CCNPP3COLA PEmails

From: Arora, Surinder
Sent: Thursday, September 17, 2009 4:52 PM
To: Poche, Robert; Jennifer.McQueeney@unistarnuclear.com; michael.stevenson@unistarnuclear.com
Cc: CCNPP3COL Resource; Mazaika, Michael; Lauron, Carolyn; Colaccino, Joseph; Biggins, James; Vrahoretis, Susan; Hair, Christopher
Subject: FINAL RAI No. 152 RSAC 2797
Attachments: FINAL RAI 152 RSAC 2797.doc

Rob,

Attached please find the subject request for additional information (RAI). A draft of this RAI was provided to you on September 1, 2009. No clarification phone call was requested on this RAI.

The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a schedule date for submitting your technically correct and complete response will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the review schedule.

Your response letter should also include a statement confirming that the response does or does not contain any sensitive or proprietary information.

Thanks

SURINDER ARORA, PE
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From: Arora, Surinder

Created By: Surinder.Arora@nrc.gov

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Return Notification: No
Reply Requested: Yes
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Request for Additional Information No. 152 (eRAI 2797)

9/17/2009

Calvert Cliffs Unit 3
UniStar
Docket No. 52-016
SRP Section: 02.03.01 - Regional Climatology
Application Section: 2.3.1.2.2.16

QUESTIONS for Siting and Accident Conseq Branch (RSAC)

02.03.01-28

The Staff agrees with the response to RAI Question No. 02.03.01-12 for the COL FSAR, submitted on October 30, 2008 (ML083100776), regarding the proposed deletion of the 2% exceedance dry- and wet-bulb temperatures from the discussion in COL FSAR Section 2.3.1.2.2.16 and COL FSAR Tables 2.3-10, 2.3-11, 2.3-13, 2.3-14, and 2.3-15.

However, the Staff has a general concern over the inclusion of what appears to be information and data without a discussion that establishes its relevance to the design of the heating, ventilation, and air conditioning systems for safety-related and/or other structures, systems, and components at the CCNPP3 site.

Therefore, in order to fully resolve the Staff's concern, the Applicant should explain the relevance of the extreme annual design wind speed, extreme annual maximum and/or minimum wet- and dry-bulb temperature data, and 10-, 20- and 50-year return interval extreme maximum and minimum dry-bulb temperatures presented in Table 2.3-12. If retained, revise Section 2.3.1.2.2.16 accordingly: otherwise, delete Table 2.3-12 as well.

02.03.01-29

The Staff considered the response to RAI Question No. 02.03.01-12 for the COL FSAR, submitted on October 30, 2008 (ML083100776), in particular revised Paragraph 2. Among other things, revised Paragraph 2:

- presents revised 1% exceedance maximum dry-bulb and coincident wet-bulb temperatures and a revised 1% exceedance minimum dry-bulb temperature for the hottest and coldest months, respectively;
- presents 0% exceedance maximum dry-bulb and coincident wet-bulb temperatures; and
- makes a statement that the design values in U.S. EPR FSAR Table 2.1-1 bound these calculated values for the Calvert Cliffs Unit 3 site.

Nevertheless, the Staff cannot tell what the maximum and minimum dry- and/or wet-bulb temperature design (site parameter) values in the U.S. EPR FSAR (including Table 2.1-1) represent statistically, or whether the corresponding site characteristic values were developed on the same basis. As a result, the Staff cannot conclude if the temperature-related site parameters in the U.S. EPR envelope the CCNPP3 site characteristics.

Therefore, to fully resolve these concerns, the Applicant should address the following technical issues:

(a) The 1% exceedance maximum dry-bulb and coincident wet-bulb site characteristic temperatures are said to be associated with the hottest month (July). This brings into question whether the design values (site parameters) in U.S. EPR FSAR Table 2.1-1 represent percent exceedances on a monthly, seasonal, or annual basis. Provide supplemental information to clarify COL FSAR Section 2.3.1.2.2.16 and COL FSAR Table 2.0-1 as to whether the U.S. EPR maximum 1% exceedance (design) values represent monthly, seasonal, or annual exceedances. Confirm that these site parameters and the corresponding site characteristic values have been developed on the same basis.

(b) The 1% exceedance minimum dry-bulb site characteristic temperature is said to be associated with the coldest month (i.e., December).

- Resolve the discrepancy between the "coldest month" as specified in revised Paragraph 2 and as defined and indicated (i.e., January) in the 2005 ASHRAE Handbook summary for the Patuxent River Naval Air Station, in the National Climatic Data Center's Climatography of the United States (No. 81) for that station, and in COL FSAR Tables 2.3-56 and 2.3-64 based on onsite and offsite meteorological data. If necessary, recalculate the 1% exceedance minimum dry-bulb temperature and revise COL FSAR Section 2.3.1.2.2.16 accordingly.
- As above, this brings into question whether the design value (site parameter) in U.S. EPR FSAR Table 2.1-1 represents a percent exceedance on a monthly, seasonal, or annual basis. Provide supplemental information to clarify COL FSAR Section 2.3.1.2.2.16 and COL FSAR Table 2.0-1 as to whether the U.S. EPR minimum 1% exceedance (design) value represents a monthly, seasonal, or annual exceedance. Confirm that this site parameter and the corresponding site characteristic values have been developed on the same basis.

(c) COL FSAR Table 2.0-1 is intended to compare design (site parameter) values against site characteristic values. Table 2.0-1 identifies the temperature-related site parameter values from U.S. EPR FSAR Table 2.1-1, but <u>does not</u> provide corresponding site characteristic values except for a questionable 0% exceedance minimum dry-bulb temperature (i.e., 31.8 ^{o}F).

- The same issues identified in (b) above for the 1% exceedance minimum dry-bulb temperature apply to the reported 0% exceedance minimum dry-bulb temperature. If necessary, recalculate the 0% exceedance minimum dry-bulb temperature and revise COL FSAR Section 2.3.1.2.2.16 accordingly.
- If applicable to the design of safety-related and other heating, ventilation, and air conditioning (HVAC) systems, specify in COL FSAR Section 2.3.1.2.2.16, as applicable, the 0% and 1% exceedance non-coincident site characteristic wet-bulb temperatures and the 0% exceedance site characteristic minimum dry-bulb temperature.
- Update COL FSAR Table 2.0-1 with the 0% and 1% exceedance dry- and/or wet-bulb site characteristic temperatures.

- If any of the 0% or 1% exceedance dry- and/or wet-bulb temperatures are also related to the design of the Ultimate Heat Sink (UHS), ensure consistency with the values presented in revised COL FSAR Section 2.3.1.2.2.13.
- Explain the criteria used to conclude that the various design (site parameter) values, as individual dry- or wet-bulb temperatures or as dry- and wet-bulb temperature pairs, bound the corresponding site characteristic values. For example, is a site characteristic dry- or wet-bulb temperature expected to be higher or lower than the corresponding design (site parameter); for a site characteristic dry- and wet-bulb temperature pair, do both the dry- and wet-bulb site characteristic values need to be bounded by the corresponding U.S. EPR site parameter values, is one parameter more applicable to the design of a given system, or is the site characteristic wet-bulb depression expected to be greater or less than the corresponding design wet-bulb depression?

(d) Consistent with the guidance in Reg. Guide 1.206, Section C.I 2.3.1.2, Paragraph 2 (Sent. 2), provide cross-references from COL FSAR Section 2.3.1.2.2.16 to the specific COL and/or U.S. EPR FSAR sections where these temperature conditions are used.

02.03.01-30

The Staff considered the response to RAI Question No. 02.03.01-12 for the COL FSAR, submitted on October 30, 2008 (ML083100776), regarding the assumption that the "use of a 30 year data set is considered to represent a sufficient period of data to capture cyclical extremes based on established NRC guidance". The Staff disagrees with this premise, as applied to the design of heating, ventilation, and air conditioning (HVAC) systems that support safety-related structures, systems, and components at the CCNPP3 site, for several reasons:

- Reference to NUREG-0800, SRP Section 2.3.1, SRP Acceptance Criterion (5) and to Reg. Guide 1.27 (Ultimate Heat Sink for Nuclear Power Plants), Regulatory Position (C.1.b) applies to the design of the Ultimate Heat Sink whereas the information in COL FSAR Section 2.3.1.2.2.16 addresses site parameters and site characteristics related to the design of HVAC systems.

- The regulation at 10 CFR 52.79(a)(1)(iii) requires, in part, a COL application to include information on the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and time in which the historical data have been accumulated.

  Temperatures based on a 100-year return period are considered by the Staff to provide this "sufficient margin" to account for situations where the historical data used to characterize a site may not adequately capture cyclical climatic events. The 100-year return period is consistent with the recurrence intervals to be considered in the evaluation of site characteristic extreme wind conditions and snow loads on safety-related structures (which are also addressed under SRP Section 2.3.1). Furthermore, if a representative historical temperature observation in the site area exceeds the estimated 100-year return period value, then the historically reported value represents the applicable site characteristic.

Given the basis in regulation and regulatory guidance for considering 100-year return period climate-related site characteristics, in order to fully resolve this concern the Applicant should address the following technical issues and update COL FSAR Section 2.3.1.2.2.16 (Paragraph 3) and Table 2.0-1 accordingly:

(a) Based on the same 30-year period of record for the Patuxent River NAS used to calculate the 0% and 1% exceedance dry- and/or wet-bulb temperatures reported in revised Section 2.3.1.2.2.16, estimate the following 100-year return period site characteristic values - the maximum and minimum dry-bulb temperatures, the non-coincident maximum wet-bulb temperature, and the maximum wet-bulb temperature coincident with the 100-year return period maximum dry-bulb temperature.

(b) Explain how the maximum wet-bulb temperature coincident with the 100-year return period maximum dry-bulb temperature is determined.

02.03.01-31

The Staff considered the response to RAI Question No. 02.03.01-12 for the COL FSAR, submitted on October 30, 2008 (ML083100776), in particular revised Paragraphs 3 and 4. Among other things, revised Paragraph 4, states that:

- "reliable, sequential hourly meteorological data does not exist for the duration of 100 years"; and
- the "use of extrapolated maximum/minimum 100 year return period temperature values would be overly conservative and exceed any recorded values in the available 30-year Pax River NAS data set".

In Paragraph 4, regarding the statement that extrapolated maximum/minimum 100-year return period values would be overly conservative, the basis in regulation and regulatory guidance for the applicability of such 100-year return period site characteristic temperatures is explained in the previous question.

Therefore, in order to fully resolve the Staff's concerns regarding revised Paragraphs 3 and 4, the Applicant should address the following technical issues by updating COL FSAR Section 2.3.1.2.2.16 accordingly:

(a) Explain the relevance of the parenthetical statement "(in this case the 50-year values of 103.4 ^{o}F and -5.9 ^{o}F)", in revised Paragraph 3, to the equation used to estimate 100-year return period site characteristic temperature values. If not relevant, then delete the parenthetical statement.

(b) In revised Paragraph 4, the statement that "[r]eliable, sequential hourly meteorological data does not exist for the duration of 100 years" is not in proper context. The Staff does not disagree with the statement per se. However, the equation for determining n-year return period temperature values is not constrained to operate on sequential hourly data; rather it takes into consideration the set of extreme annual maximum or minimum temperatures for each year in the period of record being evaluated. Therefore, the use of hourly data should, in general, only be relevant to estimating the 100-year return period wet-bulb temperature (non-coincident) and the

wet-bulb temperature that is coincident with the 100-year return period maximum dry-bulb temperature.

(c) In revised Paragraph 4, the statement that "100 year return period temperature values would…exceed any recorded values in the available 30-year Pax River NAS data set" appears to be inaccurate. The calculated 100-year return period maximum and minimum dry-bulb temperatures in revised Paragraph 3 of COL FSAR Section 2.3.1.2.2.16 (i.e., 104.6 ^{o}F and -9.1 ^{o}F, respectively), based on 20 years of data from the Patuxent River Naval Air Station (NAS), have been exceeded by temperature records set at other nearby cooperative observing stations.

Based on an independent review of the National Climatic Data Center (NCDC) TD3200/3210 (Surface Summary of the Day) data files and information available on-line from the Southeast Regional Climate Center (SERCC) for the State of Maryland at http://www.sercc.com/climateinfo/historical/historical.html, the Staff identified an historic maximum dry-bulb temperature of 106 ^{o}F recorded on July 21, 1930 at the Cambridge Water Treatment Plant (about 22 miles from the Calvert Cliffs site). An historic minimum dry-bulb temperature of -14 ^{o}F was recorded on January 11, 1942 at the Blackwater Refuge observing station (about 17 miles from the Calvert Cliffs site).

In determining whether an extreme maximum or minimum dry-bulb temperature may be reasonably expected to occur at the Calvert Cliffs site, the Staff cautions that the observations considered should not be limited to those recorded only in Calvert County. Reg. Guide 1.206, Section C.I.2.3.2.1, Paragraph 1 and NUREG-0800, SRP Section 2.3.1, Section I (Areas of Review), Item 1, call for these conditions to be addressed for the site region which nominally includes the area within 50 miles of the site. The Staff also cautions that proximity of an observing station to a large water body does not always result in extreme minimum temperatures higher than, or conversely, extreme maximum temperatures lower than those recorded at other nearby stations located farther inland.

Nevertheless, the Staff recognizes the varying topography within 50 miles of the site and that the area covered within this radius may be too large, in this case, for identifying representative dry-bulb temperature extremes given the site's location adjacent to the Chesapeake Bay. The Staff also acknowledges that the number of observing stations with representative concurrent dry- and wet-bulb temperature data may be limited. Therefore, the Applicant should:

- expand the area used to characterize the occurrence of extreme temperature events beyond Calvert County, MD (e.g., within about 25 miles of the Calvert Cliffs site);
- identify any historical maximum or minimum dry-bulb temperatures that exceed the corresponding 100-year return period site characteristic values; and
- reconcile any site characteristic 100-year return period dry- and/or wet-bulb temperatures or any historical maximum or minimum dry-bulb site characteristic temperatures that exceed the 0% exceedance maximum dry-bulb and coincident wet-bulb temperature pair, the 0% exceedance non-coincident wet-bulb temperature, and/or the 0% exceedance minimum dry-bulb temperature site characteristic values and update COL FSAR Section 2.3.1.2.2.16 (Paragraph 3 and 4) and Table 2.0-1 accordingly.

02.03.01-32

The Staff evaluated the responses to RAI Question No. 02.03.01-13 for the COL FSAR, submitted on October 30, 2008 (ML083100776). RAI Question No. 02.03.01-13 raises a number of issues related to the determination, reporting, and applicability of site characteristic and design (site parameter) dry- and wet-bulb temperatures, including:

- the bases for the 0% and 1% exceedance site characteristic dry- and/or wet-bulb temperatures in COL FSAR Table 2.0-1;
- the basis for the maximum 0% exceedance U.S. EPR site parameter dry-bulb and coincident wet-bulb temperatures;
- the rationale for considering the 0% exceedance dry- and wet-bulb temperatures, based on 30-years of data, to be sufficient compared to the more conservative 100-year return period temperatures;
- the absence of 1% exceedance site characteristic dry-and wet-bulb temperatures from COL FSAR Table 2.0-1; and
- the identification of structures, systems, and components, and reference to corresponding FSAR section(s), that rely on the 1% exceedance temperature information.

In some cases, similar technical issues have already been raised as a result of the Staff's evaluation of the responses to RAI Question Nos. 02.03.01-8 and No. 02.03.01-12. In order to fully resolve the Staff's concerns, the Applicant should address the following issues and provide additional clarification (as required) as indicated below or as referenced to these other related RAI questions:

(a) The acceptability of the responses to sub-questions (1a) and (1b) under RAI Question No. 02.03.01-13 are dependent on the resolution of the follow-up questions based on the Staff's evaluation of the responses to RAI Question No. 02.03.01-8 and/or No. 02.03.01-12. See the evaluation of the responses to those RAI questions for the technical issues to be resolved.

(b) Paragraph 1 of the response to sub-question (2) cross-references the response to RAI Question No. 02.03.01-12 regarding "the appropriateness of the use of the recorded 30-year data set versus the use of an extrapolated 100-year return period temperature". The Staff disagrees with that part of the response to RAI Question No. 02.03.01-12. See the evaluations of the response to RAI Question No. 02.03.01-12 for the basis in regulation and regulatory guidance for the applicability of such 100-year return period site characteristic temperatures and for the follow-up technical issues to be resolved.

(c) Paragraph 2 of the response to sub-question (2) concludes that Colonial Beach, VA is not representative of the CCNPP site (with respect to an historic observed maximum temperature value of 109 ^{o}F at that station). The Staff accepts the statement that Colonial Beach is not representative of the CCNPP site, at least with respect to recorded extreme maximum temperatures.

(d) Paragraph 1 of the response to sub-question (3a) states that "Table 2.0-1 has been revised in response to RAI 2.3.1-8 to include the site-specific calculated temperature values". However, the Staff notes that Table 2.0-1 as presented in Revision 4 of the

COL Application for Calvert Cliffs Unit 3 (ML090860073), does not include any such revisions.

(e) Regarding the paragraph that precedes the response to sub-question (3b) and that discusses how the 0% exceedance dry- and coincident wet-bulb temperatures and the maximum wet-bulb temperature observed at Patuxent River Naval Air Station were used in the design of the Ultimate Heat Sink cooling tower, see the evaluations of the response to RAI Question No. 02.03.01-8 for the technical issues to be resolved.

(f) Regarding the response to sub-question (3b), consistent with the guidance in Reg. Guide 1.206, Section C.I.2.3.1.2, Paragraph 2 (Sent. 2), provide cross-references from COL FSAR Section 2.3.1.2.2.16 to the specific COL and/or U.S. EPR FSAR sections where the identified structures, systems, and components are designed to the 1% exceedance temperature information.

(g) Additional confusion with the contents in COL FSAR Table 2.0-1 appears to be due to the use of similar terminology. The column labels in COL FSAR Table 2.0-1 read as follows: “U.S. EPR FSAR Design Parameter Value/Characteristic” and “CCNPP Unit 3 Design Parameter Value/Characteristic”. To help minimize further confusion, revise the second column label to read “CCNPP Unit 3 Site Characteristic Value”.