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10 CFR 50.4
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April 18, 2012

UN#12-036

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 308, Foundations

- References:
- 1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI No. 308 SEB2 5748" email dated May 23, 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#12-010, from Mark T. Finley to Document Control Desk, U.S. NRC, RAI 308, Foundations, dated February 1, 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 23, 2011 (Reference 1). This RAI addresses Foundations, as discussed in Section 03.08.05 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.

The enclosure provides our response to the portion of RAI No. 308, Question 03.08.05-9 related to the foundation of the Emergency Power Generation Building (EPGB), and includes COLA markups. As indicated in Reference 2, COLA markups to FSAR Section 2.5.4.10.2 will be later supplemented with input from the Response to RAI 308 Question 03.08.05-09 related to the

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Essential Service Water Buildings (ESWBs). Per Reference 2, this ESWB input is scheduled for submittal by February 26, 2013, once the foundation analysis of the ESWBs is finalized. The ESWB portion of this RAI response is considered to be part of CCNPP Unit 3 COLA Phase 4 closure. However, as the Nuclear Island and EPGB differential settlement have been demonstrated to be within the bounds of the EPR FSAR analysis, it is anticipated that the ESWB will also be bounded by the design certification.

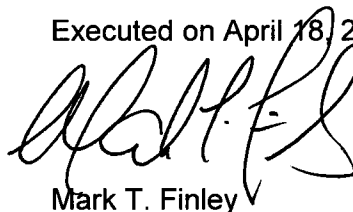
Our previous response to RAI No. 308, Question 03.08.05-8 (Reference 3), included a COLA markup which deleted reference to the EPGB and the ESWB in the Maximum Settlement row of FSAR Table 2.0-1. The EPGB is now re-inserted into FSAR Table 2.0-1 as part of this RAI 308 Question 03.08.05-09 EPGB response. The ESWB will be later inserted into FSAR Table 2.0-1 as part of the aforementioned RAI 308 Question 03.08.05-09 ESWB response.

This 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) 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 April 18, 2012



Mark T. Finley

Enclosure: Partial Response to NRC Request for Additional Information RAI No. 308, Question 03.08.05-9 (Related to EPGB), Foundations, 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 (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)

UN#12-036

Enclosure

**Partial Response to NRC Request for Additional Information
RAI No. 308, Question 03.08.05-9 (Related to EPGB), Foundations
Calvert Cliffs Nuclear Power Plant, Unit 3**

RAI No. 308

Question 03.08.05-9

03.08.05-9

SRP Acceptance Criteria 3.8.5.II.4 discusses information on the design and analysis procedures for Seismic Category I foundations, including the consideration of settlement. In RAI number 03.08.05-4. The staff requested that the applicant quantify and explain some differences obtained from the U.S. EPR structural analysis results due to site-specific settlements and groundwater conditions for the Nuclear Island (NI) common basemat structure, the Emergency Power Generating Buildings (EPGBs), and the Essential Service Water Buildings (ESWBs). The staff reviewed the RAI response to Question 03.08.05-4 provided in two parts: Part one in UniStar letter UN#10-193 dated July 23, 2010 (ML102100480) and Part two in UniStar letter UN#11-085 dated February 22, 2011 (ML110560307). The RAI response addressed most of the staff's original questions. However, the staff notes that the issue of differential settlements of Seismic Category I structures is still under discussion in the U.S. EPR Design Certification (D.C.) review, and the most recent draft EPR RAI response submittal for Question 03.08.05-22 by AREVA provides updated information on settlement evaluations of Seismic Category I structures. Therefore, the staff requests that the applicant, after the official publication of the new COL items proposed by the AREVA draft submittal, explain how the new and updated COL Items regarding settlements of the EPGBs and the ESWBs will be addressed, for example, whether the same U.S. EPR models, methodology and procedures will be used, what site-specific conditions will be considered, and how the site-specific soil case is compared to the soil cases considered in U.S. EPR's settlement evaluation of the EPGBs and the ESWBs. If not the same, explain the difference(s) and quantify the differences in structural results. The staff also notes that the new Common Basemat Intake Structure (CBIS) foundation is comparable in size with the foundations of the EPGBs and the ESWBs. In light of the new and updated COL items for Seismic Category I structures, explain whether the methodology and procedures used for the settlement evaluation of the CBIS foundation will be comparable to those used for the EPGB and the ESWB foundations. If not, explain the difference(s) and provide the technical basis for the difference(s). The staff needs the information in order to be able to conclude in the SER that there is reasonable assurance that the foundation design of the Seismic Category I structures is consistent with SRP Acceptance Criteria 3.8.5.II.4, and has been adequately addressed in the CCNPP Unit 3 FSAR.

Response (Related to EPGB)

A site-specific assessment and comparison of the angular distortion across the basemat of the Emergency Power Generating Buildings (EPGBs) is required by U.S. EPR FSAR Tier 2, Table 1.8-2, COL Item 3.8-19. The site-specific angular distortion of the EPGBs was compared to the angular distortion in the total differential settlement contours shown in U.S. EPR FSAR Tier 2, Figure 3.8-135, as supplemented by AREVA in response to U.S. EPR FSAR RAI 354, Question 03.08.05-22, Supplement 34¹.

The EPGB uses the same models, methodology and procedures in U.S. EPR FSAR Tier 2 Section 3.8.5.4.3 to evaluate the predicted settlement and angular distortion.

¹ AREVA Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 34, dated March 14, 2012.

The Calvert Cliffs Unit 3 site-specific angular distortion values were compared to the angular distortion in the total differential settlement contours in U.S. EPR FSAR Tier 2, Figure 3.8-135, using methods described in U.S. Army Engineering Manual 1110-1-1904. The same models, methodologies and procedures were used as with the U.S. EPR Standard Plant design. The basemat area is partitioned into separate slab design areas in both the east-west and north-south directions. The maximum CCNPP Unit 3 angular distortion is less than the maximum angular distortion in every slab design area for the softest soil case in U.S. EPR FSAR Table 3.7.1-8; thus, the U.S. EPR design envelops the site.

Site-specific considerations which account for short and long term effects of settlement include the effects of dewatering, excavation, foundation material preparation, umbilical connections and sequence of placing the basemat. No construction sequence is specified for the EPGB in the U.S. EPR FSAR. These considerations conform to the requirements specified in U.S. EPR Tier 2, Table 1.8-2, COL Item 2.5-12 and CCNPP Unit 3 FSAR Section 2.5.4.10.2.

CCNPP Unit 3 FSAR Section 3.8.5.4.3 states that no departures or supplements are made from the U.S. EPR FSAR.

The settlement for the Common Basemat Intake Structure (CBIS) structural model is also checked using the same philosophy. Foundation springs used in the structural model are assigned in such a way that the spring displacements are in agreement with the settlement of the soil underneath the structure.

The U.S. EPR FSAR does not include a specific design of the CBIS and therefore it does not provide COL items for tilt and angular distortion. The site specific analysis and design of the CBIS foundation mat is discussed in CCNPP Unit 3 FSAR Section 3.7 and 3.8. The site specific design is inclusive of angular distortion and the reported tilt values are less than the ½ inch in 50 feet that is specified for the generic structures.

COLA Impact

CCNPP Unit 3 COLA FSAR Table 2.0-1, U.S. EPR Site Design Envelope Comparison (Page 2 of 6), will be revised as shown in a future revision of the COLA:

Table 2.0-1 – {U.S. EPR Site Design Envelope Comparison}

	U.S. EPR FSAR Design Parameter Value	CCNPP Unit 3 Site Characteristic Value
...
Slope Failure Potential	No slope failure potential is considered in the design of safety-related SSCs for U.S. EPR design certification.	No slope failure potential that would adversely affect the safety of the proposed CCNPP Unit 3 (See Section 2.5.5)
Maximum Settlement (across the basemat)		
1. Differential Settlement	Figure 3.8-124 through Figure 3.8-136	See Section 3.8.5.5.1 for NI and <u>Section 3.8.5.5.2 for the EPGB</u>
2. Tilt Settlement	½ inch in 50 feet in any direction	Less than ½ inch in 50 feet in any direction of NI Common Basemat. See Section 2.5.4.10.2
Angle of Internal Friction (in situ and backfill)	26.6 degrees (minimum) 30 degrees (maximum)	TBD
...

COLA FSAR Section 3.8.5.5.2 will be revised as follows:

3.8.5.5.2 Emergency Power Generating Buildings Foundation Basemats

The U.S. EPR FSAR included the following COL Item in Section 3.8.5.5.2:

A COL Applicant that references the U.S. EPR design certification will compare the EPGB site-specific predicted angular distortion to the angular distortion in the total differential settlement contours in Figure 3.8-135, using methods described in U.S. Army Engineering Manual 1110-1-1904. The comparison is made throughout the basemat in both the east-west and north-south directions. If the predicted angular distortion of the basemat of the EPGB structure is less than the angular distortion shown, the site is considered acceptable. Otherwise, further analysis will be required to demonstrate that the structural design is adequate.

The COL Item is addressed as follows:

{TBD}The Calvert Cliffs Unit 3 site-specific angular distortion values were compared to the angular distortion in the total differential settlement contours in U.S. EPR FSAR Tier 2, Figure

3.8-135, using methods described in U.S. Army Engineering Manual 1110-1-1904. The same models, methodologies and procedures are used as with the U.S. EPR Standard Plant design. The basemat area is partitioned into separate slab design areas in both the east-west and north-south directions. The maximum CCNPP Unit 3 angular distortion is less than the maximum angular distortion in every slab design area for the softest soil case in U.S. EPR FSAR Table 3.7.1-8; thus, the U.S. EPR design envelops the site.}

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