



April 27, 2010
NND-10-0151

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

ATTN: Document Control Desk

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Combined License Application (COLA) - Docket Numbers 52-027 and 52-028 Supplemental Response to NRC Request for Additional Information (RAI) Letter No.072 Related to Radiation Protection Design Features

- References:**
1. Letter from Donald C. Habib (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 072 Related to SRP Section 12.03-12.04 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated November 23, 2009.
 2. Letter from Ronald B. Clary (SCE&G) to Document Control Desk (NRC), Response to NRC Request for Additional Information (RAI) Letter No. 072 Related to Radiation Protection Design Features, dated January 6, 2010.

The enclosure to this letter provides the South Carolina Electric & Gas Company (SCE&G) supplemental response to the RAI items included in Reference 1. This response is considered to supersede the response provided in Reference 2. The enclosure also identifies any associated changes that will be incorporated in a future revision of the VCSNS Units 2 and 3 COLA.

Should you have any questions, please contact Mr. Alfred M. Paglia by telephone at (803) 345-4191, or by email at apaglia@scana.com.

DD83
NRD

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 27th day of April, 2010.

Sincerely,



Ronald B. Clary
Vice President
New Nuclear Deployment

JMG/RBC/jg

Enclosure

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NRC RAI Letter No. 072 Dated November 23, 2009

SRP Section: 12.03-12.04 - Radiation Protection Design Features

QUESTIONS for Health Physics Branch (CHPB)

NRC RAI Number: 12.03-12.04-3

V C Summer COL FSAR section 12.4.1.9 provides a description of the potential sources of exposure to construction workers. The dose limits to the workers are reviewed by the staff against the standards of 10 CFR 20.1301.

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 Staff will review related V C Summer SCOL documents to support an independent assessment of compliance with the regulations, but the staff needs additional information to make a determination of reasonable assurance.

- 1) FSAR 12.4.1.9.2 discussed the exposures to Units 2 and 3 to direct and gaseous radioactive effluents from Unit 1. The FSAR does not provide sufficient details on the use of TLD data, and the assumed 1 mrem/y dose contribution from Unit 1 for the Units 2 and 3 construction workers. During the ER Site Audit conducted March 9 thru 12, 2009, the details of this assessment were discussed, where the applicant indicated that that for this evaluation 5 years of TLD data, including baseline background radiation measurements prior to Unit 1 operations, were compared with measurements collected during recent years of Unit 1 operation. With the construction site for Units 2 and 3 being approximately 1 mile from Unit 1 containment and buildings, any direct dose component would be negligible considering Unit 1 building the shielding and air attenuation. However, no details are provided for the evaluation of Unit 1 gaseous effluents for the Units 2 and 3 construction workers. No basis has been provided to justify what appears to be the use of recent Unit 1 data as representative of design basis conditions as should be used for a bounding assessment. Please provide the following additional information:
 - a. Actual location (along with basis) and dispersion parameters assumed for the maximum exposed Units 2 and 3 construction workers relative to the Unit 1 release points.
 - b. Justification for the use of what appears to be a single year of Unit 1 effluent data for this construction worker dose assessment. Consideration should be given to how the Unit 1 operating conditions compare with design basis conditions (e.g., failed fuel level and operating capacity). Alternatively, potential dose from gaseous effluents to construction workers from Unit 1

operations should consider a design basis source term (i.e., as assumed for Unit 1 licensing 10 CFR 50, Appendix I compliance).

2) FSAR 12.4.1.9.3 addresses the dose to Unit 3 construction workers following completion and operation of Unit 2. The details provided are not sufficient to substantiate the doses and conclusions. Please provide the following additional information:

- a. Actual location (along with basis) and dispersion parameters assumed for the maximum exposed Unit 3 construction worker relative to the Unit 2 release points;
- b. Rationale why 2000 hours per year exposure represents the maximum exposure time, considering likely overtime during major construction activities.

VCSNS RESPONSE:

This revised response provides a complete replacement and supersedes the previous response to RAI 12.03-12.04-3 submitted to the NRC in SCE&G letter NND-10-0006, dated January 6, 2010. The response is being updated to clarify certain information as requested by the NRC in a telephone conference call on March 4, 2010 related to the calculation of construction worker doses and the adjustment of doses to account for worker occupancy times. In addition, the NRC requested a revision to the justification previously provided of the dose contribution from normal gaseous effluent from VCSNS Unit 1 and an editorial change to clarify how the TEDE does is determined based on the LADTAP results.

- 1) A review of TLD data in the Unit 1 Radiological Environmental Operating Reports for five years showed direct radiation dose rates comparable to pre-operational levels, indicating direct radiation dose from Unit 1 is negligible. For conservatism, however, it is assumed that the direct dose rate from Unit 1 to the construction site for Units 2 and 3 is 1 mrem/yr, resulting in an annual worker dose of 0.23 mrem when multiplied by 2000/8766 to account for the 2000 hours per year that the worker spends at the construction site out of an average of 365.25 days or 8766 hours. The requested information on the evaluation approach used to assess the effect of Unit 1 gaseous effluents on the Units 2 and 3 construction workers is provided below.
 - a. The doses to Units 2 and 3 construction workers from Unit 1 gaseous effluents are not explicitly calculated based on the locations of the release point and the receptors and the associated dispersion. Instead, the doses are estimated from the Virgil C. Summer Nuclear Station - Annual Effluent Radioactive Release Reports for Unit 1 from 2003 through 2007 (see References 1 to 5). Table 6 of each effluent report shows gamma, and beta doses in air, as well as the organ dose to the hypothetical maximally

exposed individual (MEI) in an unrestricted area. Although the effluent reports for 2003 through 2007 do not show total effective dose equivalent (TEDE) doses, a conservative TEDE dose rate of 1.2 mrem/yr is assumed based on the information provided in the effluent reports. This value bounds the gamma air doses shown in the effluent reports. When adjusted for the worker occupancy time of 2000 hr/yr, the annual worker dose from Unit 1 gaseous effluents is 0.27 mrem TEDE. Since the construction area for Units 2 and 3 is farther away than the nearest unrestricted area of Unit 1, this approach is considered conservative.

- b. The annual construction worker dose in FSAR Table 12.4-201 includes a gaseous effluent contribution from Unit 1 of 0.27 mrem TEDE, adjusted for worker time of 2000 hr/yr. As explained in the previous paragraph, the dose from Unit 1 is based on the annual effluent reports for 2003 through 2007. Operational data is representative of the actual plant conditions and selecting the maximum dose based on a review of five years of operational data conservatively compensates for variations in annual data.
- 2) The calculation of doses to Unit 3 construction workers from Unit 2 operation provided in FSAR 12.4.1.9.3 has been updated to incorporate 2 years of meteorological data (2007-2008). The information requested in the RAI on the calculation of doses to Unit 3 construction workers from Unit 2 operation is provided below based on the updated calculations.
- a. For calculating the dose to Unit 3 construction workers from Unit 2 gaseous effluents, the undecayed and undepleted atmospheric dispersion factor (χ/Q) and the 2.26-day decayed and undepleted χ/Q are both $1.7E-5 \text{ sec/m}^3$. The 8-day decayed and depleted χ/Q is $1.6E-5 \text{ sec/m}^3$. The ground deposition factor (D/Q) is $6.5E-8 \text{ m}^{-2}$. These values reflect 2007-2008 meteorological data and are based on the reactor center-to-center distance of 0.17 mile in the southwest direction from Unit 2 to Unit 3. The center-to-center distance between the reactors of Units 2 and 3 is used for the annual dose because it represents the average location of a worker moving about the construction area over the course of a year. The resulting annual dose from Unit 2 gaseous effluents to the Unit 3 construction worker is 0.48 mrem TEDE.
 - b. As discussed in FSAR 12.4.1.9.3, a peak construction workforce of 3600 is assumed based on working 2000 hours per year. To be consistent with the workforce calculation, the dose to the individual construction worker is also based on 2000 hours per year. If overtime had been planned, the assumed workforce estimate would have been smaller. As shown in FSAR Table 12.4-201, the construction worker doses are orders of magnitude below the limits of 10 CFR 20.1301. However, an evaluation was performed to determine the number of hours a construction worker would

have to be exposed in order to exceed the regulatory limits defined in 10 CFR 20.1301. The case of Unit 3 construction workers was evaluated considering the contributions from Units 1 and 2. The amount of hours that can be spent at the Unit 3 construction site without exceeding the 10 CFR 20.1301 limit of 100 mrem TEDE is 150,000 hours. Therefore since there are only 8,766 hours in one year, even if overtime is worked, construction worker exposures would be well within regulatory limits for members of the public.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

VCSNS COLA Part 2 will be revised in a future update as indicated below:

The statement of the revision to be made is done in bold and italics and the change itself is in regular font with red strikeouts being used to denote text that is being removed from Revision 2 of the VCSNS Units 2 and 3 FSAR. New text being added to the VCSNS Units 2 and 3 FSAR is denoted by green, underlined text.

The second paragraph of FSAR Section 12.4.1.9.2 will be revised as follows:

Direct radiation from the Unit 1 containment and other plant buildings is negligible. Routine operational thermo-luminescent dosimeter (TLD) measurements at the site boundary for Unit 1 show that the annual doses are comparable to the preoperational annual dose rates. For conservatism, the ~~annual~~ direct dose to area from Unit 1 in the construction worker area for Units 2 and 3 is assumed to be 1 mrem per year. Small quantities of monitored airborne effluents are normally released from the Unit 1 from the waste gas decay tank, reactor building purges, and oil incineration. The construction workers are assumed to be exposed to the gaseous and liquid doses from routine operation of Unit 1.

The fourth paragraph of FSAR Section 12.4.1.9.2 will be revised as follows:

For Unit 2, 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. For conservatism, the ~~annual~~ dose to area from Unit 2 in the construction worker area for Unit 3 is assumed to be 1 mrem per year.

The third paragraph of FSAR Section 12.4.1.9.3 will be revised to incorporate the following editorial changes:

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 LADTAP II computer code (NUREG/CR-4013). 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 ~~from~~based on the ~~LAPTAP~~LADTAP II results. The annual TEDE dose was corrected for the actual time the construction workers are onsite by multiplying by the ratio of hours worked per year to hours in a year.

The following new paragraph will be inserted at the end of FSAR Section 12.4.1.9.3:

When adjusted for an occupancy time of 2000 hours per year, the direct, gaseous, and liquid doses from Unit 1 are 0.23, 0.27, and 0.0020 mrem TEDE, respectively, yielding a total annual dose of 0.50 mrem TEDE. The occupancy-adjusted direct, gaseous, and liquid doses from Unit 2 are 0.23, 0.48, and 0.067 mrem TEDE, respectively, resulting in a total of 0.77 mrem TEDE. Therefore, the total annual dose to the Unit 3 construction worker from Units 1 and 2 is 1.3 mrem TEDE.

ASSOCIATED ATTACHMENTS:

None

REFERENCES:

1. SCE&G Virgil C. Summer Nuclear Station - Annual Effluent and Waste Disposal Report for the operating period January 1, 2003 through December 31, 2003, April 2004 (ML041250040).
2. SCE&G Virgil C. Summer Nuclear Station - Annual Effluent and Waste Disposal Report for the operating period January 1, 2004 through December 31, 2004, April 2005 (ML061360185).
3. SCE&G Virgil C. Summer Nuclear Station - Annual Effluent and Waste Disposal Report for the operating period January 1, 2005 through December 31, 2005, April 2006 (ML061220346).
4. SCE&G Virgil C. Summer Nuclear Station - Annual Effluent Radioactive Release Report for the operating period January 1, 2006 through December 31, 2006, April 2007 (ML071100292).
5. SCE&G Virgil C. Summer Nuclear Station - Annual Effluent Radioactive Release Report for the operating period January 1, 2007 through December 31, 2007, April 2008 (ML081280581).