July 22, 2008

Mr. J. A. “Buzz” Miller, Senior Vice President
Nuclear Development
Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
P.O. Box 1295
Birmingham, AL 35201

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 11 – SOUTHERN NUCLEAR OPERATING COMPANY EARLY SITE PERMIT APPLICATION FOR THE VOGTLE ESP SITE

Dear Mr. Miller:

By letter dated August 14, 2006, Southern Nuclear Operating Company, Inc. (SNC) submitted an application for an early site permit (ESP) for the Vogtle ESP site. Subsequently, SNC submitted changes to the Vogtle ESP application by letters dated September 13, 2006, November 13, 2006, and May 3, 2007. On August 15, 2007, SNC submitted to the U. S. Nuclear Regulatory Commission (NRC) a supplement to the ESP application expanding the scope of the application to include a request for approval to perform selected construction activities, generally labeled limited work authorization (LWA) activities, as described in Title 10 of the *Code of Federal Regulations* Section 50.10(e)(3).

The NRC staff is performing a detailed review of SNC’s ESP application and LWA request, and has determined that it needs additional information to continue portions of the safety review. The topics covered in the enclosed RAIs are related to Chapter 2 and Chapter 3 of the application.

By letter dated June 26, 2008, (ML081640428) the staff provided SNC with a revised safety review schedule that incorporates an additional round of RAIs on the LWA review. As outlined in the safety review schedule, the staff expects responses to RAIs associated with the LWA request to be provided by August 14, 2008. RAIs associated with Section 2.4, “Hydrology,” will carry the normal expectation of responses within 30 days of the date of this letter. Please note that failure to respond in a timely fashion may delay the completion of the staff’s safety evaluation report.

If you have any questions or comments concerning this matter, you may contact me at (301) 415-3637 or cja2@nrc.gov.

Sincerely,

/RA/

Christian Araguas, Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-011

Enclosure: As stated

cc: See next page

If you have any questions or comments concerning this matter, you may contact me at (301) 415-3637 or cja2@nrc.gov.

Sincerely,

/RA/

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Requests for Additional Information Regarding the
Southern Nuclear Operating Company Vogtle ESP/LWA Application

RAI 2.4.12-4

Provide input and output files electronically for the following model runs; Model 3, run 305; Model 5, run 504; Model 6, run 612; and Model 7, run 708. These files should enable NRC staff (1) to understand changes to Southern's modeling effort (e.g., mass balance, convergence), (2) to better understand the modeling assumptions associated with key regions of the model domain, and (3) to evaluate the key elements of the conceptual model identified by Southern, (e.g., the high hydraulic conductivity region upgradient of Mallard Pond, the low hydraulic conductivity region in the southwest model quadrant, the five recharge zones).

RAI 2.4.12-5

Provide a version of the baseline groundwater model (i.e., the model of the existing water table aquifer) that better accounts for the field data concerning both (1) the known groundwater high (which lies below the proposed cooling towers) and (2) the topography and flow around the tributary to Daniels Branch (which is to the west of the cooling tower area proposed for Units 3 and 4). The model should provide a plausible conservative representation of the real system in order to address whether changes in the hydrology necessary to cause a shift in the groundwater flow path are plausible.

The model should also better simulate flow associated with the tributary to the Daniels Branch. According to the wetland report submitted by Southern (see January 2007 submittal), the tributary to Daniels Branch that lies to the west of the cooling tower area includes segments of an ephemeral stream (adjacent to OW-1007), wetland, and a perennial stream. The perennial stream is upstream of Lower Debris Basin 2. The baseline model could exhibit groundwater flow toward each of these segments of the stream during the wetter period of the year (e.g., March); determine whether it should do so for the perennial stream segment as well. In the real setting based on groundwater observations, groundwater flow occurs from the proposed cooling tower area to the tributary to Daniels Branch; however, in the simulated setting it does not. Furthermore, the potentiometric surface shown for Model 7 (see Figure 50) suggests that groundwater flow occurs across or through the streambed and continues in a northerly direction even though the topographic data suggests the streambed is below the groundwater level in this vicinity. To the extent that the groundwater model does not appear to acknowledge the presence of the streambed, assess whether the perennial stream segment may be better represented by a constant head boundary condition rather than a "drain."

RAI 2.4.12-6

Provide a further assessment of the assignment of infiltration rates, with special attention to the potential for higher infiltration in the immediate vicinity of the groundwater high that occurs beneath and adjacent to the proposed cooling towers for Units 3 and 4. The presence of highs or lows in the potentiometric surface of an aquifer suggests sources or sinks of groundwater, respectively. In the case of a broad region of uniform hydraulic conductivity, the presence of a groundwater high suggests a topographic high or a greater amount of infiltration. The region of interest is an area that was reshaped during construction of the existing units, and as a result is relatively flat and may present an opportunity for minimal runoff and maximum recharge. In

addition, the presence of asphalt roadways and concrete pads may contribute to runoff to areas prone to infiltration (unlined ditches, water retention basins), with infiltration rates locally approaching if not exceeding precipitation because of the collection area aspect of ditches and basins.

RAI 2.4.12-7

Based on the revised baseline model incorporating the further assessment of infiltration rate assignments – i.e., the most plausible conservative conceptual model of today's site - provide an analysis of (1) the magnitude of change in hydraulic conductivity, if any, that would cause a groundwater flow path to exist to the west or southwest from the power block area, (2) the spatial distribution and magnitude of infiltration rate changes, if any, that would cause a groundwater flow path to exist to the west or southwest of the power block area, and (3) combinations of the above.

RAI 2.5.2-25

Review of Subsection 2.5.2.9.2 of the Vogtle ESP application, Revision 4, and Westinghouse Report SV0-1000-S2C-802 suggests that the difference between the site amplification from the 2D SASSI site response analysis (with the "Bath-tub" effect) and the site amplification from the 1D SHAKE results for the same set of input motion and soil properties (without "bath-tub" effect) is insignificant as shown in Figures 2.5.2-55 through 2.5.2-57. Also, comparison of floor response spectra from the analyses based on the Vogtle "bathtub" 2D SASSI NI model with those based on the 2D SASSI SSI model with horizontal soil layers indicates that the differences are very small (Figures 2.5.2-59 through 2.5.2-64). To explain and support these analyses, please provide the following:

(a) At key reference locations, a comparison of transfer functions from 2D SASSI ("bath-tub" effect of backfill soil with no structures included in the model) analyses with those from 1D SHAKE analyses, and

(b) At key reference locations in the structural model, a comparison of transfer functions from 2D SASSI ("bath-tub" effect of backfill soil with structures included in the model) analyses with those based on the assumption of uniform layer of backfill (without "bath-tub" effect included).

RAI Appendix 2.5E-1

From its review of Appendix 2.5E, "AP1000 Vogtle Site Specific Seismic Evaluation Report," to Vogtle ESP Application, Revision 4, Appendix 3G,"Nuclear Island Seismic Analysis," to AP1000 DCD Section 3.7, and Westinghouse Vogtle Seismic Analysis Report SV0-1000-S2C-802 (at the on-site meeting), "Soil-Structure Analysis of Vogtle site," the staff identified the following two matters:

(a) The Zero Period Accelerations (ZPAs) of floor response spectra (at various locations) for the soft-to-medium soil are much higher (a factor of 1.6 to 3.2) than those for the soft soil (AP1000 DCD Figures 3G.3-2 through 3G.3-11). However, the ZPAs of floor response spectra (at various locations) for the ESP soil case (equivalent to the DCD soft soil case) are about the same (slightly higher or lower) as those based on the sensitivity soil case (equivalent to DCD soft-to-medium soil case).

(b) As shown in DCD Figures 3G.3-2 through 3G.3-11, the ZPAs of floor response spectra (at various locations) increase when the floor elevation increases. The range of amplification factor is about 2 to 5.3. However, some deamplification of the ZPAs of floor response spectra was observed.

Please explain and justify the application's analysis of these two issues.

RAI Appendix 2.5E-2

During Southern's presentation of Phase 2 of the test backfill program, Southern stated that the purpose of the mechanically stabilized earth (MSE) wall section construction is to demonstrate the effectiveness of the fill placement and compaction techniques using small-sized compactors within the zone immediately behind the MSE wall in compacting each of the soil types to the required degree of compaction. Provide in Appendix 2.5E to the ESP SAR this description and discussion of the effect of backfill adjacent to the MSE walls on SSI analysis results.

RAI 3.8.5-3

Section 3.8.5.1.1, Waterproof Membrane, states that the purpose of the waterproof membrane is to protect the seismic Category I structures from external flooding. Section 3.8.5.1.1 also states that the waterproof membrane to be used at Vogtle is a departure from the DCD, both in material and in location. The waterproof membrane will be located in the middle of the mud mat instead of being at the bottom of the DCD base mat. Due to the change of the location of the waterproof membrane for the mud mat, it is necessary to ensure that the interfaces between the waterproof membrane and the upper and lower mud mats will posses a sufficient coefficient of friction so that the upper portion of the mud mat will not move relative to the lower portion of the mud mat during earthquakes. Section 3.8.5.1.1 also states that a qualification program will be used to demonstrate that the waterproof membrane meets the waterproofing and friction requirements, and that the program includes tests simulating field conditions to demonstrate that a minimum 0.7 coefficient of friction is achieved by the mud mat / waterproof membrane structural interface. Therefore, the staff requests that the applicant:

(a) Provide chemical and structural (mechanical) properties of the waterproof membrane.

(b) State whether the waterproof membrane has been used in structures in which a minimum 0.7 coefficient of friction between the waterproof membrane and concrete was achieved, and, if so, describe the structure and data obtained to show that the 0.7 coefficient of friction was met.

(c) If no data indicating that a minimum 0.7 coefficient of friction between the waterproof membrane and concrete exist, provide the basis for the adequacy of the design assumption that the upper portion of the mud mat will not move relative to the lower portion of the mud mat during earthquakes.

(d) Describe the qualification and test programs and how they can be used to demonstrate that the waterproof membrane meets the waterproofing and friction requirements, as stated in Section 3.8.5.1.1.

RAI 3.8.5-4

Section 3.8.5.1.1 states “For Vogtle Electric Generating Plant (VEGP) Unit 3 and 4 an alternate waterproofing system is presented as a departure from the DCD design.” Analysis indicates that the soils at the bottom of the mud mat are capable of producing only a coefficient of friction of 0.45 instead of 0.7 as stated in DCD Revision 16. Due to the mud mat design departure from the DCD and the decrease of the value of the coefficient of friction, the staff requests the following:

(a) For stability analysis during earthquakes, state whether the bottom of the mud mat is allowed to move relative to the supporting soils or not. If relative movement is predicted, state the maximum value of the horizontal movement during the SSE and the basis for accepting that amount of movement. If relative movement is not predicted, state the maximum magnitude of the horizontal force generated in the nuclear island structure during the SSE, and the magnitude of frictional force provided at the interface between the mud mat and the supporting soils.

(b) If the magnitude of frictional force provided at the interface between the mud mat and the supporting soils is less than the maximum magnitude of the horizontal force generated in the nuclear island structure during the SSE, state the magnitude of forces due to the passive earth pressure on one side and the active earth pressure on the opposite side of the embedded nuclear island walls generated through the rotation of the nuclear island structure, and describe how these horizontal forces are in equilibrium so that the bottom of the mud mat will not move relative to its supporting soils. At that equilibrium stage, state (1) the rotational angle of the nuclear island structure and the horizontal displacement at the top surface of the soils adjacent to the nuclear island structure during the SSE, and (2) whether or not buoyancy force due to ground water and vertical seismic forces were subtracted from the total weight of the nuclear island.

(c) Describe how the shear loads (or stresses) in different regions of the upper portion of the mud mat are transferred through the waterproof membrane to the lower portion of the mud mat. State the maximum shear load (or stress) in the mud mat and the shear capacity of the waterproof membrane and the mud mat, and describe how these values were derived or obtained.

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