December 6, 2007

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 – GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS," EXTENSION REQUEST EVALUATION (TAC NO. MC4730)

Dear Mr. Campbell:

By letter dated August 1, 2007, revised by letter dated October 2, 2007, Tennessee Valley Authority (TVA, the licensee) submitted a request for an extension of the completion date for Generic Letter (GL) 2004-02 corrective actions at the Watts Bar Nuclear Plant, Unit 1 (WBN-1).

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's request and concludes that it is acceptable to extend the due date for completion of thermal insulation modifications until the completion of the WBN-1 spring 2008 refueling outage, scheduled to begin February 10, 2008. Should the licensee elect to begin the outage more than 30 days after February 10, 2008, TVA will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02.

Further details on the bases for the NRC staff's conclusions are contained in the enclosed evaluation. If you have any questions regarding this issue, please feel free to contact the WBN-1 Project Manager, Brendan Moroney, at (301) 415-3974.

Sincerely,

/RA/

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Evaluation

cc w/enclosure: See next page

December 6, 2007

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 – GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS," EXTENSION REQUEST EVALUATION (TAC NO. MC4730)

Dear Mr. Campbell:

By letter dated August 1, 2007, revised by letter dated October 2, 2007, Tennessee Valley Authority (TVA, the licensee) submitted a request for an extension of the completion date for Generic Letter (GL) 2004-02 corrective actions at the Watts Bar Nuclear Plant, Unit 1 (WBN-1).

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's request and concludes that it is acceptable to extend the due date for completion of thermal insulation modifications until the completion of the WBN-1 spring 2008 refueling outage, scheduled to begin February 10, 2008. Should the licensee elect to begin the outage more than 30 days after February 10, 2008, TVA will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02.

Further details on the bases for the NRC staff's conclusions are contained in the enclosed evaluation. If you have any questions regarding this issue, please feel free to contact the WBN-1 Project Manager, Brendan Moroney, at (301) 415-3974.

Sincerely,

/RA/
Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Evaluation

cc w/enclosure: See next page

Distribution:

PUBLIC	LPL2-2 r/f	RidsOgcRp	RidsNrrPMBMoroney
RidsAcrsAcnwMailCenter	RidsNrrDorlLPL2-2	RidsNrrLACSola	RidsRgn2MailCenter
RidsNrrDssSsib	EGeiger, NRR	JGolla, NRR	JBowen, NRR

ADAMS ACCESSION NUMBER: ML073380152 NRR-106

OFFICE	LPL2-2/PM	LPL2-2/PM	LPL2-2/LA	SSIB/BC	LPL2-2/BC
NAME	JBowen	BMoroney	RSola	MScott by memo dated	TBoyce
DATE	12/05/07	12/05/07	12/05/07	11/21/07	12/06/07

OFFICIAL RECORD COPY

William R. Campbell, Jr.
Tennessee Valley Authority
cc:
Mr. Gordon P. Arent
New Generation Licensing Manager
Tennessee Valley Authority
5A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Ashok S. Bhatnagar
Senior Vice President
Nuclear Generation Development
and Construction
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. James R. Douet
Vice President
Nuclear Support
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. H. Rick Rogers
Vice President
Nuclear Engineering & Technical Services
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Michael D. Skaggs, Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

General Counsel
Tennessee Valley Authority
6A West Tower
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. John C. Fornicola, Manager
Nuclear Assurance
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Larry E. Nicholson, General Manager
Performance Improvement
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

WATTS BAR NUCLEAR PLANT

Ms. Beth A. Wetzel, Manager
Corporate Nuclear Licensing and
Industry Affairs
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Masoud Bajestani, Vice President
Watts Bar Unit 2
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000, EQB 1B
Spring City, TN 37381

Mr. Michael K. Brandon, Manager
Licensing and Industry Affairs
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Mr. Michael J. Lorek, Plant Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Senior Resident Inspector
Watts Bar Nuclear Plant
U.S. Nuclear Regulatory Commission
1260 Nuclear Plant Road
Spring City, TN 37381

County Executive
375 Church Street
Suite 215
Dayton, TN 37321

County Mayor
P. O. Box 156
Decatur, TN 37322

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

GSI-191/GL2004-02 EXTENSION REQUEST

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

In a letter dated August 1, 2007, revised by letter dated October 2, 2007, Tennessee Valley Authority (TVA) requested an extension to the corrective action due date of December 31, 2007, stated in NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design-Basis Accidents at Pressurized Water Reactors" (GL 2004-02), for the Watts Bar Nuclear Plant, Unit 1 (WBN-1). In the letter, TVA stated that it had partially completed the corrective actions associated with GL 2004-02 during the WBN-1 fall 2006 refueling outage. However, as a result of a revised debris generation analysis, the inventory of fiber Min-K insulation and 3M fire-wrap had increased with respect to the quantity represented in the WBN-1 strainer head loss testing program. Therefore, TVA has determined that Min-K insulation on certain components needs to be replaced with reflective metal insulation (RMI), and that some Min-K needs to be secured with additional bands to prevent damage. TVA plans to perform this work during the refueling outage scheduled to start February 10, 2008.

As stated in SECY-06-0078, proposed extensions to permit changes at the next outage of opportunity after December 2007 may be granted if, based on the licensee's request, the staff determines that:

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

2. 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 emergency core cooling system (ECCS) and containment spray system (CSS) functions during the extension period.

SECY-06-0078 also states that for proposed extensions beyond several months, a licensee's request will more likely be accepted if the proposed mitigative measures include temporary physical improvements to the ECCS sump or materials inside containment to better ensure a high level of ECCS sump performance.

In regard to the first criterion for approving an extension, WBN-1 has a plant-specific plan, with milestones and schedules, to complete the GL 2004-02 required corrective actions and modifications by February 2008. Specifically, during the refueling outage scheduled to start on February 10, 2008, TVA plans to replace some Min-K insulation with RMI insulation and add restraint bands to Min-K insulation that cannot be replaced.

In regard to the second criterion for approving an extension, TVA has stated that the following modifications, mitigating measures, compensatory measures, and/or favorable conditions are in effect at WBN-1, minimizing the risk of degraded ECCS and CSS functions during the extension period:

1. All planned modifications (except for the modifications to the Min-K insulation described herein) required to comply with the requirements of GL 2004-02 have been completed. The major modifications are as follows:

    - A new strainer with smaller opening size and larger flow area has been installed to accommodate the loss-of-coolant accident (LOCA) generated debris load. The new strainer has 0.085-inch diameter perforations and a flow area of approximately 4600 square feet (ft^2) whereas the original screen had ¼-inch rectangular mesh and 200 ft^2 flow area. The small size selected for the perforations in the new strainer is to prevent large material with a potential to block [coolant flow paths through the] fuel, ECCS injection pathways, or the containment spray nozzles from bypassing the strainer.

    - The size of each orifice in the high head injection flow paths has been reduced to allow for increased seat openings in the throttle valves. As a result, the potential for throttle valve clogging is reduced. The orifice sizes and valve openings are, at minimum, 50 percent larger than the openings in the sump strainer.

    - The LOCA-generated coatings debris source term has been reduced as a result of the installation of uncoated replacement steam generators.

2. An emergency operating procedure has been prepared to manage ECCS sump performance during a LOCA. The procedure provides guidance to the operators for monitoring the containment sump and ECCS and CSS pumps for sump blockage and for the ability to deliver the necessary flow. To reduce the rate of debris transport to the sump strainer, the procedure provides guidance on reducing containment spray and ECCS flow to single-train operation. The reduction in flow and accumulated debris results in a reduced pressure drop across the sump strainer. The procedure also provides for refill of the refueling water storage tank to make additional water available for core cooling in the event of sump blockage.

3. A formal program for inspecting and cleaning areas inside containment has been implemented to control the quantity of latent debris. To ensure that no loose debris is left in containment, containment access and housekeeping procedures provide guidelines for entering/exiting containment and specify acceptance criteria for cleanliness.

4. Design features that help minimize the possibility of sump strainer and fuel channel blockage have been incorporated into WBN-1. Specifically:

    - The containment sump is located in the containment floor below the refueling canal, shielded from high-energy pipe failures.

- The lower containment is an open, one-level area, with features that channel recirculation flow in a manner that minimizes the transport of debris to the ECCS sump strainer. The only drains which are used to route water to the sump from upper containment are the two large refueling cavity drains and the twenty ice condenser floor drains. These drains route water away from the sump strainers, thereby enhancing the settling of debris.

- The new ECCS sump strainers are located in the annular space between the reactor biological shield wall and the divider wall located beneath the refueling canal. There are only two water entry points in lower containment leading to the sump strainers, one on each side of the strainer. Therefore, if a break were to occur near one of the sump entry points, water would have to travel around in this annulus area to the opposite entry point, allowing the bulk of the debris to settle and not reach the strainer.

- The high containment pool water level in this ice condenser containment provides large margins in available net positive suction head (NPSH). This feature, coupled with the low head losses established during strainer testing, indicates that the ECCS pumps have a large safety margin.

- Sodium tetraborate is used as the buffering agent, sump water temperature is relatively low, and a relatively neutral sump pH is maintained throughout the accident period. These attributes limit the corrosion of light metals and, therefore, limit chemical effects. Testing performed to date supports the conclusion that chemical effects are not a significant issue at WBN-1.

- Surveillance Instruction 1-SI-304-2, “18 Month ECCS Containment Sump Inspection,” is performed during each refueling outage to ensure that the containment sump suction pit is free of debris and that the sump components, including strainers, show no evidence of degradation.

- Surveillance Instruction 1-SI-72-3, “Containment Refueling Canal Drains,” is performed every 92 days to ensure that the refueling canal drains that direct the flow of containment spray water from the upper compartment to the lower compartment (accessible during plant operation) are not blocked.

- Surveillance Instruction 1-SI-61-9, “18 Months Ice Condenser Floor Drains Visual Inspection,” is performed during each refueling outage to ensure that the twenty ice-condenser floor drains to lower containment and associated piping and valves are free of ice, frost, or debris and that each valve seat is free of corrosion, pitting or cracking.

- Procedure 1-TRI-40-901, “Accumulator Rooms 3 and 4 Open Ended Crane Wall Drains ASME Section XI Unimpaired Flow Test,” is performed every other outage to verify that the two floor drains located in accumulator Rooms 3 and 4 are clear and free-flowing. These two floor drains return water to the area inside the polar-crane wall. Also, Surveillance Instruction 1-SI-304-2, “18 Month ECCS Containment Sump Inspection,” in conjunction with the sump screen inspection, requires inspection of these drains for “no blockage” each refueling outage.

TVA performed a risk evaluation and concluded that the probability of a Large Break LOCA (LBLOCA) resulting in core damage during a two-month extension is less than 1E-06. The risk evaluation conservatively assumed that fibrous material, released from the existing Min-K insulation inside containment, resulted in a debris layer on the containment sump screen sufficient to cause the loss of NPSH to the ECCS pumps, and subsequent core damage. Because an LBLOCA is assumed to result in core damage, the probability of core damage is assumed to be equal to the probability of an LBLOCA -- 2.67E-06 per year (calculated in the WBN-1 PRA model) times the fraction of a year the extension is in effect (planned for less than two months). Therefore, the probability of core damage during the extension period is less than 1E-06.

TVA stated that the assumption that the LBLOCA results in sump blockage and core damage is conservative because mitigative measures to deal with sump blockage were not credited. The staff also notes that the presence of additional insulation in the debris inventory does not necessarily mean that the WBN-1 strainer will not perform acceptably during an LBLOCA. Rather, the licensee has not tested the strainer's performance with this inventory. The licensee's decision to remove or remediate the unrepresented quantity of insulation, rather than retesting, is an acceptable (and conservative over the long term) method for addressing the discrepancy between the quantity of fiber represented in the strainer head-loss test and the quantity of debris estimated to be generated during a LOCA.

The NRC has confidence that TVA's plan, as described herein, will result in the installation of final GSI-191 modifications that provide acceptable strainer function with adequate margin for uncertainties. Further, the NRC has concluded that TVA has put mitigation measures in place to adequately reduce risk for the approximate 2-month extension period, Therefore, it is acceptable to extend the completion date for the corrective actions for certain issues discussed in GL 2004-02 (specifically, replacement of some Min-K insulation with RMI and the installation of additional restraint banding to some Min-K insulation) until the completion of the WBN-1 spring 2008 refueling outage, currently scheduled to begin February 10, 2008. Should TVA elect to begin the outage more than 30 days after February 10, 2008, TVA will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02.