August 11, 2010

LICENSEE: Tennessee Valley Authority

FACILITY: Watts Bar Nuclear Power Plant, Unit 2

SUBJECT: SUMMARY OF AUGUST 3, 2010, MEETING WITH TENNESSEE VALLEY AUTHORITY REGARDING WATTS BAR NUCLEAR PLANT, UNIT 2, FINAL SAFETY ANALYSIS REPORT

On August 3, 2010, a meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of the Tennessee Valley Authority (TVA) at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose of the meeting was to discuss the NRC staff's questions and comments on the Watts Bar Nuclear Plant (WBN) Unit 2 Final Safety Analysis Report (FSAR) in support of TVA's application for an operating license. A list of participants is included as Enclosure 1.

TVA discussed information regarding: (1) integrated safeguards testing in FSAR Section 14, (2) radiological emergency plan (REP) in FSAR Section 13.3 including evacuation time estimates (ETEs), (3) meteorology in FSAR Section 2.3, (4) nuclear fuel design and considerations in FSAR Section 4.2, (5) overpressure protection in FSAR Section 5.2.2, and (5) limiting accidents and analysis in FSAR Section 15.3. TVA described the manner by which the onsite and offsite emergency electrical power systems were tested during the integrated safeguards test for WBN Unit 1 prior to initial licensing. TVA indicated that the WBN Unit 1 testing was done in accordance with the guidance in NRC Regulatory Guide 1.41, "Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments." TVA also stated that all electrical buses associated with the four load groups were tested at the time. Therefore, TVA plans to propose a modification to the integrated safeguards test plan to use portions of the WBN Unit 1 test instead of conducting the same testing for Unit 2. Because of the modification to incorporate a new inverter bank, TVA will have to test for the independence of the new inverters between the units. In response to a staff question, TVA stated that it would review the functional testing of associated circuits and conduct functional performance of loads. Using this approach, TVA stated that WBN Unit 1 would not need to be shut down during the testing. The NRC staff stated that since the Unit 2 loads were not imposed on the power supplies during testing of Unit 1, TVA needs to be assured that the Unit 1 test remains valid for both offsite and onsite power. Also, the NRC staff stated that TVA would have to demonstrate the capability of each common station service transformer to carry the load required to supply engineered safety feature loads on WBN Unit 2 under loss of coolant accident conditions in addition to power required for safe shutdown of WBN Unit 1.

During the review of TVA's REP and the ETE, the NRC staff requested information about the resources to handle transportation-dependent people who do not reside in special facilities. The NRC staff noted that the intent of its question was to ascertain the number of transportation dependent people and the transportation resources needed to support evacuation for residents who do not reside in special facilities. At the meeting, TVA understood the difference and agreed to provide the answer.

Regarding the area of meteorology, the NRC staff discussed a number of questions that it had on TVA's information supporting Section 2.3 of the FSAR. The specific items are detailed in Enclosure 2. TVA stated that it would respond to these items and make appropriate changes to the FSAR.

TVA described its planned approach toward answering the NRC staff's requests for additional information regarding nuclear fuel in Section 4.2 of the FSAR. The NRC staff indicated that it had one issue with the information. In NRC Information Notice 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," the NRC staff stated that some fuel thermal models do not account for the effect of degradation in the thermal conductivity of uranium fuel pellets with increasing exposure. The NRC staff stated that TVA should review this issue because it could lead to nonconservative results for thermal conductivity.

Regarding the information on TVA's analyses of various accidents and transients, the NRC staff noted that in support of FSAR Section 5.2.2, an analysis of a loss of load transient must be completed that does not credit the first safety grade actuation signal. Further, the NRC staff discussed its comments on the analysis of an inadvertent actuation of the emergency core cooling system. The NRC staff informed TVA that it needs to consider the information in NRC Regulatory Information Summary 2005-29, "Anticipated Transients That Could Develop into More Serious Events," dealing with the qualification of the pressurizer power-operated relief valves (PORVs) for water discharge and the closure of the PORV block valves. The NRC staff also stated that an analysis was required in the FSAR for a malfunction of the charging and volume control system. In addition, the NRC staff noted that the graph describing the response to a main steamline break with a loss of offsite power was terminated at 200 seconds. The NRC staff noted that the transient conditions had not yet fully stabilized at that point in time and that it appeared that there was an insufficient boron addition to control power. The NRC staff asked TVA to similarly review the results presented for other analyses to ensure that the results were not truncated early.

Please direct any inquiries to me at 301-415-1457 or Patrick.Milano@nrc.gov.

/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

Enclosures:
1. List of Attendees
2. NRC Staff Questions

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LIST OF ATTENDEES

AUGUST 3, 2010, MEETING WITH TENNESSEE VALLEY AUTHORITY

FINAL SAFETY ANALYSIS REPORT REVIEW

WATTS BAR NUCLEAR PLANT, UNIT 2

Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation Participants:

Name	Position/Title	Organization
Stephen Campbell	Branch Chief	Watts Bar Special Projects Branch (LPWB) Division of Operating Reactor Licensing (DORL)
Patrick Milano	Sr. Project Manager	LPWB\DORL
Carl Schulten	Sr. Reactor Engineer	Technical Specifications Branch Division of Inspection & Regional Support
John Huang	Mechanical Engineer	Component Performance and Testing Branch Division of Component Integrity
Leta Brown	Physical Scientist	Accident Dose Branch Division of Risk Assessment
Joshua Kaizer	Reactor Systems Engineer	Nuclear Performance and Code Review Branch (SNPB) Division of Safety Systems (DSS)
Thea Tadlock	Intern	SPNB\DSS
Andrew Proffitt	Intern	SPNB\DSS
Samuel Miranda	Sr. Reactor Systems Engineer	Reactor Systems Branch\DSS

Tennessee Valley Authority (TVA) Participants:

Gordon Arent	Licensing Manager	New Generation Development
William Crouch	Licensing Manager	TVA Watts Bar Unit 2
Peter Olson	Startup Manager	TVA Watts Bar Unit 2
Joseph Mayo	Startup Engineer	TVA Watts Bar Unit 2

NUCLEAR REGULATORY COMMISSION (NRC) STAFF QUESTIONS

SECTION 2.3, "METEOROLOGY"

WATTS BAR UNIT 2 FINAL SAFETY ANALYSIS REPORT (FSAR)

The NRC staff discussed the following questions regarding Section 2.3, "Meteorology," of the Watts Bar Nuclear Plant Unit 2, FSAR provided in Amendment No. 99. Tennessee Valley Authority agreed to provide a response to these questions, along with any supporting information, and to make the appropriate changes in an upcoming amendment to the FSAR.

Section 2.3.1.3, Severe Weather

1. The annual probability of tornadoes with winds exceeding 113 miles per hour in the vicinity of the Watts Bar site is given as 2.69×10^{-4} per square mile. NRC staff has estimated another probability based upon default information in Figure 2-2 of NUREG/CR-4461, Revision 2, "Tornado Climatology of the Contiguous United States," for the Watts Bar area. Please provide further information describing your calculation to show how the value of 2.69×10^{-4} per square mile was obtained.

2. Amendment No. 99 provides data for the 1995 through 2009 period in which high wind speeds of short duration were measured in 3-second intervals. Record high wind speeds of short duration, measured as fastest mile wind speeds that were discussed in prior FSAR amendments, were not carried forward or otherwise discussed in Amendment No. 99 and, therefore, the historic period of record presented in the FSAR may appear to be incomplete. Therefore, provide a discussion of the record historical measurements of both fastest mile and three-second gust wind speeds or reference appropriate sections in the FSAR amendment where engineering analysis demonstrates the maximum historical short duration winds speeds, whether based upon fastest mile or 3-second gust, have been considered in the design of Watts Bar, Unit 2.

3. With regard to winds equal to or greater than 50 knots reported during 1950 through 2009, how many occurrences were reported in each of the seven counties? Is each total for the entire county or were criteria applied to consider only portions of any of the counties? If criteria were applied, what is the basis for selection of the criteria?

4. With respect to hail three-fourths of an inch in diameter or larger reported during 1950 through 2009, how many occurrences were reported in each of the seven counties? Is each total for the entire county or were criteria applied to consider only portions of any of the counties? If criteria were applied, what is the basis for selection of the criteria?

5. Provide an example of how the seasonal densities of lightning flashes to ground per square kilometer were estimated from FSAR Table 2.3.1.

6. Why was the single storm snowfall record for Knoxville, Tennessee (TN) of 22.5 inches in Amendment No. 93 replaced by 15 inches in subsequent FSAR amendments? Why was the value of 22.5 inches used to calculate the weight of snow per square foot in

Amendment No. 93 retained in subsequent FSAR amendments rather than being replaced by the single storm value for Chattanooga, TN of 47 inches?

Section 2.3.2 Local Meteorology

7. Several of the historic record values for Decatur, TN in FSAR amendments prior to Amendment No. 94 appear to be more limiting than values measured in more recent years following movement of the National Oceanic and Atmospheric Administration measurement site from Decatur to Dayton, TN. However, the limiting Decatur values were not carried forward or otherwise addressed in Amendment No. 99. As a result, the summary historic record presented in the FSAR may appear to be incomplete. Therefore, in the next FSAR amendment, discuss the entire period of historic measurements. Confirm that the Decatur data were considered and that the limiting values have been identified.

8. With regard to mean temperatures, the text of FSAR Section 2.3.2.2 states that certain value ranges occurred at both of two locations, Dayton and Chattanooga, TN. Although the differences are small, information provided in FSAR Tables 2.3-2 and 2.3-3 indicate that the values cited in the text tended to occur at only one of the locations. Therefore, it would seem appropriate to modify the text in the next FSAR amendment to provide a range that includes both locations or reword to facilitate deletion of “at both locations,” as appropriate.

9. Some of the precipitation measurements made at the Watts Bar Dam site appear to be more limiting than subsequent measurements made at the Watts Bar meteorological tower site. However, the limiting Watts Bar Dam site values were not carried forward or otherwise discussed in Amendment No. 99. As a result, the summary historic record presented in the FSAR may appear to be incomplete. Therefore, in the next FSAR amendment, discuss the entire period of historic measurements. Confirm that the Watts Bar Dam site data were considered and that the limiting values have been identified.

10. The text of FSAR Section 2.3.2.2 of Amendment No. 99 states that the annual average precipitation for 1974 through 2009 was approximately 43.4 inches while Table 2.3-4 lists a slightly different value of 45.43 inches. Confirm which number is correct. Further, either number is a decrease from the 1941 through 1970 value of 52.57 inches in prior FSAR amendments. Why should 52.57 inches not be identified as the limiting value?

11. Some of the humidity data presented in FSAR Tables 2.3-10 and 2.3-11 of prior FSAR amendments appear to be more limiting than subsequent measurements reported in Amendment No. 99. However, the limiting values were not carried forward or otherwise discussed in Amendment No. 99. For example, in FSAR Table 2.3-10, the January and July values of extreme minimum relative humidity appear to be lower in previous FSAR amendments than in Amendment No. 99. In FSAR Table 2.3-11, the extreme maximum of absolute humidity appears to be lower for February and extreme minimum appears to be higher in July in Amendment No. 99 than in previous FSAR amendments. As a result, the summary historic record presented in the FSAR may appear to be incomplete. Therefore, in the next FSAR amendment, please discuss the entire period of historic

measurements. Confirm that data humidity measurements reported in prior FSAR amendments were considered and that the limiting values have been identified.

12. Reconfirm that the relevant meteorological parameters and analysis in FSAR Section 2.3, "Meteorology," were reviewed and updated, as appropriate and, that, although resolution of Items 1 through 11 above may result in changes to the FSAR, any changes associated with these items are either not sufficient to impact design assumptions or that design assumptions have been appropriately updated.

13. Please note the following for possible editorial adjustment in the FSAR and make changes as appropriate:

- Review and, as appropriate and feasible, reformat titles of tables associated with Section 2.3, "Meteorology," to clarify the listings in Section 2.3, List of Tables (pages 2-vi through 2-xii). In some cases, the title listings:

  a. appear to contain typographical errors because of apparent word processor manipulation of footnote superscripts in the actual titles,

  b. are identical to one or more other table listings because apparent word processor truncation has omitted key information due to the arrangement of the information in the actual title, and

  c. contain awkward line breaks in the title listings.

  The following are examples:

  - Tables 2.3-5, 2.3-6, 2.3-9 & 2.3-11 - superscript
  - Tables 2.3-13 & 2.3-14, and Tables 2.3-15 & 2.3-16 – truncation
  - Tables 2.3-17 through 2.3-40 - truncation, Table 2.3-32 – typographical error
  - Tables 2.3-45 & 2.3-53, Tables 2.3-46 & 2.3-54, etc. – truncation
  - Tables 2.3-61 & 2.3-61A, etc. – truncation, superscript, line breaks

  In addition, consideration should be given to editorial modification of several of the table titles to conform to common practice. For example:

  Tables 2.3-61 through 2.3-63 and 2.3-642.3-66a – capitalize "q" in X/Q
  Tables 2.3-67 and 2.3-67a – capitalize "loca"

- The first paragraph of Section 2.3.3.3 states that Tables 2.3-45 through 2.3-52 and Tables 2.3-53 through 2.3-60 summarize data measured from 1974 through 1988 and 1977 through 1988, respectively. However, the titles of the tables state that the data were measured from 1974 through 1993 and 1977 through 1993, respectively. Table 2.3-13, which references data measured from 1974 through 1988, is not mentioned in Section 2.3.3.3. Please resolve this discrepancy between the text and tables.

- Table 2.3-2: Several of the column headings are out of alignment. The footnote superscript for the Daily Mean column is shown as "3" although it appears that the

intended superscript was probably “a.” In addition, should “Highest Daily Minimum” be “Lowest Daily Minimum”?

- Table 2.3-3: Several of the column headings are out of alignment.

- Table 2.3-4: Delete “Dam” from the title if the 1974 through 2009 data were collected at the Watts Bar meteorological tower location, rather than at the Watts Bar Dam site as was done prior to 1974.

- Table 2.3-5: Are the column superscripts, “*,” intended to refer to item “b” in the footnotes? Also, does the period of record include 2001 although the reference title, Climatography of the United States, No. 20, 1971-2000, appears to cite data only through 2000?

- Table 2.3-10: Is the extreme minimum relative humidity for March 10.4 percent, rather than 1.04 percent?

- Table 2.3-11: Is the extreme annual minimum absolute humidity 0.4 percent?