SummerRAIsPEm Resource

From: Ravindra Joshi
Sent: Thursday, February 12, 2009 12:19 PM
To: SummerRAIsPEm Resource
Subject: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 032 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-032.doc

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From: Ravindra Joshi

Created By: Ravindra.Joshi@nrc.gov

Recipients:
"SummerRAIsPEm Resource" <SummerRAIsPEm.Resource@nrc.gov>
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Reply Requested: No
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February 12, 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. 032 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. 1952

Enclosure:
Request for Additional Information

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NRO-002

OFFICE	RGS2/BC	NWE1/PM	OGC	NWE1/L-PM
NAME	CMunson*	RJoshi*	LGoldin*	RJoshi*
DATE	1/14/09	1/21/09	2/3/09	2/4/09

*Approval captured electronically in the electronic RAI system.

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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)

02.05.04-12
FSAR Section 2.5.4.2.2 indicates that plant grade located at El. 400' will be founded on sound rock or on fill concrete. In-situ materials to the side of the plant will be removed and replaced with compacted fill. However, the impact of the non-uniform profile conditions as indicated in Figures 2.5.4-219 through 2.5.4-223 on the SSI response is not discussed in the FSAR. Since the seismic response of the AP1000 was evaluated for uniform profile conditions only, please provide an explanation of the potential effects of this non-uniformity on the plant design.

02.05.04-13
FSAR Section 2.5.4.2.2.1 indicates that the top of Layer V (sound rock) was based on estimates of RQD from the available boring samples as well as measured shear wave velocities determined from the suspension logger. Table 2.5.4-201 indicates that the top of Layer V can vary from as low as elevation 335' to as high as elevation 360'. Figure 2.5.4-211 indicates that measured RQD for sound rock varies from as low as 20% up to 100% with average RQD values exceeding 50%. Please provide information on the correlation of RQD with Vs as well as how average values were determined from the boring data for rock profiles that have such apparent non-uniformity with depth.

02.05.04-14
FSAR Section 2.5.4.2.2.2 indicates that moderately weathered rock is to be defined from RQD's that fall in the range of 0% to 50%. Boring data is used to define the top of the MWR from elevations varying as low as 317' to as high as 391'. Again, shear wave velocity measurements are used to set the appropriate elevation as 360' to 370'. During the excavation process, the decision on removal will most likely be made by site-specific information on RQD and not on shear wave velocity. In a similar fashion, the judgment for determining excavation of PWR materials will also be made on the basis of RQD data, not on shear wave velocity. Please provide criteria that will be used by field geologists to guide the excavation process.

02.05.04-15
FSAR Section 2.5.4.2.3 indicates that 7 down-hole seismic cone tests were taken through the surface soils. However, these tests do not provide any information on shear wave velocity characteristics of the underlying rocks or compacted backfill to the side of the plant. Please provide information on how these 7 tests were used in the site-specific plant evaluation and in comparison with the AP1000 design.

02.05.04-16
FSAR Section 2.5.4.2.3.2 describes piezometer readings from observation wells. Figure 2.5.4-237 indicates piezometric head varying across the site from about elevation 310' to 370' Please provide information on the impact of this unbalanced pressure distribution on lateral sliding stability.

02.05.04-17
FSAR Section 2.5.4.2.5.1 indicates that elastic moduli computed from the P-S logger measurements agrees reasonably well with the results generated from the laboratory compression tests performed on small rock samples. However, for PWR and MWR materials, effective moduli can be significantly influenced by the rock fracture configuration. It is not unusual for measured velocities from laboratory tests on small samples to be significantly greater than the results of field geophysical testing for such fractured materials. Please provide information on why these results, especially for the PWR materials, do not apparently show such differences.

02.05.04-18
FSAR Section 2.5.4.2.5.4 describes results from the 3 RCTS test conducted on one saprolite and two backfill samples. The results shown in Figure 2.5.4-218 indicate relatively large hysteretic damping at low strain (about 3.5%). Such values may indicate disturbance in the tested samples. In addition, results are presented for the 1st and 10th testing cycle. Please provide information for the other load cycles to indicate if the cyclic loadings have reached steady-state conditions. The results for hysteretic damping are indicated to be greater than 15% for large shear strains. However, the SRP specifies this value to be 15% or less. Please provide information on strain levels calculation in the various site response calculations and the maximum damping found from these calculations.

02.05.04-19
FSAR Section 2.5.4.2.5.5 indicates that pH results for site soils can be expected to be corrosive to steel. Please indicate if corrosion potential can be increased due to any stray current effects that may exist at this power station, and if so, what is its potential effect on foundation rebar or concrete and whether there are any installations requiring the embedment of metal in the soils.

02.05.04-20
FSAR Section 2.5.4.4.2 describe the process of installing the steel or PVC casing in the eight holes used for the suspension logger measurements. The description indicates that the casings were removed from the hole and "in some cases, acceptable results obtained from the suspension P-S logger, provided the casing was well-grouted into the soil." Please provide information to indicate how these results were judged to be adequate, how the grouting was evaluated to indicate a well-grouted condition, and if the removal of the casing caused disturbance of the surrounding soil. Also in this description, please include the impact of this procedure on measurements through the PWR and MWR materials.

02.05.04-21
FSAR Section 2.5.4.4.2.3 indicates that borehole deviation measurements were made. Please provide a description of the process used and the results obtained.

02.05.04-22
FSAR Section 2.5.4.4.4.1 indicates that a shear wave velocity of 6,500 fps will be used to define the top of sound rock (Layer V), this being selected based on a consideration of “rippability”. However, the measured velocity through the sound rock from the suspension logger is closer to 10,000 fps, as indicated in Figures 2.5.4-224, 225 and 226. Does this process imply that some of the MWR materials will be included in the definition of top of sound rock? Please provide information to judge the adequacy of this selected cut-off velocity as well as how this relates to the RQD definitions of rock.

02.05.04-23
FSAR Section 2.5.4.5.1 describes cross-sections indicating the extent of excavation and backfill as shown in Figures 2.5.4-219 through 223. The natural grade at the site is indicated to vary from elev. 374’ to 428’, with the estimated plant grade to be set at 400’ (FSAR Section 2.5.4.2.2). The cross-sections shown do not provide information on the relation of the natural grade to the plant grade, and if such variation is significant from an SSI perspective. Please provide information indicating full final profiles and describe evaluations made to assess the relation of the site-specific configuration to those used in the AP1000 design evaluations.

02.05.04-24
FSAR Section 2.5.4.5.3 describes the structural fill materials by providing gradation information from two samples. Please provide a description of the anticipated backfill that indicates the range of material sizes that will be used to judge acceptability of the fill, the number of gradation tests to be performed per lift as is usually done for standard backfill programs. Also, the FSAR description indicates that compaction tests will be performed at a rate of 1 per 10,000 square feet of fill. Please indicate if this rate is meant to refer to every lift placed (10,000 square feet of fill per lift) and how this rate will confirm the requirements to guarantee the uniformity of the site placement.

02.05.04-25
FSAR Section 2.5.4.7.1.2 describes the process used to estimate the velocity profile through the structural backfill. Figure 2.5.4-238 indicates that the best estimate surface velocity will be about 800 fps. This value seems high as compared to results determined at other sites. Please provide the basis for this estimate, how the results will be determined after fill placement, and please describe the impact on the evaluation if the actual surface velocity is found to be significantly lower.

02.05.04-26
FSAR Section 2.5.4.7.3 describes the variability of layer thicknesses in the velocity profiles used in the PSHAKE calculations. For shallow soil sites, it has been found that the site amplification function from top of sound rock to plant grade are very sensitive to this change in thickness. Please provide information from each of the 60 randomized profiles to indicate how the individual spectral amplification functions vary with assumed soil thickness.

02.05.04-27
FSAR Section 2.5.4.10.2 presents descriptions of bearing capacities, including estimates using Terzaghi or Vesic bearing capacity factors. These descriptions are all associated with determination of ultimate capacities for general shear failure under static load conditions. However, allowable bearing capacities for foundations on soil are not typically governed by general shear failure assumptions, but

rather by settlement considerations. Please provide information on how these estimates listed in the FSAR can be considered appropriate for the dynamic loading conditions associated with seismic response of the plant.

02.05.04-28
FSAR Section 2.5.4.10.2 indicates that the Annex and Radwaste buildings will be supported on deep soil and the turbine building is founded on deep soil at one end and hard rock on the other. Please provide information to indicate how settlements were estimated for these sandy foundations soils, if dynamic effects are included in these estimates, and potential impact of the varying support condition on design of the turbine building.

02.05.04-29
FSAR Section 2.5.4.10.3 indicates that active and at-rest pressures are used for the evaluation of lateral wall pressures. The design of the AP1000 is based on considerations of the development of passive pressures due to horizontal seismic loadings, and how the total lateral load is distributed to both lateral wall loads and base shear. The pressure diagrams shown in FSAR Figures 2.5.4-243 and 244 indicate dynamic pressures distributions, which do not follow the anticipated results typically calculated from the recommendations in ASCE 4-98 and 43-05. Please provide information justifying the calculation of these pressure diagrams and how they compare to the estimates used in the AP1000 design process.

02.05.04-30
FSAR Section 2.5.4.10.3 indicates that lateral pressure effects due to potential soil compaction are not included in the lateral pressure computation. References such as “Compaction-Induced Earth Pressures Under Ko-Conditions” by Duncan and Seed indicate that significant lateral pressures may be developed even with use of light compaction equipment. Please provide information on the planned compaction procedures to be used, impact on lateral pressures, reduced compacted density and shear wave velocity which may impact horizontal SSI response.

02.05.04-31
Section 2.5.4.6.3 of the AP1000 DCD requires that information be provided on waterproofing systems to be used along the NI boundaries. The FSAR does not discuss this issue. Please provide information on the system planned for use and the ability of the system to resist site-specific sliding and bearing loads.

02.05.04-32
In FSAR 2.5.4., Figure 2.5.4-242 indicates that the ZPA for this site exceeds the design input motions used in the AP1000 design. It is presumed that the site-specific GMRS exceeds the CSDRS used in the plant design. Please provide information on computed site-specific surface spectra generated and implication of any exceedances on re-analyses planned for the plant.