

CCNPP3eRAIPEm Resource

From: Arora, Surinder
Sent: Monday, August 27, 2012 8:53 AM
To: Infanger, Paul; UNECC3Project@unistarnuclear.com
Cc: CCNPP3eRAIPEm Resource; Segala, John; Wilson, Anthony; Vrahoretis, Susan; Thomas, Brian; Jeng, David; Miernicki, Michael; McLellan, Judith
Subject: CCNPP3 - Final RAI 368 SEB 6569
Attachments: FINAL RAI 368 SEB 6569.doc

Paul,

Attached is Final RAI No. 368 (eRAI No. 6569) pertaining to section 3.8.5 of the Calvert Cliffs Unit 3 FSAR. The draft of this RAI was sent to you on August 14, 2012 asking you to request a clarification call, if required. By your email dated August 23, 2012, you confirmed that UniStar does not require clarification call on this RAI. This email, therefore, transmits the RAI as "final" for providing your response.

The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a schedule date for submitting your technically correct and complete response will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the review schedule.

Your response letter should also include a statement confirming that the response does or does not contain any sensitive or proprietary information.

Thanks

SURINDER ARORA, PE
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From: Arora, Surinder

Created By: Surinder.Arora@nrc.gov

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Request for Additional Information 368 (eRAI 6569)

Issue Date: 8/27/2012

Application Title: Calvert Cliffs Unit 3 - Docket Number 52-016

Operating Company: UniStar

Docket No. 52-016

Review Section: 03.08.05 - Foundations

Application Section: FSAR 3.8.5

QUESTIONS

03.08.05-10

Followup RAI for RAI 308, Question Number 03.08.05-8

In RAI number 03.08.05-8, the staff requested that the applicant explain how the new and updated COL Items, regarding the settlement of the NI common basemat structure, will be addressed, and what site-specific conditions will be considered.

The staff reviewed the RAI response to Question 03.08.05-8 provided in UniStar letter UN#12-010 dated February 1, 2012 (ML12037A002).

The response partially addresses some of the staff's concerns regarding models, methodology, procedures and soil spring data inputs utilized in the site-specific settlement analysis of the NI common basemat structure. However, the following additional information is needed to help the staff ensure that, for the settlement of the NI common basemat structure, the related COL items are adequately addressed, and site-specific conditions are adequately considered in the analysis:

(1). Regarding the analysis procedure, U.S. EPR Revision 3 Section 3.8.4.5.2 indicates that two sets of soil springs are developed using Plaxis 3D foundation software. The first set of soil springs is developed with the geometry and loading of the basemat only, corresponding to the first step of the construction sequence. The second set of soil springs is developed with the geometry and loading of the full NI common basemat structure, corresponding to the last step of the construction sequence. Each set of soil springs is developed by iterating on settlement results between a full 3D finite element structural model with soil springs and a Plaxis 3D model. The set of soil springs which controls the design of forces and moments due to settlement is used in 3D FE structural models for the design. The staff understands that iteration processes are performed for the first and last construction steps, two different sets of soil springs are obtained and the controlling set of soil springs is used for the design. The staff requests that the applicant explain why iteration process to determine soil springs was not done for intermediate construction steps in the site-specific settlement analysis of the NI common basemat structure.

(2). The RAI response states that the site-specific conditions considered conform to the requirements specified in CCNPP Unit 3 FSAR Revision 7 Section 2.5.4.10.2. According to this section of the FSAR, the site-specific settlement analysis of the CCNPP Unit 3 Powerblock Area (including the NI common basemat structure) considers eight construction steps and site-specific conditions including those described in the RAI response, as well as backfill steps, irregular thickness of the subsurface strata, and the symmetry in surface topography, etc. The staff notes that U.S. EPR FSAR Revision 3 Section 3.8.5.4.2 indicates that the U. S. EPR settlement analysis of the NI common basemat structure considers eleven construction steps and a sandy material with laterally uniform soil stiffness. Considering the differences between the construction sequences and site-specific conditions described above, the staff requests that the applicant explain whether the site-specific settlement analysis discussed in CCNPP Unit 3 FSAR Section 2.5.4.10.2 is the same analysis discussed in the RAI response for CCNPP Unit 3 FSAR Section 3.8. If they are not the same, explain why two sets of site-specific settlement analysis are performed and discuss the differences between the two analyses. If they are the same, explain why a construction sequence different from the U.S. EPR settlement analysis is considered in the site-specific settlement analysis, how the two sets of settlement profiles corresponding

to the two different construction sequences can be compared, and explain the inconsistency between the construction sequences discussed in CCNPP Unit 3 FSAR Section 2.5.4.10.2 and the RAI response.

(3). As discussed before, the U. S. EPR settlement analysis of the NI common basemat structure considers a sandy material with laterally uniform soil stiffness. It is not clear to the staff whether the analysis considers all the site-specific conditions discussed in CCNPP Unit 3 FSAR Revision 7 Section 2.5.4.10.2. Therefore, the staff requests that the applicant explain in detail how each of the site-specific conditions discussed in Section 2.5.4.10.2 is considered in the site-specific settlement analysis of the NI common basemat structure. If not considered, provide the technical justification in detail for not doing so. Particularly, among the site-specific conditions, lateral variation of soil properties has significant effect on the differential settlement and hence the resulting member forces of a foundation mat. Consequently, the SRP Acceptance Criteria 3.8.5.II.4 discusses the review of the stiff and soft spots evaluation in the foundation soil to maximize the bending moments used in the design of the foundation mat. According to the response to RAI 276 Question 02.05.04-29, the coefficient of variation (COV) of shear wave velocity (Vs) measurements within Stratum IIb is as high as 0.4, and the COVs of Vs at certain elevations of Strata IIc and III are higher than 0.1. Furthermore, CCNPP Unit 3 FSAR Revision 7 Section 2.5.4.2.5.5 indicates that the values of soil elastic modulus utilized in the site-specific settlement analysis are also based on pressuremeter testing data and corrected SPT N-values, which both have high variation. The effect of the variation discussed above may be insignificant for overall settlement, but can be significant for differential settlement of the NI common basemat. Therefore, the staff requests that the applicant explain in detail whether and how the effect of the lateral variation of soil properties within a subsurface stratum has been considered in the site-specific settlement analysis of the CCNPP Unit 3 NI common basemat structure. If not done, provide the technical justification for not doing so. Since soil stiffness also depends on Poisson's ratios and soil densities, provide information on lateral variation for each of these parameters, including the supporting data based on field tests.

(4). In addition, to ensure that structural settlements during and post construction will be within the design envelop, so as to ensure the adequacy of the structural design, the updated U.S. EPR Tier 2 Table 1.8-2 COL Item 3.8-13 requires that CCNPP identify site-specific settlement monitoring requirements for Seismic Category I foundations based on site-specific soil conditions. For the NI common basemat structure, the settlement to be monitored includes the overall settlement, tilt, as well as differential settlements as per U.S. EPR Tier 2 Table 1.8-2 COL Item 3.8-18. CCNPP Unit 3 FSAR Revision 7 Section 3.8.5.7 describes a site-specific settlement monitoring program, and Section 2.5.4.10.2.2 provides more details of the program. However, based on the information provided in the FSAR, the staff cannot determine that the settlement monitoring program identified in the CCNPP Unit 3 FSAR Revision 7 is capable of providing the NI common basemat differential settlement contours similar to those described in the COL Item 3.8-18. To ensure that the COL Item 3.8-13 is adequately addressed, the staff requests that the applicant explain how the settlement monitoring program described in CCNPP Unit 3 FSAR Revision 7 Sections 2.5 and 3.8 is capable of providing the NI common basemat differential settlement contours similar to those described in U.S. EPR FSAR. Otherwise, identify a more detailed site-specific monitoring program, and revise the FSAR accordingly.

The staff needs the information to be able to conclude in the SER that there is reasonable assurance that the foundation design of the Seismic Category I structure is consistent with SRP Acceptance Criteria 3.8.5.II.4, and has been adequately addressed in the CCNPP Unit 3 FSAR.

