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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 303, Liquid Waste Management System

Reference: Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 303 CHPB 5715" email dated May 10, 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 10, 2011 (Reference). This RAI addresses the Liquid Waste Management System, as discussed in Section 11.2 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 7.

The enclosure provides our response to RAI No. 303 Question 11.2-6. Our 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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NRO

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 June 9, 2011

Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 303, Question 11.2-6, Liquid Waste Management System, 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

Enclosure

Response to NRC Request for Additional Information
RAI No. 303, Question 11.2-6, Liquid Waste Management System
Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 303

Question 11.02-6

Supplemental question to the response of RAI 290, Q11.2-05(A)

While the response for RAI 290, Q11.02-5(A) refers to CCNPP-3 ER Section 5.3.2 for details (see p.4 of 31) on the basis of the stated "50-mile dilution factor of 296", a review of CCNPP-3 ER Section 5.3.2 (Discharge System) and Section 2.3.1.1.2.2 (Chesapeake Bay Circulation and Freshwater Flow), ER Tables 5.3-2 to 5.3-5, and ER Figure 5.3-1 indicates that the input parameters and results address near-field dilution effects, as shown in ER Figure 5.3-1 with a limited radial extent from the discharge diffuser outlet. Based on a review of CCNPP-3 ER Tables 5.3-2 to 5.3-5, the staff cannot find details on the stated "50-mile dilution factor of 296" from the information presented in the proposed revision to FSAR Tier 2, Section 11.2 and ER Sections 5.3.2 and 2.3.1.1.2.2. The staff's understanding of the CORMIX thermal plume model is that it cannot be used in developing far-field dilution factors. Provide the information and details supporting the basis of the "50-mile dilution factor of 296" given in the response to RAI 290, Q11.2-05(A).

Response

The CORMIX thermal plume model, as described in the COLA Part 3, Environmental Report (ER), Section 5.3.2, works well at near-field locations for calculating effluent plume effects in tidally influenced waters. It is, however, generally unsuitable when the effluent plume's transit time is much greater than 3.5 hours, or about one quarter tidal cycle. Nevertheless, a notable exception to this rule applies when the transit time is so great that tidal effects can be ignored.

The estimated elapsed time required for effluent to be transported to locations 50 miles away from the CCNPP Unit 3 point of discharge is about 550 hours, which is much greater than the 12.6-hour period of a tidal cycle. As a result, CORMIX was used to calculate dilution credits at locations both in the near-field as well as in the far-field 50 miles away. A finite volume computer program was used to construct a depth-average tidal flow model to calculate far-field dilution credits at locations where CORMIX could not be applied.

The bathymetry of the tidal flow model was the same as that used in the CORMIX model and the receiving water data were identical to that used for the calculation of near-field dilution. Only the discharge geometry and tidal drift velocities were different in the tidal flow model. In addition, calibration parameters in the tidal flow model were adjusted so that results matched closely with the CORMIX results in the near-field. The resulting tidal flow model was then used to calculate time-averaged effluent dilution at shoreline locations extending from the northern property boundary to approximately 7 miles south of the discharge point.

The far-field 50-mile CORMIX analysis was based on the drift velocity used in the tidal flow model. The drift velocity accounts for the seaward movement of water in the bay as calculated from monthly mean inflows into the bay divided by the cross sectional area of the bay at the discharge point. This approach neglects mixing energy provided by the tide and gives a conservative estimate of dilution at the 50-mile limit.

From these analyses, the far-field dilution credits derived are shown in Table 1:

Table 1 Far-Field Dilution Credits

Transit Time (hrs)	Description	Dilution
3.5	Northern Property Boundary	316
0.8	Nearest Shoreline	78
1.4	Southern Property Boundary	62
4.9	Minimum Shoreline Dilution	58
77	Cove Point Beach	78
550	Waters 50 Miles Downstream	296

It is important to note that there are a number of conservatisms in the far-field 50-mile dilution analysis. For example, only freshwater inflows from upstream of the discharge were used to calculate the drift velocity. If included, freshwater inflows downstream (i.e., seaward) of the discharge location would increase both drift velocity and dilution. Also, the calculated time-averaged dilution credit assumes that the plume is not laterally well-mixed 50 miles downstream of the discharge point. The maximum dilution ratio of 296, therefore, is for a plume that extends only a portion of the total distance across the bay. To contrast this result, a dilution ratio of 1281 to 1 was calculated for a condition where total mixing occurs.

COLA Impact

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