Greg Gibson
Senior Vice President, Regulatory Affairs

750 East Pratt Street, Suite 1600
Baltimore, Maryland 21202

UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

September 1, 2011

UN#11-246

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 No. 275, Structural Inspection, Tests, Analysis, and Acceptance Criteria

Reference:

1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 275 SEB2 5205" email dated January 21, 2011

2) UniStar Nuclear Energy Letter UN#11-240, from Greg Gibson to Document Control Desk, U.S. NRC, RAI Closure Plan, dated August 23, 2011

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 (UNE), dated January 21, 2011 (Reference 1). This RAI addresses Structural Inspection, Tests, Analysis, and Acceptance Criteria (ITAAC), as discussed in Section 14.3.2 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 7.

Reference 2 provided a schedule for the response date for Question 14.03.02-13. The enclosure provides our response to RAI No. 275, Question 14.03.02-13, and includes revised COLA content. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

D096
NRO

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) 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 September 1, 2011

for Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 275, Question 14.03.02-13, Structural ITAAAC, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Charles Casto, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/JMR/mdf

Enclosure

**Response to NRC Request for Additional Information
RAI No. 275, Question 14.03.02-13,
Structural ITAAC,
Calvert Cliffs Nuclear Power Plant, Unit 3**

RAI No. 275

Question 14.03.02-13

The staff reviewed the RAI response to Question 14.03.02-2 A provided in UniStar Letter UN#10-071 dated March 31, 2010 (ML100950110) and found that the responses to Items 2 to 6 and 8 of the RAI are adequate, however, the following information is needed to address Items 1 and 7 of the RAI:

Regarding Item 1, the RAI response did not provide the markup to CCNPP Unit 3 FSAR Section 14.3.2 to show that the revised title of this section will be "Structural and Systems Engineering – Inspections, Tests, Analyses, and Acceptance Criteria." Please provide the markup showing the proposed change to the FSAR.

Regarding Item 7, the RAI response explained that several of the interface requirements listed in FSAR Table 14.3-3 are associated with the design criteria for a SSC. The RAI response also explained that the CCNPP Unit 3 COLA contains the specific design criteria that have adequate information for the NRC to establish the acceptability of the site-specific design to meet those interface requirements, therefore, no ITAAC were provided for those items. The specific interface requirements listed in Table 14.3-3 under discussion are as follows:

The COL Applicant will provide the design of the Fire Protection Storage Tanks and Building.
The COL Applicant will provide the design of the Switchgear Building.
The COL Applicant will provide the design of the Turbine Building.
The COL Applicant will provide the design of the Access Building.

For the Fire Protection Storage Tanks and Building, Table 14.3.3 references Section 3.7.2.3.3 and Section 3.7.2.8 for design information. For the Switchgear Building, the Turbine Building and the Access Building, Table 14.3.3 references Table 3.2-1 for design information.

The staff reviewed the FSAR tables/sections referenced above, and found that the referenced sections and table for the Fire Protection Storage Tanks and Building, the Switchgear Building, the Turbine Building and the Access Building contain only structural seismic classifications and references to design codes for the design of these structures. The staff considers that there is insufficient design information provided in the referenced sections or table to satisfy the interface requirements for these structures. Specifically, the design information should consist of a summary of the analysis and design approach (including acceptable codes and standards, load and load combinations, analysis procedures, acceptance criteria and materials) and design results for some representative structural members. Therefore, the staff requests that the applicant explain where the design information, to satisfy the interface requirements for these structures, is included in the FSAR; otherwise, include the information in an appropriate section of the CCNPP Unit 3 FSAR. For any of the design information that is identical to other Category I structures, a reference to the appropriate subsections in the FSAR would be adequate.

The staff needs the above information to be able to conclude in the SER that there is reasonable assurance that the specific COL interface requirements listed in Table 14.3-3, as discussed above, have been adequately implemented and addressed in the CCNPP Unit 3 COLA.

Response

Part 1: Follow-up to Response to RAI 118 Question 14.03.02-2A, Item 1

The title of Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 COLA FSAR, Revision 7, Section 14.3.2 will be revised to "Tier 1, Chapter 2, Structural and Systems Engineering – Inspections, Tests, Analyses, and Acceptance Criteria," consistent with NUREG-0800 Standard Review Plan 14.3.2.

Part 2: Follow-up to Response to RAI 118 Question 14.03.02-2A, Item 7

UniStar Nuclear Energy (UNE) is in the process of reclassifying the Fire Protection Storage Tanks and Building from Seismic Category II-Safe Shutdown Earthquake (SSE) to Conventional Seismic. The Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 COLA will be updated, as part of this reclassification effort, in the UNE response to RAI 253 Question 03.07.02-45. Therefore, there will be no design interface requirements for the Fire Protection Storage Tanks and Building. This response is, therefore, limited to the discussions for the Turbine Building, Switchgear Building, and Access Building.

The analysis and design of the Seismic Category II Turbine Building, Switchgear Building, and Access Building has not been performed, and the design of these structures will be performed during the detailed design engineering phase. Thus, the design results and final member sizes for these structures are not currently available. The design information in this response, therefore, only provides an overview of the analysis and design approach (including acceptable codes and standards, load and load combinations, analysis procedures, acceptance criteria, and materials) to satisfy the design interface requirements for these structures. The response is organized to provide this information for each of the above mentioned structures, including appropriate references to the COLA FSAR. Where certain information about building layout and details is available, that information is also included in the response.

It is noted that the analysis and conceptual design of Seismic Category II Turbine Building, Switchgear Building, and Access Building will be provided in the UNE response to RAI 315 Question 03.07.02-63 and will address the seismic interaction of the Seismic Category II structures with Seismic Category I structures. CCNPP Unit 3 COLA will be subsequently updated to include the stability evaluation results for the Seismic Category II structures.

Turbine Island (TI) Structure (Turbine Building and Switchgear Building)

1. Building Layout/Details

The Turbine Building and Switchgear Building together comprise the Turbine Island (TI) structure. The TI structure is a site-specific structure and is classified as a Non Safety-Related Augmented Quality (NS-AQ) Seismic Category II structure according to COLA FSAR Table 3.2-1.

The TI sub-structure is comprised of a reinforced concrete basemat and below grade reinforced concrete walls. Integral reinforced concrete pilasters are situated beneath steel columns along the perimeter walls. The TI super-structure is primarily a structural steel, braced frame in both directions below the operating deck and parallel to the Turbine Generator (TG) above the operating deck. Structural steel moment frames are used perpendicular to the TG above the

operating deck. A three-hour rated fire barrier separates the Turbine Building from the adjacent Switchgear Building.

Typical plan and elevation views of the TI structure are depicted in the UNE response to RAI 177 Question 09.05.01-14[1]. Key floor levels of the TI structure and their structural floor systems include:

- Turbine Building and Switchgear Building share a common Reinforced Concrete Basemat
- Basement Level: Top of the reinforced concrete TI structure basemat
- Grade Level: Composite slab supported by composite beams and either composite or non-composite girders
- Mezzanine Level: Structural steel framing supporting steel grating typically, with select areas of composite slabs, composite beams and girders
- Operating Deck Level: Reinforced concrete slab supported by composite beams and either composite or non-composite girders.
- Roof: Structural steel beams and roof purlins supported by long-span structural steel roof trusses at main column lines

The Turbine Generator (TG) is located at Operating Deck Level. The reinforced concrete TG deck is supported by spring isolators. The spring isolators, grouped at primary column locations, are supported by either structural steel box columns or composite columns, which are integral with the overall structural steel frame of the TI structure.

2. Acceptable Codes and Standards

As described in the UNE response to RAI 253 Question 03.07.02-46[2], the TI structure is analyzed and designed to the same requirements as the site-specific Seismic Category I structures. The applicable design codes and standards for the reinforced concrete and structural steel components of the TI structure are listed in COLA FSAR Tables 3.2-1 and 3.7-11. The reinforced concrete components of the TI structure are designed in accordance with ACI 349 and the structural steel components of the TI structure designed in accordance with ANSI/AISC N690.

3. Loads and Load Combinations

The design loads and load combinations for the TI structure are consistent with those used for the design of site-specific Seismic Category I structures.

---

[1] Greg Gibson to U.S. NRC Document Control Desk, "Response to RAI No. 177, "Fire Protection Program," UN#10-272, dated October 22, 2010

[2] Greg Gibson to U.S. NRC Document Control Desk, "Response to RAI No. 253, "Seismic System Analysis," UN#11-116, dated March 30, 2011

a. Dead Loads

Dead loads for the TI structure are in accordance with COLA FSAR Section 3.8.4.3.1, which incorporates the U.S. EPR FSAR Section 3.8.4.3.1 by reference.

b. Live Loads

Live loads for the TI structure are in accordance with COLA FSAR Section 3.8.4.3.1. The live loads include the loads due to rain, snow and ice and are based on the site-specific conditions. The live loads of the TI structure further include loads consistent with the equipment layout within the structure.

c. Seismic Loads

Seismic loads are calculated using the CCNPP Unit 3 Site SSE Spectrum, which is depicted in COLA FSAR Figure 3.7-1.

d. Wind Loads

The TI structure is a site-specific structure and is designed for site-specific wind loads. The site-specific wind parameters (i.e. basic wind speed, 100-year recurrence interval wind speed) and applicable codes and guidelines (e.g., importance factor of 1.15) for the determination of site-specific wind loads were included in COLA FSAR Section 3.3.1 as part of the UNE response to RAI 264 Question 03.03.02-4[3].

e. Tornado Loads

Tornado loads for the analysis and design of TI structure are in accordance with COLA FSAR Section 3.3.2. Design basis tornado characteristics and tornado missile parameters are in accordance with Tornado Region I of NRC RG 1.76, Revision 1. Tornado wind loads will be converted to wind pressure loads according to SEI/ASCE 7-05 guidelines. Tornado wind pressures are mitigated through the use of pressure relief siding panels.

f. Load Combinations

Load combinations for the analysis and design of the TI structure are consistent with those used for the analysis and design of Seismic Category I structures, as described in COLA FSAR Section 3.8.4.3.2, which incorporates the U.S. EPR FSAR Section 3.8.4.3.2 by reference.

4. Analysis Procedures

As described in the UNE response to RAI 253 Question 03.07.02-46[2], finite element methods are utilized to analyze the TI structure for applicable loads and load combinations. For seismic loads, the TI structure is designed to maintain a margin of safety equivalent to that of Seismic Category I structures. The margin of safety equivalent to that of Seismic Category I structures

---

[3] Greg Gibson to U.S. NRC Document Control Desk, "Response to RAI No. 264, "Tornado Loads," UN#11-176, dated June 10, 2011

is achieved by analyzing and designing the TI structure to the same requirements as a Seismic Category I structure.

5. Materials

Concrete and reinforcing steel materials for the TI structure conform to those for site-specific Seismic Category I structures which are discussed in COLA FSAR Section 3E.4.2. The concrete used for the TI structure has a minimum design compressive strength of 5000 psi (with ASTM A615, Grade 60 or 75 reinforcing steel). The structural steel W-shape members are ASTM A992, and the structural steel channels, angles, and plates conform to ASTM A36 (except angles of cased seats for modular composite floor panels which conform to ASTM A572 Grade 50).

6. Acceptance Criteria

Since the TI structure is designed to the same requirements as the Seismic Category I structures, the structural acceptance criteria for the TI structure is identical to those for Seismic Category I structures, which are outlined in COLA FSAR Section 3.8.4.5, which incorporates the U.S. EPR FSAR Section 3.8.4.5 by reference.

The TI structure is designed to remain elastic under an SSE. Therefore, in regards to seismic interaction considerations, the design methodology for the TI structure meets NUREG-0800, Standard Review Plan 3.7.2, Acceptance Criterion 8.C as described in the response to RAI 253 Question 03.07.02-46[2]. The elastic displacements of the TI structure are computed using finite element analysis methods. Upon closure of COLA Part 10 Appendix B ITAAC, Revision 7, in Tables 2.4-10 and 2.4-11, the finite element analyses report will confirm that the elastic displacements of the TI structure combined with those of adjacent Seismic Category I structures are less than the provided separation distances.

Access Building

1. Building Layout/Details

The Access Building is a site-specific structure and is classified as a Non Safety-Related Augmented Quality (NS-AQ) Seismic Category II structure according to COLA FSAR Table 3.2-1.

The multi-story Access Building is comprised of both reinforced concrete and structural steel components. Reinforced concrete components include below grade walls, partial height shear walls (to an elevation nominally 20 ft above grade), and a basemat. The structural steel super-structure includes composite slabs, composite beams and both composite and non-composite girders.

The layout details of the Access Building are in the preliminary stage and will be finalized during the detailed design engineering phase. Therefore, layout sketches and details are not included as part of this response.

2. Acceptable Codes and Standards

As described in the UNE response to RAI 253 Question 03.07.02-46[2], the Access Building is analyzed and designed to the same requirements as the site-specific Seismic Category I structures. The applicable design codes and standards for the reinforced concrete and structural steel components of the Access Building are listed in COLA FSAR Tables 3.2-1 and 3.7-11. The reinforced concrete components of the Access Building are designed in accordance with ACI 349 and the structural steel components of the Access Building designed in accordance with ANSI/AISC N690.

3. Loads and Load Combinations

The design loads and load combinations for the Access Building are consistent with those used for the design of site-specific Seismic Category I structures.

a. Dead Loads

Dead loads for the Access Building are in accordance with COLA FSAR Section 3.8.4.3.1, which incorporates the U.S. EPR FSAR Section 3.8.4.3.1 by reference.

b. Live Loads

Live loads for the Access Building are in accordance with COLA FSAR Section 3.8.4.3.1. The live loads include loads due to rain, snow and ice and are based on the site-specific conditions. The live loads of the Access Building further include loads consistent with the equipment layout within the structure.

c. Seismic Loads

Seismic loads are calculated using the CCNPP Unit 3 Site SSE Spectrum, which is depicted in COLA FSAR Figure 3.7-1.

d. Wind Loads

The Access Building is a site-specific structure and is designed for site-specific wind loads. The site-specific wind parameters (i.e. basic wind speed, 100-year recurrence interval wind speed) and applicable codes and guidelines (e.g., importance factor of 1.15) for the determination of site-specific wind loads were included in COLA FSAR Section 3.3.1 as part of response to RAI 264 Question 03.03.02-4[3].

e. Tornado Loads

Tornado loads for the analysis and design of Access Building are in accordance with COLA FSAR Section 3.3.2. Design basis tornado characteristics and tornado missile parameters are in accordance with Tornado Region I of NRC RG 1.76, Rev. 1. Tornado wind loads will be converted to wind pressure loads according to SEI/ASCE 7-05 guidelines. Pressure relief siding panels are utilized, as necessary, to mitigate tornado wind pressures.

f. Load Combinations

Load combinations for analysis and design of the Access Building are consistent with those used for the analysis and design of Seismic Category I structures, as described in COLA FSAR Section 3.8.4.3.2, which incorporates the U.S. EPR FSAR Section 3.8.4.3.2 by reference.

4. Analysis Procedures

Finite element methods are utilized to analyze the Access Building for applicable loads and load combinations described above. For seismic loads, the Access Building is designed to maintain a margin of safety equivalent to that of Seismic Category I structures. The margin of safety equivalent to that of Seismic Category I structures is achieved by analyzing and designing the Access Building to the same requirements as a Seismic Category I structure.

5. Materials

Concrete and reinforcing steel materials for the Access Building conform to those for site-specific Category I structures, which are discussed in COLA FSAR Section 3E.4.2. The concrete used for the Access Building has a minimum design compressive strength of 5000 psi (with ASTM A615, Grade 60 or 75 reinforcing steel). The structural steel W-shape members are ASTM A992, and the structural steel channels, angles and plate conform to ASTM A36.

6. Acceptance Criteria

Since the Access Building will be designed to the same requirements as the Seismic Category I structures, the structural acceptance criteria for the Access Building are identical to those for Seismic Category I structures, which are outlined in COLA FSAR Section 3.8.4.5, that incorporates the U.S. EPR FSAR Section 3.8.4.5 by reference.

The Access Building is designed to remain elastic under an SSE event. Therefore, in regards to seismic interaction considerations, the design methodology for the Access Building meets NUREG-0800, Standard Review Plan 3.7.2, Acceptance Criterion 8.C as described in the UNE response to RAI 253 Question 03.07.02-46[2].

The elastic displacements of the Access Building are computed using finite element analysis methods. Upon closure of COLA Part 10 Appendix B ITAAC, Revision 7, in Table 2.4-32, the finite element analyses report confirm that the elastic displacements of Access Building combined with those of nearest Seismic Category I structures are less than the provided separation distances.

COLA FSAR Section 3.7.2.8 will be updated to include a summary of the analysis and design approach for the Turbine Building, Switchgear Building, and Access Building.

COLA Impact

The FSAR Section 3.7.2.8 will be updated as follows:

3.7.2.8 Interaction of Non-Seismic Category I Structures with Seismic Category I Systems

Table 3.7-11 provides the criteria used to prevent seismic interaction of Turbine Building, Switchgear Building, Circulating Water Makeup Intake Structure and Grid Systems Control Building with other Seismic Category I structures, systems and components (SSCs).

The Seismic Category II Turbine Building and Seismic Category II Switchgear Building together comprise a common Turbine Island (TI) structure and are situated approximately 30 ft (9.1 m) from the NI Common Basemat structures. The Switchgear Building is a steel framed structure. The Turbine Building and Switchgear Building are designed using conventional seismic codes and standards presented in Table 3.7-11, but are also analyzed and designed using Site SSE to prevent seismic interaction with the Seismic Category I SSCs. An evaluation of the site specific SSE responses will confirm that the separation distance between the TI structure and the Seismic Category I SSCs exceeds the sum of the maximum relative seismic displacement between the structures, construction tolerances and settlement effects by an appropriate factor of safety.

The analysis and design of the Seismic Category II Turbine Building, Switchgear Building, and Access Building for loads and load combinations not involving seismic loads, are performed to the same requirements as Seismic Category I structures. The analysis of these structures is performed using three-dimensional finite element models, and the design of reinforced concrete and structural steel components is performed using ACI 349 (ACI, 2001) and ANSI/AISC N690 (ANSI/AISC, 2004), respectively. Therefore, these Seismic Category II structures have a margin of safety equivalent to that of Seismic Category I structures for applicable loads and load combinations. The structural acceptance criteria for these structures is consistent with those for Seismic Category I structures.

The FSAR Section 14.3 will be updated as follows:

14.3.2 ~~Tier 1, Chapter 2, System Based Design Descriptions and ITAAC~~
Tier 1, Chapter 2, Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria