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UniStar
NUCLEAR ENERGY

10 CFR 50.4
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January 16, 2013

UN#13-001

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

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Partial Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI 314, Seismic Design Parameters

References:
1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 314 SEB2 5926, dated August 3, 2011.
2) UniStar Nuclear Energy Letter UN#12-017, from Mark T. Finley to Document Control Desk, U.S. NRC, Updated RAI Closure Plan, dated February 21, 2012
3) UniStar Nuclear Energy Letter UN#11-261, from Greg Gibson to Document Control Desk, U.S. NRC, RAI 314, Seismic Design Parameters, dated September 30, 2011

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 August 3, 2011 (Reference 1). This RAI addresses Seismic Design Parameters, as discussed in Section 03.07.01 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 8.

Reference 2 provided a response date of February 6, 2013, for RAI 314 Question 03.07.01-17, Item 1, Bullet 1. The enclosure to this letter provides our response to RAI 314 Question 03.07.01-17, Item 1, Bullet 1. Reference 3 provided the remainder of the response for RAI 314 Question 03.07.01-17, (Item 1, Bullet 3). The response in this letter, combined with the response in Reference 3, provides a complete response for RAI 314 Question 03.07.01-17.

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RAI responses normally provide a table of changes to the CCNPP Unit 3 COLA associated with the RAI response. This table of changes is not provided as there is no COLA revision required in connection with this RAI 314 Question 03.07.01-17, Item 1 Bullet 1 response.

There are no regulatory commitments identified in this letter. This letter does not contain any proprietary or sensitive information.

If there are any questions regarding this transmittal, please contact me at (410) 369-1907, or Mr. Wayne A. Massie at (410) 369-1910.

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

Executed on January 16, 2013

Mark T. Finley

Enclosure: Response to NRC Request for Additional Information RAI No. 314, Question 03.07.01-17, Item 1 Bullet 1, Seismic Design Parameters, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn-Willingham, NRC Environmental Project Manager, U.S. EPR COL Application, (w/o enclosure)
Amy Snyder, NRC Project Manager, U.S. EPR DC Application, (w/o enclosure)
Patricia Holahan, Acting Deputy Regional Administrator, NRC Region II, (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2,
David Lew, Deputy Regional Administrator, NRC Region I (w/o enclosure)

Enclosure

**Response to NRC Request for Additional Information
RAI No. 314, Question 03.07.01-17, Item 1 Bullet 1, Seismic Design Parameters,
Calvert Cliffs Nuclear Power Plant, Unit 3**

RAI No. 314

Question 03.07.01-17

Follow Up Question to RAI 252, Question 03.07.01-15

<u>Item 1, Bullet 1</u>:

Two-dimensional (2D) and one-dimensional (1D) site response analyses were performed to evaluate the impact of modeling the structural backfill as free field soil layers. Results of 1D and 2D site response analyses indicate that modeling the actual extent of the backfill for the NI produces a negligible difference to that of modeling the backfill as free field soil layers. For the CBIS the difference between the 2D and 1D analysis was more significant. For this case the FIRS were adjusted by the ratio of the 2D to 1D result from the study but were shown to be still less than the site SSE. From this study the applicant concludes that the modeling of the structural backfill as free field soil layers combined with the use of the site SSE as the design ground input motion is conservative and that the use of the SSE will compensate for any effect the modeling assumption of the backfill may have on the seismic response. In order to accept the applicant's conclusion, the applicant is requested to also address if the impedance difference between the structural backfill and the in-situ sand will have an effect on the frequency response of the combined soil-structure model used in the SSI analysis which would alter the results obtained using assumed free field soil layers.

Response to Item 1 Bullet 1

For a seismic wave travelling from one layer to another, the seismic energy can be transmitted or reflected at the boundary interface. The partitioning of the seismic energy at the interface between the two layers depends only on the ratio of the specific impedance of the materials on either side of the interface. In order to evaluate the seismic energy transition between the structural backfill and the in-situ soil profile for the Common Basemat Intake Structures (CBIS), the impedance ratio is evaluated.

The CBIS sits on Stratum IIc-Chesapeake Clay/Silt Layer. The in-situ soil between the bottom elevation of CBIS and grade at a distance from the CBIS foundation is Stratum IIb-Chesapeake Sand Layer.

The structural backfill material around the intake structure is mainly surrounded by the Stratum IIb above the foundation elevation. Considering seismic wave propagation toward the intake structure (backfill soil), the impedance ratio is computed for the surrounding in-situ strata with respect to the structural backfill soil, and the results are presented in Table 1. The impedance ratio is calculated with respect to the backfill soil as:

Impedance ratio (IR) = $\rho_b v_{ab} / \rho_i v_{si}$

Where ρ_b= Average density of structural back fill soil,
v_{ab}= Average shear wave velocity of structural backfill,
ρ_i= Average density of in-situ soil,
v_{si}= Average shear wave velocity of in-situ soil,

Based on the impedance ratio computed in Table 1, the impedance ratio between the structural backfill soil and the in-situ soil is close to 1, and as a result the seismic wave propagation will not be affected at the interface between the in-situ soil and the structural backfill soil. Hence, the frequency response of the combined soil structure model is not affected.

TABLE 1
CALCULATION OF IMPEDANCE RATIO FOR INTAKE AREA PROFILES

SOIL LAYER	UNIT WEIGHT	DENSITY (ρ)	AVERAGE V_s		IMPEDANCE (ρ*V_s)	IMPEDANCE RATIO*
	(Pcf)	**(Kg/m^3)**	**(ft/s)**	**(m/s)**	**(Kg/(m^2*s))**	**(IR)**
Structural Backfill	145	2321.88	923	281.44	653458	1.00
IIb-Chesapeake Cemented Sand	121	1937.57	1070	326.14	631918	1.03
IIc-1 Chesapeake clay/silt	115	1841.49	1150	350.52	645486	1.01

*The impedance ratio is computed with respect to the backfill soil impedance.

COLA Impact

Revision to the COLA FSAR is not required as a result of this response.