CCNPP3eRAIPEm Resource

From: Arora, Surinder
Sent: Wednesday, August 14, 2013 2:33 PM
To: Infanger, Paul; UNECC3Project@unistarnuclear.com
Cc: CCNPP3eRAIPEm Resource; Segala, John; Wilson, Anthony; Xu, Jim; Chakrabarti, Samir; Miernicki, Michael; McLellan, Judith
Subject: Draft RAI 396 SEB2 7202
Attachments: DRAFT RAI 396 SEB2 7202.docx

Paul,

Attached is Draft RAI No. 396 (eRAI No. 7202) pertaining to section 3.7.2 of the Calvert Cliffs Unit 3 FSAR. Note that this RAI is a follow up to your responses to previous RAI Questions 03.07.02-56 of RAI 304 (eRAI 5717) and 03.07.02-75 of RAI 378 (eRAI 6726). You have until August 28, 2013 to review it and decide whether you need a clarification phone call to discuss the RAI question before the final issuance. After the phone call or after August 28, 2013, the RAI will be finalized and sent to you for your response. You will then have 30 days to provide a technically complete response or an expected response date for the RAI.

Thanks

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Request for Additional Information 396 (eRAI 7202)

DRAFT
Issue Date: 08/14/2013
Application Title: Calvert Cliffs Unit 3 - Docket Number 52-016
Operating Company: UniStar
Docket No. 52-016
Review Section: 03.07.02 - Seismic System Analysis
Application Section: FSAR 3.7.2

QUESTIONS

03.07.02-76

Follow Up Question to RAI 304, Question 03.07.02-56

In RAI 304, Question 03.07.02-56, the staff had asked the applicant for additional details regarding analyses for the hydrodynamic effects of the water contained within the basins of the Common Basemat Intake Structure (CBIS). In part 4 of its response, the applicant notes there is a difference between the water height of 23.14 feet stated in the response and that used in the FSAR. As the FSAR states that normal mean sea level is at 0.64 ft. and, according to FSAR Figure 9.2-8, the top of the basemat is at -22 ft. 6 in., it appears that the water height provided with the response agrees with that provided in the FSAR. The applicant should explain why it believes the FSAR and the value used in the response are not consistent.

In part 7 of its response the applicant provided information regarding the basis for the calculation of the sloshing effect of the enclosed water within the basins of the CBIS. To calculate the wave height, the applicant has used the equations of ACI 350.3-06 and a water height of 26.84 feet. This water depth was based on a maximum water level of 3.67 ft. above mean sea level. However, based on information in FSAR Section 2.4.5.2.2.1 the maximum water level is 4.4 ft. NGVD. As the normal mean sea level is at 0.64 ft. NGVD, the maximum water level becomes 3.76 ft. above mean seal level not 3.67 ft. This results in a maximum depth of water equal to 26.93 ft. The applicant states that the result of the sloshing is a calculated wave height of 0.95 ft. in the forebay and a remaining freeboard of 9.05 ft. According to Figure 2 of the response the height of the forebay wall is 32.50 ft. Subtracting a water height of 26.93 ft. and a calculated wave height of 0.95 ft. the remaining freeboard is 4.62 ft. not the 9.05 ft. reported in the response. The applicant is requested to address these discrepancies identified in its response.

In selecting the spectral response to be used in determining the wave height, the applicant stated that it used as input the site-specific Foundation Input Response Spectra (FIRS). However, the seismic analysis of the CBIS is based on the site SSE not the FIRS. In addition, the staff believes the basemat ISRS should be used to calculate the wave height and not the spectra in the free field. The applicant is requested to provide the technical basis for its response and why the CBIS foundation basemat ISRS was not used to determine the sloshing effect of enclosed water. In addition the applicant is requested to explain why the higher water level of 4.4 ft. NGVD 29 was not used as the basis for determining the impulsive and convective water masses for the CBIS analysis since this higher water level is based on an anticipated increase over time of the water level in the Chesapeake Bay as documented in FSAR Section 2.4.5.2.2.1.

TID 7024 provides equations that calculate the heights at which the impulsive and convective water masses are considered to act in order to determine the overturning effect of the water on a structure's basemat foundation. The heights thus determined are greater than the heights that are used to determine the hydrodynamic effects of the impulsive and convective water on the portions of the structure that are above the basemat. The applicant is requested to confirm how the overturning effect was addressed in the stability analysis of the CBIS and if it was not addressed, provide the technical justification for not doing so.

03.07.02-77

Follow Up Question to RAI 378, Question 03.07.02-75

In RAI 378, Question 03.07.02-75, the applicant was asked to explain the seismic categories and their technical requirements for the Fire Protection System (FPS).

- In Part b, the applicant was asked to identify the additional design requirements imposed on the Fire Protection Building (FPB) and Fire Water Storage Tanks (FWSTs) that are over and above those of the IBC or other building codes. In its response, the applicant stated that the FPB and FWSTs are components that must remain functional during and following an SSE and are therefore designated as Conventional Seismic-I (CS-I). The design of the FPB and FWSTs will be equivalent to that of an SC I structure in that they will be analyzed to SSE load conditions using the same codes and standards and the same margin of safety that apply to an SC-I structure.

  The FPB will be analyzed as a fixed-base structure using a seismic load that is 1.5 times the maximum spectral acceleration of the SSE. As FPB is a one story structure and the peak spectral acceleration times a factor of 1.5 is applied to the total superstructure weight concentrated at the roof, the staff believes this approach is conservative and therefore adequate. However, the applicant is requested to confirm that the SSE is as identified on Figure 3.7-1, Revision 9 of the FSAR or otherwise provide the SSE to be used, and provide justification for its application to the FPB which is located nearly at grade level. One concern the staff has regarding the proposed method of analysis is that it does not provide the anchor movement of FPS CS-I piping that is interconnected between the FPB and other structures. The applicant is requested to address how these anchor movements will be determined. Regarding the design codes for this building, the markup of FSAR Table 3.2-1 does not list any concrete codes yet the superstructure rests on a concrete foundation. The applicant is requested to add the appropriate concrete design code to Table 3.2-1. Also, the markup of FSAR Table 3.2-1 lists ASCE 43 as one of the applicable codes for the FPB. Since the building analysis and design will be equivalent to that of a SC I structure, the applicant is requested to explain what portions of ASCE 43 apply to this structure with appropriate technical justification. Regarding the design codes for the FWST, FSAR Table 3.2-1 lists ASCE 43 and both ASCE 4 and ASCE 4-98. The applicant is requested to explain why ASCE 43 is applicable for design of FWSTs, and why ASCE 4 is listed. The applicant is also requested to update the FSAR with the information and clarifications mentioned above.

In Part b of the response, the applicant states that for CS-I SSCs located on the foundation basemat of the FPB, the In-Structure Response Spectra (ISRS) will be the envelope of the CCNPP Unit 3 SSE and Foundation Input Response Spectra (FIRS). The applicant is requested to provide a figure displaying the SSE, FIRS, and the ISRS for the basemat foundation. It should also describe how the FIRS were determined. Since the basemat ISRS may be amplified at certain frequencies above that of the input ground spectra, the applicant is requested to demonstrate that using an envelope of the SSE-FIRS spectra is a conservative estimate of the basemat ISRS. For CS-I equipment above the basemat, the applicant states that the ISRS will be determined by performing an elastic single degree of freedom response time history or by scaling the base ISRS by a ratio of maximum acceleration response obtained with a modal analysis. As this description provides insufficient information for the staff to evaluate, the applicant is requested to provide the technical detail and technical basis for what it is proposing. The applicant should also describe how the different damping levels for equipment as defined in R.G. 1.61.will be accommodated with these approaches.

For the FWSTs, the applicant states that the seismic forces will be based on the American Water Works Association (AWWA) D-100 Standard and TID 7024. The applicant is requested to describe any differences between the two standards as they relate to the seismic analysis for the FWSTs. Where they are different, the applicant should explain which of the two documents will be used and the technical basis for this selection. The applicant is also requested to confirm that of SRP 3.7.3 Acceptance Criteria (AC) 14 is being met for the analysis and design of these tanks, or provide justification for not doing so. The applicant should also identify the basis of the assumed water height within the tanks.

The applicant states that to determine the acceleration of the impulsive component of the water, the maximum spectral acceleration (0.45g) of the SSE will be used. The applicant is requested to confirm that the damping value to be used for the FWSTs complies with R.G. 1.61 for metal atmospheric storage tanks, i.e. 3 percent for the impulsive component and 0.5 percent for the sloshing component, or provide justification for not doing so. The applicant is also requested to provide the design response spectra for both of these damping values and state how the forces on the tank associated with sloshing component are determined.

- In Part d, the applicant was asked to revise the FSAR to include the fact that SSCs categorized as CS would comply with SRP 3.7.2 AC 8A. This states that the collapse of a non-category I structure will not cause the non-category I structure to strike a Category I structure. In addition, the applicant was requested to include the methodology that would be followed to assure that SSCs classified as CS meet the SRP acceptance criteria. In its response the applicant stated that it would revise CCNPP FSAR Section 3.7.2.8 to include SRP 3.7.2 AC 8A for structures designated as CS-I and provide the criteria to be invoked to assure CS-I structures meet this SRP guidance. However, those portions of the FPS classified as CS-I must remain functional during and after a seismic event. They also have design requirements which are similar to SC-I requirements. Therefore, the staff believes that SRP 3.7.2 AC 8A is not applicable to the CS-I classification. The applicant is requested to revise its response and update the FSAR to make it clear that SRP 3.7.2 AC 8A is only applicable to the CS seismic category and to make clear the distinction between CS and CS-I. The applicant should also include the methodology that will be followed to assure that SSCs classified as CS meet the SRP acceptance criteria 8A, i.e., SSCs classified as CS will not strike a Category I structure if they collapse.

- In Part g the applicant was asked to revise the FSAR to make the designation and requirements for SCII structures consistent throughout the FSAR. The applicant in its response states that the Access Building, Turbine Building, and Switchgear Building will be designed using the same codes and standards as Category I structures. The applicant went on to state that the write-up in CCNPP Unit 3 FSAR Section 3.7.2.3.3, “Seismic Category II Structures,” would be revised to incorporate other buildings and make the requirements equivalent to those specified for Category II structures in the US EPR FSAR. However, FSAR mark-up provided with the response did not include the proposed revision of FSAR Section 3.7.2.3.3. The applicant is requested to revise FSAR Section 3.7.2.3.3 as stated in the response.

- On page 20 of Enclosure 2, additional structures are identified as being capable of potentially interacting with SC I SSCs and on page 24 a reference is made to FSAR Table 3.7-11 which identifies those buildings that have the potential for structure-to-structure interaction with a SC I building. In FSAR Revision 9, this table lists the AB, TB, and SB as SC II structures. Two other structures are also listed. These are the Grid Systems Control Building (GSCB) and the Circulating Water Intake Structure (CWIS). The seismic category for the CWIS is SC II. The design code for the CWIS is inconsistent with that of the AB, TB, and SB in that it will be designed according to the IBC code. If the CWIS is designated as a SC II structure, it seems that the design approach should be similar to other SC II structures. The seismic category for the GSCB is CS; the design code listed is IBC; and non-nuclear codes are used for steel and concrete. If no interaction is allowed with a SC I structure the applicant is requested to explain why the design basis for these two structures is different from that of the AB, TB, and AB and why the seismic category for the GSCB is not SC II. Also listed in the FSAR markup on page 20 of Enclosure 2 as having the potential to interact with a SC I SSC, is the Conventional Seismic Sheet Pile Wall and Existing Baffle Wall. However, no further discussion of these two structures appears in this section of the FSAR. The applicant is requested to include a discussion of these two structures and address how the potential for interaction is addressed in the site-specific design of CCNPP Unit 3.

- In part n, the applicant was asked to provide a table which identifies the seismic classification for each portion of the FPS to include safety classification, seismic category, applicable design codes, and seismic requirements. In its response, the applicant provided the requested information for the systems and components that makeup the FPS in Table 1 of Enclosure 1. The first item listed on page 15 of the response is the Fire Water Distribution System, Conventional Area (Safe Shutdown Equipment Protection). The table indicates that the safety classification, seismic category, codes, and design requirements for this portion of the FPS are incorporated by reference to the U.S EPR FSAR. As this portion of the Fire Water Distribution System provides safe shutdown equipment protection, it should be classified as seismic category CS-I. However the U.S. EPR FSAR in FSAR Table 3.2.2-1 lists the seismic category as SC II. As the design requirements for SC II are not the same as those for CS-I, the applicant is requested to make the appropriate change to Table 1.

- In part o, the applicant was asked to provide and include in the FSAR the seismic inputs, seismic models, methods of analysis and acceptance criteria for each SSC which must remain structurally intact under an SSE or which must remain functional during and after an SSE while maintaining its pressure boundary. Table 2 of Enclosure 1 provides by reference for the major elements of the FPS (buried piping, HVAC ducts, mechanical and electrical equipment, and aboveground piping) the information requested by the staff. The applicant has also provided this information in FSAR Table 3.8-6. As part of the response, the applicant states that site-specific SSE or appropriate ISRS created from site specific SSE is used for seismic analysis and design of site-specific CS-I FPS SSCs. The applicant is requested to clearly describe in Section 3.7 the seismic input used for the CS-1 SSCs listed in Table 3.8-6 with supporting technical justification where the site specific SSE may be used as input for the seismic analysis of the FPS. In addition, the applicant is also requested to describe how appropriate ISRS are created from the site-specific SSE for cases where ISRS are used as seismic input. Table 3.8-6 should also be revised to reflect the appropriate seismic input being used.