



Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

March 1, 2013

10 CFR 50.90

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

Watts Bar Nuclear Plant Unit 1  
Facility Operating License No. NPF-90  
NRC Docket No. 50-390

**Subject: Supplement to Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis (WBN-UFSAR-12-01)**

**Reference:** Tennessee Valley Authority (TVA) Submittal to NRC Document Control Desk, "Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis, TAC No. ME8200 (WBN-UFSAR-12-01)," dated July 19, 2012 (ADAMS Accession No. ML12236A167)

In the reference letter, the Tennessee Valley Authority (TVA) submitted a request for an amendment to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant (WBN) Unit 1. This license amendment request seeks approval to revise the WBN Unit 1 Updated Final Safety Analysis Report (UFSAR) to adopt a revised hydrologic analysis for the WBN Unit 1 site.

In the submittal, TVA identified the WBN Unit 1 Thermal Barrier Booster (TBB) Pump Motors as the most limiting components affected by the updated design basis flood (DBF) level of elevation 739.7 ft in the Auxiliary Building.

Recently TVA has identified that the chilled water circulating pump motors for the Main Control Room (MCR) Chillers and the 6.9kV Shutdown Board Room (SDBR) Chillers located on Auxiliary Building floor elevation 737.0 ft, and ancillary equipment, may also be affected (partially submerged) during a DBF event based on the updated hydrologic analysis for WBN Unit 1. Enclosure 1 provides additional information addressing the impact of the updated hydrologic analysis for WBN Unit 1 on these components required for flood mode operation.

U.S. Nuclear Regulatory Commission  
Page 2  
March 1, 2013

Enclosure 1 of the reference letter provided a description, technical evaluation, regulatory evaluation and environmental consideration of the proposed technical changes. TVA requested NRC review and approval of all of the technical changes to the WBN Unit 1 UFSAR as described in Enclosure 1 to incorporate the cumulative effects that have occurred in the WBN Unit 1 hydrologic analysis since issuance of the Operating License.

The technical changes proposed, including the changes described as well as shown in the updated WBN Unit 1 UFSAR pages, are not materially altered by this new information provided regarding flood protection of the MCR Chillers and the SDBR Chillers. Instead, this information is presented to demonstrate that pending NRC review and approval of the updated hydrologic analysis and resultant update of the WBN Unit 1 UFSAR, TVA has implemented appropriate compensatory measures and plant modifications that will ensure that safety-related systems, structures, and components identified in Regulatory Guide 1.29 are designed to withstand the flood conditions associated with the updated DBF elevations, and would remain functional during external floods.

TVA requests that the NRC continue to review and approve this amendment by July 19, 2013. This additional information does not affect the technical changes proposed to the WBN Unit 1 UFSAR, and should not alter the NRC findings regarding the technical adequacy, regulatory compliance, and impact on the health and safety of the public, of the proposed changes.

Consistent with the standards set forth in 10 CFR 50.92(c), TVA has determined that the additional information provided in this submittal, does not affect the no significant hazards considerations associated with the proposed license amendment previously provided in the reference letter.

TVA has further determined that the proposed amendment still qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

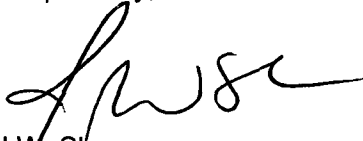
Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and the enclosure to the Tennessee Department of Environment and Conservation.

Enclosure 2 contains a list of new regulatory commitments in this letter. Please address any questions regarding this request to Ed Schrull at 423-751-3850.

U.S. Nuclear Regulatory Commission  
Page 3  
March 1, 2013

I declare under penalty of perjury that the foregoing is true and correct. Executed on this  
1st day of March 2013.

Respectfully,



J.W. Shea  
Vice President, Nuclear Licensing

Enclosures:

1. Effect of Updated Hydrologic Analysis on Main Control Room (MCR) and Shutdown Board Room (SDBR) Chillers
2. List of New Regulatory Commitments

cc (Enclosures):

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector – Watts Bar Nuclear Plant, Unit 1  
Director, Division of Radiological Health - Tennessee State Department of Environment  
and Conservation

## **ENCLOSURE 1**

### **EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS**

#### **SUMMARY DESCRIPTION**

By letter dated July 19, 2012, (Tennessee Valley Authority (TVA) Submittal to NRC Document Control Desk, "Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis, TAC No. ME8200 (WBN-UFSAR-12-01)," (ADAMS Accession No. ML12236A167)) the Tennessee Valley Authority (TVA) submitted a request for an amendment to Facility Operating License No. NPF-90 for Watts Bar Nuclear Plant (WBN) Unit 1. This license amendment request seeks approval to revise the WBN Unit 1 Updated Final Safety Analysis Report (UFSAR) to adopt a revised hydrologic analysis for the WBN Unit 1 site. In the submittal, TVA identified the WBN Unit 1 Thermal Barrier Booster (TBB) Pump Motors as the most limiting components affected by the updated design basis flood (DBF) level of elevation 739.7 ft in the Auxiliary Building. Field measurements taken from the floor and calibrated with benchmark locations near the TBB Pump Motors indicate that the actual elevation to the baseplate of the TBB Pump Motors is elevation 739.3 ft. To restore margin for the TBB Pump Motors, compensatory measures have been implemented as described in the submittal that are scheduled to be replaced by plant modifications as previously committed to by TVA by letter dated June 13, 2012 (Tennessee Valley Authority (TVA) submittal to NRC Document Control Desk, "Commitments Related to Updated Hydrologic Analysis Results for Sequoyah Nuclear Plant, Units 1 and 2, and Watts Bar Nuclear Plant, Unit 1," (ADAMS Accession No. ML12171A053)).

Recently TVA has identified that the chilled water circulating pump motors for the Main Control Room (MCR) Chillers and the 6.9kV Shutdown Board Room (SDBR) Chillers located on Auxiliary Building floor elevation 737.0 ft, and ancillary equipment, may also be affected (partially submerged) during a DBF event based on the updated hydrologic analysis for WBN Unit 1. Specifically, the bottoms of the chilled water circulating pump motors are located at elevation 738.6 ft. Additional walkdowns determined that other ancillary equipment for the MCR and SDBR Chillers may also be affected at the new DBF level. This ancillary equipment is discussed later in this enclosure.

#### **DETAILED DESCRIPTION AND TECHNICAL EVALUATION**

The MCR Heating Ventilation and Air Conditioning (HVAC) system is designed to maintain temperature and humidity and maintain a positive pressure in the Main Control Room Habitability Zone (MCRHZ) area relative to the surroundings. The system consists of two 100% redundant trains. Each train contains an air handling unit, a water chiller, a chilled water circulating pump and associated piping, ductwork, dampers, instrumentation and controls. All MCR HVAC equipment necessary for MCR habitability is designed to remain operable during and after a DBF event.

The SDBR HVAC system provides cooling to the individual 6.9KV and 480V SDBR, the battery board rooms and the auxiliary control room. The system consists of two 100% redundant trains containing air handling units, a chilled water circulating pump and piping, and a chiller package which consists of a centrifugal compressor with a two section heat exchanger. Normally, one chiller will be in operating mode with the other in standby mode. The unit in standby starts

## ENCLOSURE 1

### EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS

should the operating unit fail. The SDBR HVAC system is designed to remain operable during and after a DBF event.

Pending implementation of plant modifications to provide flood protection for the MCR and SDBR chilled water circulating pumps and motors, and to protect the affected MCR and SDBR Chiller ancillary equipment from water intrusion, an evaluation has been performed to demonstrate that the plant can be safely shutdown and maintained in a safe shutdown condition during flood mode operations even with the loss of the MCR and SDBR chillers. The loss of the MCR and SDBR HVAC systems will cause temperature increases in the areas served by these systems, including the MCR and SDBR as well as the auxiliary control room, auxiliary instrument rooms, and the battery board rooms. These areas are required for conducting operator actions and providing electrical power and instrumentation and controls for flood mode operations. To compensate for partially flooding the cable spreading room, flood protection provisions utilize those portions of the control system that terminate in the auxiliary control room and are designed to be operable under flood conditions. Therefore it is acceptable to operate the plant for the duration of a DBF event from the auxiliary control room, and the maximum temperature reached in the MCR will not affect the plant operators. Transient analyses were performed for loss of MCR and SDBR HVAC in wintertime conditions to determine the maximum temperatures achieved and temperature profiles for the MCR and SDBR, as well as for the auxiliary control room, auxiliary instrument rooms, and the battery board rooms. The MCR HVAC transient analysis was run to determine the steady-state temperature in the MCR with a 50% reduction in lighting load applied. The MCR temperature under these conditions was used as an input boundary condition to the SDBR transient analysis since these areas share a common boundary and MCR cooling is lost in this scenario. The results of the calculation show that the SDBRs remain below the 104°F environmental qualification temperature limit. However, the maximum temperatures in the auxiliary control room, auxiliary instrument rooms, and the battery board rooms exceed the 104°F environmental qualification temperature limit. These room temperatures are a maximum of 114.3°F for the auxiliary control room, a maximum of 123.4°F for the auxiliary instrument rooms, and a maximum of 114.4°F for the battery board rooms, based on a wintertime temperature scenario.

TVA has determined that electrical equipment in mild areas can withstand either: 1) an increasing ambient temperature to 140°F for 24 hours followed by a period of 99 days at less than or equal to 120°F, or 2) a slow ramp to 135°F followed by a temperature of 135°F for 100 days. Although the maximum temperatures in the auxiliary control room, auxiliary instrument rooms, and the battery board rooms exceed the required 104°F environmental qualification temperature limit, the calculated temperature profiles for these areas are bounded by the temperature profiles determined to be acceptable for electrical equipment in mild areas. Therefore, the electrical equipment in the areas required for flood mode operation remains operable for the duration of a DBF event, and no immediate compensatory measures are required. In addition, the maximum temperature of 114.3°F for the auxiliary control room will allow for the limited occupancy by the plant operators required during a DBF event. Also, the evaluation is conservative in that several factors that could reduce the affected room temperatures have not been included in the calculation. This includes the following:

- Use of conservative outdoor air temperatures for a winter event,

## ENCLOSURE 1

### EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS

- No reduction in MCR or SDBR heat loads other than a 50% reduction in MCR lighting heat loads,
- Internal doors connecting rooms were not opened to allow natural air circulation between rooms with differing temperatures,
- Not including opening of the hatch connecting the SDBR rooms to the 480 V Board Rooms on Elevation 772 ft where conditioned air continues to cool the area,
- No portable fans to move cooler air to hot areas, such as from the 480 V Board Room on Elevation 772 ft to the Shutdown Board Room, and
- Other operational compensatory measures that could be taken to reduce area temperatures.

TVA is implementing plant modifications to provide a flood barrier around each of the MCR and SDBR chilled water circulating pumps and motors, and to protect the affected MCR and SDBR Chiller ancillary equipment from water intrusion, to provide flood protection up to the DBF level of 739.7 ft, ensuring they are able to perform as designed during and after a DBF event. These plant modifications will be installed by March 31, 2013.

The proposed flood barriers surrounding each chiller will consist of 10 gauge steel sheet metal that will enclose the affected pumps and motors on all four sides and be rigidly attached to the existing concrete pedestal by 3/8" diameter bolts anchors. The sheet metal enclosure around each pump and motor will be adequately reinforced to withstand the hydrostatic pressure created during a DBF event. A drain line with a manual valve will penetrate the flood barrier to prevent inadvertent filling of the enclosure and potential submergence of the pump motor in the case of a complete pump seal burst or from fire protection water during normal operating conditions without a flood. The valve will be closed as part of Stage II flood warning preparations in accordance with approved plant procedures to prevent water intrusion into the enclosure during a DBF event.

The multiple interferences penetrating the flood barriers will be sealed by a combination of seal welds or application of an approved sealant, whichever is most appropriate, to prevent water intrusion into the barrier during a DBF event. Adequate ventilation will still be available to the pump motors with the flood barriers installed; therefore the installation of the flood barriers will not adversely impact normal operation of the motors.

The MCR and SDBR chilled water circulating pumps are evaluated as part of the Failure Modes and Effects (FMEA) evaluation for the Auxiliary Building. The failure modes for these pumps are 1) fails to start, and 2) stops. Crediting the opposite train MCR or SDBR Chiller automatically starting results in no effect on plant safety. This plant modification separately protects each train from failure due to submersion of the pump motor during a DBF event.

Each flood barrier around the respective chilled water circulating pump is a static structure rigidly attached to the concrete pump foundation that will resist the hydrostatic forces generated during a DBF event. The design will maintain its position during a seismic event and will not cause any interaction hazard with any safety-related component required to be operable during an earthquake. The additional load the flood barrier generates on the concrete pump foundation is negligible to the overall structural qualification of the Auxiliary Building structure.

## ENCLOSURE 1

### EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS

To provide additional assurance that the chilled water circulating pumps and associated motors are protected against flood waters during a DBF event, a portable submersible pump will be installed inside the flood barrier during Stage I flood warning preparations in accordance with approved plant procedures. This submersible pump will remove any in-leakage that may occur. These submersible pumps will be powered from a temporary 120VAC source that is supplied from a 480VAC source that is available during the DBF event and backed up by the diesel generators in the event that normal AC power supply is lost.

The chilled water circulating pumps are Safety-Related, Seismic Category I. The chilled water pump motors are Environmentally Qualified (EQ) and are powered by class 1E power. The MCR and SDBR Chillers are Seismic Category 1, powered by class 1E power, TVA safety class 2b. The flood barriers are designed in accordance with the approved WBN regulatory design basis to ensure that required codes and standards of the systems, and regulatory requirements and classifications, are met.

There will be no changes in the systems' ability to perform under the environmental requirements established for the original design. These plant modifications ensure that the chilled water pumps will continue to operate during and after a DBF event. There are no changes in the pump's ability to meet environmental requirements caused by these design changes.

The installation of the sheet metal barriers will not adversely affect plant or personnel safety. The pumps are still accessible for maintenance. No new tests are required because of this design change, and the current testing requirements for the MCR HVAC and SDBR HVAC systems are not changed. Access for maintenance on or replacement of the chilled water circulating pump motors will require removal and reinstallation of the associated flood barrier. Installation of the flood barriers will require additional Operator actions to be performed during Stage I and Stage II flood warning preparations in accordance with approved plant procedures.

Operations and Maintenance Departments will be impacted due to changes in Stage I and Stage II flood mode warning preparation procedures and activities requiring closure of the drain valves on the pump enclosures, installation of the portable sump pumps inside the enclosures and routing of electrical extension cords to a power source available during a DBF event. These actions have been evaluated, and determined to be capable of being performed along with existing flood mode operations in the required completion time. Maintenance on the pump motors will require removal and reinstallation of the associated flood barrier.

In addition to the new barriers, other plant modifications to the affected MCR and SDBR Chiller ancillary equipment will be implemented by March 31, 2013, to ensure flood protection up to the DBF level of 739.7 ft. These modifications to the MCR and SDBR Chiller ancillary equipment provide protection from water intrusion for the following electrical components:

- Two MCR Chiller compressor motor junction boxes (one for each MCR Chiller) and conduit connections,

## ENCLOSURE 1

### EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS

- Four MCR Chiller expansion valve solenoid valves (two for each MCR Chiller) and conduit connections,
- Two MCR Chiller temperature sensors (one for each MCR Chiller) and conduit connections between the sensors and other components,
- Four MCR Chiller junction boxes below the oil heaters (two for each MCR Chiller) and conduit connections,
- Two SDBR Chiller oil return solenoid valves (one for each SDBR Chiller) and conduit connections,
- Two SDBR Chiller resistance temperature elements (one for each SDBR Chiller) and conduit connections,
- Two SDBR Chiller low water temperature switches (one for each SDBR Chiller) and conduit connections,
- Two SDBR Chiller pull boxes for the resistance temperature element and low water temperature switch (SDBR Chiller A only, pull boxes for SDBR Chiller B are above DBF level) and conduit connections, and
- Two SDBR Chiller circulating water pump differential pressure switches (one for each SDBR Chiller).

To provide additional assurance that the MCR and SDBR Chillers ancillary equipment is protected against flood waters during a DBF event, additional measures to prevent water intrusion for these components will be completed during Stage I flood warning preparations in accordance with approved plant procedures. These actions have been evaluated, and determined to be capable of being performed along with existing flood mode operations in the required completion time.

The technical changes proposed in the July 19, 2012, license amendment request, including the changes in the revised WBN Unit 1 UFSAR pages, are not materially altered by this additional information provided regarding flood protection of the MCR Chillers and the SDBR Chillers. There are no other changes required to the detailed description and technical evaluation presented in the original license amendment request submitted on July 19, 2012, other than to add this additional information. Therefore, the descriptions of the proposed changes, need for proposed changes, evaluation, uncertainties, margins, and conclusions provided in the license amendment request are not materially altered by the additional information provided in this enclosure.



## **ENCLOSURE 1**

### **EFFECT OF UPDATED HYDROLOGIC ANALYSIS ON MAIN CONTROL ROOM (MCR) AND SHUTDOWN BOARD ROOM (SDBR) CHILLERS**

#### **REGULATORY EVALUATION AND ENVIRONMENTAL CONSIDERATION**

The technical changes proposed in the July 19, 2012, license amendment request, including the changes in the revised WBN Unit 1 UFSAR pages, are not materially altered by this additional information provided regarding flood protection of the MCR Chillers and the SDBR Chillers. This information is presented to demonstrate that TVA has implemented appropriate compensatory measures and plant modifications that will ensure that safety-related systems, structures, and components identified in Regulatory Guide 1.29 are designed to withstand the flood conditions associated with the updated DBF elevations, and would remain functional during external floods.

There are no other changes required to the regulatory evaluation and environmental consideration presented in the original license amendment request submitted on July 19, 2012, other than to add this additional information. Therefore, the descriptions of the applicable regulatory requirements and criteria, precedent, significant hazards consideration, conclusions, and environmental consideration provided in the license amendment request are not materially altered by the additional information provided in this enclosure.

## **ENCLOSURE 2**

### **LIST OF NEW REGULATORY COMMITMENTS**

1. By March 31, 2013, TVA will implement plant modifications to provide a flood barrier around the MCR and SDBR chilled water circulating pumps and motors, and other changes to the affected MCR and SDBR Chiller ancillary equipment, to provide flood protection up to the DBF level of 739.7 ft, ensuring they are able to perform as designed during and after a DBF event.