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May 15, 2009

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

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Request for Additional Information
(RAI No. 1881)
Ltr# WLG2009.05-05

Reference: Letter from Brian Hughes (NRC) to Peter Hastings (Duke Energy), Request for Additional Information Letter No. 060 Related to SRP 02.05.04 for the William States Lee III Units 1 and 2 Combined License Application, dated January 9, 2009

This letter provides the Duke Energy response to the Nuclear Regulatory Commission's request for additional information (RAI) included in the referenced letter.

The response to the NRC information request described in the referenced letter is addressed in a separate enclosure, which also identifies associated changes, when appropriate, that will be made in a future revision of the Final Safety Analysis Report for the Lee Nuclear Station.

If you have any questions or need any additional information, please contact Peter S. Hastings, Nuclear Plant Development Licensing Manager, at 980-373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

Enclosure:

1) Duke Energy Response to Request for Additional Information Letter 060, RAI 02.05.04-010

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Subscribed and sworn to me on May 15, 2009

Phoebe P. Elliott

Notary Public

My commission expires: June 26, 2011

SEAL

xc (w/o enclosure):

Loren Plisco, Deputy Regional Administrator, Region II
Stephanie Coffin, Branch Chief, DNRL

xc (w/ enclosure):

Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 060

NRC Technical Review Branch: **Geosciences and Geotechnical Engineering Branch 1 (RGS1)**

Reference NRC RAI Number(s): **RAI 02.05.04-010**

NRC RAI:

10 CFR 100.23 (d) (4) requires that each applicant evaluate all siting factors and potential causes of failure, such as the physical properties of the materials underlying the site and Regulatory Guide 1.206 section C.I.2.5.4.5, "Excavations and Backfill" states that the applicant should discuss sources and quantities of backfill and borrow, including a description of exploration and laboratory studies and the static and dynamic engineering properties of these materials.

In order for the staff to adequately assess engineering properties of the planned backfill, please explain what will be done to ensure that the engineered backfill meets the DCD requirements. Please also describe what will be done to ensure that the engineering properties of the backfill equal or exceed the values used in the static and dynamic stability analyses (e.g., bearing capacity, settlement, slope stability, and lateral earth pressures) presented in FSAR Section 2.5.4.

Duke Energy Response:

For a hard rock site such as the Lee Nuclear Station, with materials selected to ensure a 0.7 coefficient of friction interface requirement beneath the Nuclear Island (NI), no credit is required for passive resistance of fill adjacent to the NI to ensure that stability criteria for sliding and overturning of Category I structures are met. Based upon Subsection 2.5.4.6 of Revision 16 and Revision 17 of the AP1000 DCD (References 1 and 2), *a determination of the static and dynamic engineering properties of the surrounding soils will be made to demonstrate these soils are competent and provide passive earth pressures greater than or equal to those used in the seismic stability evaluation for sliding of the nuclear island.* For a hard rock site, the Westinghouse dynamic analysis model did not include side fill, and the sliding and overturning analyses did not credit resistance by that side fill. Accordingly, Duke Energy considers the backfill around the NI to be conventional quality and non-seismic.

Westinghouse evaluations demonstrate the acceptability of coefficients of friction as low as 0.55 beneath the NI to support locating AP1000 units at a variety of sites. This conclusion is documented in Reference 3. As the site-specific coefficient of friction is reduced from 0.7, greater reliance is placed upon passive resistance from the fill adjacent to the NI to resist sliding. For the analyses summarized in Reference 3, "at rest" soil pressure from adjacent fill is also relied upon before the adjacent fill displaces enough to engage passive resistance. Reference 3 also states that passive resistance is not considered for overturning seismic stability evaluation.

Additional detail on the analyses supporting Reference 3 is provided by Westinghouse in RAI responses such as Reference 4. For various assumed values of the coefficient of friction below the NI, Reference 4 presents the magnitude of the passive soil resistance relied upon to resist sliding. For a hard rock site with coefficient of friction of 0.7, there is no reliance on passive soil resistance. In subsequent evaluations, Westinghouse confirms that even if the "at rest" soil

pressure resistance is ignored, the NI sliding factor of safety is still over 1.14, compared to a 1.1 acceptance criterion for that factor of safety. These analyses confirm Duke Energy's approach of treating fill adjacent to the NI as conventional quality and non-seismic.

To provide defense-in-depth to the features that preclude sliding and overturning of the NI, Duke Energy has chosen to use granular backfill material adjacent to the NI and beneath adjacent structures. Therefore, the FSAR will be revised to require granular backfill material from an off-site source for backfill adjacent to the NI and beneath adjacent structures. Although the source and specific properties of this material have not yet been identified, it will meet the interface requirements in the AP1000 DCD Subsection 2.5.4.6.2. The granular backfill will be compacted to 96% relative compaction based on the modified Proctor compaction test (ASTM D1557), and will have an effective stress friction angle of 35 degrees or more as used in sliding stability analyses in Reference 3, Section 2.9, Table 2.9-1.

To ensure that the engineering properties of the proposed granular backfill material meets the values used to calculate the static and dynamic lateral earth pressures, FSAR Table 2.5.4-222 will be revised to show that laboratory tests will be performed on remolded samples of the proposed granular backfill when its source is known. The engineering properties of the backfill relevant to the lateral earth pressure that will be determined in the laboratory tests include unit weight, coefficient of earth pressure at-rest, shear strength, and dynamic Poisson's Ratio. In addition, prior to constructing the backfill adjacent to the NI and beneath adjacent structures, a test fill pad will be constructed on-site using the equipment and proposed granular backfill material. An engineering report will be prepared to confirm that the granular backfill material, construction equipment, and methods used to construct the test fill are capable of producing acceptable and consistent results. Implementation of this change will require additional engineering activities to develop the required revisions to the FSAR and supporting documentation. Therefore, Duke Energy will submit proposed mark-ups for the Lee Nuclear Station FSAR by October 30, 2009.

Since imported granular backfill material will be used adjacent to the NI and beneath adjacent structures, the liquefaction evaluation of Group I Fill from on-site sources is no longer applicable to the Lee Nuclear Station COLA. Therefore, Duke Energy withdraws the report identified in Reference 5.

References:

1. AP1000 DCD Revision 16, Chapter 2 (ML071580872).
2. AP1000 DCD Revision 17, Chapter 2 (ML083230296).
3. Robert Sisk (Westinghouse Electric Company) to Document Control Desk, U.S. Nuclear Regulatory Commission (NRC) , AP1000 Standard COL Technical Report Submittal of APP-GW-GLR-044, Revision 1 (TR-85), dated February 2, 2009, (ML090400846).
4. Robert Sisk (Westinghouse Electric Company) to Document Control Desk, U.S. Nuclear Regulatory Commission, AP1000 Response to Requests for Additional Information (TR-85), Revision 1, dated December 2, 2008, (ML083660089).
5. Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission (NRC), Liquefaction Evaluation Results for Seismic Category II and Non-Seismic Power Block Structures, dated May 23, 2008 (ML081500028).

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

Duke Energy will submit proposed mark-ups for FSAR Table 2.5.4-222 and associated FSAR text implementing the changes described above by October 30, 2009.

Attachments:

None