



Tennessee Valley Authority, Post Office Box 2000, Spring City, TN 37381-2000

June 8, 2010

U.S. Nuclear Regulatory Commission
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Mail Stop: OWFN P1-35
Washington, D.C. 20555-0001

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

10 CFR 50.4

Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – PRELIMINARY REQUEST FOR ADDITIONAL INFORMATION REGARDING FINAL SAFETY ANALYSIS REPORT (FSAR) AMENDMENT 94, SECTION 2.3, “METEOROLOGY”

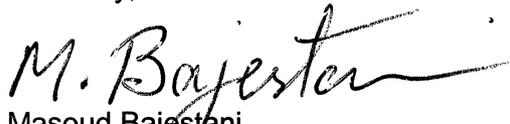
Reference: 1. NRC Facsimile Transmittal dated March 1, 2010, “Request for Additional Information, Watts Bar, Unit 2, Final Safety Analysis Report, Amendment 94, Section 2.3, Meteorology, Docket No. 50-391”

This letter responds to NRC’s Preliminary Request for Additional Information (RAI) dated March 1, 2010 (Reference 1), regarding the WBN Unit 2 FSAR Section 2.3, “Meteorology,” that was submitted in WBN Unit 2 FSAR Amendment 94. The enclosure provides the NRC questions and TVA’s responses.

There are no regulatory commitments contained in this letter. If you have any questions, please contact William Crouch at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of June, 2010.

Sincerely,


Masoud Bajestani
Watts Bar Unit 2 Vice President

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Enclosure:

Request for Additional Information – WBN Unit 2 FSAR Amendment 94, Section 2.3,
“Meteorology”

cc (Enclosure):

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ENCLOSURE

Watts Bar Nuclear Plant Unit 2 Request for Additional Information Final Safety Analysis Report, Amendment 94 Section 2.3, "Meteorology"

This enclosure provides TVA's responses to NRC's requests for additional information on TVA's WBN Unit 2 FSAR, Section 2.3, "Meteorology." Note that letters (e.g., [A], [B], etc.,) have been added for clarity.

NRC Request:

1. *Nuclear Regulatory Commission (NRC) staff noted that only some of the meteorological information in Amendment 94 appeared to be updated when compared with prior Watts Bar, Unit 2, Final Safety Analysis Report (FSAR) amendments. [A] Provide additional information regarding what criteria were used to determine which meteorological parameters and associated analyses should be updated. [B] Please provide an assessment of the Watts Bar, Unit 2, design bases and safety structures, systems and components potentially impacted by meteorological phenomena and how they could be impacted. [C] Include a discussion to confirm that all relevant meteorological parameters and analyses were examined and updated, if appropriate. This should include consideration of changes in the limiting values resulting from, 1) the addition of recently measured data to the compiled historic climate data base and, 2) resultant changes in locations that are found to be more limiting than those locations identified in prior FSAR amendments.*

TVA Response:

Item A:

During Unit 2 FSAR Amendment 94 (A94) preparation, meteorological data was only updated when later data was available. It was not recognized until questioned by the staff that an error had occurred in Section 2.3, "Meteorology," during the conversion to the Adobe Framemaker software program when a corrupted file containing 1988 data versus 1993 data was used. This error was corrected in Unit 2 FSAR A98 when the wind speed data contained in this section was reinstated to the original data in tables provided in A91 (baseline amendment for Unit 2 FSAR) on October 24, 1991. Further review by TVA, during the Unit 2 FSAR A98 preparation, identified other needed changes to this section and, as committed, was provided in Unit 2 FSAR A99 submitted to NRC on May 27, 2010. Other sections of the FSAR were reviewed to determine if any changes are needed because of revisions to Section 2.3. No changes were identified.

Item B:

Given that WBN was originally constructed as a two-unit plant, safety structures, systems and components for Unit 2 have been designed and built to withstand the meteorological parameters of the site area. Please refer to the appropriate sections of the FSAR for specific discussions of impact analyses (e.g., FSAR Sections 3.3, "Wind and Tornado Loading"; 9.2.5, "Ultimate Heat Sink"; 11.6.3, "Sampling Media Locations and Frequency"; and 15.5.3, "Environmental Consequences of a Postulated Loss of Coolant Accident", etc.).

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Item C:

As part of the preparation for updating the Unit 2 FSAR, A99, a review was performed to confirm that the relevant meteorological parameters and analysis were reviewed and updated, as appropriate. This review included consideration of changes in the limiting values resulting from: (1) the addition of recently measured data to the compiled historic climate data base, and (2) resultant changes in locations that are found to be more limiting than locations identified in prior FSAR amendments. Although the results of this review resulted in changes to FSAR Section 2.3 that were incorporated into Unit 2 FSAR A99 submitted to NRC on May 27, 2010, these changes were not sufficient to impact design assumptions.

NRC Request:

- In several cases, it appears that changes in tables were highlighted, but the text discussing the table or an analysis using the information in the table does not appear to have been revised. Provide additional information regarding what criteria were used to determine when the text should be revised, if a table had been revised. For example, NRC staff notes that the annual occurrence of fog at Oak Ridge, Tennessee (TN), as presented in Table 2.3-12 is considerably greater than suggested in the text of Section 2.3.2.2, which was not annotated with a change bar in the margin.*

TVA Response:

The general rule is that the text was revised if the information in the table was significantly changed. Otherwise, it is assumed that there was no impact from the additional information.

Changes in tables and text are described below.

Table	Discussion of Changes and Impact on Text
2.3-1	<p>Table has been updated to reflect additional information collected since 1974 (Data period is 62 years for both stations).</p> <p>Since there has been no significant change to the data, no change in text is necessary.</p>
2.3-2	<p>Table was changed from utilizing Decatur data to Dayton because the Dayton record is more current (1971-2000) (Data period is for 30 years and was the most current data available from the National Weather Service [NWS]). Decatur data ended in 1956.</p> <p>Text was revised to explain the reason for the change in the city. Also, there is one occasion where "Decatur" is used instead of "Dayton," because it was inadvertently not updated in Unit 2 FSAR A94. This editorial error was correct in Unit 2 FSAR A99.</p>

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Table	Discussion of Changes and Impact on Text
	Also, Figure 2.3-3 (Refer to Attachment to this Enclosure) was revised to add Dayton. Decatur was retained in the figure to show that Dayton is equivalent (with respect to distance).
2.3-3	Table was changed to reflect a new data period (1971-2000) (Data period is for 30 years and was the most current data available from the NWS) for the normals and a longer period for extreme values (82 years for Mean Daily Maximum and Minimum temperature data and 70 years for the Highest Daily Maximum and Lowest Daily Minimum Temperature Data). Some minor changes were incorporated into the FSAR to match the numbers in the text with the numbers in the tables.
2.3-4	Table has been replaced to use precipitation data from WBN meteorological tower (Met tower). Data has been collected for more than 30 years and can be considered as climate data. Text has been revised appropriately in Unit 2 FSAR A99.
2.3-5	In Table 2.3-5, Decatur has been replaced by Dayton and more current data is being used. The revised table includes information for 1956-2001 (which was the most current data available from the NWS). Text was revised to reflect that Decatur has been replaced by Dayton in Unit 2 FSAR A99, since Dayton's data are more current.
2.3-6	Table 2.3.6 has been updated to reflect additional data since 2008. Period of record has been clarified. Minor text revisions were made in Unit 2 FSAR A99 to reflect latest information.
2.3-7	Table 2.3.7 has been updated to reflect both original data and additional data since 2008. Text has been revised in Unit 2 FSAR A99 to state table shows no significant changes in humidity characteristics.
2.3-8 & 2.3-9	Information is old and cannot be easily updated. Text revised in Unit 2 FSAR A99 to state that data are still valid since Table 2.3-7 shows no significant changes in humidity characteristics.
2.3-10 & 2.3-11	Tables have been updated to include the longer data history for WBN. No change in text is necessary.

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Table	Discussion of Changes and Impact on Text
2.3-12	Table has been updated to reflect latest information from NCDC (National Climatic Data Center, http://lwf.ncdc.noaa.gov/oa/ncdc.html). No change in text is necessary.

NRC Request:

3. *[A] In several cases, it appears that the period of record for extreme values had been changed to a more recent period, rather than appending the more recent period to the longer historic period cited in prior FSAR amendments. [B] Provide additional information regarding what criteria were used to determine which historic extreme weather data should be removed from consideration rather than using the entire historic period of record.*

TVA Response:

Item A:

Data periods were extended to include both old and new information to capture the extreme information identified in the source reference (i.e., local climatological data reports for the various sites) for the following tables:

- Table 2.3-1 -- This table, which does not include extremes, was updated to include an additional year of data.
- Table 2.3-3 -- This table was updated to reflect more recent reference information and to clarify the data periods specified in the reference source.
- Table 2.3-6 -- This table was updated to clarify the periods of record and to include all available appropriate data from the source references.
- Tables 2.3-10 and 2.3-11 -- These tables were updated to include additional data from the WBN Met Tower.

Data periods were not extended for the following tables:

- Tables 2.3-2 and 2.3-5 -- The local cooperative observer station was changed from Decatur to Dayton in 1956. Since Dayton now has more than 30 years of data; it is considered a climatic record. Decatur was dropped because those data are not current (before 1956).

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- Table 2.3-4 -- This table includes data from a new location (WBN Met Tower replaced Watts Bar Dam). Because more than 30 years of data are available from the Met tower, it is considered a climatic record. Also, more recent data from the Watts Bar Dam are available only as daily (but not hourly) totals, so similar statistics cannot be determined.
- Table 2.3-7 -- The information in this table reflects data as presented in the official NCDC summary for Chattanooga. The latest NCDC summary presents data only for the most recent 30 years. Because these data are more current and have no significant differences from the previous information, the older data was replaced.
- Tables 2.3-8 and 2.3-9 -- The original information was calculated from individual observations. These tables are still valid, because there was no significant difference from the previous relative humidity data (based on Table 2.3-7).
- Table 2.3-12 -- The information in this table reflects data as presented in the official NCDC summaries for Chattanooga, Knoxville, and Oak Ridge. A change in the observation method resulted in a significant increase in the number of fog days for Oak Ridge. Specifically, in 1998, an automated observing station replaced visual observations at Oak Ridge. Because of this disparity, the official NCDC summary now includes only the period of automated observations (10 years). The data for Chattanooga and Knoxville did not have the same disparity, so the official NCDC summary includes both visual and automated data.

Item B:

Criteria were not utilized to remove extreme weather data, since the extreme weather data that was inadvertently deleted in Unit 2 FSAR A94 was restored in Unit 2 FSAR A99.

NRC Request:

4. *In Section 2.3.1.3, the period of record of the single tornado occurrence in Rhea County in which Watts Bar, Unit 2, is located has been updated. However, it appears that the reference citation does not include the full period discussed in the text. Further, calculation of the probability that a tornado will strike the Watts Bar site is based on data of tornado occurrence between 1950 and 1986 in a 30 nautical mile radius area centered at the onsite meteorological tower and the track of the single tornado that is recorded to have occurred in Rhea County. Please provide additional information describing whether the analysis in Amendment 94 is limiting with respect*

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to reported tornado occurrences subsequent to 1986 and areas neighboring Rhea County.

TVA Response:

Unit 2 FSAR A99 contained an improved tornado frequency discussion that included tornado information from the Morristown (http://www.srh.noaa.gov/mrx/?n=mxr_tornado_db) and Nashville (<http://www.srh.noaa.gov/ohx/?n=tornadodatabase>) NWS web sites that include tornado listings by county. The neighboring counties included are: Cumberland, Bledsoe, Hamilton, McMinn, Meigs, and Roane Counties. Data pertaining to those portions of each county that are within the 30 mile radius of the plant was reviewed to identify tornado occurrences during 1950 to 2009. Data prior to 1950 was not used because the climatological data is not complete. TVA has reviewed the tornado occurrences data since 1986 for Rhea County and surrounding counties and updated the FSAR in Unit 2 FSAR A99 to reflect the new data.

Further, the probability of occurrences was re-calculated based on NUREG/CR-4461, Rev. 2 (published in 2007), and the results were incorporated into Unit 2 FSAR A99.

NRC Request:

5. *Updated wind speed values for high winds in Section 2.3.1.3 refer to the fastest mile of wind, but the data in the references cited in the section 2.3.1.3 text are reported as 3-second gust wind speeds. Please discuss this apparent discrepancy. How does the more recent data provided in Amendment 94 compare with the historic fastest mile wind speed data in prior FSAR amendments.*

TVA Response:

Fastest-mile wind speeds are preferred for many engineering calculations. However, NWS stopped collecting this information when the observation system was automated. Conversion tables have been published in various engineering standards. The following table is based on Annex L of ANSI/TIA-222-G, "Structural Standard for Antenna Supporting Structures and Antennas."

3-sec gust (mph)	Fastest-mile		10-min avg. (mph)	Hourly mean (mph)
	Wind speed (mph)	Averaging period (sec)		
60	50	72	42	40
70	58	62	49	46
80	66	55	56	53
85	70	51	59	56
90	75	48	62	60

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3-sec gust (mph)	Fastest-mile		10-min avg. (mph)	Hourly mean (mph)
	Wind speed (mph)	Averaging period (sec)		
95	78	46	66	63
100	80	45	69	66
105	85	42	73	70
110	90	40	76	73
115	95	38	80	76
120	100	36	83	79

Text was modified to replace fastest mile with 3-second gust.

NRC Request:

6. Section 2.3.2.2 states that the mean minima temperature for both Chattanooga and Dayton, TN, ranged from about 24°F to about 74°F for Dayton and 75°F for Chattanooga based upon data measure between 1971-2000. [A] How do values in Tables 2.3-2 and 2.3-3 support these estimates? [B] With regard to extreme minima temperature values recorded in the Watts Bar area, NRC staff noted that measurements made at three other National Oceanic and Atmospheric Administration (NOAA) Climate Division TN 1 locations, Knoxville, Sevierville, and Tazewell, TN, were reported as -24°F in NOAA "Climatology of the United States No. 20," summaries. This value is more limiting than the -15°F minima cited for Dayton in Table 2.3-2. Given that these locations are all within Climate Division TN 1, please describe why the use of the Dayton minima is acceptable although it has been exceeded [by] at least three other locations in the same climatic region as Dayton.

TVA Response:

Item A:

Prior to revising the FSAR, the data in these tables did not match the numbers in the FSAR text. This inconsistency was corrected in Unit 2 FSAR A99 by updating Tables 2.3-2 and 2.3-3 to include the latest available climatological data and then updating the affected numbers in the FSAR text to agree.

Item B:

Dayton was selected because it is both the closest site (approximately 15 miles to the SW) with suitable data and is located in the same river valley as WBN. The other locations are much more distant from WBN (Knoxville = 45 miles, Sevierville = 70 miles, Tazewell = 90 miles). Further, while WBN, Dayton, and Sevierville are all located in river valleys and have similar elevations (WBN = 720 feet MSL, Dayton = 865 feet MSL, Sevierville = 899 feet MSL), Sevierville is located in a different river valley with the terrain of a markedly different orientation that affects monitoring site

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exposure. The other two locations are at higher elevations (Knoxville = 962 feet MSL and Tazewell = 1,365 feet MSL) in terrain that is markedly dissimilar from WBN.

NRC Request:

7. *Please note the following editorial clarifications and make changes as appropriate.*

- *It appears that the reference to "Decatur" in Section 2.3.2.2 should be "Dayton," based on information provided in Table 2.3-2.*

TVA Response:

Agreed. Table has been revised in Unit 2 FSAR A99 to reference "Dayton" instead of "Decatur."

- *The reference list and/or citation in the text may not have been properly updated in all cases. For example, the discussion of tornadoes in Section 2.3.1.3 states that data from 1916-2008 were considered, but the latest date of the three listed references is 1989. Reference 12 regards climatic data at Dayton, TN, but the citation in Section 2.3.1.3 discusses Chattanooga and Knoxville, TN.*

TVA Response:

References have been updated in Unit 2 FSAR A99 to reflect information presented in section.

- *In Table 2.3-1 the December, January and February thunderstorm day frequency values for Knoxville appear to be printed on a single line, with no entries on the lines for January and February. Also, is the footnote reference to Knoxville, TN, data essentially the same as for the Chattanooga, TN, data except for Knoxville?*

TVA Response:

Agreed. Table, including footnotes has been corrected in Unit 2 FSAR A99.

- *One or more of the values cited in Tables 2.3-5 and 2.3-6 appear to be different than values given in the cited references.*

TVA Response:

Agreed. Tables have been updated in Unit 2 FSAR A99.

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- [A] *The period of record for the data in Table 2.3-7 appears to be the 30 year normal for 1971-2000 rather than 1979-2008. [B] What reference does the superscript "b" footnote?*

TVA Response:

Item A:

Agreed. Table has been corrected in Unit 2 FSAR A99.

Item B:

The superscript "b" footnote description (i.e., "b. Period of record, 1931 - 1974") was deleted as part of the Unit 2 FSAR A94 update, but the reference "b" was inadvertently left in the heading. This reference "b" was subsequently deleted from the heading in Unit 2 FSAR A99.

- *Table 2.3-12 provides two periods of record for each of three locations, a 30-year interval from 1979-2008 and a second period of record of a specified number of years (e.g., 45 years). Provide addition information to explain how these two periods of record are correlated for each location when they appear to be of different durations.*

TVA Response:

Table has been revised in Unit 2 FSAR A99 to clarify the period of record for each site.

ATTACHMENT

**Watts Bar Nuclear Plant Unit 2
Request for Additional Information
Final Safety Analysis Report, Amendment 94
Section 2.3, "Meteorology"**

FIGURE 2.3-3

**CLIMATOLOGICAL DATA SOURCES
IN
AREA AROUND WATTS BAR SITE**

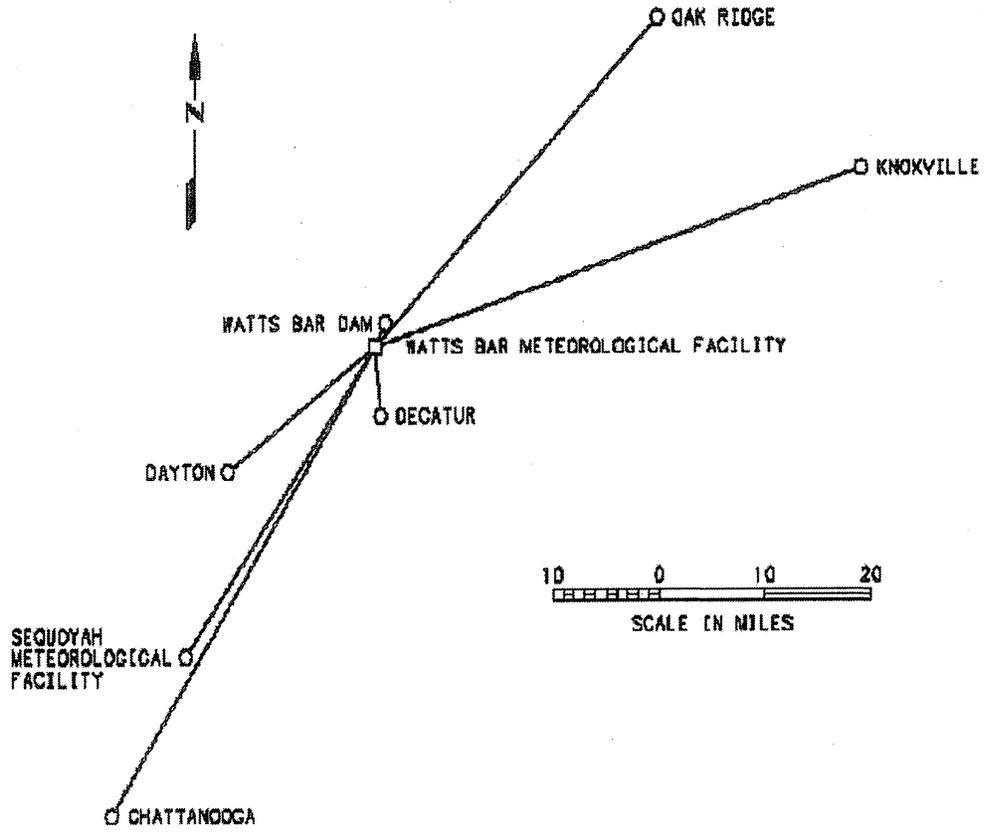


Figure 2.3-3 Climatological Data Sources in Area Around Watts Bar Site