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J Kane
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 13 1984

Docket Nos.: 50-424 and 50-425

MEMORANDUM FOR: Elinor G. Adensam, Chief
Licensing Branch No. 4
Division of Licensing

FROM: George Lear, Chief
Structural and Geotechnical Engineering Branch
Division of Engineering

SUBJECT: REVIEW QUESTIONS - STRUCTURAL ENGINEERING

Plant Name: Vogtle Electric Generating Plant, Units 1 and 2
Licensing Stage: OL
Docket Number: 50-424/425
Responsible Branch: Licensing Branch No. 4, M. Miller, LPM

We have reviewed Sections 3.3, 3.4.2, 3.5.3, 3.7 and 3.8 of the Vogtle Electric Generating Plant (VEGP), Units 1 and 2 FSAR submitted by Georgia Power Company in support of their application for an Operating License for VEGP. On the basis of this review we have identified the additional information needed to complete our safety evaluation. The enclosed questions prepared by S. P. Chan (x29534), Structural Engineering Section A, Structural and Geotechnical Engineering Branch, Division of Engineering, have been prepared for your transmittal to the applicant.

George Lear

George Lear, Chief
Structural and Geotechnical
Engineering Branch
Division of Engineering

Enclosure:
As stated

cc: J. Knight
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ENCLOSURE

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2
Docket Nos. 50-424/425
REQUEST FOR ADDITIONAL INFORMATION, FSAR REVIEW

STRUCTURAL AND GEOTECHNICAL ENGINEERING BRANCH
STRUCTURAL ENGINEERING SECTION A

220.0	STRUCTURAL ENGINEERING
220.1 SRP 3.3.2.II FSAR 3.3.2.2	With regard to tornado load combinations identify the controlling load combinations used for design of structures or structural elements. Provide example of design calculations covering the controlling load combination.
220.2 SRP 3.4.2.II FSAR 3.4.1	The FSAR stated that for flood protection construction joints are provided with waterstops. Are the waterstop materials properly selected and designed so as to resist possible deterioration due to potential environmental effects such as time, heat, radiation, and chemicals? Provide details of the materials used, their expected service environment, and their expected resistance to same.
220.3 SRP 3.5.3.II.1a FSAR 3.5.1 and 1.8	There are discrepancies in the tornado missile spectrum between Table 2 of SRP 3.5.3 and Table 3.5.1-5 of the FSAR. In particular, the design missile velocity of automobile is somewhat low in the FSAR. Explain the descrepancies and demonstrate that these descrepancies would not significantly affect the outcome of design.
220.4 SRP 3.5.3.II FSAR 3.5.3	Are there any openings in the walls or roofs of Category I structures which could allow a tornado missile to pass? If so, what protection is provided to protect safety related components or systems which may be located in the way of the missile passage.
220.5 SRP 3.5.3.II FSAR 3.5.3	For concrete structural components designed to resist impactive or impulsive loads, provide a comparison of the design criteria you used for allowable ductility ratios and the criteria outlined in Appendix C of ACI 349 as modified by USNRC Regulatory Guide 1.142. Also provide an explanation for any deviation in criteria which may lead to unconservative results.
220.6 SRP 3.5.3.II FSAR 3.5.3	For steel structural components designed to resist impactive or impuslive loads, provide a comparison of the design criteria you used for allowable ductility ratios and the criteria outlined in Appendix A of NUREG-0800, SRP Section 3.5.3. Also provide an explanation for any deviation in criteria which may lead to unconservative results.

220.7 SRP 3.7.1 FSAR 3.7.B.1	The current SRP Section 3.7.1 Rev. 1 and Appendix A to 10 CFR 100 require that for seismic analysis of structures, the design motion is applied at the foundation level of Seismic Category I structures regardless of depth embedment. The applicant is required to comply with this position and provide necessary analyses for all Category I structures including the containment structure.
220.8 SRP 3.7.1.II FSAR 3.7.B.1.2	Show that the artificial time histories as demonstrated in Figures 3.7.B.1-5 and 3.7.B.1-6 will produce response spectra enveloping the corresponding design response spectra of Regulatory Guide 1.60 and meet the SRP requirements for all damping values.
220.9 SRP 3.7.1.II FSAR 3.7.B.1.3	Damping values of structural systems and subsystems higher than those listed in Regulatory Guide 1.61 may be used in a dynamic analysis if documented test data are provided to support them. These higher damping values should be identified in the FSAR and subject to NRC review and approval. Specifically, the background information of damping values for cable trays and supports as shown in Figure 3.7.B.1-7 should be provided.
220.10 SRP 3.7.2 FSAR 3.7.B.2	The current SRP Section 3.7.2 Rev. 1 requires that the enveloped results of both half-space and finite boundary methods of modeling should be used for all seismic Category I structures, deeply embedded or otherwise. The applicant is required to comply with this position and provide necessary analyses for all Category I structures including the containment structure.
220.11 SRP 3.7.2.II FSAR 3.7.B.2.1	It is stated in the FSAR that in the confirmatory study, the response spectra calculated from the finite element method of soil structure interaction using the VEGP design procedure were compared with those obtained using the impedance (half-space) method. Provide additional information of the analyzed results from comparison of floor response spectra and show that they satisfy the acceptance criteria of Section 3.7.2 of the SRP Rev. 1 (7/81).
220.12 SRP 3.7.1.II and 3.7.2.II FSAR 3.7.B.2.1 and 1.8	The applicant has identified in FSAR Section 1.8 the differences with the Standard Review Plan 3.7.1 (Rev. 1) and 3.7.2 (Rev. 1) that: 1. For deeply embedded seismic Category I structures, Vogtle applies the design motion at the grade level instead of the foundation level, and 2. Vogtle soil-structures interaction analysis uses finite elements methods for deeply embedded structures and half-space methods for shallowly embedded structures while SRP requires enveloped results of both methods regardless of the depth of embedment.

	Provide justification and technical bases for these differences and prove that the safety of structures would not be compromised.
220.13 SRP 3.7.2.II FSAR 3.7.B.2.2	Provide significant natural frequencies for major Seismic Category I structures as required by the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants.
220.14 SRP 3.7.2.II FSAR 3.7.B.2.2 3.7.B.2.3	What is a complex response time-history method? How does it apply to soil-strucutre interaction analysis? If model ing of the soil-structure system involves finite element method for soil media and lumped masses for buildings, how are the equations of motion formulated and how are the damping problems resolved?
220.15 SRP 3.7.2.II FSAR 3.7.B.2.4.1	Define and describe "transmitting boundary." Describe the physical significance of a transmitting boundary. Provide justification of its use at the VEGP site.
220.16 SRP 3.7.2.II FSAR 3.7.B.2.4.1	The following requests of additional information refer to Figures 3.7.B.2-3 and 3.7.B.2-4: (a) Provide horizontal and vertical distances of the soil-structure system model, and sizes of elements, (b) Provide mass, stiffness and damping information of stick models of structures, (c) Describe the boundary condition at the bottom (El. 1') of the soil-structure model, (d) Provide a summary of calculated motions at all boundaries of the soil media, including horizontal and vertical components of displacements, accelerations and reaction forces at significant nodal points.
220.17 SRP 3.7.2.II FSAR 3.7.B.2.8	Provide a tabulation of the actual structural gaps between Category I structures along with an adjacent tabular listing of the worst computed gaps between structures. Discuss the basis for the selected structural gap. Also demonstrate that adequate physical separations exist between Category I structures, considering the variability and uncertainties associated with parameters used in the analysis.
220.18 SRP 3.7.3.II FSAR 3.7.B.2.4.3 3.7.B.3.12	Describe in detail the methods used for seismic design and analysis of Category I tunnels. Also provide a description of pertinent design criteria and results of design/analysis used for the buried Category I tunnels.
220.19 SRP 3.7.4.II FSAR 3.7.B.4	Provide details of a seismic instrumentation inservice surveillance program. The staff's position is outlined in NUREG-0800, SRP Section 3.7.4.II.5.

220.20 SRP 3.8.1.II.4.1	A concrete containment design report should be prepared and made available for review during the structural design audit to be performed by the staff at a later date. A suggested format is included in Appendix C to SRP Section 3.8.4, but as long as substantial structural design information is included in its content, some deviation from that format will be acceptable.
220.21 SRP 3.8.1.II.4 FSAR 3.8.1.4.5 FSAR 3.8.1.5.2	With respect to the allowable stress for tangential shear in the concrete, SRP Section 3.8.1.II.5 stated that under no conditions shall the tangential shear carried by the concrete exceed 40 psi and 60 psi for the load combinations representing abnormal/severe environmental and abnormal/ extreme environmental conditions respectively. The FSAR should address compliance with this position or provide justification for deviations.
220.22 SRP 3.8.1.II.4 FSAR 3.8.1.4.7	Identify all discrepancies between BC-TOP-1 and Sub article CC-3600 of the ASME Code in steel liner plate and anchorage system design. Provide justification for these discrepancies.
220.23 SRP 3.8.1.II.6 FSAR 3.8.1.6.1-9	Identify all items of materials, quality control and special construction techniques that do not comply with, or do not meet the requirements of, SRP Section 3.8.1.II.6 and its referenced regulatory guides. Provide explanation and justification for such non-compliances.
220.24 SRP 3.8.1.II.7 FSAR 3.8.1.7.2	The long-term surveillance program of the post-tensioning system should be modified to agree with the current staff position which has been described in the Proposed Revision 3 to Regulatory Guide 1.35, April 1979. Liftoff testings are required for both containments at a site.
220.25 SRP 3.8.3.II.2 FSAR 3.8.3.2.1 3.8.3.2.4	The SRP specifies that interior structures of containment should be designed in accordance with the requirements of the ACI 349 Code as augmented by Regulatory Guide 1.142. The Vogtle interior structures are designed in accordance with the requirements of ACI 318-71 Code including the 1974 supplement. Identify and justify all deviations of the interior structural design from the applicable requirements of the ACI 349 Code as amended by Regulatory Guide 1.142.
220.26 SRP 3.8.4.II.2 FSAR 3.8.4.2.1	The SRP specifies that Category I structures shall be designed in accordance with the requirements of the ACI 349 Code as augmented by Regulatory Guide 1.142. The Vogtle Category I structures are designed in accordance with the ACI 318-71 Code. The applicant should identify and justify his Category I structural design from the requirements of ACI 349 Code as amended by Regulatory Guide 1.142.

220.27 SRP 3.8.3.II.4.e SRP 3.8.4.II.4.d SRP 3.8.5.II.5.e	Provide design reports for future strucutral design audit work covering SRP Sections 3.8.3, 3.8.4, and 3.8.5. A suggested format is shown on Appendix C to SRP Section 3.8.4. As long as the design reports provide sufficient structural design information, some deviation from that format is acceptable.