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10 CFR 50.4  
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October 15, 2012

UN#12-101

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 343, Seismic System Analysis

- References:
- 1) Surinder Arora (NRC) to Paul Infanger (UniStar Nuclear Energy), "CCNPP3 - Final RAI 343 SEB2 6471," dated May 14, 2012.
  - 2) UniStar Nuclear Energy Letter UN#12-058, from Mark Finley to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI 343, Seismic System Analysis, dated June 26, 2012
  - 3) UniStar Nuclear Energy Letter UN#12-009, from Mark Finley to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI 316, Seismic System Analysis, dated January 30, 2012

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 May 14, 2012 (Reference 1). This RAI addresses Seismic System Analysis, as discussed in Section 3.7.2 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 indicated that a response to RAI No. 343, Questions 03.07.02-70 through 03.07.02-74, would be provided to the NRC by January 31, 2013. The enclosure provides our complete response to RAI No. 343, Question 03.07.02-70. Responses to RAI No. 343,

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Questions 03.07.02-71 through 03.07.02-74 continue to be worked to the established January 31, 2013, schedule as defined in Reference 2.

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 markup available in connection with this RAI 343 response.

The response to RAI No. 343, Question 03.07.02-70 supersedes the response to RAI 316, Question 03.07.02-67 (Reference 3), as the RAI 316 response discussed the use of the SASSI Subtraction Method for various structures.

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 October 15, 2012



Mark T. Finley

Enclosure: Partial Response to NRC Request for Additional Information RAI No. 343, Question 03.07.02-70, Seismic System Analysis, 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  
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application  
Patricia Holahan, Acting Deputy Regional Administrator, NRC Region II  
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2  
David Lew, Deputy Regional Administrator, NRC Region I

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**Enclosure**

**Partial Response to NRC Request for Additional Information RAI No. 343,  
Question 03.07.02-70, Seismic System Analysis,  
Calvert Cliffs Nuclear Power Plant, Unit 3**

**RAI No. 343**

**Question 03.07.02-70**

**Follow-Up to Question 03.07.02-67**

In RAI 316, Question 03.07.02-67, the staff had asked the applicant to provide an assessment of the SASSI subtraction method including its impact on the seismic analyses performed in support of the CCNPP3 COL application and to identify steps taken to ensure any future seismic analyses will be free of errors or anomalies identified in the DNSFB letter of April 8th, 2011.

**Assessment of Part a**

In Part a of its response, the applicant states that the NI, EPGB, ESWB, and NAB will be analyzed using the MTR/SASSI Modified Subtraction Method (MSM). Since the MSM can also produce analysis errors, the applicant is requested to demonstrate the validity of the MSM as applied to the site specific analysis of the NI, EPGB, ESWB, and NAB by comparing the MSM results to the results obtained using the Direct Method of analysis.

For the future seismic analysis of the Turbine Island structures the applicant has stated that it will be based on either the Subtraction or MSM with the structural responses thoroughly examined to address concerns raised by the DNFSB letter. As both the Subtraction Method and the MSM can produce analysis errors, and the phrase "thoroughly examined" lacks specificity as to what action will be taken, the applicant is requested to state that the applicability of the Subtraction Method or MSM to the Turbine Island structures will be verified by a comparison of Subtraction Method or MSM results to the results obtained using the Direct Method of analysis.

Similar to the Turbine Island structures, the Access Building is a Seismic Category II structure that has design requirements which are equivalent to those of a Seismic Category I structure. The applicant is requested to describe the method of seismic analysis to be used for this building. If the Subtraction Method or MSM is to be used, the applicant is requested to verify the applicability of either method to this structure by comparing the analysis results to the results using the Direct Method of analysis. If the Access Building is a surface founded structure and therefore not subject to the potential errors of the Subtraction Method of MSM, the applicant is requested to so state this in its response.

**Assessment of Part b**

In Part b of its response the applicant states that for the NI, EPGB, and ESWB the technical and software quality assurance issues raised by the DNFSB letter will be addressed as indicated in AREVA's response to U.S. EPR FSAR RAI 489, Supplement 2, Question 03.07.02-75. It further states that the methodology described in the referenced response provides test problems using MTR/SASSI to examine the accuracy of different impedance modeling schemes. However, for the following reasons, the staff has not accepted the response to RAI 489, Supplement 2, Question 03.07.02-75:

- The basis for the test problems and the test problem results were not included in the response. In addition the conclusion from the test problems was that the Subtraction Method is valid for limited applications and that the direct method should be used when feasible.

- AREVA did not demonstrate that the MSM is conservative relative to the Direct Method. Therefore, comparisons of the MSM to the Subtraction Method provided with the response do not necessarily support the AREVA conclusion that "the analyses performed using the Subtraction Method provided adequate seismic design demands.

Thus, with respect to the AREVA certified design, the staff considers the issues raised by the DNFSB letter to still be open. As such, the applicant is requested to provide the staff with the process by which it will address the technical and quality assurance issues raised by the DNFSB letter for the NI, ESWB, EPGB and NAB in its site specific analysis of these structures.

For the CBIS, the applicant states that the software quality assurance was addressed per the RIZZO QA program requirements and that the Subtraction Method results obtained using the RIZZO SASSI Version 1.3a were compared to a benchmark problem using the Direct Method. In order for the staff to better understand the basis for the validation and verification of the RIZZO SASSI Version 1.3a code, the applicant should provide the benchmark problem, the comparison that was performed and its applicability to the CBIS analysis for the staff's review.

The applicant states that the future seismic analysis of the Turbine Island structures will be performed using SASSI 2010. Since the current seismic basis for the EPR certified design is SASSI 2000 and that of the CBIS is RIZZO SASSI Version 1.3a, the applicant should provide additional information on SASSI 2010 including its applicability to the seismic analysis of structures, systems and components of CCNPP3.

#### Assessment of Part c

In its response to Part c, the applicant provided a simplified model of the CBIS which was analyzed using both the subtraction method and the direct method of analysis. ISRS from these analyses were compared in the Y direction at 13 control points. The results of this comparison demonstrated close agreement between the methodologies for the models analyzed. However the staff believes the applicant should provide the following additional information regarding the analyses that were performed to enable it to conclude that the Subtraction Method is applicable to the SSI analysis of the CBIS:

1. Provide the basis for selecting the indicated control points.
2. Provide additional control points at elevation -35.0.
3. Provide control points at wall locations between each floor elevation.
4. Provide comparisons of ISRS results for both the X and Z directions or provide a technical justification for not including these comparisons with the results.
5. Provide a table comparing ZPA's for the X, Y, and Z directions for the control points provided with the response and for the additional control points requested above in item's 2 and 3.
6. Since the original analysis of the CBIS assumed a N-S plane of symmetry, it effectively cut the size of the finite element model by half over that of a full model. Since there is no geometric symmetry for this structure about an E-W plane, the applicant should explain why it was necessary to further reduce the seismic model to  $\frac{1}{4}$  size. If there are no size limitations of the software to perform the direct method of analysis using the  $\frac{1}{2}$  model, the applicant should provide results with this model comparing the Subtraction Method to the Direct Method for the staff's review.

7. If due to size limitations of the software code it is not possible to perform an analysis of the  $\frac{1}{2}$  model using the direct method, the applicant should demonstrate that the  $\frac{1}{4}$  model of the CBIS used in the comparison is dynamically equivalent to the  $\frac{1}{2}$  model and provide the key parameters that support this conclusion.

8. State whether or not it was necessary to consider structure to structure interaction effects on the response of the CBIS and if so, state how these were included in the analysis.

### **Response**

UniStar will reassess the Soil Structure Interaction (SSI) of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 facilities in response to updated ground motion demand that resulted from the Central and Eastern United States (CEUS) 2012 hazard update. The SASSI Direct method will be used for performing SSI analyses at CCNPP Unit 3. The SASSI Subtraction Method will not be used for any SSI analyses at CCNPP Unit 3.

The analyses of the Nuclear Island, Nuclear Auxiliary Building, Access Building, Emergency Power Generation Building, and Essential Service Water Building will be conducted using the Direct Method in MTR/SASSI.

The following versions of computer code MTR/SASSI will be used for the SSI analyses:

- MTR/SASSI version 9.2.2 or version 9.4.2 on Windows based platform or
- MTR/SASSI version 9.5 on Linux based HPC platform

The defined versions of MTR/SASSI are controlled under the AREVA QA Program.

SSI analysis of Turbine Island structures will be performed with the Bechtel Standard Computer Program (SCP) SASSI2010 using the Direct method. SASSI2010 is an enhanced version of Bechtel computer program SASSI2000 and has all of the features of the older version. The required program validation and verification (V&V) documentation for Bechtel SCP SASSI2010 is in compliance with nuclear industry QA requirements. Bechtel SCP SASSI2010 contains a new solver, such that it can solve much larger problems at faster speed.

The SSI analysis of the CCNPP Unit 3 Common Basemat Intake Structure (CBIS) will be performed with the flexible volume method. ACS SASSI Standard Version 2.3.0 will be used for the SSI analysis. The use of this software is controlled by the RIZZO Quality Assurance Program.

### **COLA Impact**

There is no COLA markup available in connection with this RAI 343 Question 03.07.02-70 response. However, FSAR Section 3.7 will be updated to reflect the use of the new SSI SASSI code versions once the respective analyses are completed. The FSAR Section 3.7 updates will be transmitted with the responses to RAIs 314, 315, and the remainder of 343. Submittal dates

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for the RAI 314 and 315 responses are as defined in UNE letter UN#12-017<sup>1</sup>, and the remainder of the RAI 343 responses are as defined in UNE letter UN#12-058<sup>2</sup>.

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<sup>1</sup> UniStar Nuclear Energy Letter UN#12-017, from Mark Finley to Document Control Desk, U.S. NRC, Calvert Cliffs Nuclear Power Plant, Unit 3, Updated RAI Closure Plan, dated February 21, 2012

<sup>2</sup> UniStar Nuclear Energy Letter UN#12-058, from Mark Finley to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI 343, Seismic System Analysis, dated June 26, 2012