March 11, 2010

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

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – REQUEST FOR ADDITIONAL INFORMATION REGARDING RADIOLOGICAL EMERGENCY RESPONSE PLAN (TAC NO. ME0853)

Dear Mr. Bhatnagar:

In its letter of March 4, 2009, Tennessee Valley Authority (TVA) updated its original application for an operating license at Watts Bar Nuclear Plant (WBN) Unit 2. In Section 13.3, "Emergency Planning," of the WBN Final Safety Analysis Report, TVA states that the TVA Radiological Emergency Plan (REP) provides protective measures for TVA personnel and for the health and safety of the public in the event of a radiological emergency resulting from an accident at WBN. The REP contains site-specific appendices for each plant. In letter of March 4, 2009, TVA provided a template of the WBN Appendix C. TVA also stated that the WBN Unit 2 specific data and references provided were preliminary; and that final verification will be provided as part of the construction completion of WBN Unit 2. In a letter dated December 3, 2009, TVA included a copy of its REP and again noted that the WBN Unit 2 specific data and references would be provided in January 2010.

The U.S. Nuclear regulatory Commission (NRC) staff is reviewing the TVA REP, Revision 89, including its Appendix C, "Watts Bar Nuclear Plant," Revision 88, in support of the operating license application for WBN Unit 2. The staff has determined that it needs additional information to complete its review. The specific information is detailed in the enclosed request for additional information (RAI). In this regard, the NRC staff requests a response to this RAI within 30 days of receipt of this letter.

If you should have any questions, please contact me at 301-415-1457.

Sincerely,

**/RA/**

Patrick D. Milano, Senior Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosure: RAI

cc w/encl: Distribution via Listserv

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OFFICIAL AGENCY RECORD

REQUEST FOR ADDITIONAL INFORMATION

WATTS BAR NUCLEAR PLANT, UNIT 2

RADIOLOGICAL EMERGENCY PLAN

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-391

On March 4, 2009, the Tennessee Valley Authority (TVA) updated its operating license (OL) application for the Watts Bar Nuclear Plant (WBN) Unit 2, which had been submitted pursuant to Section 50.34, "Contents of construction permit and operating license applications; technical information," of Title 10 of the *Code of Federal Regulations* (10 CFR). Specifically, 10 CFR 50.34(b)(6)(v) requires an applicant to provide its plans for coping with emergencies, which shall include the items specified in appendix E to 10 CFR Part 50. In this regard, TVA has submitted the TVA Radiological Emergency Plan (REP), Revision 89, including Appendix C, "Watts Bar Nuclear Plant," Revision 88, in support of the OL application for WBN Unit 2.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the REP and finds that additional information is needed to complete its review. The specific information is described as follows in this request for additional information (RAI):

Notes: Reference is made to the evaluation criteria in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants." As specified in Regulatory Guide (RG) 1.101, NUREG-0654 is an acceptable method for showing compliance with the Commission's regulations. In the absence of an alternative method of demonstrating compliance proposed by an applicant, the U.S. Nuclear Regulatory Commission (NRC) staff will use NUREG-0654 in evaluating the acceptability of the applicant's emergency plans.

If the information requested has already been provided in the TVA REP, and its Appendix C, provide a citation to the location where it can be found.

If an RAI response describes the programmatic methods that TVA uses to demonstrate compliance with the Commission's EP regulations, and that description is not provided in the TVA REP, revise the TVA REP or Appendix C, as applicable, to incorporate that description.

1. Since the TVA REP serves all of TVA's licensed nuclear facilities, it is likely that TVA will make changes to the plan under the authority of 10 CFR 50.54(q) prior to the issuance of the WBN Unit 2 OL. These changes could result from plan reviews or implementation of various corrective actions. Describe how TVA will ensure that the NRC staff will have accurate and complete information with which to make its requisite findings on the acceptability of the TVA REP, as it applies to WBN Unit 2

2. In Section 13.3 of Supplement 13 to the NUREG-0847, "Safety Evaluation Report [SER] related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," the NRC documented its review and acceptance of the TVA REP in the context of WBN Unit 1.

The staff reviewed the WBN REP submitted on February 12, 1993, and subsequent Revisions 1 through 5, in performing the evaluation documented in SER Supplement 13. In support of the OL application for WBN Unit 2, TVA submitted Revision 89 to the REP and Revision 88 of Appendix C. In the period since the NRC accepted the TVA REP in the context of WBN Unit 1, changes have been made to the TVA REP under the authority granted by 10 CFR 50.54(q), or for those changes deemed to be decreases in effectiveness, with prior NRC approval. Describe any significant changes made to the REP and Appendix C that cause the content of the plan to be substantially different from that described in SER Supplement 13.

3. Planning standard (b)(4) in 10 CFR 50.47 (50.47(b)(4)) requires that the emergency plan contain a standard emergency classification and action level scheme that is to be used by the licensee. Appendix E to 10 CFR Part 50 establishes additional requirements. Revision 88 of Appendix C, which is currently approved for WBN Unit 1, is based upon the NUMARC-007 emergency action level (EAL) scheme endorsed in RG 1.101 as an acceptable method of demonstrating compliance with § 50.47(b)(4) and Appendix E. Although the EAL scheme in Appendix C will be applicable to the proposed WBN Unit 2, as well as the existing WBN Unit 1, the NRC staff's review and findings apply only to the proposed WBN Unit 2. Changes to the EAL scheme that affect WBN Unit 1 need to be addressed separately under 10 CFR Part 50, Appendix E, Section IV.B. TVA is requested to respond to the following questions regarding the WBN EAL scheme. If you believe that the information has already been docketed, provide a reference.

   NOTE: With regard to WBN deviations from the endorsed NUMARC-007 guidance identified in any of the following RAIs, if the deviations were approved for WBN Unit 1, indicate so, citing the approval.

   a. Provide a copy of the Emergency Classification Flow Chart referenced on page C-7. If there is a listing of the capitalized standard terms used in the EAL scheme and their definitions, provide a copy to facilitate the staff review of the scheme.

   b. The EAL scheme has numerous statements, values, and phrases that have been highlighted in red. The NRC understands from discussions with TVA that these changes represent the revisions that were needed to enable the EAL scheme approved for WBN Unit 1 to address events at WBN Unit 2. The staff also understands that the numeric values provided are still undergoing engineering verification. Confirm that this understanding is correct. Are the changes indicated essentially complete as is known at this time? Does TVA expect to identify significant additional changes for WBN Unit 2? Although the staff is not as concerned with the absolute numeric values as they are with the stated bases for those values, the NRC staff has questioned some values, discussed below, that appear to be inconsistent with their bases.

   c. In Section C.1 on page C-3, the highlighted text states, in part, that *"These conditions apply to each and both Unit 1 and Unit 2…"* However, a limited number of Initiating Conditions (ICs) also contain phrases such as *"…to either unit…"* (e.g., ICs 3.1.G, 3.1.S, 3.1.A, and 3.1.U). Explain the rationale for including such phrases in these limited ICs in light of the generic statement in Section C.1 and the absence of similar wording in the remaining ICs. Does the inclusion of the phrase *"…to either*

*unit…"* override the generic *"…and both…."* in Section C.1 for these ICs? If this was not TVA's intent, the NRC staff requests that the redundant *"…to either unit…"* be removed from these ICs or that the bases for these ICs be revised to clarify the intent.

d. In IC 1.1.3, TVA revised the core exit thermocouple measurements that correspond to critical safety function core cooling conditions. Similarly, TVA revised the reactor vessel level indication system (RVLIS) level used in IC 1.1.4. Since the previous values were applicable to Unit 1, it is assumed the change was made for consistency with Unit 2. Are these revised values consistent with the emergency operating procedures for both Unit 1 and Unit 2?

e. ICs 1.1.5 and 1.3.5 address containment radiation monitor readings associated with the fuel clad barrier and the containment barrier respectively. The bases for IC 1.1.5 states that the reading of 74 R/hr [59 R/hr] corresponds to fuel damage approximately 2-5% clad failure. The bases for IC 1.3.5 states that the reading of 108 R/hr [86 R/hr] corresponds to fuel damage approximately 20% clad failure. The difference between the two sets of readings (a factor of about 1.5) does not correspond to the stated difference in the fuel damage assumption (a factor of about 4-10). As such, the numeric EAL thresholds appear questionable. Provide an explanation of the apparent discrepancy and justify why the proposed values should be found acceptable.

f. In IC 1.2.4, the Loss threshold identifies a level of <33%, whereas the bases discussion identifies a level of 40%. Resolve the apparent discrepancy.

g. The WBN EAL scheme does not contain an EAL threshold comparable to NUMARC-007 RCS [reactor coolant system] Fission Product Barrier Matrix Loss EAL #4. Explain the basis for this deviation from the endorsed guidance.

h. In IC 1.3.1, the potential loss threshold includes the standard term "INEFFECTIVE." The endorsed NUMARC-007 CNMT [containment] Fission Product Barrier Matrix Loss EAL #6 uses the phase "…not effective within 15 minutes…" The bases of this IC do not explicitly define "INEFFECTIVE." If this 15-minute timeframe is not explicitly included in the definition of "INEFFECTIVE," provide a justification for this apparent omission.

i. A change to the IC 1.3.4 and to the associated bases defined a prolonged release as being greater than 4 hours. Explain the basis of this greater than 4-hour threshold.

j. In IC 2.1.S, the logic for this IC and the is not clear. (ICs S.1.A and S.1.U are similarly affected.) For example, does a loss of most main control room (MCR) annunciators in Unit 1 and a SIGNIFICANT TRANSIENT in Unit 2 exceed the IC? Revise the language to clarify TVA's intent and/or provide additional explanation in the bases.

k. IC 2.2.A appears to focus on an inability to *achieve* cold shutdown whereas the referenced NUMARC-007 IC SA3 focuses on an inability to *maintain* the plant in cold shutdown. Provide an explanation of the apparent discrepancy.

l. IC 2.4.U omits the site-specific radiation monitors example EAL included in the referenced NUMARC-007 IC SU4. Explain why IC 2.4.U does not a have a threshold based upon, for example, the radiation monitor typically provided on the letdown line in plants with Westinghouse nuclear steam supply system?

m. The logic in the electric power ICs 3.1.G, 3.1.S, 3.1.A, 3.1.U, 3.2.A, and 3.2.U is potentially unclear as a result of the changes made to reflect both units. For example, as addressed in RAI 2.c above, do these IC's apply to loss of power at *both* units? Also, does an event that involves a loss of offsite power to Unit 1 (EAL 1a) and a degraded onsite power capability at Unit 2 (EAL 1b) exceed IC 3.1.A? Revise the language to clarify TVA's intent and/or provide additional explanation in the bases.

n. Does the WBN design provide inter-ties between the two units such that one or more unit boards at one unit could be energized from a power source in the other unit? The same for the shutdown boards? If so, can these capabilities be credited as a means of maintaining a unit or shutdown board energized (e.g., IC 3.1.A EALs 1a or 1b)? What would be the protocol for crediting these in making classification determinations? Could a single emergency diesel generator running in one unit be credited in both units and avoid classification?

o. ICs 3.3.S, 3.3.U, and 6.3.U do not appear to have been updated for WBN Unit 2 (i.e., the buses all appear to have a Unit 1 designator (e.g., 1-I, 1-II, … I-IV)). Revise these ICs and EALs or explain why revision isn't necessary to reflect WBN Unit 2.

p. For each occurrence of Table 4-1, explain why *"Additional Equipment Buildings (Unit 1 & 2)"* shouldn't read *"Additional Equipment Buildings (Unit 1 or 2)."* Explain why unit designators are not applied to the condensate storage tank (CST) and refueling water storage tank (RWST) entries.

q. For each occurrence of Table 4-2, explain why the *"Unit 1 & 2"* designators on the reactor building and additional equipment buildings shouldn't read *"Unit 1 or 2."*

r. ICs 4.6.S and 4.6.A appear to omit the EAL *"Other security events as determined from (site-specific) Safeguards Contingency Plan*" (HS1, HA4), identified in NRC Bulletin 2005-02 (and Attachment 3 of the Nuclear Energy Institute (NEI) white paper identified in TVA's January 20, 2006, letter). Resolve these discrepancies or provide justification for their omission.

s. In ICs 5.2.A and 5.3.A, explain why the Table 5-1 *"Unit 1 & 2"* designators on the reactor building and additional equipment buildings shouldn't read *"Unit 1 or 2."* Explain why unit designators are not applied to the CST and RWST entries.

t. ICs 6.2.A and 6.2.U do not appear to have been revised for dual-unit operation as was done for ICs 3.1.G, 3.1.S, 3.1.A, 3.1.U, 3.2.A, and 3.2.U. In resolving this observation, consider the issues expressed in RAI 3.m above.

u. The NRC approved "Methodology for Development of Emergency Action Levels," NEI 99-01, Revision 5, as an acceptable alternative EAL scheme, in a letter to NEI dated February 22, 2008 (NRC Agencywide Documents Access and Management System Accession No. ML080430535). Does TVA intend to revise the EAL scheme to incorporate the enhancements in NEI 99-01, Revision 5? If so, identify your tentative timeframe for doing so.

4. In accordance with the Standard Review Plan (SRP) Chapter 13.3, "Emergency Planning," if an application is for an additional reactor at an operating reactor site, and the application proposes to incorporate and extend elements of the existing emergency planning program to the new reactor, those existing elements may be considered acceptable and adequate. The SRP directs the NRC staff to focus the review on the extension of the existing program to the new reactor. In this regard, respond to the following requests:

   a. Explain why TVA believes that the REP and Appendix C to the TVA REP is applicable and adequate to WBN Unit 2.

   b. Confirm that the NP-REP and Appendix C, as submitted on the WBN Unit 2 docket, are up-to-date.

5. Planning Standard 50.47(b)(2) requires the establishment of an emergency response organization that provides adequate staffing to provide initial facility accident response in key functional areas at all times, with provision for timely augmentation. NUREG-0654, Section II.B provides evaluation criteria for evaluating the licensee's organization for compliance with 50.47(b)(2). In May 2003, TVA proposed a change in the WBN Unit 1 staffing level and technical support center/operations support center (TSC/OSC) augmentation time. TVA responded to staff RAIs on that proposal by a letter dated May 11, 2004. The staff issued a safety evaluation (SE) accepting the proposed changes on June 24, 2004. TVA has proposed to increase the on shift staffing level to reflect WBN Unit 2 by adding an additional Unit Supervisor and an additional reactor operator, consistent with the first footnote in NUREG-0654 Table B-1. Respond to the following requests:

   a. The staff's acceptance of TVA's 2003 staffing proposal was based in part on the availability of 6-10 advanced radiation workers (ARW) to perform various radiation protection activities. Confirm that TVA's discussion in the 2003 staffing proposal, as supplemented, regarding the use of ARWs as a compensatory measure for radiation protection technicians remains correct with regard to WBN Unit 2.

   b. TVA's on-shift staffing in the 2003 staffing proposal credited the five dedicated shift fire operations personnel for providing rescue and first aid functions as well as fire fighting. Are any other on-shift staffing positions expected to be filled by these five dedicated fire operations personnel? If so, how will those functions be met if the emergency involves a fire or a rescue/first aid situation?

   c. Section 5.1, page 11 of the REP (comparable language appears in Sections 8.1.1, 8.1.2, and 8.2 of Appendix C) provides that the staffing time for the augmenting forces could vary slightly, depending on the time of day, weather conditions,

immediate availability of personnel, and radiological conditions. The SE in which the NRC approved TVA's request to increase the augmentation time from 60 minutes to 90 minutes included the following statement:

> The TSC and OSC are to be fully staffed in the expected maximum time of 90 minutes and the ERO [emergency response organization] is expected to respond immediately without delay once notified.

The NRC staff expects TVA to demonstrate this augmentation capability without regard to time of day, weather conditions, availability of personnel, and radiological conditions. Further, the staff recognizes that circumstances not under TVA's control may occasionally cause a delay in gathering the required minimum number of staff. However, a persistent inability to meet the minimum staffing within 90 minutes during drills, exercises, and actual events, for whatever cause, is a regulatory concern that warrants corrective action. TVA is requested to revise the cited language to clearly reflect the staff's expectation as stated in the SE, or to justify why such clarification is not warranted.

6. Planning standard 50.47(b)(6) requires that provisions exist for prompt communications among principal response organizations to emergency personnel. NUREG-0654 Section II.F provides evaluation criteria for this standard. Appendix C does not appear to indicate any changes in communication capabilities due to the extension of the REP and Appendix C to WBN Unit 2. Identify changes made to extend the existing communication capabilities to WBN Unit 2. Explain why the existing capabilities, as modified, are adequate to meet the needs of WBN Unit 2, as well as Unit 1.

7. Appendix E, Section VI, of 10 CFR Part 50 contains requirements for an Emergency Response Data System, or ERDS. Describe how these requirements will be met for WBN Unit 2.

8. Planning standard 50.47(b)(8) requires that adequate emergency facilities and equipment to support the emergency response be provided and maintained. NUREG-0654 Section II.H provides evaluation criteria for this standard. Appendix C does not appear to indicate any changes in equipment, facilities, and supplies due to the extension of the REP and Appendix C to WBN Unit 2. Identify changes made to extend the existing equipment, facilities, and supplies to WBN Unit 2. Explain why the existing resources, as modified, are adequate to meet the needs of WBN Unit 2 or dual-unit operation.

9. Planning standard 50.47(b)(9) requires that adequate methods, systems and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency be in use. NUREG-0654 Section II.I provides evaluation criteria for this standard. Appendix C does not appear to indicate any changes in assessment methods, systems, or equipment due to the extension of the REP and Appendix C to WBN Unit 2. Identify changes made to extend the existing assessment methods, systems, or equipment to WBN Unit 2. Explain why the existing resources, as modified, are adequate to meet the needs of WBN Unit 2 and dual-unit operation. Explain the capability of TSC, OSC, and central emergency control center (CECC) plant data displays and other assessment capabilities to simultaneously handle an emergency

event affecting both WBN Unit 1 and Unit 2 (e.g., events initiated by loss of offsite power, earthquake, tornado, flooding, or hostile actions).

10. Planning standard 50.47(b)(12) requires that arrangements be made for medical services for contaminated injured individuals. NUREG-0654 Section II.L provides evaluation criteria for this standard. Section C.6.6 of Appendix C addresses these arrangements. Reference is made in this section to a Medical Emergency Response Team (MERT). Figures 1-C, 2-C, and 3-C do not show these personnel nor does the REP or Appendix C appear to describe this team. Provide a description of the team, including its structure, number of team members, their qualification and training, their availability 24/7, and whether this is a dedicated assignment or a collateral duty. If a collateral duty, explain how the other duties assigned to these personnel are to be accomplished if the event involves the MERT.

11. Planning standard 50.47(b)(14) requires that periodic exercises and drills be conducted to develop and maintain key skills and that deficiencies identified in these exercises and drills are or will be corrected. Planning standard 50.47(b)(15) requires response training be provided to those who may be called upon to assist in an emergency. This planning standard is expanded upon in Part 50, Appendix E, Section IV.F. NUREG-0654 Sections II.N and II.O provides evaluation criteria for these standards. The REP and Appendix C do not appear to indicate any changes in drill and exercise or training programs due to the extension of the NP-REP and Appendix C to WBN Unit 2. Explain why the existing exercise and training programs are adequate to establish and maintain emergency response organization competency in responding to emergency events at WBN Unit 2 as well as at Unit 1.

12. NRC Bulletin 2005-02, “Emergency Preparedness and Response Actions for Security-based Events,” requested licensees to provide information to the NRC regarding actions taken or planned to be taken on security-based emergency classification levels and emergency action levels, emergency response organization augmentation for security-based events, accelerated NRC notifications, and onsite protective measures. TVA responded to this request via a letter dated August 16, 2005, and supplemented this response in a letter dated January 20, 2006. Enclosure 3, “Watts Bar Nuclear Plant Unit 1 Responses,” to the August 16, 2005, letter provided the requested information. In Enclosure 1 to TVA letters dated September 7, 2007, and March 20, 2008, TVA stated that the response provided for WBN Unit 1 also addressed WBN Unit 2 and that the item could be considered to be closed. The NRC staff has reviewed the WBN EAL scheme in Appendix C and observed that the requested hostile action EALs are, in fact, available for WBN Unit 1 and WBN Unit 2. However, the staff was unable to locate any discussion in the REP or Appendix C on emergency response organization augmentation for security-based events, accelerated NRC notifications, and onsite protective measures. (The staff is aware of TVA’s participation in the industry hostile action based drill initiative and has no questions related to that topic.) For example, Section C.6, “Emergency Response Facilities, Equipment, and Supplies,” is silent with regard to the availability and use of alternative facilities. Identify where the programmatic information related to emergency response organization augmentation for security-based events, accelerated NRC notifications, and onsite protective measures is located in the REP or Appendix C.