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UniStar
NUCLEAR ENERGY

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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
Calvert Cliffs Nuclear Power Plant, Unit 3,
Impact of U.S. EPR FSAR RAI Responses on CCNPP Unit 3 FSAR Section 3.7

Reference: UniStar Nuclear Energy letter UN#10-226 from Greg Gibson to Document Control Desk, U.S. NRC, Calvert Cliffs Nuclear Power Plant, Unit 3, Impact of U.S. EPR FSAR RAI Responses on CCNPP Unit 3 FSAR Section 3.7, dated August 12, 2010

As discussed in the referenced letter, AREVA NP has been updating the seismic analyses presented in U.S. EPR Final Safety Analysis Report (FSAR), Tier 2, Sections 3.7, 3.8, and Appendix 3E to address NRC requests for additional information (RAIs), and other identified issues since the second quarter of 2010. The referenced letter delayed submission of associated changes to the CCNPP Unit 3 (CC3) COLA and RAI Responses until AREVA completed more of their analyses.

The Calvert Cliffs Unit 3 COLA compares the response of CC3 structures, considering site specific soil and seismic parameters, to the response of the structures using bounding conditions as presented in the Design Certification Document. The focus of UniStar Nuclear Energy (UNE) since August 2010 has been to monitor the progress of AREVA's design information prior to determining what changes, if any, are required to the Calvert COLA.

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Background

UNE provided a status report (Enclosure 1) to the NRC Staff at our Public Meeting on March 3, 2011 on the progress of completing outstanding CC3 FSAR Section 3.7 RAI responses, and confirmed that UniStar would be providing this letter by March 31, 2011. At the meeting, UniStar discussed the provisions in the U.S. EPR FSAR Section 2.5.2.6 for evaluating site-specific information to determine if a site-specific confirmatory seismic analysis is required. Previously, the CC3 approach was not to perform the evaluation of site conditions, but to perform a complete site-specific confirmatory seismic analysis in CC3 FSAR Section 3.7. At the Public Meeting, UNE presented an assessment of two key parameters and discussed the large margins that are evident between the In-Structure Response Spectra (ISRS) developed in the U.S. EPR FSAR and used for the design of Seismic Category I structures and the ISRS that occurred at the CC3 Site.

UNE will use the generic design for buildings and equipment as described in the U.S. EPR FSAR at CC3. Therefore, the site-specific confirmatory seismic analysis will not be used in the design of generic buildings and equipment other than to confirm the generic design is conservative for CC3. The UNE position is that, with a rigorous evaluation of site conditions, an updated site specific confirmatory seismic analysis in Section 3.7 is not required. The UNE approach is to utilize the provision of U.S. EPR FSAR Section 2.5.2.6 and thus only re-perform the Section 3.7 site-specific confirmatory seismic analysis when required. UNE will follow the provisions of Section 2.5.2.6 to evaluate future changes to the U.S EPR FSAR or changes in site conditions, to determine if the changes would alter the conclusion that the CC3 site conditions are bounded by the parameters used in the U.S. EPR FSAR seismic analysis. If the assessment concludes that the evaluated changes challenge the conclusion that the site conditions are bounded, then UNE will update the site specific confirmatory seismic analysis in the CC3 FSAR as required by Step 8 of Section 2.5.2.6 of the U.S. EPR FSAR.

As stated in the referenced letter, and expanded upon in the March 3, 2011 Public Meeting, the SSE at CC3 is much smaller than the CSDRS curves presented in the U.S. EPR FSAR. It is therefore unlikely that minor changes to the response spectra presented in the U.S. EPR FSAR will result in any changes to the conclusions presented in the CC3 FSAR for the NI common basemat structures [including the Nuclear Auxiliary Building (NAB) and Radioactive Waste Processing Building (RWPB)] or to the Emergency Service Water Buildings (ESWBs) and the Emergency Power Generation Buildings (EPGBs).

Methodology

Within the referenced letter, UNE indicated that text and figures in the CC3 FSAR would be updated to incorporate the new U.S. EPR FSAR information, and to reflect the new embedded seismic model. However, as discussed at the March 3 Public Meeting, UNE has concluded that the current site specific confirmatory seismic analysis is sufficient to demonstrate that the U.S. EPR structural design may be used at the CC3 site without alteration.

To support that position, UNE is expanding the text in Section 2.5.2.6 to provide a detailed assessment of the CC3 site characteristics with the criteria established within the U.S. EPR, to be used by the applicant to determine if a site specific confirmatory seismic analysis is required. The U.S. EPR FSAR Section 2.5.2.6 contains a "nine step assessment process." In this "nine step process," the first five steps identify the main categories of comparison, with steps six through nine detailing additional actions, if necessary, based upon the results of the comparison.

Step 1 is to confirm that peak ground acceleration is less than 0.3g. This element is the most important aspect of the UNE position that the existing analysis is sufficient. At CC3, the ground motion response spectra (GMRS) has a zero period acceleration of 0.08g and a peak spectral acceleration of 0.18g. Because this spectra is very low, UNE established a site safe shutdown earthquake (SSE) based on the U.S. EPR FSAR soft soil spectra anchored at 0.15g and the RG 1.60 spectra anchored at 0.1g for the low frequencies. This SSE has a peak spectral acceleration of 0.45g compared to 0.90g for the CSDRS presented in the U.S EPR FSAR. In other words, UNE has established an earthquake spectra that is roughly twice the predicted GMRS, yet still only half the CSDRS. The SSE is used for the analysis of the Nuclear Island, EPGB, and ESWB.

Step 2 is to confirm that the low-strain best-estimate shear wave velocity under the Seismic Category I structures is 1000 fps or greater. CC3 exceeds 1000 fps for the Nuclear Island and ESWBs, but is slightly lower, at 900 fps, for the EPGBs. The purpose of this criterion is to ensure that the safety-related structures are founded on competent material. The in-situ soils below the excavation have been shown to exceed 1000 fps. The lower shear wave velocity values are predicted for the backfill and are at shallow depths. A competent backfill has been selected and is described in CC3 FSAR Section 2.5.4.

Step 3 is to confirm that the foundation input response spectra (FIRS) is bounded for each Seismic Category I structure. This confirmation is provided by the current analysis presented in COLA FSAR Section 3.7.

Step 4 is to confirm that the site soil profile is laterally uniform by confirming that no individual layer has a dip angle of greater than 20 degrees. This has been confirmed for the CC3 site, as discussed in COLA FSAR Section 2.5.4.

Step 5 is to confirm that the soil characteristics beneath the safety-related structures, including strain compatible properties are bounded by the parameters established in the U.S. EPR FSAR. This comparison is provided in the revised COLA FSAR Section 2.5.2.6.

The remaining four Steps (6 – 9) describe how an applicant may assess differences identified in the first five criteria. These elements are also discussed in the revised COLA FSAR Section 2.5.2.6.

Enclosure 2 provides the revised CC3 FSAR Section 2.5.2.6. Enclosure 3 also provides a revised FSAR Section 3.7.

Nuclear Island Soil Column (backfill)

As described in CC3 FSAR Revision 7, the soil configuration beneath the Nuclear Island has changed to include backfill beneath the basemat. This change resulted from incorporating the waterproof liner (needed to prevent direct contact of the low pH groundwater with safety-related concrete) under the Nuclear Island. Initial analysis of the earthquake motion shows that the fill beneath and beside the Nuclear Island will experience best estimate strain-compatible shear wave velocities on the order of 580 to 650 fps. Because these shear wave velocities are less than the 700 fps used in the U.S. EPR FSAR Seismic analysis, UNE is required to take a departure. This departure is identified in CC3 FSAR Section 2.5.2.6 and added to COLA Part 7 in Enclosure 4.

UNE has determined that the foundation input response spectra using the new shear wave velocity profiles remain bounded by the SSE as discussed in COLA FSAR Section 2.5.2.6.

However, because there is now backfill beneath the Nuclear Island, a new Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) will be created in Table 2.4-1 in COLA Part 10-ITAAC.

Similar to the currently existing ITAAC for backfill, UNE intends to establish a test value for the low strain shear wave velocity that would ensure the strain compatible properties would be bounded by the values used in the analysis. This ITAAC test value will be less than the 1000 fps minimum established as a Tier 1 value in the U.S. EPR FSAR, and will constitute a departure. This new ITAAC and the revision to the Shear Wave Velocity departure currently in Section 1.1.5 of COLA Part 7-Departures and Exemption Requests, will be provided by May 31, 2011.

Low Frequency Departure

UNE previously identified the small exceedance by the CCNPP Unit 3 ISRS for the EPGB and ESWB as a departure. This exceedance exists below approximately 0.3 hz and is a result of adopting the RG 1.60 spectra for the low frequencies. Because the CSDRS also exceeds the RG 1.60 curve in the low frequencies and is accepted as a valid design spectra, UNE is eliminating the departure. The resulting markup of COLA Part 7 is provided in Enclosure 4. Enclosure 5 provides a conforming markup of FSAR Section 3.10.

RAI Status Update

With respect to other information presented in the referenced letter:

- UNE will not update the responses to RAI 58 Question 03.07.01-1 and 03.07.01-2, RAI 179 Question 03.07.01-14 and RAI 65 Question 03.07.02-18 and 03.07.02-24. Because UNE does not intend to update the existing site specific confirmatory seismic analysis of record for CCNPP Unit 3, the responses do not require update.
- UNE will not need a direct comparison of the CCNPP Unit 3 structure-soil-structure interaction (SSSI) between the NI and the EPGB and ESWB with the existing approach which used an amplification factor. Rather, UNE will assess the change within the future Design Certification analysis and determine if it affects the conclusions of the existing analyses.
- Additional information to address the design approach for the Turbine Building, Switchgear Building and Access Building to preclude interaction with safety-related structures is being added to Section 3.7 as a part of the response to RAI 253 Question 03.07.02-46.
- Elimination of the Seismic Category II-SSE design classification is being pursued and will be provided as the response to RAI 253 Question 03.07.02-45.
- The RAI 252 response was submitted to the NRC in UniStar letter UN#11-103 dated March 22, 2011.
- The RAI 253 response to Question 03.07.02-46, 49, 50 and 51 was submitted to the NRC in UniStar letter UN#11-116 dated March 31, 2011. This letter provides a schedule for the completion of the response to Question 03.07.02-45 and the Intake Structure portion of the response to Question 03.07.02-46.

Other Completed Activities

- The discussion of the free field acceleration sensor was updated in COLA Revision 7.

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- The reconfiguration of the intake to consolidate the Ultimate Heat Sink Makeup Water Intake Structure and Electrical Building into a single structure was provided to the NRC in UniStar letter UN#10-285 dated November 16, 2010 and incorporated into COLA Revision 7.

Future Evaluations

The referenced letter anticipated that AREVA would have completed all analyses for the Design Certification (DC) and associated NRC RAIs by December 31, 2010. Since August 2010, it has become apparent that additional DC Analysis and information will continue to be developed during 2011. As such, UNE will utilize our 10 CFR 50, Appendix B Engineering Process to formally assess new site-specific or DC information to determine if the new information alters the conclusions that the design of the generic structures is adequate for the CC3 site.

With respect to AREVA's ongoing changes to the U.S. EPR FSAR, the most significant changes are:

- Changing the dynamic model for the Nuclear Island (NI) to an embedded finite element model (FEM) from a surface-founded stick model.

- Adding a 4th certified seismic design response spectra (CSDRS) curve to address high frequency content.

- Reworking the Critical Sections in Appendix 3E to resolve concerns associated with the selection of Critical Sections.

Specifically, for the three major changes identified above, it is the conclusion of UNE that changing the model from a surface founded stick model to an embedded finite element model, or minor changes to the critical structures within the buildings will not alter the fundamental relationship between the site conditions and those analyzed in the U.S. EPR FSAR. For example, the addition of a new CSDRS curve with larger accelerations in the high frequency range has no effect on CC3 beyond demonstrating that even larger margins exist at high frequencies. Therefore, the current site specific confirmatory seismic analysis for CC3 remains valid.

This engineering process will continue to be used by UNE as new information is developed for the Certified Design by AREVA for their responses to U.S. EPR FSAR RAI 320 and other U.S. EPR FSAR seismic design and analysis related RAIs. This approach will document the determination that changes in the U.S. EPR FSAR, such as the transition to an embedded finite element model of the Nuclear Island, do not substantively reduce the margin that exists between CC3 and the U.S. EPR FSAR. In addition, this approach will allow for the cumulative effects of changes to be seen so that margin is not eroded. UNE is relying upon the existing site specific confirmatory seismic analysis and the assessment of soil characteristics in Section 2.5.2.6 to provide the basis for concluding the safety-related structures developed for the Certified Design may be used at the CC3 site without alteration.

Accordingly, UNE will assess the U.S. EPR FSAR RAI responses after they are issued to determine if they alter the conclusion that the U.S. EPR Site Parameters bound the actual site characteristics and that the structures may be used without alteration. The process will assure that each change is assessed against the nine U.S. EPR FSAR steps described above.

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If, based upon UNE assessment, it is determined that an update to the site specific confirmatory seismic analysis in the COLA FSAR is required, UNE will notify the NRC and provide a schedule at that time. Additionally, if, based upon UNE assessment, it is determined that an update to the site specific confirmatory seismic analysis in the COLA FSAR is not required and the parameters remain bounded, UNE will notify the NRC of this conclusion.

Conclusions

This letter includes one regulatory commitment.

> *Following acceptance of the proposed FSAR change by the NRC Staff, UNE will begin assessing the U.S. EPR FSAR RAI 320 responses and other U.S. EPR FSAR seismic design and analysis related RAIs to determine if they alter the conclusion that the U.S. EPR FSAR site parameters bound the actual site characteristics, and that the structures may be used without alteration. UNE commits to provide a written description of these assessments and our conclusions as they are completed.*

A Licensing Basis Document Change Request has been initiated to incorporate the changes provided in Enclosure 2 through 5 into a future revision of the COLA. This letter does not contain any sensitive or proprietary information.

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 March 31, 2011

Greg Gibson

Enclosures
1) Slide Deck from the Public Meeting
2) Revised CCNPP Unit 3 FSAR Section 2.5.2.6
3) Revised Section 3.7
4) Revised COLA Part 7
5) Revised Section 3.10

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
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