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10 CFR 50.4
10 CFR 52.79

August 3, 2011

UN#11-217

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. 307, Stability of Subsurface Materials and Foundations

Reference: 1) Surinder Aurora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI
No. 307 RGS2 5741, dated May 03, 2011.

2) UniStar Nuclear Energy Letter UN#11-192, from Greg Gibson to Document
Control Desk, U.S. NRC, Response to RAI No. 307, Stability of Subsurface
Materials and Foundations, dated June 21, 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 May 03, 2011 (Reference 1). RAI 307 addresses the Stability of Subsurface Materials and Foundations as discussed in Section 2.5.4 of the Final Safety Analysis Report, as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 7.

Reference 2 provided a response date of August 3 for RAI 307 Question 02.05.04-31.

Enclosure 1 provides our responses to RAI No. 307 Question 02.05.04-31, Items 1 and 2. UniStar Nuclear Energy requires additional time to finalize the response to Question 02.05.04-31, Item 3. A response to this question will be provided by September 5, 2011.

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NRW

Our response does not include any new regulatory commitments. This letter does not contain any sensitive or proprietary information.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Wayne A. Massie at (410) 470-5503.

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

Executed on August 3, 2011

A handwritten signature in black ink, appearing to read 'Greg Gibson', with a long horizontal flourish extending to the right.

Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 307, Question 02.05.04-31, Items 1 and 2, Stability of Subsurface Materials and Foundations, 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)
Charles Casto, 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

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Enclosure

**Response to NRC Request for Additional Information
RAI No. 307, Question 02.05.04-31, Items 1 and 2, Stability of Subsurface Materials and
Foundations
Calvert Cliffs Nuclear Power Plant, Unit 3**

RAI No. 307

Question 02.05.04-31

In response to RAI Questions 02.05.04-26 and -27, you provided additional details on your settlement analysis, including the models and parameters that were applied. In order for staff to complete its review to ensure the stability of foundations, and in accordance with 10 CFR 100.23, please provide the following additional information:

1. In the RAI response you state that “for the Chesapeake Clay/Silt Stratum IIc, the consolidation test results should not be used in Terzaghi Consolidation Model for the CCNPP Unit 3 Site, and that the behavior is best represented by the in-situ tests as was done in the settlement analysis discussed in Section 2.5.4 of COLA FSAR Revision 7.” COLA FSAR Revision 7, 2.5.4.2.5.3 “Performance Properties Under Static Conditions,” states that “the selected values for the consolidation properties are based on average parameters obtained from laboratory testing.” Please clarify how the consolidation property parameters were determined if consolidation test results were not used, and provide a justification for the parameter values used in the settlement analysis. In addition, please clarify whether you took the standard design lateral-uniformity requirement into consideration for soil layers underneath the foundation.
2. Although you state that the settlement will be monitored during construction and describe measures that will be taken in the event differences occur between actual and predicted settlement, you did not state whether these methods will control the anticipated large total settlement at the CCNPP Unit 3 site. Please clarify if these methods will control the predicted large total settlement. Also, please discuss how the proposed measures are related to the U.S. EPR standard design construction sequence requirement.
3. In the RAI response you state that the pseudo-elastic analysis, as reported in the COLA FSAR Section 2.5.4, provides the best estimate of the settlement to be experienced by the CCNPP Unit 3 structures. However, staff's confirmatory analysis showed a much larger settlement using a non-linear Cam-Clay model, which is generally considered to be a realistic model for clay-type soils, such as the Chesapeake Clay/Silt Stratum IIc. Please justify why a non-linear model was not considered in your settlement estimate for the CCNPP Unit 3 Site.

Response

Item 1:

Section 2.5.4 of the Final Safety Analysis Report provides a summary of laboratory testing results including those from the consolidation tests. The input for the settlement analysis reported in FSAR Section 2.5.4 is based on a statistical and qualitative analysis of field and laboratory tests performed for the site. The consolidation parameters deduced from the field and laboratory test data were reviewed and after an assessment of the consolidation test results and the triaxial test results, the field test results were selected as the most representative for

assessing the settlement at the CCNPP Unit 3. The justification for the parameters used in settlement analysis is given as a response to CCNPP Unit 3 RAI 268¹ Question 02.05.04-27.

The standard design lateral uniformity requirement was taken into consideration, as addressed in CCNPP Unit 3 RAI 276².

Item 2:

The U.S. EPR FSAR does not specify a total settlement criterion, but limits the differential settlement to 0.5 in/50 ft. CCNPP Unit 3 RAI Response 268¹ Question 02.05.04-27 states that in the event that large differential settlements occur, actions such as extension of dewatering duration, intentional delays in making connections and arrangement of backfilling, will be taken to control the differential settlements.

Settlement monitoring may indicate the need to readjust plant grade and site grading should total settlement exceed predicted values. The impact control measures for larger than predicted total settlements will include: delaying the connections between the building(s), adaptability to adjust the plant grade, reassessment of surface drainage measures, and delay of piping and underground utility connections from the Powerblock to external structures. The predicted settlement is calculated using as input construction steps that are based on the construction sequence used to calculate the U.S. EPR settlement values. Therefore control measures will be related to the construction sequence.

The U.S. EPR FSAR Section 2.4 requires the groundwater level to be at least 3.3 ft below the plant grade. The post construction groundwater level is more than 25 ft below the site grade level. Therefore, settlement on site will not require a departure from the U.S. EPR requirement for grade elevation above groundwater.

COLA Impact

The COLA FSAR will not be revised as a result of this response.

¹ UniStar Nuclear Energy Letter UN#11-113 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. 268, Stability of Subsurface Materials and Foundations, dated March 31, 2011.

² UniStar Nuclear Energy Letter UN#11-119 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. 276, Stability of Subsurface Materials and Foundations, dated March 30, 2011.