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December 4, 2008

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 Nos. 1156 and 1162)
Ltr # WLG2008.012-08

Reference: Letter from Ravindra Joshi (NRC) to Peter Hastings (Duke Energy), *Request for Additional Information Letter Nos. 024 Related to SRP Section 12.03-12.04 for the William States Lee III Units 1 and 2 Combined License Application*, dated September 26, 2008.

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

Responses to the NRC information requests described in the referenced letter are addressed in separate enclosures, which also identify 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

Enclosures:

1) Duke Energy Response to Request for Additional Information Letter 024, RAI 12.03-12.04-001
2) Duke Energy Response to Request for Additional Information Letter 024, RAI 12.03-12.04-002

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.

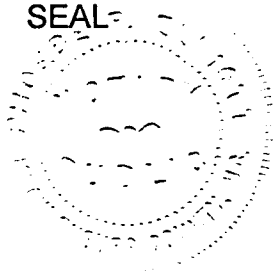
Bryan J. Dolan

Subscribed and sworn to me on December 4, 2008

Notary Public

My commission expires: June 26, 2011

SEAL



xc (w/o enclosures):

Luis Reyes, Regional Administrator, Region II
Loren Plisco, Deputy Regional Administrator, Region II
Thomas Bergman, Deputy Division Director, DNRL
Stephanie Coffin, Branch Chief, DNRL

xc (w/enclosures):

Ravindra Joshi, Project Manager, DNRL
Brian Hughes, Senior Project Manager, DNRL

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

RAI Letter No. 024

NRC Technical Review Branch: Health Physics Branch (CHPB)

Reference NRC RAI Number(s): RAI 12.03-12.04-001

NRC RAI:

10 CFR 20.1301(a)(2) states "The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with § 35.75, does not exceed 0.002 rem (0.02 millisievert) *in any one hour*"(italics added); which implies a maximum dose rate.

Table 12.4-201, "Construction Worker Dose Comparison to 10CFR20.1301 Criteria," in the Lee FSAR Chapter 12, section 4 describes the regulations as being 2 mrem (0.02 millisievert) *average* in any hour and then compares the collective average dose of the worker population to the 2 mrem/hour *average*. If the table is implemented as stated, it is in non-compliance with 10 CFR 20.1301, (i.e., there could be areas that could exceed 2 mrem/hour (0.02 millisievert/hr)).

The applicant is applying the 2 mrem/hour as a average rate limit, not as an individual maximum limit.

Revise Table 12.4-201 to comply with 10CFR20.1301 and update the Lee FSAR Section 12.4.

Duke Energy Response:

Consistent with the requirements of 10 CFR 20.1301, the wording of FSAR Table 12.4-201 will be changed so it is clear that the dose limit of 2 mrem (0.02 mSv) in any one hour is a maximum hourly dose and not an average. The maximum hourly dose determined for the construction worker is calculated at the point of maximum exposure on the assumed fence line surrounding Unit 1. According to Section 12.4.2.1 of the AP1000 DCD, there is no significant source of direct radiation at the site. Therefore, the only potentially significant source of exposure to a construction worker is through routine gaseous releases. Per DCD Subsection 11.3.3, these releases are on-going throughout normal plant operations. There is no gaseous waste holdup capability in the gaseous waste management system. Thus, the hourly dose is approximated by dividing the annual dose to a worker at the most limiting fence location by the number of occupational hours in a year (2,080 hrs/yr) to demonstrate that the construction worker dose is well below the limit of 2 mrem/hr.

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

FSAR Table 12.4-201

Attachment:

1) Revision to FSAR Table 12.4-201

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

Attachment 1 to RAI 12.03-12.04-001

Revision to FSAR Table 12.4-201

TABLE 12.4-201
CONSTRUCTION WORKER DOSE
COMPARISON TO 10 CFR 20.1301 CRITERIA

Type of Dose	Dose Limits [1] (TEDE)	Estimated Dose [2]
Annual Total Effective Dose Equivalent	100 mrem	0.29 mrem
~~Average~~ Maximum Dose in any Hour	2 mrem	2.85~~1.4~~E-043 mrem

NOTES:

1. 10 CFR 20.1301 criteria
2. The estimated annual total effective dose equivalent was calculated at the point on the Unit 2 shield building closest to Unit 1. The ~~E~~estimated maximum dose in any hour wa~~s~~is calculated at the maximum point of exposure on the assumed fence line surrounding Unit 21 ~~shield building construction area~~. T~~otal body~~he doses were calculated using the methodology in Regulatory Guide 1.109.

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

RAI Letter No. 024

NRC Technical Review Branch: Health Physics Branch (CHPB)

Reference NRC RAI Number(s): RAI 12.03-12.04-002

NRC RAI:

10 CFR 20.1301 (a)(1) states "The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year",

The WS Lee III FSAR states that the dose to Unit 2 construction workers from liquid effluents is minimal due to the tie-in of the Unit 2 piping and dose at the Unit 2 shield building construction area. The FSAR does not contain sufficient information describing the applicants' conclusion that minimal exposure of Unit 2 construction workers results from liquid effluents due to the tie-in of the Unit 2 liquid effluent piping.

Section 12.4.1.9.4 states that for an occupational year (i.e., 2080 hours on site), dose at the Unit 2 shield building construction area would be 0.29 mrem Total Effective Dose Equivalent (TEDE). The applicant also states that the maximum dose anywhere on site that would be accessible to a construction worker would be 5.9 mrem per year in the southeast sector at the Unit 1 fence line.

The discussion of the Unit 2 shield building dose does not provide information as to the source of that dose (i.e., is it due to direct exposure from Unit 1, building wake effects of the air effluent, etc.?) or as to the derivation of that annual exposure.

Provide the necessary information to confirm the FSAR calculation results and revise the FSAR Section 12.4 to provide sufficient information to demonstrate compliance with 10CFR20.1301.

Duke Energy Response:

As stated in the RAI above, 10 CFR 20.1301 requires that the total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year. The regulation also requires that the dose in any unrestricted area from external sources does not exceed 0.002 rem (0.02 mSv) in any one hour. Lee Nuclear Station FSAR Subsection 12.4 discusses the potential radiological dose impacts to construction workers at the Lee Nuclear Station resulting from the operation of Unit 1. Subsection 12.4.1.9.2 identifies that once Unit 1 is operational, workers constructing Unit 2 may be exposed to gaseous radioactive effluents and direct radiation emanating from the routine operation of Unit 1. Direct radiation from the AP1000 containment and other plant buildings is negligible, as discussed further in Subsection 12.4.1.9.2 and DCD Section 12.4.2. Therefore, the only source of dose to the Unit 2 construction workers is associated with exposure to gaseous radioactive effluents emanating from the routine operation of Unit 1.

Doses are determined at the principal area of construction for Unit 2, the nearest point of the shield building which is near the center of the power block of Unit 2. Doses are also determined at locations where particularly high dose rates could be expected, at the fence surrounding Unit 1. The necessary information to confirm the construction worker dose calculation results is

provided in FSAR Section 12.4 and in Figure 1 and Table 1 of this response. Figure 1, which is taken from FSAR Figure 1.1-202, shows the fence surrounding Units 1 and 2 as well as the assumed fence line between Units 1 and 2, which is shown with a dashed red line. The location of the Unit 1 plant vent, the location of most significant normal gaseous effluent releases, is approximated in Figure 1 with a red triangle on the northwest side of the shield building. Figure 15A-1 of the AP1000 DCD provides a more accurate location of the plant vent. Table 1 provides the χ/Q and D/Q values calculated at the distances from the Unit 1 plant vent to the nearest point on the assumed fence line surrounding Unit 1 in each of the 16 directional sectors. Lee Nuclear Station site meteorological data for the year beginning December 1, 2005 and ending November 30, 2006, was used in determination of χ/Q and D/Q values. Releases were conservatively modeled as ground-level releases. A conservative cross-sectional area of 1500 m^2 and height of 71 m for the shield building were used to evaluate the effects of building wake. A discharge height of 56 m for the plant vent was used in the calculation. No terrain correction was necessary because the construction area surrounding Units 1 and 2 is flat.

The source terms used to evaluate the dose to construction workers are the expected annual releases of airborne radionuclides as provided in Table 11.3-3 of the AP1000 DCD. The analyzed pathways for gaseous effluents include plume exposure, ground exposure, and inhalation.

FSAR Subsection 12.4.1.9.2 also states that the only exposure of Unit 2 construction workers to liquid effluents would be due to the tie-in of the Unit 2 liquid radioactive effluent piping to Unit 1 piping and that the exposure from this activity would be minimal. The basis for the conclusion that this exposure would be minimal is 10 CFR 20.1302. Consistent with the requirements of 10 CFR 20.1302, Unit 1 compliance with the dose limits for individual members of the public in 10 CFR 20.1301 shall be demonstrated with surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas. Once Unit 1 is operating, activities which would result in a potentially significant exposure to a worker would be addressed under the Unit 1 radiation protection program. As appropriate, Unit 1 radiation workers would be used to perform the work.

Subsections 12.4.1.9.2 through 12.4.1.9.5 will be revised to clarify the text including discussion of the source of the dose to construction workers and dose due to the tie-in of the Unit 2 liquid effluent piping. The changes to section 12.4 are shown in Attachment 1. These changes will be applied in a future revision of the FSAR.

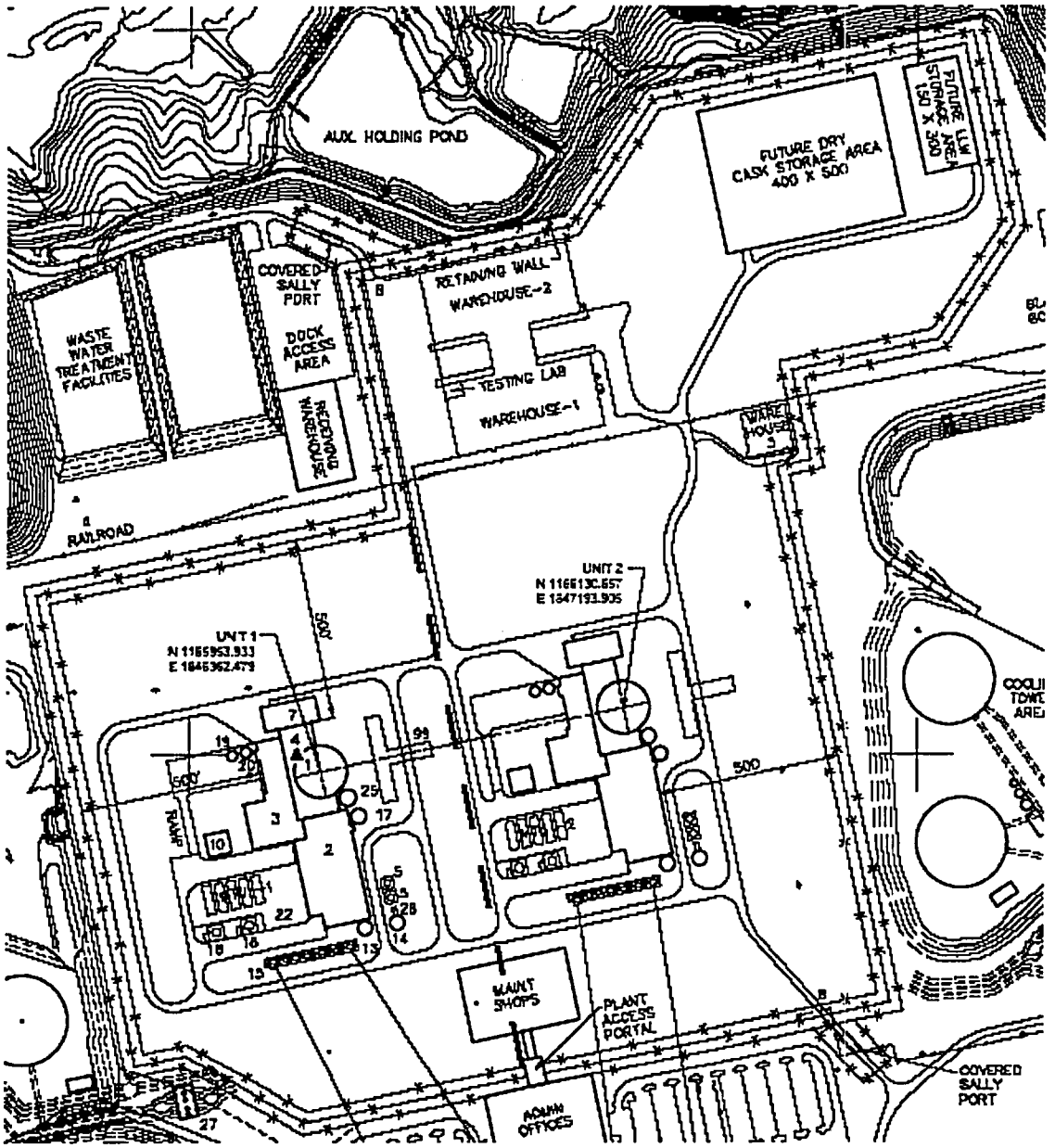


Figure 1

The following table provides the χ/Q and D/Q values at the distances from the Unit 1 plant vent to the nearest point on the assumed fence line surrounding Unit 1 in each of the 16 directional sectors as well as to the nearest point on the Unit 2 shield building.

Table 1
Atmospheric Dispersion and Deposition Values

Location	Sector	Distance (miles)	Distance (meters)	X/Q No Decay Undepleted (sec/m^3)	X/Q 2.26 Day Decay Undepleted (sec/m^3)	X/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
Unit 1 Fence Line	S	0.17	267	3.70E-05	3.70E-05	3.50E-05	6.50E-08
Unit 1 Fence Line	SSW	0.14	221	4.20E-05	4.20E-05	4.00E-05	8.20E-08
Unit 1 Fence Line	SW	0.12	189	5.70E-05	5.70E-05	5.40E-05	1.00E-07
Unit 1 Fence Line	WSW	0.11	184	6.80E-05	6.80E-05	6.40E-05	9.30E-08
Unit 1 Fence Line	W	0.11	184	7.60E-05	7.60E-05	7.20E-05	8.40E-08
Unit 1 Fence Line	WNW	0.12	189	6.70E-05	6.70E-05	6.30E-05	7.50E-08
Unit 1 Fence Line	NW	0.11	170	7.80E-05	7.80E-05	7.30E-05	1.10E-07
Unit 1 Fence Line	NNW	0.1	166	5.50E-05	5.50E-05	5.20E-05	1.20E-07
Unit 1 Fence Line	N	0.1	166	4.00E-05	4.00E-05	3.80E-05	1.30E-07
Unit 1 Fence Line	NNE	0.1	166	2.70E-05	2.70E-05	2.60E-05	1.40E-07
Unit 1 Fence Line	NE	0.08	133	3.80E-05	3.80E-05	3.50E-05	2.00E-07
Unit 1 Fence Line	ENE	0.08	129	4.10E-05	4.10E-05	3.80E-05	1.40E-07
Unit 1 Fence Line	E	0.08	129	3.50E-05	3.50E-05	3.30E-05	8.00E-08
Unit 1 Fence Line	ESE	0.08	133	1.30E-04	1.30E-04	1.30E-04	2.00E-07
Unit 1 Fence Line	SE	0.1	156	2.60E-04	2.60E-04	2.50E-04	3.20E-07
Unit 1 Fence Line	SSE	0.14	230	6.50E-05	6.50E-05	6.10E-05	9.30E-08
Unit 2 Shield Bldg	E	0.15	248	1.10E-05	1.10E-05	1.00E-05	3.20E-08

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

FSAR Subsections 12.4.1.9.2 through 12.4.1.9.5

Attachment:

1) Revision to FSAR Subsections 12.4.1.9.2 through 12.4.1.9.5

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

Attachment 1 to RAI 12.03-12.04-002

Revision to FSAR Subsections 12.4.1.9.2 through 12.4.1.9.5

COLA Part 2, FSAR Chapter 12, Subsection 12.4.1.9.2 through 12.4.1.9.5 will be revised as follows:

12.4.1.9.2 Radiation Sources

Construction workers at the site are not exposed to any radiation sources other than background radiation until Unit 1 becomes operational. At that time, wWorkers constructing Unit 2 may also be exposed to direct radiation and to gaseous radioactive effluents emanating from the routine operation of Unit 1. ~~Radiation dose to construction workers is due to direct radiation and airborne effluents from Unit 1, and from background radiation.~~

The radiation exposure at the site boundary is considered in DCD Section 12.4.2. As stated in that section, direct radiation from the containment and other plant buildings is negligible. Additionally, there is no contribution from refueling water since the refueling water is stored inside the containment instead of in an outside storage tank.

Small quantities of monitored airborne effluents are normally released through the plant vent or the turbine building vent. The plant vent provides the release path for containment venting releases, auxiliary building ventilation releases, annex building releases, radwaste building releases, and gaseous radwaste system discharge. The turbine building vents provide the release path for the condenser air removal system, gland seal condenser exhaust and the turbine building ventilation releases. The ventilation system is described in DCD Section 9.4. The expected radiation sources (nuclides and activities) in the gaseous effluents are listed in DCD Table 11.3-3.

Exposure of Unit 2 construction workers to radioactive liquid effluents is not evaluated because the discharge structure and blowdown piping are completed during Unit 1 construction. Any work done after Unit 1 is operating that could potentially result in doses exceeding the limits for members of the public, such as tie in of Unit 2 liquid effluent piping, will be done under the Unit 1 radiation protection program. This is consistent with 10 CFR 20.1302 which requires that the dose limits for individual members of the public in 10 CFR 20.1301 be demonstrated with surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas. ~~The only exposure of Unit 2 construction workers to liquid effluents is due to the tie-in of the Unit 2 piping. The exposure from this activity is minimal.~~

12.4.1.9.3 Construction Worker Dose Estimates

The determination of construction worker dose from Unit 1 operation depends on the airborne effluent release and the atmospheric transport to the worker location. The atmospheric dispersion calculation used the guidance provided in Regulatory Guide 1.111, meteorological data for the year beginning December 1, 2005 and ending November 30, 2006, and downwind distances to the construction worker locations. The XOQDOQ computer code (NUREG/CR-2919) was used to determine the χ/Q and D/Q values for the nearest location along the Unit 1 protected area fence in each direction as well as the nearest point of the Unit 2 shield building construction area. The plant vent is assumed for the normal gaseous effluent release location.

Construction worker doses are conservatively estimated using the following information:

- The estimated maximum dose rate for each pathway.

- External exposure to contaminated ground~~.~~
- External exposure to noble gas radionuclides in the airborne plume~~.~~
- Inhalation of air~~.~~

- A construction worker exposure time of 2080 hours per year~~.~~
- A peak loading of 2100 construction workers per year for Unit 2 construction~~.~~

The use of 2,080 hours assumes the worker works 40 hours per week for 52 weeks per year.

The methodology used to calculate the doses to construction workers from normal effluent releases complies with the guidance provided in Regulatory Guide 1.109. Construction worker doses were estimated by use of the GASPAR computer code (NUREG/CR-4653). The Total Effective Dose Equivalent (TEDE), which is the sum of the Deep Dose Equivalent (DDE) and the Committed Effective Dose Equivalent (CEDE), was determined based on the GASPAR results. The annual TEDE dose was corrected for the actual time the construction workers are on-site by multiplying by a ratio of hours worked per year to hours in a year.

12.4.1.9.4 Compliance with Dose Regulations

Unit 2 construction workers are, for the purposes of radiation protection, members of the general public. This means that the dose to the individual does not exceed 100 mrem per year, the limit for a member of the public. The construction workers do not deal with radiation sources.

Dose limits to the public are provided in 10 CFR 20.1301 and 10 CFR 20.1302. Because the construction workers are considered members of the public, the requirements of 10 CFR 20.1201 through 20.1204 do not apply.

The 10 CFR 20.1301 limits annual doses from licensed operations to individual members of the public to 100 mrem TEDE. In addition, the dose from external sources to unrestricted areas must be less than 2 mrem in any one hour. This applies to the public both outside and within access controlled areas. The dose limits and estimated doses are given in Table 12.4-201. For an occupational year, i.e., 2080 hours on site, the dose due to routine gaseous effluents at the Unit 2 shield building, the principal construction area, would be 0.29 mrem TEDE. The use of 2080 hours assumes the worker works 40 hours per week for 52 weeks per year. The maximum hourly dose due to routine gaseous effluents was determined at the locations where the highest dose rates could be expected, the Unit 1 fence line. ~~anywhere on site that would be accessible to a construction worker~~ The limiting annual dose to a worker was determined to be~~would be~~ 5.9 mrem per year in the southeast sector at the Unit 1 fence line. This assumes the worker stands at this point on the fence line for all working hours for the entire year. The hourly dose at this location, based on an occupational year, is 2.85E-03 mrem/hr. These~~is~~ values are~~is~~ less than the limits specified for members of the public. Therefore, construction workers can be considered to be members of the general public and do not require radiation monitoring.

12.4.1.9.5 Collective Doses to Lee Nuclear Station Unit 2 Workers

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose is 0.61 person-rem. This estimate is based upon the construction workforce of 2100 and assumes 2,080 hours per year occupancy for each worker. This estimate evaluates the Unit 2 shield building as the average location of the workforce. This

is reasonable because the shield building is near the center of the Unit 2 power block, which is the principal Unit 2 construction area.