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10 CFR 50.4  
10 CFR 52.79

July 12, 2010

UN#10-182

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 249, Probable Maximum Surge and Seiche Flooding  
Questions 02.04.05-6

Reference: Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI  
249 RHEB 4622" email dated June 11, 2010

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 June 11, 2010 (Reference). This RAI contains one question regarding Probable Maximum Surge and Seiche as discussed in Section 2.4.5 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 6.

The enclosure to this letter provides the response to RAI 249 Question 02.04.05-6. The enclosed response does not include any new regulatory commitments and does not impact COLA content. This letter does not contain any sensitive or proprietary information.

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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 July 12, 2010



Greg Gibson

Enclosure: Response to NRC Request for Additional Information, RAI 249; Probable Maximum Surge and Seiche Flooding, Question 02.04.05-6, 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

**Enclosure**

**Response to NRC Request for Additional Information**

**RAI No. 249; Probable Maximum Surge and Seiche Flooding,  
Question 02.04.05-6,**

**Calvert Cliffs Nuclear Power Plant Unit 3**

**RAI 249**

**Question 02.04.05-6**

To meet the requirements of GDC 2, 10 CFR 52.17, and 10 CFR Part 100, estimates of the probable maximum hurricane (PMH) and the probable maximum storm surge are needed. The storm surge induced by the PMH should be estimated as recommended by Regulatory Guide 1.59, supplemented by current best practices. The following relates to RAI No. 103 (eRAI 2089), Questions 02.04.05-2 & 02.04.05-4:

The applicant's estimation of the effects of the Probable Maximum Storm Surge (PMSS) are based on the estimation of storm surge using two approaches: (i) storm surge water surface elevations obtained from Regulatory Guide 1.59 and adjusted for CCNPP site location using procedures described in U.S. Army Corps of Engineers (USACE) report, "Storm Surge Analysis and Design Water Level Determinations," (USACE, 1986), ANSI/ANSI 2.8-1992 and the model developed for the Chesapeake Bay (USACE, 1959), and (ii) extrapolation from storm surge values obtained from the NOAA model "Sea, Lake, and Overland Surges from Hurricanes (SLOSH)" near the CCNPP site for Category 1 through 5 hurricanes.

The maximum PMSS water surface elevations obtained by using the extrapolation procedure described above may not be technically valid or conservative. Please either provide additional justification for the method used to determine PMSS demonstrating technical validity and appropriate conservatism or provide the following information: (a) an analysis of the PMSS event using a conservative approach such as those predicted by a storm surge model (e.g., SLOSH) with input from appropriate PMH scenarios, (b) reasons why the use of historical estimations of sea level rise (SLR) is more conservative than current climatic predictions, and (c) if factored into the PMSS analysis (i.e., application of margins), a detailed description of the process for determining uncertainty estimations.

**Response**

- (a) An analysis of storm surge utilizing the National Oceanic and Atmospheric Administration (NOAA) storm surge model SLOSH (*Sea, Lake, and Overland Surges from Hurricanes*) was performed and the discussion in the Final Safety Analysis Report (FSAR) updated as described in the response to Question 02.04.05-2<sup>1</sup>. A discussion of empirical results was also provided in the FSAR. There is good agreement between the SLOSH and empirical methods.
- (b) Sea level rise (in the FSAR update prepared as part of the response to Question 02.04.05-2<sup>1</sup>) was estimated to be 1.07 feet (33 cm) over the previous century. This rise was used in both the SLOSH model and the empirical calculations. The plant will reach the end of its normal operating life in about 50 years. As such, this is equivalent to a sea level rise of 66 cm over the next 100 years. This estimate is consistent with the higher value contained in the Intergovernmental Panel on Climate Change (IPCC) report: *Climate Change 2007 - The Physical Science Basis Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, which estimated sea level rise of 18 to 59 cm by the end of the century.

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<sup>1</sup> UniStar Nuclear Energy letter UN#10-180, 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 103, Probable Maximum Surge and Seiche Flooding, dated June 30, 2010.

- (c) Uncertainty was not estimated in the PMSS analysis. Rather, the analysis approach was to determine worst case conditions by using the 10% exceedence high tide, a long term estimate of sea level rise, inclusion of a sea level anomaly rise, and adding the 20% uncertainty identified by NOAA for SLOSH to the SLOSH calculated surge values.

**COLA Impact**

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