Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

January 27, 2009

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of) Docket No. 52-014 and 52-015
Tennessee Valley Authority)

BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – REGIONAL CLIMATOLOGY

References: 1) Letter from Ravindra Joshi (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 133 Related to SRP Section 2.3.1 for the Bellefonte Units 3 and 4 Combined License Application, dated November 3, 2008

2) Letter from Andrea L. Sterdis (TVA) to Document Control Desk (NRC), Response to Request for Additional Information – Regional Climatology, dated December 3, 2008

This letter provides the Tennessee Valley Authority's (TVA) revised response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) item 02.03.01-12 included in Reference 1.

A response to the NRC request in the subject letter is addressed in the enclosure which also identifies any associated changes that will be made in a future revision of the BLN application.

If you should have any questions, please contact Tom Spink at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7062, or via email at tespink@tva.gov.

D085
NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 27th day of Jan, 2009.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
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Enclosure
cc: See Page 3

cc: (w/Enclosure)
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Enclosure
TVA letter dated January 27, 2009
RAI Responses

Responses to NRC Request for Additional Information letter No. 133 dated November 3, 2008
(6 pages, including this list)

Subject: Regional Climatology in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.03.01-012	December 3, 2008; Revised by this letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
None	

NRC Letter Dated: November 3, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.01-12

This question is related to the applicant's response to RAI 02.03.01-08.

(a) Update Bellefonte Air Temperature Site Characteristics, FSAR Table 2.0-201 as follows.

• The BNL site characteristic values to be compared with the AP1000 maximum safety and minimum safety air temperature site parameter values should be either 100-year return period values or historic extreme values, whichever are bounding.

• The BNL site characteristic values to be compared with the AP1000 maximum normal and minimum normal air temperatures site parameter values should be 1% and 99% seasonal exceedance values.

10 CFR 52.79(a)(1)(iii) states in part that COL applications must identify 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 and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. Temperatures based on a 100-year return period are considered to provide sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated as required by the regulation. The maximum normal and minimum normal air temperature site parameter values are 1% and 99% seasonal (not annual) exceedance values, respectively, as discussed in Footnote (b) to Revision 17 to AP1000 DCD Tier 2 Table 2-1.

(b) Clarify whether the BNL 100-year return period coincident wet bulb site characteristic value of 71 °F is a maximum coincident value or a mean coincident value.

The BNL 100-year return period coincident wet bulb site characteristic value should be the maximum (not the mean) value extrapolated from historic data in order to be consistent with the Westinghouse data definition of 0% exceedance maximum coincident wet bulb temperature provided in the response to RAI 02.03.01-08. If the 71 °F is a maximum coincident value, it does not appear to be conservative. See attached chart.

BLN RAI ID: 2745

BLN RESPONSE:

As noted by the RAI, the following discussion supplements the response to RAI 02.03.01-08 (BLN RAI ID 378). To avoid duplication, this RAI response and the following revision details are based on the changes defined in RAI response 378 (which has been incorporated into an application update).

a) The previous BNL 100-year return period dry bulb and coincident wet bulb values were re-evaluated based on a revised calculational methodology as described below. The resulting updated 100-year return period values bound the 0% exceedance historic values. As a result, both FSAR Table 2.0-201 and the text in FSAR Subsection 2.3.1.3.1 are updated to incorporate the 100-year return values. In addition, FSAR Tables 2.0-201 and 2.0-203 are updated to list the seasonal 1% and 99% exceedance values for comparison with the AP1000 DCD maximum normal and minimum normal air temperatures.

b) Because the maximum 100-year return period dry bulb temperature is a calculated value, there are no occurrences of maximum dry bulb temperatures to pair with coincident wet bulb temperatures. In order to calculate a 100-year return period coincident wet bulb temperature, the 35-year sequential hourly meteorological data set for the Huntsville, AL NWS station was used to develop a dry bulb to coincident wet bulb correlation curve. The maximum measured coincident wet bulb temperature was

conservatively correlated with each dry bulb temperature, in 1° F dry-bulb temperature increments. The range of measured dry bulb temperatures used to develop this correlation was limited to those dry bulb temperatures with greater than five occurrences over the 35-year hourly meteorological data set (-1° F to 102° F). This occurrence threshold was established to prevent extremely limited data occurrences from inaccurately weighting the dry bulb to coincident wet bulb correlation. The resultant 100-year return period maximum dry bulb and coincident wet bulb temperature are 107.7° F and 79.6° F, respectively. The 100-year non-coincident maximum wet bulb temperature was determined to be 83.5° F.

In addition to FSAR Subsection 2.3.1.3.1, the 100-year return maximum dry bulb temperature of 107.7° F and the coincident wet-bulb temperature of 79.6° F are incorporated into FSAR Table 2.0-201 and Table 2.0-203.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

1. COLA Part 2, FSAR Chapter 2, Table 2.0-201, Air Temperature entries for the Site Characteristic will be revised from:

Maximum Safety[(b)]	104°F dry bulb / 73°F coincident wet bulb (0 % exceedance)
	82°F wet bulb (noncoincident) (0 % exceedance)
Minimum Safety[(b)]	-9°F (100% exceedance)
Maximum Normal[(c)]	92°F dry bulb / 77°F coincident wet bulb (1% exceedance)
	77°F wet bulb (noncoincident) (1% exceedance)
Minimum Normal[(c)]	21°F (99% exceedance)

c) Maximum and minimum normal values are the 1 percent exceedance magnitudes.

To read:

Maximum Safety[(b)]	107.7°F dry bulb / 79.6°F coincident wet bulb (100-year return)
	83.5°F wet bulb (noncoincident) (100-year return)
Minimum Safety[(b)]	-12.2°F (100-year return)
Maximum Normal[(c)]	94°F dry bulb / 75°F coincident wet bulb (1% seasonal exceedance)
	78°F wet bulb (noncoincident) (1% seasonal exceedance)
Minimum Normal[(c)]	20°F (99% seasonal exceedance)

c) Maximum and minimum normal values are the ASHRAE equivalent 1 percent seasonal exceedance magnitudes.

2. COLA Part 2, FSAR Chapter 2, Table 2.3-203, Sheet 2 of 2, will be revised from:

BLN Site Characteristics

	Frequency of Occurrence				
	0%	100-year	0.4%[a]	1%	2%[a]
Cooling dry-bulb temperature, °F	104	108	94	92	90
Coincident wet-bulb temperature, °F	73	71	75	77	74
Evaporation wet-bulb, °F	82	84	78	77	76
Coincident dry-bulb, °F			89		86

	DB Temperature °F	
	Maximum	Minimum
1 percent exceedance	92	21
0.4 percent exceedance[a]	94	15
0 percent exceedance	104	-9
100-year return	108	-12

a) Data from ASHRAE Fundamentals Handbook 2001, for Huntsville, Alabama.

To read:

BLN Site Characteristics

	Frequency of Occurrence			
	0%	100-year	1%[a][b]	2%[a]
Cooling dry-bulb temperature, F	104	107.7	94	90
Coincident wet-bulb temperature, F	73	79.6	75	74
Evaporation wet-bulb, F	82	83.5	78	76
Coincident dry-bulb, F			89	86

	DB Temperature F	
	Maximum	Minimum
1 percent exceedance[a][b]	94	20
0 percent exceedance	104	-9
100-year return	107.7	-12.2

a) Data from ASHRAE Fundamentals Handbook 2001, for Huntsville, Alabama.

b) The 1% exceedance maximum values listed are on a seasonal basis, based on a direct conversion from the 0.4% exceedance ASHRAE annual data. As stated in the 1997 ASHRAE Fundamentals Handbook, "the 0.4% annual value is about the same as the 1% summer design temperature." Additionally, the ASHRAE Fundamentals Handbook states that "annual 99.6% and 99.0% design conditions represent a slightly colder condition than the previous cold season design temperatures." As a result, a straight conversion of the 99.0% annual measurement is used as the 99.0% seasonal value (i.e., 1% exceedance minimum). The 0.4%, 1%, and 99% exceedance

temperature values are identical between the 2001 and 1997 editions of the ASHRAE Fundamentals Handbook, References 238 and 239. As a result, the annual to seasonal conversion arguments provided in the 1997 ASHRAE Fundamentals Handbook are valid for use on the Huntsville, Alabama meteorological data listed in the 2001 ASHRAE Fundamentals Handbook.

3. COLA Part 2, FSAR Chapter 2, Subsection 2.3.1.3.1 will be revised from:

The maximum dry-bulb temperature and the maximum wet-bulb temperature (non-coincident), have been determined as the highest dry-bulb temperature that persists for at least 2 hours using 35-years (1973-2007) data set-of sequential hourly meteorological data. The maximum dry-bulb temperature is 104° F, and the coincident wet-bulb temperature is 73° F (Table 2.3-203). The maximum wet-bulb temperature (noncoincident) that persists for at least 2 hours has been determined to be 82° F from the 35-year data set. The minimum dry-bulb temperature (100% exceedance), as indicated in Table 2.3-203, determined from the same data set is -9° F.

To read:

The maximum dry-bulb temperature, coincident wet-bulb temperature, maximum wet-bulb temperature (non-coincident), and minimum dry-bulb temperature have been determined using 35-years (1973-2007) of sequential hourly meteorological data to calculate 100-year return period values.

The maximum 100-year return period dry-bulb temperature was calculated using the 35-year sequential hourly meteorological data set for the Huntsville, AL NWS station, and was based on methodology provided in ASHRAE Fundamental Handbook Chapter 27 – Climatic Design Information (Reference 238). See Equations 1 and 2 below:

$$T_n = M + IFs \qquad \text{Equation 1}$$

where:

T_n = n-year return period value of extreme dry-bulb temperature to be estimated, years

M = mean of the annual extreme maximum or minimum dry-bulb temperatures, °F

s = standard deviation of the annual extreme maximum or minimum dry-bulb temperatures, °F

I = 1, if maximum dry-bulb temperatures are being considered

I = -1 if minimum dry-bulb temperatures are being considered

$$F = -\frac{\sqrt{6}}{\pi}\left\{0.5772 + \ln\left[\ln\left(\frac{n}{n-1}\right)\right]\right\} \qquad \text{Equation 2}$$

The resultant maximum 100-year return period dry-bulb temperature was 107.7° F.

Since the maximum 100-year return period dry-bulb temperature value was calculated, there are no occurrences of maximum dry-bulb temperatures to pair with concurrent wet-bulb temperature values to determine a coincident wet-bulb temperature. To calculate a 100-year return period coincident wet-bulb temperature, the 35-year sequential hourly meteorological data set for the Huntsville, AL, NWS station was used to develop a dry-bulb to coincident wet-bulb correlation curve. The range of measured dry-bulb temperatures used to develop this correlation was limited to those dry-bulb temperatures with greater than five occurrences over the 35-year hourly meteorological data set (-1° F to 102° F). This occurrence threshold was established to prevent extremely limited data occurrences from inaccurately weighting the dry-bulb to coincident wet-bulb correlation. The maximum measured coincident wet-bulb temperature was conservatively correlated with each dry-bulb temperature, in 1° F dry-bulb temperature increments. The resultant 100-year return period coincident wet-bulb temperature is 79.6° F.

Similar to the approach described above for determining the maximum 100-year return period dry-bulb temperature, the maximum 100-year return period wet-bulb temperature (non-coincident) was calculated

to be 83.5° F using the 35-year sequential hourly meteorological data set for the Huntsville, AL, NWS station. Likewise, the minimum 100-year return period dry-bulb temperature was calculated to be -12.2° F.

4. COLA Part 2, FSAR Chapter 2, Subsection 2.3.7, "References," will be revised to include:

238. *ASHRAE Handbook-Fundamentals*, Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), 2001.

239. *ASHRAE Handbook-Fundamentals*, Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), 1997.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None