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SOUTHERN COMPANY

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ND-09-0006

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. 022

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 information, involving roof loading during the 48-hour probable maximum winter precipitation (PMWP), required to complete their review of the COL application's Final Safety Analysis Report (FSAR) Section 3.8, "Design of Category I Structures." By letter dated December 18, 2008, the NRC provided SNC with Request for Additional Information (RAI) Letter No. 022 concerning this roof loading information need. This RAI letter contains one RAI question numbered 03.08.04-1. The enclosure to this letter provides the SNC response to this RAI.

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

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NRO

Mr. J. A. (Buzz) Miller states he is a Senior 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

Joseph A. (Buzz) Miller

Sworn to and subscribed before me this 16 *day of* January, *2009*

Notary Public: Gloria H. Burr

My commission expires: 05/06/09

JAM/BJS/lac

Enclosure: Response to NRC RAI Letter No. 022 on the VEGP Units 3 & 4 COL Application Involving Roof Loading

cc: Southern Nuclear Operating Company
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Mr. M. J. Ajluni, Nuclear Licensing Manager
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Document Services RTYPE: AR01.1053
File AR.01.02.06

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Southern Nuclear Operating Company

ND-09-0006

Enclosure

Response to NRC RAI Letter No. 022

on the VEGP Units 3 & 4 COL Application

Involving

Roof Loading

FSAR Section 3.8, Design of Category I Structures

eRAI Tracking No. 1854

NRC RAI Number 03.08.04-1:

In the Vogtle early site permit application, ESP SSAR Section 2.3.1.3.4, Precipitation Extremes, states that the 48-hour probable maximum winter precipitation (PMWP) is about 147 lb/ft^2, and that the roof design of safety-related structures with respect to that design basis (147 lb/ft^2) would be described in the COL application. In the Vogtle COL application, FSAR Section 2.3.1.3.4 states that (1) the AP1000 DCD design basis snow load for the roof was 63 lb/ft^2, (2) the roof will not deflect enough to hold water under the snow load, and therefore ponding of rain water with pre-existing snow pack conditions will not occur, and (3) the physical arrangement of the AP1000 sloped roof is designed such that the 100-year snow pack will not prevent the PMWP water from draining off the sloped roof system.

In light of the 147 lb/ft^2 PMWP design basis described in the ESP application and the 63 lb/ft^2 design basis snow load for the AP1000 DCD referenced in the COL application, please provide the following: (1) Describe the required design basis in lb/ft^2 for the Vogtle roof; (2) Explain with specificity the application's conclusion that the roofs in the AP1000 DCD are designed such that all the Vogtle-specific winter PMP water will drain off from the roof; and (3) Describe the magnitude of the maximum roof deflection under the roof design load for the 100-year snow pack and precipitation extremes identified at the Vogtle site, and demonstrate why this magnitude indicates that no roof ponding will occur under the Vogtle PMWP.

SNC Response:

1. The required design basis for the Vogtle roof is the same as the design basis for all AP1000 roofs, which was certified by the NRC under Design Certification Document (DCD), APP-GW-GL-700, Revision 15, and has not changed in subsequent revisions. The approved design basis is based on a 75 pounds per square foot (psf) ground snow load with roof loads being determined using ASCE 7. The basis of 75 psf can be found in DCD Appendix 3H "Auxiliary and Shield Building Critical Section" subsection 3H.3.3 "Loads." The following is an explanation of the origin of the 75 psf ground snow load.

   AP1000 design parameters follow the Utility Requirements Document (URD). The URD calls for a ground snow load of 50 psf. The AP1000 is designed for a higher load to account for the combined effect of snow with ice and/or rain build up. Using ASCE 7, the 50 psf ground snow load converts to a 42 psf roof snow load for roof design. The AP1000 75 psf ground snow load converts to a 63 psf roof snow load for roof design. The difference between the URD and AP1000 roof snow load is 21 psf, (63 psf minus 42 psf). This additional load accounts for the potential accumulation of ice and water on the roof. This additional loading of 21 psf converts to a depth of approximately 4" of water or ice depth using the density of water (62.4 pcf) or the density of ice (57.23 pcf). Again, this depth of water or ice and its load is in addition to the existing snow depth and load from previously accumulated snow on the roof. The density of snow (19 pcf) is lower than that of water due to the amount of voids present in packed snow. Therefore, it can be assumed that 26.5" of snow already is present on the roof when the rain falls.

   The value of 147 psf is a load generated specifically to the Vogtle site as derived from the site specific probable maximum winter precipitation (PMWP). This load is that which would apply to a flat roof with parapets and no roof drainage; in other words, this is the load, should the full PMWP be impounded on the roof. The AP1000 is designed with a sloped roofing system to allow water to run

off, with no parapets and with gutters at the edge of the roof for drainage. Therefore, this load would never actually be seen on the roof.

2. The NRC certified design for the AP1000 states in Tier 2 section 3.4.1.1.1, "Protection from External Flooding," that "The roofs are sloped such that rainfall is directed towards gutters located along the edges of the roofs. Therefore, ponding of water on the roofs is precluded." The roof slopes are shown graphically in Tier 2 figures 1.2-13 thru -16.

   Specifically, the roof slope of all nuclear island buildings is a minimum of 2.0% as shown in Westinghouse drawing APP-0070-X4-001, Revision A, "AP1000 Plant Grid Coordinates & Roof Plan." This proprietary drawing was previously provided to the NRC as part of the AP1000 Information Training and is contained in the AP1000 Information Session Instruction Books. If necessary, the drawing will be made available for further NRC review at the Westinghouse Rockville Office. The roof slope of 2.0% is 1.5% greater than the absolute minimum slope of 0.5%, which is required for water to drain. The absolute minimum slope of 0.5% is documented in Chapter 3 under "Minimum Grades" in A Policy on the Geometric Design of Highways and Streets, 2001 Edition, as published by the American Association of State Highway and Transportation Officials (AASHTO). This publication has been adopted by the Federal Highway Administration (FHWA) in the Code of Federal Regulations 10 CFR 625.4. The Federal Aviation Administration (FAA) has also adopted this code via AC 150/5320-5C.

   Furthermore, ASCE 7-98 "Minimum Design Loads for Buildings and Other Structures," states in section 8.4, "Ponding Instability," that roof slopes of ¼ in/ft or greater are not subject to ponding and do not need to be analyzed for ponding. As stated previously, all nuclear island buildings have a minimum slope of 2.0%, and therefore the AP1000 nuclear island roof design meets this requirement since ¼ in/ft equates to 2% slope. Therefore, the nuclear island roofs are not subject to ponding.

3. The AP1000 roof design is based on different load combinations as defined in DCD Table 3.8.4-2. Each section of roof is designed to the highest calculated load combination, which in all cases involves more than just the snow load; further, because the sections of roof are being designed based on different maximum load combinations, a maximum deflection value is used as an acceptance criteria.

   Because the roof is composite with structural steel beams supporting the roof slab, it is conservative to discuss the steel beam deflection with respect to roof deflection and ponding. The structural steel members have been designed for the roof using the maximum load cases as previously mentioned. These steel members have been designed using maximum deflection as an acceptance criterion. With specific regard to steel members with applied live and dead loads, the maximum deflection is defined by S/240, with S being the length of span. The largest free span for the structural beams in the auxiliary building is approximately 35', which yields a maximum deflection of 1.8" under the largest combined load application. In other words, the AP1000 roof beams will have a maximum deflection of 1.8" under the maximum load. This deflection is insignificant and the water will run off.