingement loading to reduce the zone of influence (ZOI) for encapsulated fiber, removal of material, and/or sump strainer re-testing. Based on additional jet impingement testing, TVA has determined that in order to meet the fibrous debris loading for

the tested sump configuration that some Min-K insulation needs to be replaced with reflective metal insulation and some requires installation of additional restraint bands to prevent damage.

Mitigative Measures

1. Measures Completed at WBN Unit 1

During the Unit 1 Cycle 7 (U1C7) refueling outage that concluded in November 2006, TVA implemented changes to the plant that included the installation of the new containment sump strainer design, installation of a resized orifice in the high head injection flow path and replacement of the old coated steam generators with non-coated steam generators.

The new strainer is a significant improvement over the original design and increases the available flow area from approximately 200 ft^2 to approximately 4600 ft^2. The openings in the new strainer are round holes with a diameter of 0.085 inch. This is substantially smaller than the 1/4 inch rectangular mesh of the original sump screens. Testing of the new sump strainer has been conducted that showed very low head loss with extremely conservative debris loadings.

A review of the Emergency Core Cooling System (ECCS) injection pathways was performed and determined that a change to the throttle position of the high head injection flow path throttle valves was necessary to ensure debris would not be trapped in the throttle valves. To allow for the further opening of the throttle valves the orifice in the flow path was replaced with one having a smaller bore size. The new orifice and the throttle valve position changes were accomplished during the U1C7 outage. These changes ensured that the orifice and the throttle valve openings were at least 115% larger than the strainer opening size to eliminate any potential blockage in the ECCS injection path. The changes to the fuel bottom nozzles meet the licensing basis requirement that the strainer openings be the smallest opening in the ECCS flow path.

The debris generation calculation and successor downstream impact evaluations are currently being revised to reconcile the fiber quantities considered due to Min-K insulation and 3M fire wrap relative to that tested in the WBN strainer test.

2. Containment Cleanliness

As discussed in Reference 5, WBN has a formal program for inspecting and cleaning areas inside containment. Technical instruction TI-12.07, "Containment Access" and procedure SPP-10.7, "Housekeeping/Temporary Equipment Control," provide guidelines for entering/exiting containment, acceptance criteria for housekeeping/cleanliness to ensure no loose debris is left in

containment, and for storage of materials inside containment during MODE 4 and higher.

TI-61.003, "Ice Condenser Loose Debris Log," records, tracks, and evaluates debris that is found in the ice condenser system to ensure that this debris cannot adversely impact sump operation.

3. Procedural Guidance

Emergency operating procedure, ES-1.3, "Transfer to Containment Sump," contains guidance to the operators for monitoring the containment sump for blockage. This procedure provides for monitoring the ECCS pumps and Containment Spray pumps for potential loss of net positive suction head (NPSH) and ability to deliver necessary flow. Monitoring of containment sump level to determine the necessity to refill the refueling water storage tank (RWST). Also with the assistance of the Technical Support Center (TSC) personnel, the procedure provides for guidance on reducing containment spray and ECCS flow to single train operation to reduce the rate of debris accumulation.

4. Risk Evaluation

Included in Generic Letter 2004-02 were the following observations regarding risk significance that remain valid through the proposed extended implementation period to the completion of the Spring 2008 refueling outage. The probability of a large break loss of coolant accident (LOCA) remains extremely low, as is the probability of a small break LOCA that may require recirculation. The Watts Bar Unit 1 containment is compartmentalized making total debris transport to the sump strainers less likely. The time to switchover to recirculation (approximately 10 minutes after initiation of an event) allows for debris settling.

5. Safety Features and Margins in Current Configuration/Design Basis

The WBN containment sump incorporates many design features that help to minimize the possibility of strainer blockage. The containment sump is located in the containment floor below the refueling canal to provide protection from high energy pipe failures. The lower containment is an open, one-level area. The only drains which are used to route water to the sump are the two large refueling cavity drains and the twenty ice condenser floor drains. These drains route water away from the sump strainers. There are two entry paths to the sump area, separated by approximately 320 degrees around lower containment. The water fills the floor areas and covers the sump entrance. This provides two entry points into the sump area on opposite sides.

Thus if a break were to occur near one of the sump entry points, some of the debris could travel around to the other side of containment to collect on the strainer modules on the opposite side. There are only small quantities of fibrous material in containment. Stainless steel reflective metallic insulation is the predominant insulation type. There are no break locations or break sizes in the reactor coolant system that will result in min-K or 3M fire wrap being debris in the sump without the presence of substantial amounts of reflective metal insulation (RMI) debris. The containment sump has a high water level compared to most containment designs which provides large margins in available net positive suction head (NPSH). This coupled with the low head losses established during the testing shows that the sump screens have large safety margins. WBN as an ice condenser used sodium tetraborate as the buffering agent, has low temperature in the sump water, and maintains a relatively low sump pH throughout the accident period. This limits corrosion of light metals and limits chemical effects. All testing performed to date supports the conclusion that chemical effects are not an issue at WBN. The small hole size selected for the new strainer prevents any large material with a potential to block fuel, ECCS injection pathways, or the containment spray nozzles from bypassing the strainer. While it could be assumed that long fibers could pass through the strainer openings with a potential to block fuel a visual microscopic examination of the type of material that passed through the strainer openings showed that the lengths of such fibers were too short to be of concern.

Analyses by the vendors and NRC have shown that very little open area at the bottom of the core is needed to maintain long term core cooling and acceptable fuel clad temperatures. The number of new bottom nozzles already installed on fuel currently in WBN substantially exceeds the flow area needed to assure core cooling post-LOCA. Based on the visual examination of the bypass debris from the tests of the WBN strainer, no fuel blockage would occur with the old bottom nozzles. Using very conservative bypass fractions it is theoretically, but not physically, possible to block the old bottom nozzles. With the removal or banding of the fibrous insulation in the next outage, these theoretical bypass fractions will be reduced to acceptable values with the old bottom nozzles. Approximately 2/3 of the core will have the new nozzles in place after the spring 2008 outage. The old nozzles will only be present on twice burned fuel assemblies, so there are no concerns with long term core cooling and clad temperatures.

WBN has NRC approval to invoke the leak-before-break methodology to eliminate the dynamic effects (pipe whip and jet impingement) of postulated reactor coolant piping (hot leg, cross-over leg, and cold leg) ruptures from the design basis of the plant. The approval was based on the conclusion that the probability or likelihood of large pipe breaks occurring in the primary coolant loops is sufficiently low. The leak would be detected and the

unit brought to a safe shutdown condition prior to the occurrence of a large pipe break. While the leak-before-break methodology was not used in determining the debris loading on the sump strainer, it does provide additional margin in the overall sump strainer design.

Conclusion

Based on the above discussion TVA has determined that overall plant safety will be maintained until the corrective actions are completed during the spring 2008 refueling outage.

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COMMITMENT LIST

The following provides a list of commitments in this submittal which are being tracked by TVA's commitment process.

1. The actions to replace the Min-K insulation and add additional restraint bands will be completed during the upcoming refueling outage (Unit 1 Cycle 8 Outage) that is scheduled to start in early February 2008.