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UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

August 27, 2009

UN#09-364

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI No. 58, Seismic Design Parameters, Questions 03.07.01-3 and 03.07.01-5

References:

1) John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No. 58 SEB2 1966.doc (PUBLIC)" email dated February 17, 2009

2) UniStar Nuclear Energy Letter UN#09-339, from Greg Gibson to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI No. 65, Seismic System Analysis, Question 03.07.02-6, dated August 13, 2009

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated February 17, 2009 (Reference 1). This RAI addresses Seismic Design and Analysis, as discussed in Section 3.7 of the Final Safety Analysis Report, as submitted in Part 2 of the CCNPP Unit 3 Combined License Application (COLA), Revision 5.

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Enclosure 1 provides the current status of responses to the RAI questions for Seismic Analysis RAI Nos. 58, 65, and 112. Enclosure 2 provides a partial response to RAI No. 58, Question 03.07.01-3 and 03.07.01-5, as committed in Reference 2.

The response to RAI No. 58, Question 03.07.01-3 and 03.07.01-5 does not include revised COLA content and does not include any new regulatory commitments.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Michael J. Yox at (410) 495-2436.

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

Executed on August 27, 2009

Greg Gibson

Enclosures:

1) Response Summary for Requests for Additional Information, RAI No. 58, Seismic Design Parameters; RAI No. 65, Seismic System Analysis; and RAI No. 112, Seismic Design Parameters; Calvert Cliffs Nuclear Power Plant Unit 3

2) Response to NRC Request for Additional Information, Seismic Design Parameters, Questions 03.07.01-3 and 03.07.01-5, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/TD/jmm

Enclosure 1

Response Summary for Requests for Additional Information, RAI No. 58, Seismic Design Parameters, RAI No. 65, Seismic System Analysis, and RAI No. 112, Seismic Design Parameters; Calvert Cliffs Nuclear Power Plant Unit 3

Response Summary for Requests for Additional Information

RAI Set 58 Question	Description of RAI Item	Response Date
03.07.01-1	Justify assumptions of rigid basemat in SSI analysis of Nuclear Island including lower bound soil properties (where shear wave velocity is less than 1000 fps)	September 15, 2009
	Identify impact on the SSI analysis results and on the design of the foundation mat and supported superstructure.	September 15, 2009
03.07.01-2	See UniStar Nuclear Energy letter UN#09-320, dated July 15, 2009	Response submitted
03.07.01-3	For EPGB and ESWB, provide methodology to calculate FIRS at grade elevation computed from the GMRS which were determined at an applicable elevation 41 ft below grade.	This Letter – See Enclosure 2
	Describe 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.	December 29, 2009
	Provide in the FSAR the spectra at the foundation level of each structure meeting Appendix S requirements.	December 29, 2009
	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.	December 29, 2009
	Provide the basis for not performing confirmatory analysis for the EPGB and ESWB similar to that for NI. See UniStar Nuclear Energy letter UN#09-329, dated July 29, 2009.	Response submitted
03.07.01-4	See UniStar Nuclear Energy letter UN#09-320, dated July 15, 2009	Response submitted
03.07.01-5	For Ultimate Heat Sink Electrical Building, provide and include in the FSAR the horizontal and vertical spectra depicting design spectra and applicable envelope.	This Letter – See Enclosure 2
	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,	December 29, 2009

Response Summary for Requests for Additional Information

RAI Set 58 Question	Description of RAI Item	Response Date
	Appendix S.	
	Include a description of how the FIRS are developed including the soil model, soil properties, backfill properties, computer programs and analysis assumptions.	December 29, 2009
03.07.01-6	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.	September 14, 2009
	Include in the FSAR a comparison of the FIRS with the design response spectra used in the analysis.	December 29, 2009
	Include a description of how the FIRS are developed including the soil model, soil properties, computer programs, and analysis assumptions.	December 29, 2009
03.07.01-7	Provide in the FSAR a discussion of the site-specific spectra that were considered for buried utilities.	December 29, 2009
	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.	December 29, 2009
	Provide a comparison of the EUR soft soil spectrum with appropriate site specific spectra that are applicable to buried utilities.	December 29, 2009
03.07.01-8	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.01-9	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.01-10	State explicitly or by reference design ground motion time histories for Nuclear Island, EPGB and ESWB structures.	September 15, 2009
	What are the site specific design ground motions and their bases that apply to these structures? Provide this information in Section 3.7.1.1.2 of the FSAR.	December 29, 2009

Response Summary for Requests for Additional Information

RAI Set 65 Question	Description of RAI Item	Response Date
03.07.02-1	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.02-2	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-3	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-4	Provide results of SSI analysis for Ultimate Heat Sink Electrical Building that meet the acceptance criteria 4.A.vii of SRP 3.7.1 and acceptance criteria 4 of SRP 3.7.2 using subgrade model of final soil and backfill properties or justify alternative.	December 29, 2009
	Include SSSI effects from UHS MWIS.	December 29, 2009
	Reconcile with the results of assumed seismic response and ISRS.	December 29, 2009
03.07.02-5	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-6	Describe how the SSI analysis performed for Ultimate Heat Sink Makeup Water Intake Structure (UHS MWIS) meets the acceptance criteria and 4.A.vii of SRP 3.7.1 or justify alternative.	December 29, 2009
	Provide a figure depicting the soil-structure model used for the seismic analysis.	December 29, 2009
	Provide the basis for the assumed soil properties and profile used to calculate the frequency independent impedance functions. See UniStar Nuclear Energy letter UN#09-339, dated August 13, 2009	Response submitted

Response Summary for Requests for Additional Information

RAI Set 65 Question	Description of RAI Item	Response Date
	Provide the method and formulas used to calculate the values of the soil springs under the foundation as well as the lateral soil springs that represent the embedment effects. See UniStar Nuclear Energy letter UN#09-339, dated August 13, 2009	Response submitted
	State whether the soil properties used in the analysis are strain dependent or simply the low strain values. If these are low strain values, justify their use and quantify the impact of not using strain dependent properties on the results of the analysis. If the soil properties are strain dependent, describe how the final soil properties are determined in the analysis. See UniStar Nuclear Energy letter UN#09-339, dated August 13, 2009	Response submitted
	For large values of Poisson's ratio, the dynamic stiffness and damping are frequency dependent. Provide justification for assuming that the impedance functions of the supporting foundation are frequency independent. See UniStar Nuclear Energy letter UN#09-339, dated August 13, 2009	Response submitted
	Confirm that the control motion is applied at the base of the soil structure analysis model. See UniStar Nuclear Energy letter UN#09-339, dated August 13, 2009	Response submitted
	Provide a reconciliation of the final soil properties and the foundation input response spectra (FIRS) that are based on these properties with the seismic analysis results described in the FSAR.	December 29, 2009
03.07.02-7	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-8	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-9	See UniStar Nuclear Energy letter UN#09-126, dated March 19, 2009	Response submitted
03.07.02-10	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.02-11	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted

Response Summary for Requests for Additional Information

RAI Set 65 Question	Description of RAI Item	Response Date
03.07.02-12	Provide results of a structure-to-structure interaction analysis between UHS MWIS and EB.	December 29, 2009
03.07.02-13	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-14	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.02-15	See UniStar Nuclear Energy letter UN#09-320, dated July 15, 2009	Response submitted
03.07.02-16	See UniStar Nuclear Energy letter UN#09-126, dated March 19, 2009	Response submitted

Response Summary for Requests for Additional Information

RAI Set 65 Question	Description of RAI Item	Response Date
03.07.02-17	The interaction of non-seismic Category I structures with Seismic Category I systems is described in FSAR Section 3.7.2.8. In this section on page 3.0-41, it states that fire protection SSCs are categorized as either Seismic Category II-SSE, meaning the SSC must remain functional during and after a Safe Shutdown Earthquake (SSE), or Seismic Category II, meaning the SSC must remain intact after an SSE without deleterious interaction with a Seismic Category I or Seismic Category II-SSE SSC. In the U.S. EPR FSAR on page 3.7-95, it states that Seismic Category II is designed to the same criteria as Seismic Category I structures. In SRP 3.7.2, SRP Acceptance Criteria 8, which addresses the interaction of non-Category I structures with Category I SSCs, it states that when non-Category I structures are designed to prevent failure under SSE conditions; the margin of safety shall be equivalent to that of the Seismic Category I structure. • Describe how this margin of safety is achieved for the Seismic Category II-SSE and Seismic Category II portions of the fire protection system. Include in your response the seismic inputs, loading combinations, codes and acceptance criteria. What are the differences in the method of design for these two seismic categories? • Describe the basis and provide figures in the FSAR of the design response spectra used to analyze above ground seismic Category II and seismic Category II-SSE fire protection SSCs including the fire protection tanks. • What are the methods of analysis and acceptance criteria for both the buried and above ground portions of the fire protection system that are Seismic Category II-SSE that will ensure that these portions of the system will remain functional following an SSE event? • What are the modeling and analysis methods used for the fire protection tanks and to what extent do the fire protection tanks meet the acceptance criteria of SRP 3.7.3, SRP Acceptance Criteria 14.A. thru J? When the tank analysis does not meet the acceptance criteria, provide the technical justification for not doing so.	October 16, 2009
03.07.02-18	Clarify the seismic classification of fire protection tank and building. See UniStar Nuclear Energy letter UN#09-329, dated July 29, 2009.	Response submitted
	Reconcile the U.S. EPR seismic analysis for NAB with the site-specific soil properties and foundation input response spectra (FIRS)	September 15, 2009

Response Summary for Requests for Additional Information

RAI Set 65 Question	Description of RAI Item	Response Date
	Demonstrate in the FSAR that the displacement of this structure relative to the nuclear island common basemat structure is enveloped by the results of the U.S. EPR analysis.	September 15, 2009
03.07.02-19	In FSAR Section 3.7.2.8 on page 3.0-42 it states that the conventional seismic switchgear building, conventional seismic grids systems control building, the conventional seismic circulating water intake structure and the Seismic Category II retaining wall surrounding the CCNPP Unit 3 intake channel could potentially interact with Seismic Category I SSCs. For each of the above structures, describe in the FSAR how the seismic interaction acceptance criteria of SRP 3.7.2, SRP Acceptance Criteria 8 are met, or justify an alternative. If they are intended to meet criterion B, provide the technical basis for the determination that the collapse of the non-Category I structure is acceptable. For criterion C, confirm that the structure will be analyzed and designed to have a margin of safety equivalent to that of a Category I structure and state how this will be accomplished.	October 16, 2009
03.07.02-20	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-21	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.02-22	See UniStar Nuclear Energy letter UN#09-126, dated March 19, 2009	Response submitted
03.07.02-23	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted
03.07.02-24	Per COLA item 3.7-1, address that the seismic response of the nuclear island common base mat structures, seismic Category II structures, the Nuclear Auxiliary Building and the Radioactive Waste Processing Building is within the parameters of Section 3.7 of U.S. EPR FSAR.	September 15, 2009
	Provide a summary for each structure, either directly or by reference, which describes how the COL item is met.	September 15, 2009
03.07.02-25	See UniStar Nuclear Energy letter UN#09-228, dated May 1, 2009	Response submitted
03.07.02-26	See UniStar Nuclear Energy letter UN#09-291, dated June 12, 2009.	Response submitted

Response Summary for Requests for Additional Information

RAI Set 112 Question	Description of RAI Item	Response Date
03.07.01-11	Provide a definition of site SSE and explain how it meets regulation requirements..	September 15, 2009
	Consistent with the site SSE, provide the FIRS in the free field at the foundation level of each structure meeting the requirements of Appendix S, and describe how each is determined.	September 15, 2009 (NI) December 15, 2009 (EPGB, ESWB)
	For the U.S. EPR Certified Design structures, provide a comparison of the results of the site seismic September 15, 2009 (NI) analyses using the FIRS input motion defined at the foundation level of each structure, with the analyses results documented in the U.S. EPR FSAR.	September 15, 2009 (NI) December 15, 2009 (EPGB, ESWB)
	For the EPGS and ESWS, describe how the effect of structure-soil-structure interaction has been accounted December 29, 2009 for in the analysis of these buildings.	December 29, 2009 (EPGB, ESWB)

Enclosure 2

Response to NRC Request for Additional Information, Seismic Design Parameters, Questions 03.07.01-3 and 03.07.01-5, Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 58

Question 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.

Response

As summarized in Enclosure 1, the following response to this RAI question is provided herein:

How were the FIRS at grade elevation computed from the GMRS which were determined at an elevation 12.5 m (41 ft) below grade?

1.0 Calculation of FIRS as reported in FSAR Rev. 5

The Foundation Input Response Spectra (FIRS) for Emergency Power Generating Buildings (EPGBs) and Essential Service Water Buildings (ESWBs) are not computed from the Ground Motion Response Spectra (GMRS); rather they are calculated consistent with the GMRS. In particular, the transfer of GMRS to the foundation level of EPGBs and ESWBs considers the entire soil column down to the effective uniform half space. The FIRS for EPGBs and ESWBs are calculated at grade elevation (El. 85'), which is different than the foundation level of EPGBs and ESWBs structures. This approximation is conservative and will be validated during the reconciliation of the FIRS for EPGBs and ESWBs as described in the second part of this response.

The FIRS at grade elevation (El. 85') for EPGBs and ESWBs (shown in FSAR Figure 3.7-35 and 3.7-36) are computed using the same methodology described in FSAR Sections 2.5.2.5 and 2.5.2.6 to calculate the GMRS. In particular, Approach 2A from NUREG/CR-6728 (2001) and NUREG/CR-6769 (2002) is used. In this procedure, the rock Uniform Hazard Spectra (for example, at 10^{-4} annual exceedance frequency) is multiplied by a mean amplification factor at each frequency to estimate the 10^{-4} site Uniform Hazard Spectra. The following four steps are used to compute the FIRS:

1. Develop a base-case soil and rock column in which mean low-strain shear wave velocities and material damping values, and their strain-dependencies, are estimated for relevant layers from the hard rock horizon to the surface. The soil properties shown in FSAR Tables 2.5-51, 2.5-52 and 2.5-53 are used in this step, and details of the discretization of the top 41 ft of the soil profile are provided in Table 1.

2. Generate 60 randomized profiles to represent uncertainty in site properties.

3. Calculate the surface motions for the High-Frequency and Low-Frequency rock motions for 10^{-4}, 10^{-5}, and 10^{-6} annual exceedance frequencies, considering the 60 soil profiles.

4. Calculate the FIRS from the mean surface motions at grade elevation (El. 85.0 ft), using the performance-based procedure of NRC Regulatory Guide 1.208 (2007).

Description	Top Depth (ft)	Bottom Depth (ft)	Thickness (ft)	V_s (feet/sec)	Unit weight (pounds per cubic foot)	Std. Deviation of log(V_s)
Structural Backfill	0.0	5.0	5.0	790	120	0.18
Structural Backfill	5.0	10.0	5.0	790	120	0.18
Structural Backfill	10.0	15.0	5.0	790	120	0.18
Structural Backfill	15.0	20.0	5.0	790	120	0.18
Structural Backfill	20.0	25.0	5.0	790	120	0.18
Structural Backfill	25.0	30.0	5.0	1100	120	0.18
Structural Backfill	30.0	35.0	5.0	1100	120	0.18
Structural Backfill	35.0	41.0	6.0	1100	120	0.18

Table 1. Properties of Top 41 ft of Profile Used in FIRS Calculation

1.1 Computer Codes

The computer codes used for the FIRS calculations are SOILSIM and RVTSITE. Details of the codes are provided in response to RAI No. Set 58 Question 03.07.01-2[1].

1.2 Soil Profile

Soil profile provided in FSAR Tables 2.5-51 and 2.5-53 is used for depths greater than 41 ft. The structural backfill properties considered in the analysis for the top 41 ft are provided in Table 1. The shear-wave velocity used for the top 41 ft of backfill corresponds to the in-situ soils (25 ft of Terrace Sands above 16 ft of Chesapeake clay/silt). Due to unavailability of the actual backfill properties, these values were considered representative of the structural backfill material at the time of writing the FSAR. Similarly, the unit weight and degradation curves for the Terrace sands were also considered representative of the backfill properties (see FSAR Table 2.5-53 and Figure 1 below). The dynamic properties for the in-situ soils are based on Resonant Column Torsional Shear (RCTS) Tests and are randomized as shown in Figure 1.

1.3 Impact of Structural Backfill

The impact of the structural backfill on the development of FIRS is inherently accounted for in the methodology described above. Figures 2 and 3, which compare the GMRS (El. 44 ft) and the FIRS (El. 85 ft) for horizontal and vertical directions, respectively, show the effect of assumed structural backfill. The inclusion of structural backfill amplifies most of the spectral accelerations for frequencies higher than 0.3 Hz.

2.0 Reconciliation of FIRS for EPGB and ESWB

Once the actual properties of the structural backfill material are established, the FIRS at the bottom of the foundations of EPGBs and ESWBs will be recalculated following an approach similar to that outlined above in Part 1.0. Complete response to the first bulleted item of the RAI, including the recalculated FIRS, computer codes, soil profile and impact of structural backfill on the development of FIRS will be provided according to the schedule provided in Enclosure 1.

COLA Impact

FSAR Sections 3.7.1 and 3.7.2 will be updated once the horizontal and vertical FIRS at the location of the ESWBs and EPGBs are available, following completion of the structural backfill characterization and the seismic reconciliation of these structures in accordance with Enclosure 1 for this RAI.

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[1] UniStar Nuclear Energy Letter UN#09-320, from Greg Gibson (UniStar Nuclear Energy) to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Plant, Unit 3, RAI No. 58, Seismic Design Parameters, RAI 63, Seismic Subsystem Analysis, and RAI No. 65, Seismic System Analysis, dated July 15, 2009

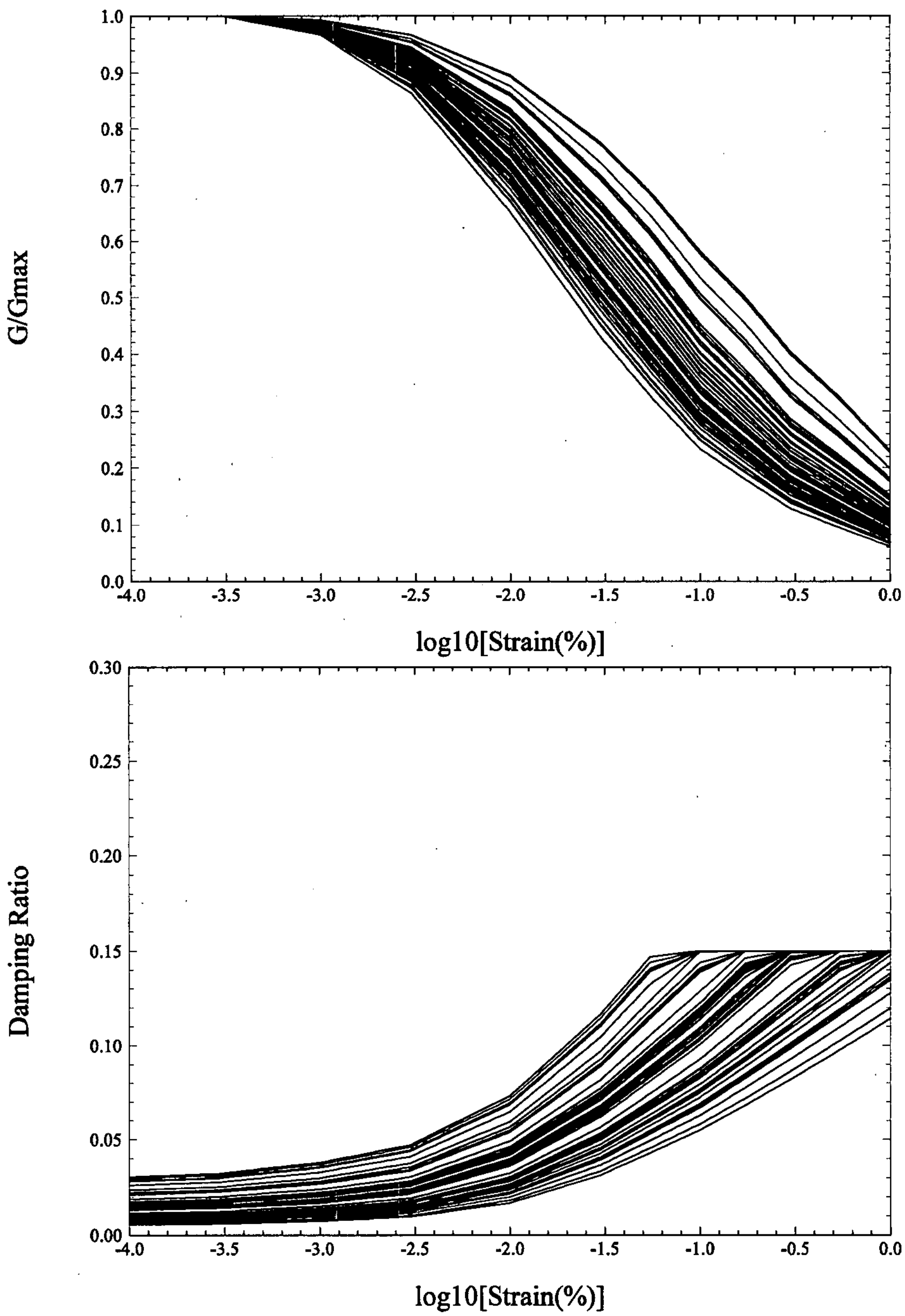

Figure 1. Randomized Shear-Modulus and Damping Degradation Curves for Terrace Sand Material Used for Assumed Structural Backfill.

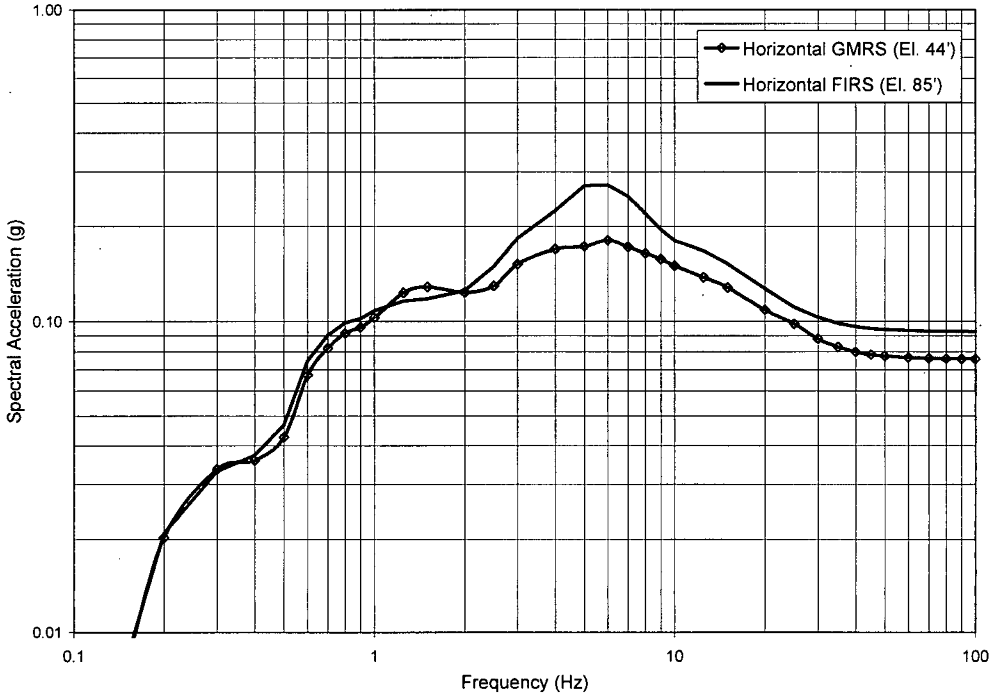

Figure 2. Comparison of Horizontal GMRS (El. 44 ft) and FIRS (El. 85 ft).

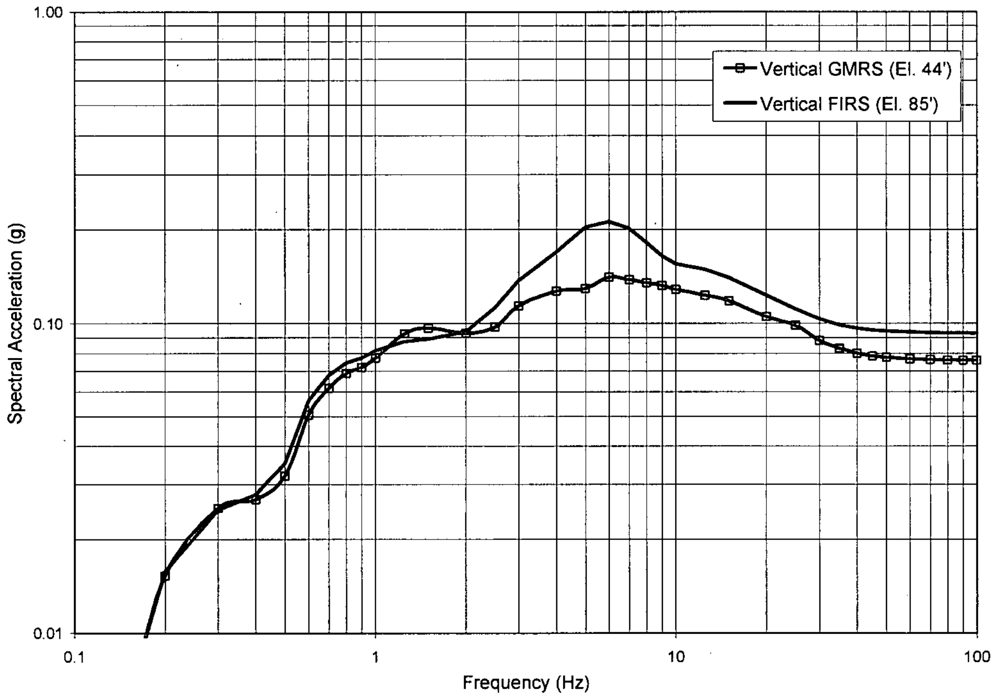

Figure 3. Comparison of Vertical GMRS (El. 44 ft) and FIRS (El. 85 ft).

Question 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.

Response

As summarized in Enclosure 1, the following response to this RAI question is provided herein:

For the Ultimate Heat Sink Electrical Building (UHS EB), provide and include the horizontal and vertical design spectra in the FSAR.

UHS EB design spectrum as reported in FSAR Revision 5

As described in FSAR Section 3.7.1.1.1, a conservative composite design response spectrum was used for the preliminary analysis of the UHS EB. This spectrum was calculated as the envelope of the following response spectra:

1. The European Utility Requirements (EUR) Soft Site Spectrum with a zero period acceleration (ZPA) of 0.15g (shown in FSAR Figure 3.7-38), and

2. The 5% damped In-Structure Response Spectra shown in FSAR Figures 3.7-39, 3.7-40 and 3.7-41 (with a ZPA of 0.35g).

The composite spectrum described above was used due to unavailability of FIRS and detailed sub-surface investigation information at the UHS EB location.

Design spectrum for seismic reconciliation for UHS EB

Figure 4 depicts the one set of horizontal and vertical Calvert Cliffs Site SSE spectra, which replaces the two sets of spectrum described above and included in FSAR Section 3.7.1.1.1. This spectrum will be used for the SSI analysis of the UHS EB integrated with UHS MWIS and other structures in the vicinity. The development of this smooth broad band spectrum is discussed in the response to RAI 58 Q03.01.07-4[1]. The results of the SSI reconciliation analysis and justification of Calvert Cliffs Site SSE spectrum as design spectra for UHS EB will be provided at a future date with responses to RAI No. 65 Questions 03.07.02-4 and 03.07.02-12 according to the schedule provided in Enclosure 1.

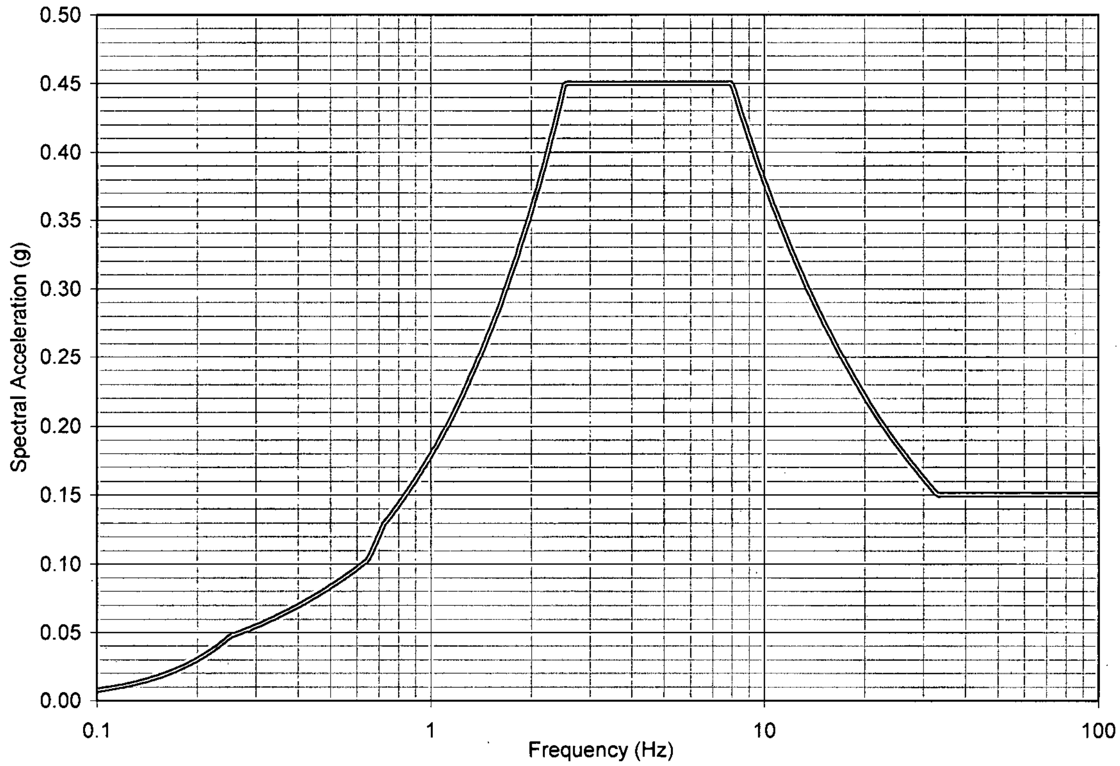

Figure 4: Calvert Cliffs Site SSE 5% damping spectrum (horizontal and vertical)

COLA Impact

FSAR sections 3.7.1 and 3.7.2 will be updated once the FIRS at the location of the UHS EB are available following sub-surface investigation and the seismic reconciliation using System for Analysis of Soils Structure Interaction (SASSI) is completed.