CCNPP3eRAIPEm Resource

From: Arora, Surinder
Sent: Wednesday, July 20, 2011 1:29 PM
To: Robert.Poche@unistarnuclear.com; 'cc3project@constellation.com'
Cc: CCNPP3eRAIPEm Resource; Chakrabarti, Samir; Thomas, Brian; Colaccino, Joseph; Miernicki, Michael; Wilson, Anthony; Vrahoretis, Susan
Subject: Draft RAI 314 SEB2 5926
Attachments: Draft RAI 314 SEB2 5926.doc

Rob,

Attached is Draft RAI No. 314 (eRAI No. 5926). You have until August 3, 2011 to review it and decide whether you need a clarification phone call to discuss any questions in the RAI before the final issuance. After the phone call or on August 3, 2011, the RAI will be finalized and sent to you for response. You will then have 30 days to provide a technically complete response or an expected response date for the RAI.

Thanks.

SURINDER ARORA, PE
PROJECT MANAGER,
Office of New Reactors
US Nuclear Regulatory Commission

Phone: 301 415-1421
FAX: 301 415-6406
Email: Surinder.Arora@nrc.gov

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Created By: Surinder.Arora@nrc.gov

Recipients:
"CCNPP3eRAIPEm Resource" <CCNPP3eRAIPEm.Resource@nrc.gov>
Tracking Status: None
"Chakrabarti, Samir" <Samir.Chakrabarti@nrc.gov>
Tracking Status: None
"Thomas, Brian" <Brian.Thomas@nrc.gov>
Tracking Status: None
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"Miernicki, Michael" <Michael.Miernicki@nrc.gov>
Tracking Status: None
"Wilson, Anthony" <Anthony.Wilson@nrc.gov>
Tracking Status: None
"Vrahoretis, Susan" <Susan.Vrahoretis@nrc.gov>
Tracking Status: None
"Robert.Poche@unistarnuclear.com" <Robert.Poche@unistarnuclear.com>
Tracking Status: None
"'cc3project@constellation.com'" <cc3project@constellation.com>
Tracking Status: None

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Request for Additional Information No. 314 (eRAI 5926)
DRAFT
7/20/2011

Calvert Cliffs Unit 3
UniStar
Docket No. 52-016
SRP Section: 03.07.01 - Seismic Design Parameters
Application Section: FSAR 3.7.1

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

03.07.01-16

Follow-up to RAI 58, Question 03.07.01-1

The Calvert Cliffs Nuclear Power Plant, Unit 3 (CCNPP) Nuclear Island (NI) site-specific seismic analysis is based on a surface mounted stick model having a rigid basemat supported by Chesapeake cemented sand. The CCNPP NI analysis has not been revised to model the engineered backfill that will be used directly under the basemat. The EPR NI analysis which was originally based on a surface-founded stick model has been revised and is now based on an embedded finite element (FE) model having an elastic mat. In the latest version (revision 3-interim) of the U.S. EPR FSAR the lowest shear wave velocity used in the NI seismic analysis is 820 ft./sec. With the addition of structural backfill beneath the CCNPP NI mat, the lower bound strain-dependent shear wave velocity directly under the mat is less than 500 ft./sec. In addition as shown in Figures 2.5-242 and 2.5-243 of Enclosure 2 to UN#11-107 there is an inversion of shear wave velocity from approximately 50 feet below grade to 70 feet below grade. This inversion can affect the radiation damping in an SSI analysis. Further, an inversion was not included in the soil cases analyzed for U.S. EPR design.

Since the soil properties and soil profile are a significant departure from U.S. EPR analysis and the softness of the subgrade, as evidenced by the low shear wave velocities, may have a significant impact on the seismic design loads for the mat as well as have an impact on the frequency response of the superstructure, the staff requests that for the site-specific reconciliation to the U.S.EPR design, CCNPP present the results of a quantitative comparison of ISRS and mat design loads from a site-specific analysis using a suitable model with the results from AREVA NI analysis reflected in revision 3-interim of the U.S. EPR FSAR.

Regarding the SSSI effect of the NI on the EPGB and ESWB, step 3 of the US. EPR evaluation guidelines presented in U.S. EPR FSAR Section 2.5.2.6 (revision 2) states that “the applicant will demonstrate that the input motion, which considers the difference in elevation between each structure and the NI Common Basemat Structures, the embedment of the ESWB, and SSSI effect of the NI Common Basemat Structures is less than the modified CSDRS used for design of the EPGB and ESWB”. The applicant is requested to explain how the SSSI effect of the NI on the EPGB and ESWB had been determined and whether or not this effect considers the difference in elevation between the structures. If it does not consider the difference in elevations the applicant should provide a technical justification as to why the resulting SSSI effect is acceptable.

03.07.01-17

Follow Up Question to RAI 252, Question 03.07.01-15

Item 1, Bullet 1:

Two-dimensional (2D) and one-dimensional (1D) site response analyses were performed to evaluate the impact of modeling the structural backfill as free field soil layers. Results of 1D and 2D site response analyses indicate that modeling the actual extent of the backfill for the NI produces a negligible difference to that of modeling the backfill as free field soil layers. For the CBIS the difference between the 2D and 1D analysis was more significant. For this case the FIRS were adjusted by the ratio of the 2D to 1D result from the study but were shown to be still less than the site SSE. From this study the applicant concludes that the modeling of the structural backfill as free field soil layers combined with the use of the site SSE as the design ground input motion is conservative and that the use of the SSE will compensate for any effect the modeling assumption of the backfill may have on the seismic response. In order to accept the applicant's conclusion, the applicant is requested to also address if the impedance difference between the structural backfill and the in-situ sand will have an effect on the frequency response of the combined soil-structure model used in the SSI analysis which would alter the results obtained using assumed free field soil layers.

Item 1, Bullet 3:

Table 2.4-1 in Part 10 of COLA Revision 7 provides ITAAC for structural fill and backfill. The ITAAC criteria are that:

a. Structural fill material under Seismic Category I and Category II SSE structures is installed to meet a minimum of 95 percent of the Modified Proctor density and that testing will be performed during the placement of the structural fill material.

b. Shear wave velocity of structural fill material beneath the Emergency Power Generation Buildings (EPGB) is greater than or equal to 630 ft./sec at the bottom of the foundation and below, and greater than or equal to 720 ft./sec at the bottom of the foundation and below for the Essential Service Water Buildings (ESWB).

The inspection activities listed in Table 2.4-1are that:

a. Field measurements and analyses of shear wave velocity in structural fill will be performed when structural fill placement is at the elevation of the bottom of the foundation and at finish grade.

b. A report exists that concludes the installed structural fill material under Seismic Category I and II SSE structures meets a minimum of 95 percent Modified Proctor density, and that concludes that the shear wave velocity within the structural fill material placed under the EPGB at its foundation depth and below is greater than or equal to 630 ft./sec and that the structural fill material placed under the ESWB at its foundation depth and below is greater than or equal to 720 ft./sec.

Shear wave velocity requirements for the Nuclear Island (NI) Common Basemat Structures, the Common Basemat Intake Structures (CBIS), and Seismic Category II SSE structures were not included in the table. The applicant is requested to add the shear wave velocity criteria for the NI, CBIS, and Seismic Category II SSE structures to Table 2.4-1, or provide justification for not doing so.