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UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

October 30, 2009

UN#09-461

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Departure for Minimum Shear Wave Velocity beneath the Emergency Power Generating Buildings.

Reference: UniStar Nuclear Energy Letter UN#09-427, from Greg Gibson to Document Control Desk, U. S. NRC, UniStar Update to Calvert Cliffs Nuclear Power Plant, Unit 3 FSAR Sections 2.5.4 and 2.5.5, dated October 9, 2009.

The purpose of this letter is to provide an update to Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 6 to incorporate a departure into COLA Part 7. This departure addresses the minimum shear wave velocity (low-strain best estimate value) beneath the Emergency Power Generating Buildings. As identified in Reference 1, the best estimate shear wave velocity in the fill below these buildings is less than the minimum shear wave velocity as stated in the U.S. EPR Design Certification Application, Tier 1, Chapter 5.0, Site Parameters.

The enclosure provides new sections to be included in COLA Part 7, Departures and Exemption Requests, and conforming changes to COLA Part 2, Final Safety Analysis Report. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the CCNPP Unit 3 COLA.

A site specific soil-structure interaction (SSI) analysis is being performed and will be submitted, as noted in our response to RAI 58, et. al., by December 29, 2009, to demonstrate that the results of the site specific SSI are bounded by the standard plant results included in the Design

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Certification Application. COLA Part 10, Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) will be updated as part of that submittal.

This letter does not include any new regulatory commitments and 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. Michael J. Yox at (410) 495-2436.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 30, 2009

Greg Gibson

Enclosures: Sections to be included in COLA Part 7, Departures and Exemption Requests, and conforming changes to COLA Part 2, Final Safety Analysis Report, 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)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
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GTG/SJS/mdf

UN#09-461

Enclosure

Sections to be included in COLA Part 7, Departures and Exemption Requests, and conforming changes to COLA Part 2, Final Safety Analysis Report, Calvert Cliffs Nuclear Power Plant Unit 3.

Changes to COLA Part 7, Departures and Exemptions

Additional text added to Section 1.1:

1.1 DEPARTURES

This Departure Report includes deviations in the CCNPP Unit 3 COL application FSAR from the information in the U.S. EPR FSAR, pursuant to 10 CFR Part 52. The U.S. EPR Design Certification

Application is currently under review with the NRC. However, for the purposes of evaluating these deviations from the information in the U.S. FSAR, the guidance provided in Regulatory Guide 1.206, Section C.IV.3.3, has been utilized.

The following Departures are described and evaluated in detail in this report:

1. Maximum Ground Water Level
2. Maximum Differential Settlement (across the basemat)
3. Maximum Annual Average Atmospheric Dispersion Factor (0.5 mile – limiting sector)
4. Accident Atmospheric Dispersion Factor (0-2 hour, Low Population Zone, 1.5 miles)
5. Toxic Gas Detection and Isolation
6. Generic Technical Specifications and Bases - Setpoint Control Program
7. Shear Wave Velocity

Additional text following subsection 1.1.6:

1.1.7 Shear Wave Velocity

Affected U.S. EPR FSAR Sections: Tier 1 Table 5.0-1, Tier 2 Table 2.1-1

Summary of Departure:

The U.S. EPR FSAR identifies a minimum shear wave velocity (low strain best estimate average value at bottom of basemat) of 1,000 feet per second (fps) in Tier 1, Table 5.0-1. This 1,000 fps requirement, without identifying specific structures, is repeated in Table 2.1-1 of Tier 2. Section 2.5.2.6, *Ground Motion Response Spectrum*, of the U.S. EPR FSAR states that the applicant will confirm that the low-strain, best-estimate, value of shear wave velocity at the bottom of the foundation basemat of the Nuclear Island (NI) Common Basemat Structures is 1,000 fps, or greater. U.S. EPR FSAR Section 2.5.4.3, *Foundation Interfaces*, specifies the following requirement with respect to shear wave velocity:

(4) adequate dynamic properties (i.e., shear wave velocity and strain-dependent

> modulus-reduction and hysteretic damping properties) to support the Seismic Category I structures of the U.S. EPR under earthquake loading.

Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC, have elected to consider a shear wave velocity of less than 1,000 fps under any Seismic Category I facility as a departure. The best estimate shear wave velocity in Fill Layer 2, the fill from 6 feet below grade (the basemat of the Emergency Power Generating Building (EPGBs)) to 22 feet below grade is 900 fps. Therefore a departure from the 1,000 fps best estimate shear wave velocity criterion is required for the EPGBs. The best estimate shear wave velocity represents a midpoint shear wave velocity for the building seismic analysis. A range of acceptable shear wave velocities will be established by analysis.

Scope/Extent of Departure:

This Departure is identified in CCNPP Unit 3 FSAR Table 2.0-1 and Section 2.5.4.2.5.8.

Departure Justification:

The fill selected for CCNPP Unit 3 is competent material. It has a moist unit weight of 145 lb/ft^3 and an angle of internal friction of more than 40°. Both of these values exceed the U.S. EPR established criteria in Section 2.5.4.2, *Properties of Subsurface Materials*. Shear wave velocity is a function of both the material and the confining pressure of the overlying soils (or structures). Because of the lack of confining pressure, a best estimate shear wave velocity of 1,000 fps or more is unlikely to be obtained immediately below a shallow foundation structure. However, this criterion can be met for CCNPP Unit 3 Seismic Category I structures except for the EPGBs, which have a foundation depth of 6 feet.

The U.S. EPR FSAR Tier 1 also states in Section 5.0:

> In the case of seismic design parameters, deviations from the defined conditions may be justified by site-specific soil-structure interaction analyses. The results may be used to confirm the seismic design adequacy of the certified design using approved methods and acceptance criteria.

The site-specific Soil-Structure Interaction (SSI) analysis of the structures in FSAR Section 3.7 uses the low strain best estimate shear wave velocities established for the soil column beneath the evaluated facilities. The 900 fps best estimate shear wave velocity in Fill Layer 2 is used as an input for the analysis of the EPGBs. More specifically, the analysis performed for FSAR Section 3.7 establishes a range of acceptable shear wave velocities beneath the building. The lowest acceptable shear wave velocity is a lower bound and the highest is an upper bound. This analysis demonstrates that the EPGBs withstand the safe shutdown earthquake (SSE) for that range of shear wave velocities.

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) testing will be performed during construction to confirm that the shear wave velocity of the installed and compacted fill exceeds

the lower bound shear wave velocity used in the analysis of the EPGB. This ITAAC testing demonstrates acceptability of this aspect of the building seismic analysis.

Departure Evaluation:

This Departure, associated with the shear wave velocity for the fill beneath the Emergency Power Generating Buildings has been evaluated and determined to not adversely affect the safety function of these structures. Accordingly, this Departure does not:

1. Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific FSAR;
2. Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific FSAR;
3. Result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific FSAR;
4. Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific FSAR;
5. Create a possibility for an accident of a different type than any evaluated previously in the plant-specific FSAR;
6. Create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific FSAR;
7. Result in a design basis limit for a fission product barrier as described in the plant-specific FSAR being exceeded or altered; or
8. Result in a departure from a method of evaluation described in the plant-specific FSAR used in establishing the design bases or in the safety analyses.

This Departure does not affect resolution of a severe accident issue identified in the plant-specific FSAR.

Therefore, this Departure has no safety significance.

Additional text added to Section 1.2:

1.2 EXEMPTION REQUESTS

These exemption requests have been developed assuming approval and issuance of a design certification for the U.S. EPR and are based on the current version of the U.S. EPR FSAR.

Calvert Cliffs 3 Nuclear Project and UniStar Nuclear Operating Services request the following exemptions related to:

1. Maximum Ground Water Level,
2. Maximum Differential Settlement (across the basemat),
3. Maximum Annual Average Atmospheric Dispersion Factor (0.5 mile – limiting sector),
4. Accident Atmospheric Dispersion Factor (0-2 hour, Low Population Zone, 1.5 miles),
5. Fitness For Duty Program
6. Use of M5™ Advanced Zirconium Alloy Fuel Rod Cladding, and
7. Toxic Gas Detection and Isolation.
8. Shear Wave Velocity

Additional text following subsection 1.2.7:

1.2.8 Shear Wave Velocity

Applicable Regulation: 10 CFR Part 52

The U.S. EPR FSAR Tier 1 Table 5.0-1, and Tier 2 Table 2.1-1, identifies a minimum shear wave velocity (low strain best estimate average value at bottom of basemat) of 1,000 feet per second (fps).

The best estimate shear wave velocity in Fill layer 2, the fill from 6 feet below grade (the basemat of the Emergency Power Generating Building (EPGBs)) to 22 feet below grade is 900 fps. Therefore this U.S. EPR criterion is not met.

Pursuant to 10 CFR 52.7 and 10 CFR 52.93, Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC request an exemption from compliance with the U.S. EPR FSAR Tier 1 and 2 requirements associated with the minimum shear wave velocity.

Discussion:

The U.S. EPR FSAR identifies a minimum shear wave velocity (low strain best estimate average value at bottom of basemat) of 1,000 fps in Tier 1, Table 5.0-1. U.S. EPR FSAR Tier 1 Section 5.0 also states:

> In the case of seismic design parameters, deviations from the defined conditions may be justified by site-specific soil-structure interaction analyses. The results may be used to confirm the seismic design adequacy of the certified design using approved methods and acceptance criteria.

This 1,000 fps requirement, without identifying specific structures, is repeated in Table 2.1-1 of

Tier 2. Section 2.5.2.6, *Ground Motion Response Spectrum*, of the U.S. EPR FSAR states that the applicant will confirm that the low-strain, best-estimate, value of shear wave velocity at the bottom of the foundation basemat of the Nuclear Island (NI) Common Basemat Structures is 1,000 fps, or greater.

U.S. EPR FSAR Section 2.5.4.3, *Foundation Interfaces*, specifies the following requirement with respect to shear wave velocity:

> (4) adequate dynamic properties (i.e., shear wave velocity and strain-dependent modulus-reduction and hysteretic damping properties) to support the Seismic Category I structures of the U.S. EPR under earthquake loading.

The best estimate shear wave velocity in Fill Layer 2, the fill from 6 feet below grade (the basemat of the Emergency Power Generating Building (EPGBs)) to 22 feet below grade is 900 fps. The fill selected for CCNPP Unit 3 is competent material. It has a moist unit weight of 145 lb/ft^3 and an angle of internal friction of more than 40°. Both of these values exceed the U.S. EPR established criteria. Shear wave velocity is a function of both the material and the confining pressure of the overlying soils (or structures). Because of the lack of confining pressure, a best estimate shear wave velocity of 1,000 fps or more is unlikely to be obtained immediately below a shallow foundation structure.

The site-specific Soil-Structure Interaction (SSI) analysis of the structures in FSAR Section 3.7 uses the low strain best estimate shear wave velocities established for the soil column beneath the evaluated facilities. The 900 fps best estimate shear wave velocity in Fill layer 2 is used as an input for the analysis of the EPGBs. More specifically, the analysis performed for FSAR Section 3.7 establishes a range of acceptable shear wave velocities beneath the building. The lowest acceptable shear wave velocity is a lower bound and the highest is an upper bound. This analysis demonstrates that the EPGBs withstand the safe shutdown earthquake (SSE) for that range of shear wave velocities.

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) testing will be performed during construction to confirm that the shear wave velocity of the installed and compacted fill exceeds the lower bound shear wave velocity used in the analysis of the EPGB. This ITAAC testing demonstrates acceptability of this aspect of the building seismic analysis.

This change associated with the shear wave velocity below the EPGB foundations has been evaluated and determined to not adversely affect the safety function of these structures. Therefore, this change will not result in a significant decrease in the level of safety otherwise provided by the design described in the U.S. EPR FSAR.

The exemption is not inconsistent with the Atomic Energy Act or any other statute. As such, the requested exemption is authorized by law.

This change does not result in a departure from the design and does not require a change in the

design described in the U.S. EPR FSAR. In addition, the change has been evaluated and determined to not adversely affect the safety function of the associated structures. Therefore, the requested exemption will not present an undue risk to the public health and safety.

The change does not relate to security and does not otherwise pertain to the common defense and security. Therefore, the requested exemption will not endanger the common defense and security.

The special circumstance necessitating the request for exemption is that the fill below the EPGB foundations will not meet the minimum shear wave velocity of 1,000 fps identified in the U.S. EPR FSAR. However, the EPGBs have been evaluated using the properties of the existing soil column and the selected fill and the lower shear wave velocity of the fill has been determined to not adversely affect the safety function of these structures. As such, application of the regulation for this particular circumstance would not serve the underlying purpose of the rule and is not required to achieve the underlying purpose of the rule.

This requested exemption does not require a change in the design described in the U.S. EPR FSAR. Therefore, this exemption will not result in any loss of standardization.

For these reasons, Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC request approval of the requested exemption from compliance with the U.S. EPR FSAR Tier 1 and 2 requirements associated with shear wave velocity.

Changes to COLA PART 2, Final Safety Analysis Report

Additional text added to FSAR Section 1.8.2:

1.8.2 DEPARTURES

The U.S. EPR FSAR includes the following COL Item in Section 1.8.2:

> A COL applicant that references the U. S. EPR design certification will provide a list of any departures from the FSAR in the COL FSAR.

This COL Item is addressed as follows:

{The list of departures from the U.S. EPR FSAR is as follows:

Maximum Differential Settlement	FSAR 2.5.4 and 3.8.5
Maximum Annual Average Atmospheric Dispersion Factor	FSAR 2.3.5
Accident Atmospheric Dispersion Factor from 0 - 2 Hours for theLow Population Zone	FSAR 2.3.4 and 15.0.3
Maximum Ground Water Elevation	FSAR 2.4.12, 3.4.2, and 3.8.5
Toxic Gas Detection and Isolation	FSAR 3.11, 6.4, 9.4.1 and 14.2.12
Technical Specifications Setpoint Control Program	FSAR 16.3.3, 16.5.5, and Bases 16.3.3
Shear Wave Velocity	FSAR 2.5.4.2.5.8

Justification for these departures is presented in Part 7 of the COL application.}

Changes to FSAR Table 2.0-1:

	U.S. EPR FSAR Design Parameter Value/Characteristic	CCNPP Unit 3 Design Parameter Value/Characteristic
Minimum Shear Wave Velocity (Low strain best estimate average value at bottom of basemat)	1000 fps	~~1450 fps~~ ~~(See Section 2.5.2.6)~~ 900 fps at bottom of Emergency Power Generating Building basemats (note h) ≥ 1000 fps for other Seismic Category I buildings (See Sections 2.5.2.6 and 2.5.4)

Notes:
h. Value is a departure from a design parameter and is listed in Part 7 of the COL Application. Justification is provided by the analysis in Section 3.7.