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April 28, 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. 1589)
Ltr# WLG2009.04-07

Reference: Letter from Brian Hughes (NRC) to Peter Hastings (Duke Energy), Request for Additional Information Letter No. 051 Related to SRP Section 02.05.02 – Vibratory Ground Motion for the William States Lee III Units 1 and 2 Combined License Application, dated January 14, 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 051, RAI 02.05.02-048

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

Bryan J. Dolan

Subscribed and sworn to me on April 28, 2009

Kim N Slayb

Notary Public

My commission expires: April 19, 2010

SEAL

KIM N. SLAYB
NOTARY
PUBLIC
NEW HANOVER COUNTY, N.C.

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. 051

NRC Technical Review Branch: **Geosciences and Geotechnical Engineering Branch 2 (RGS2)**

Reference NRC RAI Number(s): **RAI 02.05.02-048**

NRC RAI:

FSAR section 2.5.2.4 Table 2.5.2-218 "Controlling Earthquakes from Deaggregation" lists the low and high frequency controlling earthquakes magnitude and distance pairs for 10-4, 10-5 and 10-6 annual frequency of exceedance. For 10-4 and 10-5, the high frequency controlling earthquakes are distant events rather than a local event. This differs from the controlling earthquake magnitude and distance from the earlier EPRI-SOG and LLNL NUREG/CR-6606 studies. For example, the Summer site HF controlling earthquake was M 5.5 at a distance of 13 km, and for the three sites shown for comparison in Table 2.5.2-216:

Oconee site HF controlling earthquake was M 5.6 at a distance of 15 km,

Catawba site HF controlling earthquake was M 5.5 at a distance of 13 km,

McGuire site HF controlling earthquake was M 5.5 at a distance of 14 km.

Please justify the absence of a local high frequency controlling earthquake for Lee site and explain how the local event spectral shape was incorporated into the site response analysis for Lee.

Duke Energy Response:

The distances for the high-frequency (HF) and low-frequency (LF) controlling earthquakes were calculated for FSAR Table 2.5.2-218 using a mean arithmetic distance rather than a mean logarithmic distance. This captures the contribution from local earthquakes, earthquakes around R=240 km (the Charleston source), and earthquakes at R~700 km (the New Madrid source). FSAR Figure 2.5.2-232 (the deaggregation of HF hazard at 1E-4) indicates that **M**=6.6, R=210 km is a reasonable earthquake that represents the range of magnitudes and distances that contribute to HF exceedances at the 1E-4 level.

The results from other sites included in this RAI indicate a much smaller distance for two reasons. (1) For those sites, distance was calculated as a mean logarithmic distance. This will give a numerically lower distance. (2) Ground motion equations used in the cited Electric Power Research Institute (EPRI) and Lawrence Livermore National Laboratory (LLNL) studies result in a smaller contribution to HF hazard from distant large earthquakes when compared to that shown in FSAR Figure 2.5.2-232 for the Lee Nuclear Site.

To determine the effect of a closer distance for the HF controlling earthquake, 1E-4 and 1E-5 rock spectra were recalculated assuming a distance of R=20 km for these spectra. Table 1 (Attachment 1 of this response) compares the amplitudes of the 1E-4 and 1E-5 HF spectra, with columns labeled "Orig. HF" indicating amplitudes using the original controlling earthquake distances documented in the Lee Nuclear Station FSAR, and columns labeled "Alter. HF" indicating amplitudes calculated if a controlling earthquake distance of 20 km is assumed.

For frequencies at and above 2.5 Hz, which is where the HF rock spectra control the calculation of design spectra, the largest increase in the HF spectra is 1% for 1E-4 and occurs at 15 Hz. The corresponding increase for 1E-5 at 15 Hz is 0.2%, meaning that the increase in Ground Motion Response Spectra (GMRS) would be between 0.2% and 1% at 15 Hz and would be lower at other spectral frequencies. It should be noted that LF rock spectra control the calculation of the design spectrum below 2.5 Hz, as can be seen from FSAR Figures 2.5.2-237 and 2.5.2-238.

The HF spectrum is not highly sensitive to changes in distance because spectral shape itself is not highly sensitive to changes in distance, and because the controlling earthquake spectra are anchored to seismic hazard results (i.e., to the calculated uniform hazard response spectra (UHRS) values at 1E-4 and 1E-5 annual frequencies of exceedance) at 100, 25, 10, 5, 2.5, 1, and 0.5 Hz, where hazard results have been calculated. It is concluded that the use of a local distance for the HF controlling earthquake would have an inconsequential impact on UHRS and GMRS amplitudes.

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

None

Attachment:

1) Table 1. Comparison of Rock Amplitudes for HF Controlling Earthquakes

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

Attachment 1 to RAI 02.05.02-048

Table 1. Comparison of Rock Amplitudes for HF Controlling Earthquakes

Table 1. Comparison of Rock Amplitudes for HF Controlling Earthquakes

Freq, Hz	1E-4			1E-5		
	Orig. HF R=210 km	Alter. HF R=20 km	% diff	Orig. HF R=52 km	Alter. HF R=20 km	% diff
100	1.04E-01	1.04E-01	0.0%	4.71E-01	4.71E-01	0.0%
90	1.14E-01	1.14E-01	0.1%	5.21E-01	5.21E-01	0.0%
80	1.30E-01	1.30E-01	0.2%	6.05E-01	6.05E-01	0.1%
70	1.55E-01	1.56E-01	0.2%	7.33E-01	7.34E-01	0.1%
60	1.87E-01	1.87E-01	0.3%	8.98E-01	8.99E-01	0.1%
50	2.17E-01	2.18E-01	0.4%	1.07E+00	1.07E+00	0.1%
45	2.30E-01	2.31E-01	0.5%	1.14E+00	1.14E+00	0.2%
40	2.39E-01	2.40E-01	0.5%	1.20E+00	1.20E+00	0.2%
35	2.45E-01	2.46E-01	0.5%	1.25E+00	1.25E+00	0.1%
30	2.48E-01	2.49E-01	0.4%	1.28E+00	1.28E+00	0.1%
25	2.49E-01	2.49E-01	0.0%	1.29E+00	1.29E+00	0.0%
20	2.42E-01	2.43E-01	0.8%	1.21E+00	1.21E+00	0.2%
15	2.27E-01	2.29E-01	1.0%	1.06E+00	1.06E+00	0.2%
12.5	2.14E-01	2.16E-01	0.7%	9.54E-01	9.55E-01	0.1%
10	1.97E-01	1.97E-01	0.0%	8.20E-01	8.20E-01	0.0%
9	1.91E-01	1.91E-01	0.0%	7.73E-01	7.73E-01	0.0%
8	1.84E-01	1.84E-01	-0.1%	7.21E-01	7.20E-01	0.0%
7	1.75E-01	1.75E-01	-0.2%	6.63E-01	6.62E-01	-0.1%
6	1.65E-01	1.64E-01	-0.2%	5.99E-01	5.98E-01	-0.1%
5	1.52E-01	1.52E-01	0.0%	5.27E-01	5.27E-01	0.0%
4	1.33E-01	1.32E-01	-0.7%	4.43E-01	4.41E-01	-0.4%
3	1.09E-01	1.08E-01	-0.7%	3.45E-01	3.43E-01	-0.6%
2.5	9.46E-02	9.46E-02	0.0%	2.88E-01	2.86E-01	-0.6%
2	7.77E-02	7.84E-02	0.9%	2.24E-01	2.23E-01	-0.5%
1.5	5.72E-02	5.88E-02	2.7%	1.55E-01	1.54E-01	-0.4%
1.25	4.59E-02	4.76E-02	3.8%	1.20E-01	1.20E-01	-0.4%
1	3.44E-02	3.59E-02	4.5%	8.66E-02	8.61E-02	-0.6%
0.9	2.99E-02	3.12E-02	4.5%	7.40E-02	7.34E-02	-0.7%
0.8	2.55E-02	2.66E-02	4.4%	6.19E-02	6.13E-02	-0.9%
0.7	2.13E-02	2.21E-02	3.9%	5.04E-02	4.98E-02	-1.2%
0.6	1.72E-02	1.78E-02	3.1%	3.96E-02	3.89E-02	-1.6%
0.5	1.34E-02	1.36E-02	1.8%	2.95E-02	2.89E-02	-2.1%
0.4	1.07E-02	1.09E-02	1.8%	2.36E-02	2.31E-02	-2.1%
0.3	8.03E-03	8.18E-03	1.8%	1.77E-02	1.74E-02	-2.1%
0.2	5.35E-03	5.45E-03	1.8%	1.18E-02	1.16E-02	-2.1%
0.15	4.01E-03	4.09E-03	1.8%	8.86E-03	8.68E-03	-2.1%
0.125	3.35E-03	3.41E-03	1.8%	7.38E-03	7.23E-03	-2.1%
0.1	2.14E-03	2.18E-03	1.8%	4.72E-03	4.63E-03	-2.1%

Note: As can be seen from FSAR Figures 2.5.2-237 and 2.5.2-238, LF rock spectra control the calculation of the design spectrum below 2.5 Hz.