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

October 24, 2008

10 CFR 52.79

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

In the Matter of)
Tennessee Valley Authority)

Docket No. 52-014 and 52-015

BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – REGIONAL CLIMATOLOGY- EXTREME WINTER PRECIPITATION

Reference: Letter from Joseph Sebrosky (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 127 Related to SRP Section 02.03.01 for the Bellefonte Units 3 and 4 Combined License Application, dated September 25, 2008

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) items included in the reference letter.

A response to the NRC request in the reference 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 Thomas Spink at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7062, or via email at tespink@tva.gov.

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

Executed on this 24th day of Oct, 2008.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
Nuclear Generation Development & Construction

Enclosure
cc: See Page 2

D085
NRO

cc: (w/ Enclosures)
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Enclosure
TVA letter dated October 24, 2008
RAI Responses

Responses to NRC Request for Additional Information letter No. 127 dated September 25, 2008 (4 pages, including this list)

Subject: Extreme Winter Precipitation in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.03.01-011	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
None	

NRC Letter Dated: September 25, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.01-011

Revise BLN FSAR 2.3.1 to identify the normal winter precipitation event, 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). Provide a basis discussion in FSAR section 2.3.1 for the site characteristic values chosen.

BLN RAI ID: 1848

BLN RESPONSE:

FSAR Subsection 2.3.1.2.2.3 will be revised (in a future amendment) to include a discussion of the normal winter precipitation event, the extreme frozen winter precipitation event, and the extreme liquid winter precipitation event as identified in the Application Revisions section below. This revision will also include the basis for the site characteristic values chosen.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

1. COLA Part 2, FSAR Chapter 2, Subsection 2.3.1.2.2.3 will be revised from:

2.3.1.2.2.3 Weight of Snow and Ice on Safety-Related Structures

Because the plant site is subjected to a subtropical climate with mild winters, prolonged snowfalls or large accumulations of snow or ice on the ground and structures are not anticipated.

The estimated depth of the 100-year return snowpack is 10 inches, or 2.0 inches of water equivalent, as discussed above. Safety-related structures at the BLN site would be designed to withstand 10.4 pounds per square foot. No damage from snow or ice loading on structures is expected, because the DCD design loading is 75 pounds per square foot. Comparison of the BLN site characteristics with the AP1000 DCD design parameters is given in Table 2.0-201.

To read:

2.3.1.2.2.3 Weight of Snow and Ice on Safety-Related Structures

Because the plant site is subjected to a subtropical climate with mild winters, prolonged snowfalls or large accumulations of snow or ice on the ground and structures are not anticipated.

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 (Reference 235), the normal winter precipitation event, the extreme frozen winter precipitation event, and the extreme liquid winter precipitation event are considered in determining the BLN site characteristics.

The limiting normal winter precipitation event is the highest ground-level weight (in lb/ft^2) among (1) the 100-year return period snowpack, (2) the historical maximum snowpack, (3) the 100-year return period snowfall event, or (4) the historical maximum snowfall event in the site region.

The 100-year return period snowpack is given in the American Society of Civil Engineers (ASCE) Standard No. 7-05, "Minimum Design Loads for Buildings and Other Structures" (Reference 236). The maximum observed ground snow load from ASCE 7-05, Table C7-1 for Huntsville, Alabama is 7 lb/ft^2 and

the 2% annual probability (i.e., 50-yr return) value is 5 lb/ft^2 based on a record length of 33 years. As suggested by ASCE 07-05, a factor of 1.22 is a reasonable factor to convert the 50-year mean recurrence interval values to a 100-year mean recurrence interval. This results in a 100-yr return ground snow load of 6.1 lb/ft^2. The maximum observed snow depth is given in the Local Climatic Data (Reference 234) for Huntsville, Alabama as 11 inches. The algorithm for converting historical maximum snowpack depth (in inches) to a snow load is given below (Reference 235):

$$L = 0.279D^{1.36}$$

Where D is the snowpack depth and L is the resulting load in lb/ft^2.

Insertion of the maximum depth referenced above results in a historic maximum normal ground snow load of 7.3 lb/ft^2. This value is slightly larger than the value provided in ASCE 7-05 (6.1 lb/ft^2) for Huntsville, Alabama.

Based on NCDC Snow Climatology database (Reference 237), the highest observed maximum 2-day snowfall amount was 9.3 inches and the 100-year return 2-day snowfall was 12.9 inches for Scottsboro, Alabama, from 1893 through 2006. For this reporting station, the historic observed 2-day maximum (9.3 inches) is less limiting than the 100-year return 2-day value (12.9 inches); therefore, the 100-year return value is used in determining the snow load. An appropriate algorithm for converting the 100-year return period snowfall event to a snow load is given below (Reference 235):

$$L = 0.15S \times 5.2$$

Where *S* is the 100-year return period snowfall event in inches, *5.2* is the weight of one inch of water in lb/ft^2, and *L* is the resulting snow load in lb/ft^2.

This equation is based on a snow density (defined as the ratio of the volume of melt water that can be derived from a sample of snow) of 0.15. Using this density, the 100-year return 2-day snowfall (12.9 inches) is equivalent to a ground load of 10.1 lb/ft^2.

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. The roof load resulting from the 100-year return period and historical maximum snowfall event is provided above. From these results, the limiting ground snow load is 10.1 lb/ft^2.

The 48-hour PMWP at the BLN Site is estimated to be 24.7 inches, based on HMR 53 (Reference 233). As stated in Subsection 2.3.1.2.2.2, the roofs of the nuclear island have no lips around the edges; therefore, water and snow melt build up on the roofs of the Nuclear Island is negligible. However, there may be some additional roof load due to retention of rain by pre-existing snowfall.

Guidance on the additional roof load necessary to account for rain on snow is provided in ASCE Standard No. 7-05 (Reference 236). This standard states that if the ground snow load is greater than 20 lb/ft^2, it is assumed that the full rain-on-snow effect has been measured and a separate rain-on-snow surcharge is not needed. The 100-yr return snow-depth at the BLN site is 11 inches which gives a ground snow load of 8.6 lb/ft^2 (11 in-snow x 0.15 in-water/in-snow x 5.2 lb/ft^2/in-water); therefore, a rain-on-snow surcharge is appropriate. As shown above, the ground load due to snowfall (10.1 lb/ft^2) is also below the threshold given in ASCE 7-05. The only additional roof load from the PMWP is due to water soaking into the snowpack (i.e., the rain-on-snow surcharge). The remaining PMWP runs off due to the roof design and the southern location of the station. A rain-on-snow flat roof surcharge of 5.0 lb/ft^2, given in ASCE 7-05, is conservatively applied to the ground level load. The total maximum BLN ground level load is therefore 15.1 lb/ft^2.

The AP1000 DCD does not address extreme winter precipitation events for the roof design or the combination of any extreme loads with the normal winter loads. For the BLN site, if one evaluated the addition of an extreme 100-yr, 2-day fresh snow fall to an existing fresh snow or snowpack, the loads could be combined as normal live loads and the AP1000 normal design value would continue to bound the resultant load.

No damage from snow or ice loading on structures is expected, because the DCD design loading is 75 pounds per square foot at ground level. Comparison of the BLN site characteristics with the AP1000 DCD design parameters is given in Table 2.0-201.

2. COLA Part 2, FSAR Chapter 2; Subsection 2.3.7 will be revised to add the following references. (Note that new Reference 234 was added in response to BLN-RAI-LTR-22, Supplements 1 and 2.)

235. 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).

236. ASCE Standard No. 7-05, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-05, American Society of Civil Engineers, 2006.

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

3. COLA Part 2, FSAR Chapter 2; Table 2.0-201 (Sheet 5 of 5), BLN Site Characteristic for Snow/Ice will be revised from:

10.4 pounds per square foot

To read:

15.1 pounds per square foot on ground

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None