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

**Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – CONSTRUCTION
REFURBISHMENT PROGRAM ADDITIONAL INFORMATION**

- Reference:
1. TVA letter dated July 8, 2009, "Watts Bar Nuclear Plant (WBN) Unit 2 – Response to Request for Additional Information on Program for Construction Refurbishment (TAC NO. MD6581)"
 2. NRC letter dated August 31, 2009, "Summary of August 6, 2009, Meeting with Tennessee Valley Authority (TVA) Regarding Watts Bar Unit 2 Construction Refurbishment Program"
 3. TVA letter dated September 22, 2009, "Summary of August 6, 2009, Meeting with Tennessee Valley Authority (TVA) Regarding Watts Bar Unit 2 Construction Refurbishment Program"

This letter responds to a verbal request from NRC Staff. In Reference 1, TVA provided WBN Unit 2 procedure 25402-000-GPP-0000TI216, "Watts Bar Unit 2 Completion Project Refurbishment Program." The purpose of the refurbishment program is to ensure that WBN Unit 2 plant equipment meets its original licensing, design and equipment vendor specifications by performing inspections/evaluations, refurbishment/replacement and system testing. This program was discussed at a public meeting on August 6, 2009, and summarized in Reference 2. In Reference 3, TVA responded to the questions and comments provided in Reference 2. On December 10, 2009, NRC staff and TVA held a telephone conference to address further questions from the Electrical Branch. This letter provides responses to the staff questions.

Enclosure 1 provides the NRC questions and TVA's responses. Enclosure 2 provides a list of open actions required for licensing identified in Enclosure 1.

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If you have any questions, please contact me at (423) 365-2351.

Sincerely,


Masoud Bajestani
Watts Bar Unit 2 Vice President

Enclosures:

1. Request for Additional Information - Refurbishment Program
2. List of Commitments

cc (Enclosures):

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Enclosure 1
Request for Additional Information - Refurbishment Program

The Electrical Branch reviewed the refurbishment program as it related to passive and active electrical components. The staff has the following comments:

1. For active and passive electrical instrumentation and control components that are being replaced shall meet the qualification of requirements of 10 CFR 50.49. The licensee shall ensure the installations are in accordance with the vendor recommendations, EQ testing and seismic testing.

TVA Response:

In Reference 1-1, TVA requested NRC approve the use of the Watts Bar Unit 1 approach to resolve the Equipment Qualification (EQ) Special Program for Watts Bar Unit 2. In Reference 1-2, based on the staff's review of TVA's EQ Special Program description, the program documented in NUREG-1232, Volume 4 and the applicable supplements of NUREG-0847, NRC approved TVA's approach.

With respect to seismic qualification and testing, the seismic qualification requirements for safety related equipment are specified in the procurement documentation. In cases where the vendor is required to qualify the components by analysis or test, the vendor is required to certify that the component meets the requirements of the procurement documents. The vendor is required to provide these qualification documents and certification to TVA. TVA reviews and accepts the vendor's documentation. In cases where TVA qualifies the component, TVA is required to retain the seismic qualification documentation.

2. For active and passive electrical instrumentation and control components that are not being replaced but refurbished shall consider the effects of shelf life, pre aging and other degradation factors. The licensee's proposal to evaluate just the impact on qualified life due to ambient temperature is not acceptable to the staff. Also, using license renewal programs to manage the aging effect is also not an acceptable position to the staff since the components were not exposed to the operating environments.

TVA Response:

In most cases where equipment included in 10 CFR 50.49 scope is being refurbished, the non-metallic age degradable parts will be replaced as part of the refurbishment program. In those cases where the installed equipment contains age degradable materials that are not being replaced (e.g., motor insulation, electrical penetration pigtails, etc.), the qualified life will be adjusted to account for any aging during the layup period due to thermal degradation, radiation exposure, humidity and cycling, if applicable.

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3. *The conditions of the cables in WBN Unit 2 (long term degradation) are unknown. The licensee shall perform an evaluation and testing of the cables to ensure that the cables important to safety will perform their intended function for the license period since the cables were subjected to lay-up condition since 1973.*

TVA Response:

TVA has visually inspected safety-related cables to resolve the Cable Issues Corrective Action Program Plan and compiled the jacket data to identify the cable mark number and contract information. At the same time, the cables were inspected for any visible damage such as cuts, tears, discoloration, conductor corrosion, cracking, hardening, swelling, or jacket separation from insulation. Any cable found with visible damage will be either replaced or repaired using an approved WBN procedure. From this inspection, TVA has concluded that WBN Unit 2 cables are in good material condition.

WBN Unit 2 cable in the Auxiliary and Control Buildings is in raceway (i.e. tray and conduit) that is in the same environment as the corresponding Unit 1 cable. Since most cable in Unit 2 has either not been energized or has been energized for limited periods of time, cable degradation caused by internal heating is not applicable. For Unit 2 cable that is in service supporting Unit 1 or common equipment, the cable degradation due to internal heating is equal to the degradation of the similar cables of Unit 1.

Industry literature searches provide historical evidence that when cables are not subjected to long-term temperature or condensation extremes, normal service life of these cables is easily extended beyond their normal service life of 40 years.

The lay-up conditions of WBN cable are equal to or better than the Level C or D storage requirements of ANSI N45.2.2. When installed in their final configuration in tray or conduit, the cable is trained to bend radius values that meet requirements for long-term installation. Additionally, the cable is protected from sunlight and external weathering elements and is not exposed to heating effects of being energized or temperature cycling. Thus, even though WBN cable may have been in a lay-up condition for an extended period, factors that would cause accelerated degradation are not present, and therefore cable life has not been diminished.

WBN Unit 2 safety-related cables that were purchased to pre-IEEE 383 requirements (TVA types CPJ, CPJJ, CPSJ, PJJ, or PNJ) that are being replaced as part of the Cable Corrective Action Program, are replaced with cable that meets IEEE 383-1974 requirements.

Cable used at WBN for permanent plant installation was made and certified by the cable manufacturer to meet the relevant industry codes and standards (ICEA, AEIC, UL, etc.), and WBN has the documented evidence that the cable was certified by the cable manufacturer to the appropriate industry standards.

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Unit 2 Class 1E cables were evaluated for ampacity, voltage drop, short-circuit protection and Appendix R. As a result of the calculations/analysis of WBN Unit 2 safety-related cables, a portion of the original Unit 2 cable is being replaced with new Class 1E cable. This activity helps to minimize the concern about long-term cable degradation of WBN Unit 2 cable by reducing the number of cable circuits affected.

Testing of Unit 2 safety-related Medium Voltage cables is a two step process--first is an assessment using Very Low Frequency (VLF) tan delta testing followed by VLF withstand testing before they are energized and placed in service. Any degradation will be identified and evaluated based on the test results.

Safety-related cables with EQ splices will be continuity and megger tested after installation of any new splices. The safety-related 480-volt power cables which have been de-terminated from the end device will be stress tested (meggered) when the end device is re-terminated as well as being tested for continuity. This testing will provide a sufficient sample to determine the overall condition of the WBN Unit 2 cables.

IEEE Standard 1205-2000, "IEEE Guide for Assessing, Monitoring and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Plants", paragraph 4.2, lists the stressors as aging mechanisms for organic insulating materials used on electrical cables. A complete list of stressors, their aging mechanisms, aging effects and monitoring methods are further elaborated in Table A-1 of IEEE Standard 1205-2000. These stressors and their effect on WBN Unit 2 and TVA's plan to assess their effect and take mitigating action are summarized below:

3.1. Thermal

Ambient Temperature - The qualified life of the environmentally qualified WBN Unit 2 cables will be evaluated and adjusted if necessary considering the effect of ambient temperature cycles since their installation in the 1980s.

Temperature Gradient - WBN Unit 2 cables have only been subjected to normal seasonal thermal gradients that will be enveloped by ambient temperature evaluations.

Self-heating due to operation - WBN Unit 2 cables have not been subjected to self-heating due to operation because they have not been energized.

Temperature Cycling - WBN Unit 2 cables have not been subjected to temperature cycling other than seasonal temperature gradient as discussed above.

3.2. Radiation

Gamma - In general, WBN Unit 2 cables have not been subjected to gamma radiation. For Auxiliary Building areas where Unit 2 safety-related EQ cable may have been subjected to radiation because of Unit 1 operation, the cables will be evaluated and their qualified life adjusted as required in accordance with 10 CFR 50.49.

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Neutron - Neutron radiation only applies to cables in the Reactor Building. Because there has been no fuel in Unit 2 reactor, this stressor does not apply to Unit 2 cables.

3.3. Humidity

Ambient relative humidity – Ambient relative humidity has not been demonstrated to be a stressor for cables, and therefore this does not apply.

Condensation - WBN Unit 2 cables in the Auxiliary, Control and Reactor Buildings are in areas where the environment is controlled. WBN cables were bought for wet and dry environmental service. Cables in the Valve Vaults are routed in conduits which provide protection. Electrical boxes for EQ cables will be inspected for moisture collection. If signs of moisture collection are identified, the cable will be assessed under the Corrective Action Program and replaced, if necessary.

3.4. Water

External - Exposure to external water for Unit 2 cables is limited to ambient relative humidity and condensation as discussed above, except for duct banks and underground conduit which is subject to water ingress. The cable monitoring programs in place for WBN Unit 1 to identify and monitor water in duct banks and underground conduit is applicable to WBN Unit 2 cables and will be reviewed to determine if any adverse trends have been detected which would require corrective action.

3.5. Electrical

Since the Unit 2 specific cables have not been energized, they have not been subjected to electrical stressors such as overvoltage, switching surges or spikes such as lightning.

3.6. Mechanical

Any mechanical effects, including cable installation issues, for Unit 2 cables are being addressed as part of the cable issues Corrective Action Program Plan.

3.7. Vibration

Seismic - Unit 2 cables have not been exposed to any seismically induced vibration, since the WBN site has not experienced any significant seismic events.

Equipment Vibration - Unit 2 cables are in their installed configuration in trays and/or conduit which provides mechanical protection and isolates them from any vibrating equipment. Also, since most of Unit 2 equipment is not operating, Unit 2 cables have not been exposed to any significant plant-induced vibration. Therefore, this stressor does not apply.

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3.8. Chemical

Unit 2 safety-related cables have not been subjected to any chemicals that the corresponding safety-related Unit 1 cables are not exposed to. Chemical effects have not been identified during the visual inspections of Unit 2 cables. Also, the Unit 2 cables are in the same environment as Unit 1 cables and are subject to the same housekeeping requirements at the WBN site.

3.9 Electrochemical

Unit 2 cables have not been exposed to electrochemical stressors and therefore this does not apply.

3.10. Contaminants

Unit 2 safety-related cables have not been subjected to any contaminants that the corresponding safety-related Unit 1 cables are not exposed to. Also, the Unit 2 cables are in the same environment as Unit 1 cables and are subject to the same housekeeping requirements at the WBN site.

4. *For the components that are not being replaced in Unit 2, the licensee shall ensure that EQ requirements for these components were maintained identical to Unit 1 EQ program.*

TVA Response:

The EQ related installation and maintenance requirements are specified in the Qualification Maintenance Data Sheets (QMDS) section of each EQ binder. With the exception of new equipment that is being installed in Unit 2 to replace obsolete equipment, the Unit 2 EQ equipment will be addressed in the existing EQ binders and will have the same QMDS requirements as the comparable Unit 1 equipment. For new equipment that is not presently installed in Unit 1, the QMDS requirements will be specified in the QMDS section of a new EQ binder. Implementation of the QMDS requirements will be tracked and documented for Unit 2 EQ component prior to startup.

5. *The licensee stated that components that are determined to refurbish will be refurbished in accordance with the vendor recommendations. The licensee shall address any requirements that are due to EQ test and operating experience.*

TVA Response:

The EQ related installation and maintenance requirements are specified in the QMDS section of each EQ binder based on vendor recommendations, EQ testing and operating experience. Implementation of the QMDS requirements will be tracked and documented for each Unit 2 EQ component prior to startup.

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6. *For the components that replaced under like for like category, the licensee shall ensure that the internal materials are of identical formulations and are not changed over the years. If the materials are not identical, the licensee shall qualify these new materials.*

TVA Response:

For 10 CFR 50.49 equipment, the evaluation of "like for like" replacements includes the determination that the components are the same in form, fit, function and materials. Any change in material would require a revision to the applicable EQ binder to address qualification of the different material.

7. *For the components not replaced or refurbished, the licensee shall ensure that these components are corrosion and dust free externally and internally.*

TVA Response:

Components that are not replaced or refurbished will be inspected to ensure these components are free of corrosion and significant dust both externally and internally. Any components found to have corrosion or significant dust will be cleaned or appropriate corrective action, including replacement if necessary, will be taken.

8. *During the inspection process of these components, the licensee shall ensure that there is no moisture inside the EQ components.*

TVA Response:

For 10 CFR 50.49 equipment, the degradation inspection criteria in Appendix C "EQ Degradation Inspection Program" of TI-10.12 "QMDS Verification, Implementation and EQ Activities" include inspection for evidence of moisture or corrosion. Degradation inspections will be performed for Unit 2 EQ components prior to startup.

9. *The licensee shall develop and maintain EQ program at Unit 2 similar to Unit 1 and ensure that Unit 2 EQ program addresses industry operating experience.*

TVA Response:

The Unit 2 EQ Program is being implemented using the same process as Unit 1, including using the existing Unit 1 EQ binders, where applicable. The EQ related installation and maintenance requirements are specified in the QMDS section of each EQ binder based on vendor recommendations, EQ testing and operating experience.

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References:

- 1-1. TVA letter dated September 28, 2008, "Watts Bar Nuclear Plant (WBN) – Unit 2 – Regulatory Framework for the Completion of Construction and Licensing Activities for Unit 2 – Corrective Action and Special Programs, and Unresolved Safety Issues"

- 1-2. NRC letter dated February 11, 2009, "Watts Bar Nuclear Plant, Unit 2 – Status of Regulatory Framework for the Completion of Corrective Action and Special Programs and Unresolved Safety Issues (TAC No. MD9424)"

Enclosure 2
List of Commitments

1. Degradation inspections will be performed for Unit 2 EQ components prior to startup.