David H. Jones
Vice President
Engineering

Southern Nuclear
Operating Company, Inc.
40 Inverness Center Parkway
Birmingham, Alabama 35242

Tel 205.992.5984
Fax 205.992.0341

SOUTHERN COMPANY
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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4 Combined License Application
Response to Request for Additional Information Letter No. 008

Ladies and Gentlemen:

By letter dated March 28, 2008, Southern Nuclear Operating Company (SNC) submitted an application for combined licenses (COLs) for proposed Vogtle Electric Generating Plant (VEGP) Units 3 and 4 to the U.S. Nuclear Regulatory Commission (NRC) for two Westinghouse AP1000 reactor plants, in accordance with 10 CFR Part 52. During the NRC's detailed review of this application, the NRC identified a need for additional meteorological information required to complete their review of the COL application's Final Safety Analysis Report (FSAR) Subsections 2.3.1, "Regional Climatology," and 2.3.5, "Long-Term (Routine) Diffusion Estimates." By letter dated October 20, 2008, the NRC provided SNC with Request for Additional Information (RAI) Letter No. 008 concerning this meteorological information need. This RAI letter contains three RAI questions numbered 02.03.01-3, 02.03.01-4 and 02.03.05-2. The enclosure to this letter provides the SNC response to these RAIs.

If you have any questions regarding this letter, please contact Mr. Wes Sparkman at (205) 992-5061.

D092
NRO

Mr. D. H. Jones states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

David H. Jones

Sworn to and subscribed before me this 18th *day of* November, *2008*

Notary Public: Gail A. Hicks

My commission expires: July 5, 2010

DHJ/BJS/lac

Enclosure: Response to NRC RAI Letter No. 008 on the VEGP Units 3 & 4 COL Application Involving Meteorology

cc: Southern Nuclear Operating Company
Mr. J. H. Miller, III, President and CEO (w/o enclosure)
Mr. J. T. Gasser, Executive Vice President, Nuclear Operations (w/o enclosure)
Mr. T. E. Tynan, Vice President - Vogtle (w/o enclosure)
Mr. D. M. Lloyd, Vogtle Deployment Director
Mr. C. R. Pierce, Vogtle Development Licensing Manager
Mr. M. J. Ajluni, Nuclear Licensing Manager
Mr. W. A. Sparkman, COL Project Engineer
Document Services RTYPE: AR01.1053
File AR.01.02.06

Nuclear Regulatory Commission
Mr. L. A. Reyes, Region II Administrator (w/o enclosure)
Mr. M. R. Johnson, Director of Office of New Reactors (w/o enclosure)
Mr. D. B. Matthews, Director of Division of New Reactor Licensing (w/o enclosure)
Ms. S. M. Coffin, AP1000 Manager of New Reactors (w/o enclosure)
Mr. C. J. Araguas, Lead Project Manager of New Reactors
Mr. B. Hughes, Project Manager of New Reactors
Mr. R. G. Joshi, Project Manager of New Reactors
Ms. T. E. Simms, Project Manager of New Reactors
Mr. B. C. Anderson, Project Manager of New Reactors
Mr. M. M. Comar, Project Manager of New Reactors
Mr. S. C. Flanders, Director of Site and Environmental Reviews
Mr. W.F. Burton, Chief – Environmental Technical Support
Mr. M. D. Notich, Environmental Project Manager
Mr. J. H. Fringer, III, Environmental Project Manager
Mr. G. J. McCoy, Senior Resident Inspector of VEGP

Georgia Power Company
Mr. O. C. Harper, IV, Vice President, Resource Planning and Nuclear Development (w/o enclosure)

Oglethorpe Power Corporation
Mr. M. W. Price, Chief Operating Officer (w/o enclosure)

Municipal Electric Authority of Georgia
Mr. C. B. Manning, Jr., Senior Vice President, Participant and Corporate Affairs (w/o enclosure)

Dalton Utilities
Mr. D. Cope, President and Chief Executive Officer (w/o enclosure)

Bechtel Power Corporation
Mr. J. S. Prebula, Project Engineer (w/o enclosure)
Mr. R. W. Prunty, Licensing Engineer

Tetra Tech NUS, Inc.
Ms. K. K. Patterson, Project Manager

cc: Shaw Stone & Webster, Inc.
Mr. K. B. Allison, Project Manager (w/o enclosure)
Mr. J. M. Oddo, Licensing Manager

Westinghouse Electric Company, LLC
Mr. N. C. Boyter, Vice President, AP1000 Vogtle 3 & 4 Project (w/o enclosure)
Mr. J. L. Whiteman, Principal Engineer, Licensing & Customer Interface

Southern Nuclear Operating Company

AR-08-1730

Enclosure

Response to NRC RAI Letter No. 008

on the VEGP Units 3 & 4 COL Application

Involving Meteorology

FSAR Subsection 2.3.1, Regional Climatology

eRAI Tracking No. 1432

NRC RAI Number 02.03.01-3:

The Westinghouse response to AP1000 DCD RAI-SRP2.3.1-RSAC-01 (on page 4 of ML081820722) states that maximum (minimum) normal temperature site characteristics are 1-percent (99-percent) seasonal exceedance values which are approximately equivalent to the annual 0.4-percent (99.6 percent) annual exceedance. Please revise the maximum and minimum normal temperature site characteristics in FSAR Table 2.0-201 accordingly.

SNC Response:

The ASHRAE 2001 Fundamentals Handbook provides the correlation that the 1-percent and 99-percent seasonal exceedance temperature values are approximately equal to the 0.4-percent and 99.6-percent annual exceedance temperature values. The 0.4-percent and 99.6-percent annual exceedance values for VEGP are already reported in ESPA SSAR Section 2.3.1.5 and Table 1-1 under the general discussion of site meteorological characteristics. In the next revision to the COLA, FSAR Section 2.3.1.5 and Table 2.0-201 will be revised to replace the site 1-percent and 99-percent annual exceedance temperature values with 0.4-percent and 99.6-percent annual exceedance temperature values to compare to the AP1000 DCD 1-percent and 99-percent seasonal exceedance site parameter values for maximum and minimum normal temperatures. It should be noted that for Revision 0 of the COLA FSAR, the 100-year return period minimum dry bulb temperature (-8° F) had conservatively been used as the site characteristic for the minimum normal temperature. In the next revision of the COLA, the 99.6-percent annual exceedance temperature (21° F) will be used as the site characteristic for the minimum normal temperature.

Associated VEGP COL Application Revision:

FSAR Table 2.0-201 will be revised as follows to change the VEGP Site Characteristic values for the Maximum Normal and Minimum Normal Temperature values to be those of the 0.4-percent and 99.6-percent annual exceedance temperature values:

		AP1000 DCD Site Parameter[a]	VEGP Site Characteristic	VEGP Reference	VEGP Within Site Parameter
	Air Temperature				
VEGP ESP VAR 2.3-1	Maximum Normal[c]	100°F dry bulb/80.1°F coincident wet bulb	~~94°F~~ 97°F dry bulb/~~78°F~~ 76°F coincident wet bulb	~~ESPA SSAR Table 1-1~~ Subsection 2.3.1.5	Yes
		80.1°F wet bulb (noncoincident)[d]	~~78°F~~ 79°F wet bulb (noncoincident)	~~ESPA SSAR Table 1-1~~ Subsection 2.3.1.5	Yes
VEGP ESP VAR 2.3-1	Minimum Normal[c]	-10°F	~~-8°F~~ 21°F dry bulb	~~ESPA SSAR Table 1-1~~ Subsection 2.3.1.5	Yes

(a) AP1000 DCD Site Parameters are a compilation of DCD Tier 1 Table 5.0-1 and DCD Tier 2 Table 2-1.
(b) Maximum and minimum safety values are based on historical data and exclude peaks of less than 2 hours duration
(c) The maximum normal value is the 1-percent seasonal exceedance temperature. The minimum normal value is the 99-percent seasonal exceedance temperature. The minimum temperature is for the months of December, January, and February in the northern hemisphere. The maximum temperature is for the months of June through September in the northern hemisphere. The 1-percent seasonal exceedance is approximately equivalent to the annual 0.4-percent exceedance. The 99-percent seasonal exceedance is approximately equivalent to the annual 99.6-percent exceedance. See Subsection 2.3.1.5 for further discussion on this relationship.
(d) The noncoincident wet bulb temperature is applicable to the cooling tower only.

FSAR 2.3 will be revised to insert the following:

2.3.1.5 Design Basis Dry- and Wet-Bulb Temperatures

The third from last and second from last paragraphs of ESPA SSAR Subsection 2.3.1.5 will be replaced with the following paragraph as shown.

VEGP ESP VAR 2.3-1

~~The 1.0 percent annual exceedance probability dry and wet bulb temperature values from AFCCC-NCDC (1999) for Augusta, Georgia, are conservative estimates for the Maximum Normal Dry-Bulb and Coincident Wet-Bulb Temperatures because the minimum 2-hour persistence criterion in the Westinghouse methodology is not reflected in those statistics. So, as an alternative, the 1.0 percent annual exceedance probability DB and WB temperatures (94°F and 78°F, respectively) **(AFCCC-NCDC 1999)** are used to represent the Maximum Normal Dry-Bulb and Coincident Wet-Bulb Temperatures for the VEGP site.~~

~~Following the same conservative approach, the Maximum Normal Wet-Bulb Temperature (Non-Coincident) is also represented by the 1.0 percent annual exceedance probability WB temperature, i.e., 78°F **(AFCCC-NCDC 1999)**.~~

The AP1000 DCD maximum and minimum normal temperature site characteristics are 1-percent (99-percent) seasonal exceedance values. According to the ASHRAE 2001 Fundamentals Handbook, these are approximately equivalent to the annual 0.4-percent (99.6-percent) annual exceedance values. Thus, the maximum normal dry bulb temperature (1% seasonal exceedance) is 97°F with a coincident maximum normal wet bulb temperature of 76°F. The maximum normal non-coincident wet bulb temperature is 79°F. Additionally, the minimum normal dry bulb temperature (99% seasonal exceedance) is 21°F.

NRC RAI Number 02.03.01-4:

Address the extreme frozen winter precipitation event and extreme liquid winter precipitation event as site characteristics in accordance with the Proposed Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures" (ML081990438) and provide a basis discussion for the site characteristic values chosen.

SNC Response:

In accordance with the Interim Staff Guidance on the assessment of normal and extreme winter precipitation loads on the roofs of Seismic Category I structures, the extreme frozen winter precipitation and extreme liquid winter precipitation events are determined below:

The extreme frozen winter precipitation event should be the higher ground-level weight (in lb/ft^2) between (1) the 100-year return period snowfall event and (2) the historical maximum snowfall event in the site region.

Based on the National Climatic Data Center (NCDC) Snow Climatology database, the historical maximum 2-day snowfall amount at Augusta Daniel Field (the nearest first order National Weather Service (NWS) station within the site region) was 14.0 inches, while the 100-year return 2-day snowfall was 8.8 inches at that location. As discussed in ESPA SSAR Section 2.3.1.3.4, the same snowfall event that resulted in the historical maximum 2-day snowfall at Augusta Daniel Field also caused the historic maximum single-day total of 19 inches and the highest cumulative monthly total of 22 inches at the NWS Cooperative Observer Station at Bamberg, South Carolina. It is assumed that the 22-inch historical cumulative monthly total for the Bamberg station may be used as the 2-day snowfall. Because the Bamberg station is among those NWS stations selected as being representative of the site, and because the historical maximum snowfall depth at Bamberg is far greater than the 100-year return 2-day snowfall at Augusta, the 22-inch historic maximum snowfall at Bamberg is used to determine the load due to the extreme frozen winter precipitation.

It should be noted that the Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads from the NRC suggests using the NCDC US Snow Climatology web site as an appropriate source for the observed maximum snowfall event. However, the maximum snowfall value from that source is listed as 3 inches for Bamberg, SC. The 19-inch single-day total and the 22-inch cumulative monthly total values come from the "US Department of Commerce, Climatography of the United States, National Climatic Data Center, NOAA," from the 1971-2000 CD-ROM issued by NCDC.

To convert the maximum 2-day snowfall into a snow load, Equation 2 from the ISG is used:

$$L = 0.15S \times 5.2$$

Where:

- 0.15 is the factor based on a snow density (ratio of the volume of melt water that can be obtained from 1" of snow)
- S is the 100-year return period snowfall depth in inches
- 5.2 is the weight of one inch of water in lb/ft^2

Thus, the weight of the extreme frozen winter precipitation would be

$$L = 0.15(22.0) \text{ x } 5.2 = 17.16 \text{ lb/ft}^2$$

The extreme liquid winter precipitation event is defined as the theoretically greatest depth of precipitation (in inches of water) for a 48-hour period that is physically possible over a 25.9-square-kilometer (10-square-mile) area at a particular geographical location during those months with the historically highest snowpacks.

As described in ESPA SSAR Section 2.3.1.3.4, the extreme liquid winter precipitation [Probable Maximum Winter Precipitation (PMWP)] event at the Vogtle site was determined to be 28.3 inches, as derived from Hydrometeorological Report No. 53.

Associated VEGP COL Application Revision:

None

References:

1. U.S. Department of Commerce, "United States Snow Climatology," National Climatic Data Center, NOAA, available at http://www.ncdc.noaa.gov/ussc/index.jsp

2. NUREG/CR-1486, Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Extremes, United States East of the 105th Meridian, NOAA Hydrometeorological Report No. 53, June 1980
3. Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures
4. US Department of Commerce, "Climatography of the United States, No 20, 1971-2000," National Climatic Data Center, NOAA, published on CD-ROM.

FSAR Subsection 2.3.5, Long-Term (Routine) Diffusion Estimates

eRAI Tracking No. 1433

NRC RAI Number 02.03.05-2:

The response to RAI 02.03.05-1 states that, based on the updated building dimensions, the X/Q values for the EAB and various receptor locations are bounded by those provided in the ESPA SSAR. Both the building cross sectional area and containment height decreased compared to the values presented in the ESPA SSAR. This should result in less building wake influence and subsequently higher X/Q values. Please provide clarification on how the X/Q values are less than those presented in the ESPA SSAR.

SNC Response:

The initial confirmatory analysis discussed in FSAR Section 2.3.5 compared X/Q values of the ESPA with those calculated using revised containment building dimensions provided in Revision 16 of the AP1000 DCD. The response to RAI 02.03.05-1 restated that the confirmatory analysis showed that the ESPA X/Q values were bounding. On further examination, it has been determined that, while the analysis for the ESPA used an area-weighted "effective height" (65.6 m) for the reactor building height, the confirmatory analysis used the actual building height (69.7 m). This use of the actual building height as an analysis input led to the conclusion that the values calculated for the ESPA were bounding. This confirmatory analysis has now been reevaluated. Using the same methodology and assumptions and all inputs other than those associated with the building dimensions (specifically, incorporating the decreased area-weighted "effective" building height of 60.9 m), it has been determined that the X/Q values for the EAB and the other receptor locations are within approximately 3.3% of those provided in the ESPA SSAR, but are not bounding. The X/Q values from this revised confirmatory analysis would not appreciably change the normal release dose evaluations, which use these X/Q values as input, and the doses would remain within regulatory limits. The discussion in FSAR 2.3.5 will be revised as shown below to reflect this comparison result.

Associated VEGP COL Application Revision:

The last paragraph of FSAR Section 2.3.5 will be revised as follows:

> Using the same assumptions and methodology as described in the ESPA SSAR (which relied on DCD Revision 15), along with the building dimensions provided in DCD Revision 16, the long-term (routine release) dispersion and deposition estimates were evaluated at the Dose Calculation EAB and at the various receptor locations described in the ESPA SSAR. This evaluation confirmed that the X/Q values for the EAB and the various receptor locations are ~~bounded by~~ within approximately 3.3% of those provided in the ESPA. This result is reasonable given that the designated receptor points at the

EAB and the various receptor locations are beyond the distance that would be appreciably influenced by building wake.