SummerRAIsPEm Resource

From: Ravindra Joshi
Sent: Tuesday, February 10, 2009 12:55 PM
To: SummerRAIsPEm Resource
Subject: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 031 RELATED TO SRP SECTION 02.05.04 FOR THE VIRGIL C. SUMMER NUCLEAR STATION UNITS 2 AND 3 COMBINED LICENSE APPLICATION
Attachments: SUM-RAI-LTR-031.doc

Hearing Identifier: Summer_COL_eRAIs
Email Number: 32

Mail Envelope Properties (CEEA97CC21430049B821E684512F6E5EB70902F027)

Subject: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 031 RELATED TO SRP SECTION 02.05.04 FOR THE VIRGIL C. SUMMER NUCLEAR STATION UNITS 2 AND 3 COMBINED LICENSE APPLICATION
Sent Date: 2/10/2009 12:55:10 PM
Received Date: 2/10/2009 12:55:10 PM
From: Ravindra Joshi

Created By: Ravindra.Joshi@nrc.gov

Recipients:
"SummerRAIsPEm Resource" <SummerRAIsPEm.Resource@nrc.gov>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	3	2/10/2009 12:55:10 PM
SUM-RAI-LTR-031.doc	62970	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

February 10, 2009

Mr. Alfred M. Paglia
Manager, Nuclear Licensing
MC P40
South Carolina Electric & Gas Company
PO Box 88
Jenkinsville, SC 29065

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 031 RELATED TO SRP SECTION 02.05.04 FOR THE VIRGIL C. SUMMER NUCLEAR STATION UNITS 2 AND 3 COMBINED LICENSE APPLICATION

Dear Mr. Paglia:

By letter dated March 27, 2008, South Carolina Electric & Gas Company submitted its application to the U. S. Nuclear Regulatory Commission (NRC) for a combined license (COL) for two AP1000 advance passive pressurized water reactors pursuant to 10 CFR Part 52. The NRC staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within 30 days of the date of this letter. If changes are needed to the final safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6191or Ravindra.Joshi@nrc.gov.

Sincerely,

/**RA**/

Ravindra G. Joshi, Lead Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-027
52-028

Enclosure:
Request for Additional Information

CC: see next page

If you have any questions or comments concerning this matter, you may contact me at 301-415-6191or Ravindra.Joshi@nrc.gov.

Sincerely,

/**RA**/

Ravindra G. Joshi, Lead Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-027
52-028

eRAI Tracking No. 1915

Enclosure:
Request for Additional Information

Distribution:

Public	BHughes	CMunson	SGoetz
RidsNroDnrlNwe1	SCoffin	MComar	CAraguas
RidsNroLAKGoldstein	TSimms	JSebrosky	SHaggerty
RidsOgcMailCenter	BAnderson	RJoshi	MSpencer
RidsAcrsAcnwMailCenter	RidsRgn2MailCenter	SGonzalez	LGoldin
FVega	JGeorge	GStirewalt	RKaras

NRO-002

OFFICE	RGS2/BC	NWE1/PM	OGC	NWE1/L-PM
NAME	CMunson*	RJoshi*	LGoldin*	RJoshi*
DATE	1/14/09	1/14/09	1/29/09	1/29/09

*Approval captured electronically in the electronic RAI system.

OFFICIAL RECORD COPY

Request for Additional Information
Virgil C. Summer Nuclear Station Units 2 and 3
South Carolina Electric & Gas Company
Docket No. 52-027 and 52-028
SRP Section: 02.05.04- Stability of Subsurface Materials and Foundations

Application Section: FSAR Section 2.5.4

QUESTIONS from Geosciences and Geotechnical Engineering Branch 1 (RGS1)

02.05.04-1

FSAR Subsection 2.5.4.2.5.3 (pg 2.5.4-13) states that an N60 value of 30 blows per foot (bpf) was selected for the compacted structural fill, and that this value was deemed to be reasonable and conservative. However, the basis for selecting this specific value is not clear.

In order for the staff to assess whether 30 bpf is a reasonable and conservative value for the compacted structural fill, please explain the basis for selecting this numerical value.

02.05.04-2

FSAR Subsection 2.5.4.2.5.4 (pg 2.5.4-13 and Figure 2.5.4-218) presents the results of 3 RCTS tests, one for saprolite and 2 for proposed fill materials. Regulatory Guide 1.138 states that a sufficient number of tests should be performed to cover the range of values expected under field conditions for the material properties being assessed. However, variations in test results due to differences in materials being tested or to scatter resulting from testing techniques may not be apparent with this small number of tests. Also, the number of tests may not be sufficient for evaluating the validity of the test results.

In order for the staff to evaluate the comparison of RCTS results with the generic curves used in the seismic soil column analyses, shown in FSAR Figure 2.5.4-218, please justify the use of the generic curves based on such sparse site-specific data and explain the apparent divergence between test results and certain of the curves.

02.05.04-3

FSAR Subsection 2.5.4.4.4.1 (pgs 2.5.4-18 and 19) discusses the results of shear and compression wave velocity tests in the rock foundation layer. FSAR Figure 2.5.4-224 depicts the shear wave velocity measurements obtained at Units 2 and 3 from the P-S suspension logging method. The right side of the figure represents the variability in the shear wave velocities measured at different locations in the Unit 3 power block area. Variability in shear wave velocity between El. 310 to El. 355 (foundation grade) does not appear to meet two uniformity requirements cited in the AP1000 DCD. Specifically, in the AP 1000 DCD Tier 1, Table 5.0-1 states that, for a layer with a low strain shear wave velocity greater than or equal to 2500 feet per second, the layer should have approximately uniform thickness, a dip not greater than 20 degrees, and less than 20 percent variation in the shear wave velocity from the average velocity in any layer. Also, in AP1000 Tier 2, Subsection 2.5.4.5.3.1, the DCD states that the key attribute for acceptability of the site for an AP1000 is the bearing pressure on the underside of the basemat, such that a site having local soft or hard spots within a layer, or layers, will not meet the criteria for a uniform site.

In order for the staff to assess the adequacy of the site, please explain how the variations in shear wave velocities in the upper elevations of Layer V meet the AP1000 site uniformity requirements.

02.05.04-4

FSAR Subsection 2.5.4.5.3.1 (pg 2.5.4-22) specifies that structural fill is either concrete or granular fill and that concrete fill is used mainly at the bottom of the excavations for the seismic Category I nuclear island foundation.

In order for the staff to assess adequacy of the structural fill, please discuss the following aspects in regard to the concrete fill material:

(a) Target properties of the concrete fill materials and expected uniformity of these properties.

(b) Relationships between the concrete fill and the compacted structural fill.

(c) Extent of concrete fill.

(d) Governing design standard for the concrete fill.

02.05.04-5

FSAR Section 2.5.4.5.3.1 (pg 2.5.4-23) states that placement and compaction of structural backfill will be in accordance with technical specifications and procedures and in-place density testing frequency (e.g., a minimum of one per 10,000 square feet of fill).

In order for the staff to assess the adequacy of the structural fill, please provide the following information about structural fill placement and compaction:

(a) A justifiable testing frequency for performing field density testing for VCS Units 2 and 3 structural backfill.

(b) The basis for selecting this density testing frequency.

(c) How the frequency and number of density tests will provide assurance of adequate uniformity of shear wave velocity as required by the AP1000 standard design.

02.05.04-6

FSAR Subsection 2.5.4.5.3.2 (pg 2.5.4-23) describes common fill and states that such fill, from the excavated residual and saprolitic soils of layers I and II, will be compacted to 90% of the maximum dry density as determined by ASTM D 1557. This material was determined to be unacceptable for structure backfill and is potentially subject to liquefaction. Also, FSAR Figures 2.5.4-221 and 223 indicate that common fill is in close proximity to the turbine and radwaste buildings.

In order for the staff to assess the compaction criteria for common fill, please provide justification for selecting 90% as the minimum required compaction. Please also provide justification or analyses to ensure that the use of 90% in close proximity to structures and adjacent to structural backfill will not adversely affect soil density to the point that the minimum shear wave velocity falls below minimum requirements.

02.05.04-7

FSAR Subsection 2.5.4.7.1.2 (pg 2.5.4-27) states that there are no measured shear wave velocity measurements for structural backfill because none has been placed, and a profile of the fill was developed using assumptions as discussed in Subsection 2.5.4.2.5.3.

In order for the staff to evaluate the adequacy of the fill profile and the assumptions used, please discuss how shear wave velocity testing of the compacted structural backfill will be performed, including its interface with any placed concrete backfill, and what assurance will be provided that the resultant shear wave velocities will meet the velocity requirements of the AP1000 standard design for the completed as-built condition.

02.05.04-8

In FSAR Section 2.5.4.8 (pg 2.5.4-30), a liquefaction analysis was not performed for the common backfill, justified by the fact that the common backfill was outside any load bearing structures adjacent to the nuclear island. However, the common fill abuts the structural fill.

In order for the staff to assess liquefaction potential, please provide additional information to clarify whether there are areas where the common fill extends from the structural fill to the edge of the plant site. To the extent that the common fill extends to the edge of the plant site, please also address any potential concerns with flow liquefaction or lateral spreading in the common fill. Finally, please provide information to address the possible effects that flow liquefaction failure may have on the structural fill.

02.05.04-9

FSAR Section 2.5.4.8 (pg 2.5.4-30) states that a liquefaction analysis for the structural backfill adjacent to the nuclear island was not performed, citing that the backfill was dense and well-compacted and would not liquefy. Regulatory Guide 1.206 states that "[i]f the foundation materials at the site adjacent to and under safety-related structures are soils or soils that have a potential to become saturated and the water table is above bedrock, the applicant should provide an appropriate state-of-the-art analysis of the potential for liquefaction at the site." The nuclear island depends on the stability of the backfill for resistance to sliding and rocking. FSAR Figure 2.5.4-242 presents values of the predicted peak ground accelerations, and those for saprolite are relatively high.

In order for the staff to adequately evaluate liquefaction potential at the site, please perform a liquefaction analysis to confirm stability of the structural fill.

In addition, for the saprolitic soils, provide further justification for the selected peak ground acceleration values and factors of safety used for the liquefaction analysis.

02.05.04-10

FSAR Figure 2.5.4-224 shows that the shear wave velocity is variable across the power block area (PBA). Regulatory Guide 1.132 states that, where variable conditions are found, spacing of boreholes should be smaller, as needed, to obtain a clear picture of soil or rock properties and their variability.

In order for the staff to determine whether more boreholes may be needed, please provide justification for not having a smaller spacing of borings within the Unit 2 PBA and Nuclear Island (NI) footprint to better define the rock quality designation (RQD) and shear wave velocities.

02.05.04-11

FSAR Figure 2.5.4-226 shows the mean plus and minus 1 standard deviation shear wave velocity profiles for Units 2 and 3 below basemat elevation 355. It is assumed that the data shown in Figure 2.5.4-224 was used to develop Figure 2.5.4-226. It is observed from Figure 2.5.4-224 that two borings, B-201 and B-206, exhibit the lowest shear wave velocities recorded between El. 315 and 355 of the four shear wave velocity profiles shown. A review of the locations of these borings shows that Borings B-201 and B-206 are within the footprint of the nuclear island, but B-207 and B-211 are considerably outside of the NI footprint. Averaging the four shear wave velocity profiles (borings B-201, B206, B207 and B-211) yields a higher mean shear wave velocity profile than if only B-201 and B-206 were used.

In order for the staff to assess shear wave velocity data, please provide additional information to address the effects on the site response if only B-201 and B-206 were used to define the shear wave velocity profile.