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September 14, 2011

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

Subject: Duke Energy Carolinas, LLC (Duke Energy)
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
Supplemental Response to Request for Additional Information
Ltr # WLG2011.09-05

References: (1) Letter from B.J. Dolan (Duke Energy) to NRC Document Control Desk, RAI Response to Letter No. 001 Related to SRP Section 08.02 for the W.S. Lee COLA, dated September 5, 2008 (ML082530446)

(2) Letter from B.J. Dolan (Duke Energy) to NRC Document Control Desk, RAI Response to Letter No. 015 Related to SRP Section 08.02 for the W.S. Lee COLA, dated October 17, 2008 (ML082950294)

This letter provides supplemental information to Duke Energy's responses for NRC RAI Nos. 08.02-001 and 08.02-008 provided in the referenced letters. The revised responses are addressed in separate enclosures.

Updated information is being provided to reflect a change in arrangement/location of the MSUT, UAT, and RATs for the standard plant made in the AP1000 Design Control Document (DCD) Rev. 17. Those changes were reflected in the Lee Nuclear Station FSAR Rev. 1 (February 25, 2009), but the associated RAI responses were not updated at the time.

The Westinghouse transformer arrangement change resulted in the Unit 1 MSUT connection to the 525 kV switchyard and the Unit 1 RAT connection to the 230 kV switchyard crossing over each other in the span between the switchyards and the plant. In order to eliminate this crossover of the 525 kV and 230 kV lines to Unit 1, the Lee Nuclear Station 230kV and 525 kV switchyards were swapped.

A thorough review by Duke Energy generation and transmission engineering confirmed that swapping of the switchyards so that the Unit 1 MSUT now connects to the 230 kV switchyard and the Unit 2 MSUT connects to the 525 kV switchyard did not result in any changes in electrical system and circuit data, or electrical calculation/analysis results

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other than to confirm that all Unit 1 data/results now apply to Unit 2, and all Unit 2 data/results now apply to Unit 1. Accordingly, the enclosed responses have been amended to change Unit 1 data/results to Unit 2 and vice versa. No other changes to the original response have been made.

As described in the RAI Response No. 08-02-008 (Reference 2), the 230 kV and 525 kV switchyards will be tied together at the Lee Nuclear Station by two auto-transformer banks when the first Lee Nuclear Unit goes into service. Thereafter, at least one auto-transformer bank will always remain in service to continuously tie the 230 kV and 525 kV grids together at that location regardless of whether 1, 2 or no Lee Nuclear Units are in service or connected to the switchyard.

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

Sincerely,

Ronald A. Jones
Senior Vice President
Nuclear Development

Enclosures:

1) Duke Energy Supplemental Response to Request for Additional Information Letter 001, RAI 08-02-001
2) Duke Energy Supplemental Response to Request for Additional Information Letter 015, RAI 08-02-008

xc (w/out enclosures):
Loren Plisco, Deputy Regional Administrator, Region II

xc (w/ enclosures):
Brian Hughes, Senior Project Manager, DNRL

AFFIDAVIT OF RONALD A. JONES

Ronald A. Jones, being duly sworn, states that he is Senior Vice President, Nuclear 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 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.

Ronald A. Jones [signature]

Subscribed and sworn to me on September 14, 2011

Freda K. Crump
Notary Public

My commission expires: August 17, 2016

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FREDA K CRUMP NOTARY PUBLIC LINCOLN COUNTY, NC

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

RAI Letter No. 001

NRC Technical Review Branch: Electrical Engineering Branch

Reference NRC RAI Number(s): 08.02-1

NRC RAI:

Section 8.2.2 of the FSAR states that in order to maintain reactor coolant pump operation for 3 seconds following a turbine trip, the grid voltage on the high side of the step-up transformers (GSUs), and reserve auxiliary transformer (RATs) can not drop less than 80 percent of the nominal voltage at the Reactor Coolant Pump. In this regard, provide the following information:

a. Is this voltage based on worst expected switchyard voltage?

b. Is the 20% voltage drop requirement consistent with North American Electric Reliability Council (NERC) criteria (or local reliability council)?

c. Describe the effect of voltage drop of 20% on the operation of the onsite auxiliary power system equipment including the Class 1E battery chargers and uninterruptible power supplies.

Duke Energy Response:

a. At Lee Nuclear Station, there are two switchyards. Unit 1 connects to the 230 kV transmission system and Unit 2 connects to the 525 kV transmission system. These transmission systems are described in FSAR Subsection 8.2. In the Lee Nuclear Station Grid Stability Evaluation, switchyard equipment, including the transformers, were modeled to confirm required voltage would be available at the generator bus or high side of the transformer being used for bus supply. As indicated in FSAR Subsection 8.2.1.1, "The TSP/TSO maintains switchyard voltage such that steady state voltage on the 26 kV isophase bus is within 0.95 – 1.05 pu [per unit] of its nominal value." Based on the analysis, the expected voltage at the generator terminals is 1.00 pu for Unit 1 and 1.01 pu for Unit 2.

There were several different pre-contingency cases created with various generation outages that established initial conditions; then contingencies were applied. The base case, with all lines in service, and the combinations of generation outages and grid contingencies simulate different grid configurations that create several different pre-trip steady state voltages. Therefore, a series of different pre-trip voltages were studied. Steady state studies showed that, for Unit 2, a turbine trip with an Asbury West 525 kV line outage caused a 4.35 kV decrease on the 525 kV bus and a 1.18 kV decrease on the 230 kV bus, both less than a 1% change. For Unit 1, an outage of the 525/230 kV autotransformer caused a 3.29 kV decrease on the 230 kV bus and a 1.93 kV decrease on the 525 kV bus, both less than a 2% change.

The voltage changes from the worst case contingency on each unit satisfy the voltage requirement for the Reactor Coolant Pump. The contingency list used in the grid study is considered to be sufficiently extensive and at an appropriate severity level to bound the reasonably expected voltages.

b. The Duke Energy Bulk Electric System is designed to meet NERC reliability standards. The NERC standards do not give specific voltage or voltage drop criteria, but require that the system remain stable and consistent with the voltage requirements of the control area. However, maintaining "switchyard voltage such that steady state voltage on the 26 kV isophase bus is within 0.95 – 1.05 pu of its nominal value" would be considered to be consistent with the NERC requirement for system stability. Additionally, the criterion that the voltage cannot drop below a level that provides less than 80% of the nominal voltage at the Reactor Coolant Pump is consistent with Duke Energy practices to supply sufficient voltage at the nuclear switchyards or notify the plant operator when the minimum voltage may not be available.

c. The requirement that grid voltage on the high side of the GSUs and RATs not drop to less than 80 percent of the nominal voltage at the Reactor Coolant Pump does not translate to a requirement to postulate a 20% voltage drop on plant auxiliary equipment. As indicated in the response to question 08.02-1a. above, steady state studies showed changes of less than 2% and 1% for Units 1 and 2, respectively, based on contingencies considered to be sufficiently extensive and at an appropriate severity level to bound the reasonably expected voltages.

Nonetheless, even under a hypothetical transient voltage drop of 20% from a steady state condition, no adverse affect would be expected on plant auxiliary equipment. Such a hypothetical transient would be less severe than the motor starting transient described in NEMA MG1 for which the plant equipment is designed. As the NEMA MG1 transient bounds the turbine trip 3 second transient, the undervoltage relay scheme settings are designed not to trip during the turbine trip 3 second voltage transient. In specific reference to the uninterruptible power supplies (UPS), the UPS is isolated from the grid voltage by the battery charger and the batteries, and therefore is unaffected by this voltage transient.

In specific reference to the class 1E battery chargers, the battery chargers are a qualified class 1E isolation device. The battery charger function is to provide isolation between input ac and the safety-related dc system and to provide dc source power when ac power is available. Safe shutdown of the plant does not require the support of the battery chargers. The battery charger is designed to allow the battery to support the dc loads during times of ac input undervoltage. This could occur during the 3 second turbine trip transient discussed above during which the RCP must remain above 80% stall voltage. The battery charger supply breaker at the ac motor control center is not designed to trip on this undervoltage condition. Additionally, there is no design requirement in the AP1000 to lock out the battery charger on an ac input undervoltage condition.

Associated Revision to the Lee Nuclear Station Combined License Application:

None

Attachments:

None

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

RAI Letter No. 015

NRC Technical Review Branch: Electrical Engineering Branch (EEB)

Reference NRC RAI Number(s): 08.02-008

NRC RAI:

Section 8.2.2 of the FSAR discusses grid stability studies and the assumptions made for load flow and transient stability. In this regard provide the following information:

a. Provide Duke's basis for choosing the grid voltage of 525 kV and 230kV in lieu of minimum expected grid voltage in Duke Energy's analysis.

b. Consistent with RG 1.206 Position C.I.8.2.2, provide the worst-case disturbances for which the grid has been analyzed to remain stable.

Duke Energy Response:

a) This item is addressed in the response to NRC Letter 003; RAI No. 08.02-001, item a. (Duke to NRC letter, dated September 5, 2008, ML082530446)

b) Unit 1 is connected to the 230 kV network; Unit 2 is connected to the 525 kV network. The 525 kV and 230 kV networks are tied together with two 525/230 kV autotransformers. The Duke Energy analysis was performed with only one autotransformer in service. The 525 kV switchyard contains two circuits, referred to as Asbury West and Asbury East. The 230 kV switchyard contains four circuits. The two Roddey West circuits are on one common tower, and the two Roddey East circuits are on another common tower.

The following contingencies (out of service) were studied:

Roddey West Line, 230 kV

Roddey East Line, 230 kV

Asbury West Line, 525 kV

Asbury East Line, 525 kV

525/230 kV autotransformer

Each contingency was applied to the base case as well as five other cases with Oconee 525 kV, Catawba 230 kV, McGuire 525 kV, WS Lee 525 kV, and WS Lee 230 kV associated units out of service, respectively. This represents the largest units connected to the Duke Energy Carolinas system.

The worst single element contingencies are generators, transmission circuits, and transformers being out of service. Loss of largest load or common tower contingencies are not considered single element events by NERC; therefore, these contingencies were not included in the steady state voltage study. Loss of the largest load is not a worst case contingency on the Duke Energy Carolinas system, so it is not typically studied.

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

None

Attachments:

None