CCNPP3COLA PEmails

From: John Rycyna
Sent: Tuesday, February 03, 2009 11:01 AM
To: Poche, Robert; McQueeney, Jennifer
Cc: Samir Chakrabarti; Sujit Samaddar; Michael Miernicki; Joseph Colaccino; Meena Khanna; James Biggins; Adam Gendelman
Subject: Draft RAI No 58 SEB2 1966.doc
Attachments: Draft RAI No 58 SEB2 1966.doc

Rob,

Attached is DRAFT RAI No. 58. You have until February 17, 2009 to review it and to decide whether you need a conference call to discuss it. After the call or after February 17, 2009 the RAI will be finalized and sent to you. You then have 30 days to respond.

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Hearing Identifier: CalvertCliffs_Unit3Cola_Public_EX
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Request for Additional Information No. 58
DRAFT
2/3/2009

Calvert Cliffs Unit 3
UniStar
Docket No. 52-016
SRP Section: 03.07.01 - Seismic Design Parameters
Application Section: 3.7.1

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

03.07.01-1

FSAR Section 3.7.1.1.1 (Design Ground Motion Response Spectra), on page 3.0-30, describes the best estimate soil profiles for CCNPP Unit 3. The comparison of the generic site soil columns with the site-specific information shown in FSAR Figure 3.7-7 is based on low-strain best-estimate shear wave velocities. The lower bound shear wave velocities are provided in Table 3.7-2. In this table, layers 4 and 5 have a shear wave velocity of 243.5 m/sec (799 ft/sec), while layers 7 through 25 have a shear wave velocity of 269.4 m/sec (883.9 ft/sec). In both instances, the lower bound shear wave velocity is less than 1000 ft/sec the minimum shear wave velocity for the subgrade to be classified as competent material. In addition, the calculated strain dependent properties under seismic load will lower the shear wave velocities from those shown in Table 3.7-2. SRP 3.7.1, SRP Acceptance Criteria 3, states that if the minimum shear wave velocity is less than 1000 ft/sec, additional studies need to be performed addressing potential impact on soil-structure-interaction (SSI), potential settlements and design of foundation elements. Lower subgrade properties may invalidate the assumption that the mat is rigid in the SSI analysis thus affecting the analysis results, as well as the nuclear island (NI) design loads for seismic and accident design conditions. As the assumption of a non-rigid mat may produce additional seismic bending loads into the mat and NI superstructure, what is the technical justification for using a rigid mat in the SSI analysis with the lower bound soil properties? What is the possible impact on the SSI analysis results and on the design of the foundation mat and supported superstructure?

03.07.01-2

Provide a figure in the FSAR depicting the soil-structure-interaction (SSI) model for the nuclear island (NI) common basemat structure including the model of the supporting subgrade. In addition, provide the following information:

- State whether or not embedment effects were considered in this analysis and, if not, what is the justification for not including them and what impact could this have on the analysis results?

- Describe the properties of the structural backfill and how the fill was modeled in the SSI analysis.

- As the groundwater table is close to the bottom of the basemat, how are groundwater effects treated in the SSI confirmatory analysis?

- Describe the computer codes used to analyze the site-specific SSI of the NI common basemat structure including a description of the code, extent of application in the analysis, and basis for computer code validation. Provide similar information for the codes used in the development of foundation input response spectra for each of the seismic Category I structures, as well as for the codes used in the seismic analysis of other SSCs covered in FSAR Sections 3.7.1, 3.7.2, and 3.7.3.

03.07.01-3

FSAR Section 3.7.1.1.1 (Design Ground Motion Response Spectra) starting on page 3.0-31, describes the seismic reconciliation of the certified seismic design response spectra (CSDRS) and ground motion response spectra (GMRS) for the Emergency Power Generating Buildings (EPGBs) and Essential Service Water Buildings (ESWBs). A comparison is made in Figures 3.7-35 and 3.7-36 between the three European Utility Requirements (EUR) spectra that define the horizontal and vertical CSDRS for the U.S. EPR with the horizontal and vertical site specific foundation input response spectra (FIRS) defined at grade.

- How were the FIRS at grade elevation computed from the GMRS which were determined at an elevation 12.5 m (41 ft) below grade? Include in the response, computer codes, soil column model, and the basis for the shear wave velocity of the structural backfill that supports both the EPGB and ESWB and the impact of this backfill on the development of the FIRS?

- The horizontal FIRS presented in Table 3.7-4 have a peak ground acceleration of 0.0842 g’s. Appendix S to 10 CFR Part 50 states that the horizontal component of the SSE ground motion in the free field at the foundation level of a structure must be an appropriate response spectrum with a peak ground acceleration of at least 0.1 g. For both the EPGB and ESWB, provide in the FSAR the Appendix S minimum spectra at the foundation level of each structure meeting Appendix S requirements.

- Provide in the FSAR a comparison of the FIRS at the foundation level of each structure meeting the requirements of Appendix S to the CSDRS provided in the U.S. EPR FSAR.

For the nuclear island (NI) common basemat structures, a confirmatory analysis was performed to demonstrate that the seismic results using the ground motion associated with the FIRS coupled with the site specific soil profile and strain dependent soil properties were bounded by the certified design results. As the soil conditions under the EPGB and ESWB are similar to that under the NI common basemat structures and as these structures are supported on a significant depth of backfill, provide the basis for not providing a similar confirmatory analysis for the EPGB and ESWB

03.07.01-4

In FSAR Section 3.7.1.1.1, on page 3.0-32, it discusses the design response spectrum used to analyze the Ultimate Heat Sink (UHS) Makeup Water Intake Structure. The spectral comparison between the European Utility Requirements (EUR) soft soil spectrum scaled to 0.15 g, the RG 1.60 spectrum scaled to 0.1 g, and the ground motion response spectra (GMRS) shown in Fig. 3.7-38 indicates that the RG 1.60 spectrum and GMRS exceed the EUR spectrum at frequencies below 0.7 and 0.4, respectively. What is the corresponding comparison of displacements and velocities for these spectrum motions, and if the EUR displacements are exceeded, how will this be addressed in the design of piping and other appurtenances connected to these buildings including the design of buried utilities?

03.07.01-5

In FSAR Section 3.7.1.1.1 on page 3.0-33, it states that the design response spectra for the Ultimate Heat Sink Electrical Building (UHS EB) is conservatively established by an envelope of half the magnitude of the EUR soft soil spectrum with a zero period acceleration (ZPA) of 0.15 g and the In-Structure Response Spectra (ISRS) developed at the operating deck of the UHS makeup water intake structure (UHS MWIS). Since this is the seismic design input for this structure, provide and include in the FSAR the horizontal and vertical spectra depicting these design spectra envelopes. In addition, provide in the FSAR a reconciliation of the design response spectrum with the horizontal foundation input response spectra (FIRS) for this structure which meets the minimum requirements of 10 CFR Part 50, Appendix S. Also, include a description of how the FIRS are developed including the soil model, soil properties, backfill properties, computer programs and analysis assumptions.

03.07.01-6

FSAR Section 3.7.1.1.1 on page 3.0-32 states that the design response spectrum used to analyze the Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS) is the European Utility Requirements (EUR) soft soil spectrum scaled down to a ZPA of .15 g. The acceptability of using the scaled down EUR soft soil spectrum is based on comparison of the horizontal ground motion response spectra (GMRS) and a RG 1.60 spectrum scaled down to a zero period acceleration (ZPA) of 0.10 g. It then states that upon completion of the final geotechnical site investigation, it will be confirmed that the GMRS is a conservative representation of the foundation input response spectra (FIRS) for the UHS MWIS. The horizontal component of the FIRS for this structure must meet the requirements of 10 CFR Part 50, Appendix S and have a minimum ZPA of 0.10 g. Provide in the FSAR how the design response spectrum and assumed soil properties used in the analysis of the UHS MWIS will be reconciled with the FIRS that meets the requirements of Appendix S and the final soil properties determined from the site final geotechnical studies. Include in the FSAR a comparison of the FIRS with the design response spectrum used in the analysis. Also include a description of how the FIRS are developed including the soil model, soil properties, computer programs, and analysis assumptions.

03.07.01-7

FSAR Section 3.7.1.1.1 on page 3.0-33 states that half the European Utility Requirements (EUR) soft soil spectrum will be used for analysis for the site-specific buried utilities. Provide in the FSAR a discussion of the site-specific spectrums that were considered and provide justification for the use of the EUR soft soil spectrum including possible displacement and velocity differences that may exist with the use of this spectrum as opposed to using a site specific spectrum. Also provide a comparison of the EUR soft soil spectrum with appropriate site-specific spectra that are applicable to buried utilities.

03.07.01-8

In FSAR Section 3.7.1.2 (Percentage of Critical Damping Values) provide in the FSAR the structural damping values to be used in the analysis of site-specific Seismic Category I, Seismic Category II-SSE, and Seismic Category II structures and provide the justification for the values selected.

03.07.01-9

FSAR Section 3.7.1.1.1, page 3.0-32 characterizes the geotechnical data as preliminary. In general, noted throughout FSAR Section 3.7 there are issues that are to be resolved in the final detailed design. It is not clear how the site-specific structures will meet the requirements of GDC 2. Provide a table that lists the items to be resolved in the final detailed design, how the items will be closed, and how these are to be incorporated into the final version of the FSAR.

03.07.01-10

In FSAR Section 3.7.1.1.2 on page 3.0-33 a description of the design ground motion time histories are presented for the Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS). The design ground motion time histories for the nuclear island (NI) common basemat structures, Emergency Power Generating Buildings (EPGBs), and Essential Service Water Buildings (ESWBs) are not explicitly stated or provided by reference. What are the site specific design ground motions and their bases that apply to these structures? Provide this information in this section of the FSAR.