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UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

January 22, 2013

UN#13-007

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 253, Seismic System Analysis

References:
1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 253 SEB2 4788" email dated July 12, 2010

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

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 July 12, 2010 (Reference 1). This RAI addresses Seismic System Analysis, as discussed in Section 3.7.2 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.

Reference 2 indicated that a response to RAI 253, Question 03.07.02-46, would be provided to the NRC by January 23, 2013. The enclosure provides our response to RAI No. 253, Question 03.07.02-46.

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RAI responses normally provide a table of changes to the CCNPP Unit 3 COLA associated with the RAI response. A Table of Changes is not provided with this transmittal as there is no COLA revision required in connection with this RAI 253, Question 03.07.02-46 response.

Our 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 January 22, 2013

Mark T. Finley

Enclosure: Response to NRC Request for Additional Information RAI No. 253, Question 03.07.02-46, Seismic System Analysis, 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
Amy Snyder, NRC Project Manager, U.S. EPR DC Application, (w/o enclosures)
Patricia Holahan, Acting Deputy Regional Administrator, NRC Region II, (w/o enclosures)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2,
David Lew, Deputy Regional Administrator, NRC Region I (w/o enclosures)

Enclosure

Response to NRC Request for Additional Information RAI No. 253,
Question 03.07.02-46,
Seismic System Analysis
Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 253

NRC Question 03.07.02-46

Follow Up to Question 03.07.02-19

The applicant in its response stated that the Switchgear Building (SB) will be analyzed using the same methodology as the Turbine Building (TB) which is described in the response to U.S. EPR FSAR NRC RAI 248, Question 03.07.02-56. In this methodology buildings are designed in such a way that the deformation, collapse, or partial collapse due to SSE loads are controlled by introducing an eccentrically braced frame in steel structures and a "crumple zone" in concrete structures. AREVA stated that this meets Acceptance Criteria 8A of SRP 3.7.2. The staff is still reviewing the AREVA response and has asked a follow-up question requesting additional information. With respect to the applicant's response to use the methodology proposed by AREVA, the applicant is requested to provide the following additional information for the TB and SB. As the Access Building (AB) is also the design responsibility of the applicant, and as it is situated adjacent to Category I buildings, the requested information also applies to this structure:

1. Describe the design process that will be applied to these structures and describe in detail how they will be analyzed for SSE load conditions;
2. For each building (TB, SB, and AB), describe the building design including the eccentrically braced frame in steel structures and the "crumple zone" in concrete structures and how the design prevents seismic interaction with a Category I structure;
3. Describe the collapse sequence and how the collapse will be controlled under an SSE event such that failure occurs in a direction away from a Category I structure; and,
4. Describe how the displacement of the TB and AB will be determined to verify that the separation distance to Category I structures are adequate during an SSE event.

The applicant needs to add the AB to Table 3.7-14 and revise Table 3.2-1 to reflect the fact that the Access Building is now classified by AREVA as a Seismic Category II structure.

Regarding the Circulating Water System (CWS) Makeup Water Intake Structure (MWIS), the applicant in its response states that the embedded portion of the CWS MWIS will be designed as a Seismic Category I structure. Therefore, the design methodology for embedded concrete structure will meet Acceptance Criteria 8.C of SRP 3.7.2. However, it is not clear from the applicant's response whether the operating deck of the CWS MWIS will be designed as a Seismic Category I structure. As failure of this portion of the CWS MWIS could compromise the structural integrity of the embedded walls and the Seismic Category I Common Basemat Intake Structure (CBIS) slab, the applicant is requested to provide a description of the design requirements for the operating deck slab, and if not designed to Seismic Category I requirements, to provide the technical justification and consequences for not doing so.

Also, FSAR Section 3.7.2.3.2 states, in part, that a portion of the pump house enclosure is partially supported on the operating deck slab of the CWS MWIS, and that the masses corresponding to the applicable dead loads and snow loads for the pump house enclosure are appropriately included in the finite element model. The pump house enclosure is supported partially on the operating deck of the CWS MWIS and partially on its own slab. It is not clear from the response if a portion of the dead loads and snow loads associated with the pump house enclosure are included in the CWS MWIS model, or if the entire dead load and snow load is used. Since this can affect the analysis results, the applicant is requested to explain what was done and include this explanation in the FSAR.

Since the pump house enclosure is not designed for seismic loads, the applicant is requested to address what will happen to the operating deck of the CWS MWIS if the enclosure collapses and what will be the effect of this collapse on the seismic response of the CBIS.

If the pump house does not collapse, the response of the CBIS will be influenced by the mass and structural stiffness of the pump house enclosure and the pump house enclosure slab. The applicant is requested to discuss and quantify the effect of the pump house enclosure and slab on the CBIS seismic response and in-structure response spectra (ISRS).

This information will assist in determining whether or not adjacent or near-by Seismic Category I structures will be capable of meeting their intended safety functions under a design basis earthquake event.

Response

Response to Item 1:

The Turbine Building (TB) and Switchgear Building (SWGB) share a common basemat referred to as the Turbine Island (TI). Both the Access Building (AB) and the TI are Category II structures, but will be analyzed with the same loading requirements and soil interface configurations as their neighboring Seismic Category I Structures. Hence, the TI and AB will be analyzed to prevent failure under Safe Shutdown Earthquake (SSE) conditions with a margin of safety equivalent to that of a Category I structure. This meets Acceptance Criteria 8.C of Standard Review Plan (SRP) 3.7.2.

The stability analyses of the TI and AB and the methodologies used will be provided in detail in the response to RAI 315, Question 03.07.02-63.

COLA Revision 8 (Tables 3.2-1 and 3.7-11) reflects the fact that the AB is classified as a Seismic Category II structure in the US EPR Design Certification.

Response to Item 2:

"Crumple zones" will not be implemented to prevent seismic interaction with a Category I structure. As stated in response to Item 1, the TI and AB will be analyzed to prevent failure under SSE conditions, meeting Acceptance Criteria 8.C of SRP 3.7.2.

Response to Item 3:

Collapse sequences in the analysis of the TI and AB are not applicable, since their analyses will incorporate loads and foundation interfaces to prevent failure under SSE conditions.

Response to Item 4:

The displacement of the TI and AB will be analyzed to verify that the separation distances to Category I structures are adequate during an SSE event. The details of the analyses used to perform such verification will be provided in the response to RAI 315, Question 03.07.02-63.

Response to issues related to the Circulating Water System (CWS) Makeup Water Intake Structure (MWIS):

The finite element model for the Common Basemat Intake Structure (CBIS) includes the UHS Makeup Water Intake Structure (MWIS), the Forebay and the Circulating Water System (CWS) MWIS. The operating deck and pump house enclosure of the CWS MWIS is included in the finite element (FE) model so that these structural components can be analyzed and designed to meet the same design requirements as a Seismic Category I structure. Hence, the operating deck and Pump House Enclosure is designed to prevent failure under SSE conditions with a margin of safety equivalent to that of a Category I structure. The reinforced concrete operating deck is designed using ACI 349. The structural steel Pump House Enclosure is designed using ANSI/AISC N690. This meets Acceptance Criteria 8.C of SRP 3.7.2.

The steel structure of the Pump House Enclosure is included in the seismic FE model. Live and snow loads are applied to the steel structure, which then distributes these loads, as well as the self-weight, in relation to the stiffness of the structure, to the column supports. The loads induced by the Pump House Enclosure are therefore correctly proportioned to the operating deck of the CWS MWIS and the Pump House Enclosure slab.

The Pump House Enclosure is analyzed and designed to meet the same design requirements as a Seismic Category I structure. Hence, the Pump House Enclosure is designed to prevent failure under SSE conditions with a margin of safety equivalent to that of a Category I structure. This meets Acceptance Criteria 8.C of SRP 3.7.2. Collapse of the Pump House Enclosure is therefore not considered in the analysis and design.

With the steel structure of the Pump House Enclosure included in the seismic model, this structure's mass and stiffness is accounted for in the model. The operating deck of the CWS MWIS is also included in the SSE model. The effect of these structural components is therefore included in the CBIS seismic response. In-structure response spectra (ISRS) and analysis results will be provided in the FSAR markup as part of the response to RAI 343, Questions 03.07.02-70 through 03.07.02-74, when the seismic model is updated with the SSE information obtained according to 2012 Seismic Source Characterization (SSC) for the Central and Eastern United States (CEUS).

Reference used in this response:

Electric Power Research Institute (EPRI)/U.S. Department of Energy (DOE)/U.S. Nuclear Regulatory Commission (NRC), 2012, *Technical Report: Central and Eastern United States Seismic Source Characterization for Nuclear Facilities*, EPRI Report #1021097, DOE Report # DOE/NE-0140, NRC NUREG-2115, EPRI, Palo Alto, CA.

COLA Impact

Revision to the COLA FSAR is not required as a result of this response.