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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
Response to Request for Additional Information for the
Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI 302, Environmental Qualification of Mechanical and Electrical Equipment

References:
1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 302 CIB1 5615," email dated April 18, 2011

2) UniStar Nuclear Energy Letter UN#11-240, from Greg Gibson to Document Control Desk, 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, dated April 18, 2011 (Reference 1). This RAI addresses Environmental Qualification of Mechanical and Electrical Equipment, as discussed in Section 3.11 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 September 23, 2011 response date for Questions 03.11-7 through 03.11-10. The enclosure provides our response to RAI No. 302, Questions 03.11-7 through 03.11-10. There are no regulatory commitments identified in this letter. This letter does not contain any proprietary or sensitive information.

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NRO

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 22, 2011

Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 302, Questions 03.11-7 through 03.11-10, Environmental Qualification of Mechanical and Electrical Equipment, 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/RJP/mdf

Enclosure

Response to NRC Request for Additional Information

RAI No. 302, Questions 03.11-7 through 03.11-10,
Environmental Qualification of Mechanical and Electrical Equipment

Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 302

Question 03.11-7

Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment," in the Final Safety Analysis Report (FSAR) of the combined license (COL) application for the Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 3, incorporates by reference Subsection 3.11.2.2, "Environmental Qualification of Mechanical Equipment," in the U.S. EPR FSAR Tier 2, which references Appendix 3D, "Methodology for Qualifying EPR Safety-Related Electrical and Mechanical Equipment," to U.S. EPR FSAR Tier 2. As discussed in Regulatory Guide 1.206 and Commission Paper SECY-05-0197, COL applicants must fully describe their operational programs to avoid the need for ITAAC regarding those programs. The term "fully described" for an operational program should be understood to mean that the program is clearly and sufficiently described in terms for scope and level of detail to allow a reasonable assurance finding of acceptability. Further, Operational Programs should be described at a functional level and an increasing level of detail where implementation choices could materially and negatively affect the program effectiveness and acceptability.

Therefore, NRC staff requests UniStar to specify the process for implementation of the U.S. FSAR [**not a defined term - is it "U.S. EPR FSAR" or just "FSAR"] provisions for environmental qualification of safety-related mechanical equipment in both mild and harsh environments (such as by procurement specifications) with consideration of the acceptance criteria in SRP Section 3.11. Describe or provide a reference to the following information (or indicate the status of and schedule for its availability) related to the environmental qualification (EQ) operational program for mechanical equipment for the CCNPP, Unit 3, including (a) process to determine the suitability of environmentally sensitive mechanical equipment needed for safety-related functions and to verify that the design of such materials, parts, and equipment is adequate, such as (i) identifying safety-related mechanical equipment located in harsh environmental areas, (ii) identifying nonmetallic subcomponents of such equipment, (iii) identifying environmental conditions and process parameters for which this equipment must be qualified, (iv) identifying nonmetallic material capabilities, and (v) evaluating the environmental effects on the nonmetallic components of the equipment; (b) documentation for the successful completion of qualification tests and/or analysis, and qualification status for each type of equipment; and (c) the process for maintaining environmental qualification for safety-related equipment in both mild and harsh environments during the operational life of the plant.

Response

The CCNPP Unit 3 Equipment Qualification Program includes the operational program for environmental qualification of mechanical and electrical equipment in accordance with the Standard Review Plan (SRP) 3.11 and GDC 4.

The EQ program for CCNPP Unit 3 implements the environmental qualification requirements as described in U.S. EPR FSAR, Tier 2 Section 3.11. These requirements will be incorporated in the equipment purchase specifications. The environmental qualification requirements for the mechanical items on that list will be specified in accordance with the Program.

Specific items of the RAI Question are addressed as follows:

(a) As identified in the RAI question, CCNPP Unit 3 incorporates by reference U.S. EPR FSAR Sections 3.11.2 and 3D in their entirety. The process used to determine the suitability of environmentally sensitive mechanical equipment needed for safety-related functions and to verify that the design of such materials, parts, and equipment is adequate, is fully described for CCNPP Unit 3 in U.S. EPR FSAR Section 3.11.2.2, as identified below:

(i) identifying safety-related mechanical equipment located in harsh environmental areas (see U.S. EPR FSAR Section 3.11.2.2.1),

(ii) identifying nonmetallic subcomponents of such equipment (see U.S. EPR FSAR Section 3.11.2.2.2),

(iii) identifying environmental conditions and process parameters for which this equipment must be qualified (see U.S. EPR FSAR Section 3.11.2.2.3),

(iv) identifying nonmetallic material capabilities (see U.S. EPR FSAR Section 3.11.2.2.4),

(v) evaluating the environmental effects on the nonmetallic components of the equipment (see U.S. EPR FSAR Section 3.11.2.2.5),

As described in the subsequent response to RAI 302 Question 3.11-9, CCNPP Unit 3 FSAR Section 13.11.3 will be updated to provide a description of the operational environmental qualification testing program.

Requirements and implementation milestones for the Environmental Qualification Program are described in CCNPP Unit 3 FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation." As identified in FSAR Table 13.4-1, the Environmental Qualification Program has two associated license conditions. These conditions are identified as License Conditions 3 and 6 in Part 10, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) and ITAAC Closure" of the CCNPP Unit 3 license application.

License Condition 3, "Operational Program Implementation," establishes a requirement to implement the programs or portions of programs identified in FSAR Table 13.4-1 on or before the associated milestones in FSAR Table 13.4-1. As described in FSAR Table 13.4-1, the Environmental Qualification Program is required to be implemented prior to initial fuel load.

License Condition 6, "Operational Program Readiness," establishes a requirement to submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-1. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

License Condition 6 meets the requirements of Regulatory Guide 1.206, Section C.IV.4.2 and Commission Paper SECY-05-0197, such that an ITAAC is not required for implementation of the environmental qualification program.

(b) The process that will be utilized for documentation of successful completion of qualification tests and/or analysis, and qualification status for each type of equipment is described in the subsequent response to RAI 302 Question 3.11-9. CCNPP Unit 3 FSAR Section 13.11.3 will be updated to provide a description of the operational environmental qualification testing program.

(c) The process that will be utilized for maintaining environmental qualification of equipment during the operational life of the plant.is described in the subsequent response to RAI 302 Question 3.11-9. CCNPP Unit 3 FSAR Section 13.11.3 will be updated to provide a description of the operational environmental qualification testing program.

COLA Impact

CCNPP Unit 3 FSAR Section 3.11.3 will be updated to include a more detailed description of the operational Environmental Qualification Program, as indicated in the response to RAI 302 Question 3.11-9.

Question 03.11-8

In RAI 3.11-4, the NRC staff requested UniStar to address the operational aspects of the site-specific Environmental Qualification (EQ) Operational Program. In response dated February 21, 2011, UniStar stated that the operational program that supports implementation of the Maintenance Rule (10 CFR 60.65) and RG 1.160 monitors the effectiveness of maintenance at the plant, and therefore provides assurance that environmental consideration established during design are maintained on a continuing basis. In reviewing this response, NRC staff does not consider the Maintenance Rule and RG 1.160 to provide sufficient detail to maintain the EQ status of mechanical and electrical equipment. As discussed in Regulatory Guide 1.206 and Commission Paper SECY-05-0197, COL applicants must fully describe their operational programs.

Therefore, the NRC staff requests that UniStar address the operational aspects of the site-specific EQ program for safety-related mechanical and electrical equipment in both mild and harsh environments. For example, the Calvert Cliffs FSAR should indicate that the EQ operational programs as described in Section 3.11.2.2.6 of the U.S. EPR FSAR for maintaining equipment qualification during the operational life of the plant will include the following aspects: (1) evaluation of EQ results for design life to establish activities to support continued EQ; (2) determination of surveillance and preventive maintenance activities based on EQ results; (3) consideration of EQ maintenance recommendations from equipment vendors; (4) evaluation of operating experience in developing surveillance and preventive maintenance activities for specific equipment; (5) development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications; (6) development of plant procedures for reviewing equipment performance and EQ operational activities, and for trending the results to incorporate lessons learned through appropriate modifications to the EQ operational program; and (7) development of plant procedures for the control and maintenance of EQ records.

Response

The CCNPP Unit 3 environmental qualification operational programs for maintaining equipment qualification during the life of the plant will include the aspects identified above: (1) evaluation of environmental qualification results for design life to establish activities to support continued environmental qualification; (2) determination of surveillance and preventive maintenance activities based on environmental qualification results; (3) consideration of environmental qualification maintenance recommendations from equipment vendors; (4) evaluation of operating experience in developing surveillance and preventive maintenance activities for specific equipment; (5) development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications; (6) development of plant procedures for reviewing equipment performance and environmental qualification operational activities, and for trending the results to incorporate lessons learned through appropriate modifications to the environmental qualification operational program; and (7) development of plant procedures for the control and maintenance of environmental qualification records.

The CCNPP Unit 3 FSAR will be updated to include a listing of these program attributes, as shown in the COLA Impact section of this response.

COLA Impact

CCNPP Unit 3 FSAR Section 3.11.2 will be updated as shown below:

3.11.2 Qualification Tests and Analysis

~~No departures or supplements.~~ This subsection of the U.S. EPR FSAR is incorporated by reference with the following supplements.

3.11.2.1 Environmental Qualification of Electrical Equipment

No departures or supplements.

3.11.2.2 Environmental Qualification of Mechanical Equipment

No departures or supplements.

3.11.2.2.1 Identifying Safety-Related Mechanical Equipment Located in Harsh Environment Areas

No departures or supplements.

3.11.2.2.2 Identifying Nonmetallic Subcomponents of this Equipment

No departures or supplements.

3.11.2.2.3 Identifying the Environmental Conditions and Process Parameters for Which the Equipment Must be Qualified

No departures or supplements.

3.11.2.2.4 Identifying Nonmetallic Material Capabilities

No departures or supplements.

3.11.2.2.5 Evaluating Environmental Effects on the Nonmetallic Material Components of the Equipment

No departures or supplements.

3.11.2.2.6 Maintaining Mechanical Equipment Qualification

The operational programs for maintaining equipment qualification during the life of the plant will include the following aspects:

- Evaluation of environmental qualification results for design life to establish activities to support continued environmental qualification;

- Determination of surveillance and preventive maintenance activities based on environmental qualification results;
- Consideration of environmental qualification maintenance recommendations from equipment vendors;
- Evaluation of operating experience in developing surveillance and preventive maintenance activities for specific equipment;
- Development of plant procedures that specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications;
- Development of plant procedures for reviewing equipment performance and environmental qualification operational activities, and for trending the results to incorporate lessons learned through appropriate modifications to the environmental qualification operational program; and
- Development of plant procedures for the control and maintenance of environmental qualification records.

Question 03.11-9

By letter dated November 29, 2010, the AREVA stated that a COL applicant that references the US. EPR FSAR will maintain the equipment qualification test results and qualification status file during the equipment selection, procurement phase and throughout the installed life in the plant. AREVA also stated that development of procedures and maintenance activities related to the EQ of operational program is the responsibility of the COL applicant and that COL applicants will be responsible for describing development of the Environmental Qualification Master Equipment List in support of their applications to construct and operate U.S. EPR plants.

Therefore, NRC staff requests UniStar to describe the process to maintain the equipment qualification test results and qualification status file during the equipment selection, procurement phase and throughout the installed life in the plant; development of procedures and maintenance activities related to the EQ of operational program; and development of the Environmental Qualification Master Equipment List which includes the equipment mission time.

Response

U.S. EPR FSAR Tier 2, Section 3.11.3 includes a COL Item that states

> "If the equipment qualification testing is incomplete at the time of the COL application, a COL applicant that references the U. S. EPR design certification will submit an implementation program, including milestones and completion dates, for NRC review and approval prior to installation of the applicable equipment."

The response to this COL Item will be updated to describe the process that will be used to maintain the equipment qualification test results and qualification status file during the equipment selection, procurement phase and throughout the installed life in the plant; development of procedures and maintenance activities related to the EQ of operational program; and development of the Environmental Qualification Master Equipment List which includes the equipment mission times.

COLA Impact

The CCNPP Unit 3 FSAR will be updated as follows:

3.11.3 Qualification Test Results

The U.S. EPR FSAR includes the following COL Item in Section 3.11.3:

> If the equipment qualification testing is incomplete at the time of the COL application, a COL applicant that references the U. S. EPR design certification will submit an implementation program, including milestones and completion dates, for NRC review and approval prior to installation of the applicable equipment.

This COL Item is addressed as follows:

{Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC} shall develop and submit the equipment qualification testing program, including milestones and completion dates, prior to installation of the applicable equipment.

The documentation necessary to support the continued qualification of the equipment installed in the plant that is within the Environmental Qualification (EQ) Program scope is available in accordance with 10 CFR Part 50 Appendix A, General Design Criterion 1. The licensee is responsible for the maintenance of the equipment qualification file upon receipt from the reactor vendor.

Test results for site-specific electrical and mechanical equipment are maintained with the project records as auditable files. Such records are maintained from the time of initial receipt through the entire period during which the subject equipment remains installed in the plant, is stored for future use, or is held for permit verification. Full responsibility is assumed for the EQ program at time of license issuance. The EQ records are maintained for the life of plant to fulfill the records retention requirements delineated in 10 CFR 50.49, and in compliance with the Quality Assurance Program described in Chapter 17.

EQ files developed are maintained as applicable for equipment and certain post-accident monitoring devices that are subject to a harsh environment. The contents of the qualification files are discussed in U.S. EPR FSAR Section 3D.8. The files are maintained for the operational life of the plant. For equipment not located in a harsh environment, design specifications received from the vendor are retained. Any plant modifications that impact the equipment use the original specifications for modification or procurement. This process is governed by applicable plant design control or configuration control procedures.

Central to the EQ Program is the EQ Master Equipment List (EQMEL). This EQMEL identifies the electrical and mechanical equipment or components that must be environmentally qualified for use in a harsh environment. The EQMEL consists of equipment that is essential to emergency reactor shutdown, containment isolation, reactor core cooling, or containment and reactor heat removal, or that is otherwise essential in preventing significant release of radioactive material to the environment. This list is developed from the equipment list provided in U.S. EPR FSAR Tables 3.10-1 and 3.11-1. The EQMEL and a summary of equipment qualification results are maintained as part of the equipment qualification file for the operational life of the plant.

Administrative programs are in place to control revision to the EQ files and the EQMEL. When adding or modifying components in the EQ Program, EQ files are generated or revised to support qualification. The EQMEL is revised to reflect these new components. To delete a component from the EQ Program, a deletion justification is prepared that demonstrates why the component can be deleted.

This justification consists of an analysis of the component, an associated circuit review if appropriate, and a safety evaluation. The justification is released and/or referenced on an appropriate change document. For changes to the EQMEL, supporting documentation is completed and approved prior to issuing the changes. This documentation includes safety reviews and new or revised EQ files. Plant modifications and design basis changes are subject to change process reviews, e.g. reviews in accordance with 10 CFR 50.59 or Section VIII of Appendix D to 10 CFR Part 52, in accordance with appropriate plant procedures.

These reviews address EQ issues associated with the activity. Any changes to the EQMEL that are not the result of a modification or design basis change are subject to a separate review that is accomplished and documented in accordance with plant procedures.

Engineering change documents or maintenance documents generated to document work performed on an EQ component, which may not have an impact on the EQ file, are reviewed against the current revision of the EQ files for potential impact. Changes to EQ documentation may be due to, but not limited to, plant modifications, calculations, corrective maintenance, or other EQ concerns.

Table 13.4-1 provides milestones for EQ implementation.

Question 03.11-10

Operating experience from nuclear power plants has revealed the potential for adverse flow effects during normal plant operation that can impact safety-related components (such as safety relief valves). As a result, equipment qualification programs need to address these adverse flow effects to provide confidence in the capability of safety-related equipment to be capable of performing their safety functions. Please provide additional details how CCNPP Unit 3 plan to implement the U.S. EPR FSAR provisions for equipment qualification to address the effects of flow induced vibration.

Response

The design and qualification of mechanical equipment is described within the scope of the certified design and incorporated by reference in the CCNPP Unit 3 FSAR. U.S. EPR FSAR Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment," describes requirements for the environmental qualification (EQ) elements of the equipment qualification program. The environmental qualification program includes dynamic and seismic qualification. Dynamic qualification is addressed in U.S. EPR FSAR Section 3.9, "Mechanical Systems and Components," and U.S. EPR FSAR Section 3.10 "Seismic and Dynamic Qualification of Mechanical and Electrical Equipment," for Seismic Category I equipment.

Adverse piping vibration may occur due to disturbances or instabilities of the flow in the piping, depending upon the as-built piping configuration including supports, and the operating (e.g., pumps, valves and SRVs) and non-operating (e.g., pressure reducing devices and flow restrictors) components in the system. U.S. EPR FSAR, Tier 2, Sections 3.9.2 and 14.2 and CCNPP Unit 3 FSAR Section 14.2 include requirements for pre-operational and initial start-up testing for piping vibrations. This testing provides monitoring and verification of the ability of components and systems to withstand the temperatures, pressures, vibrations, and thermal expansions associated with normal plant operation and maintenance, as well as the transient conditions arising from anticipated operational events, such as valve and pump actuations. During this testing, piping vibration is corrected if it does not meet the acceptance criteria.

U.S. EPR FSAR Section 3.9.2.1 specifically addresses this performance testing as being provided:

> ". . . to identify unacceptable movement, noise, vibration, and damage caused by rapid valve opening and closing, safety valve discharge, pump operation, and other operational transients. During this phase, the piping and piping restraints are observed for vibration and expansion response and the automatic safety devices, control devices, and other major equipment are observed for indications of overstress, excessive vibration, overheating, and noise. Each system test includes critical valve operation during anticipated transients."

U.S. EPR FSAR Section 3D provides an example Equipment Qualification Data Package checklist that includes consideration of non-seismic vibration loads.

UniStar Nuclear Energy will perform vibration testing as described in U.S. EPR FSAR Sections 3.9.2.1 and 14.2, and CCNPP Unit 3 FSAR Section 14.2.

COLA Impact

None