
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

06/13/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 1034-7055

SRP SECTION: 03.11 - ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT

APPLICATION SECTION: 3.11, APPENDIX 3D

DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-63:

In the supplemental response to RAI 805-5915, dated November 1, 2012, the applicant replaced "SSCs important to safety" with "safety-related and specified nonsafety-related SSCs requiring environmental, seismic and functional qualification" in MUAP-08015. The staff understands that the applicant did this in part because there may be important to safety SSCs not required to be in an environmental qualification program. However, the proposed language changes are unacceptable because: (1) the proposed language departs from 10 CFR 50.49, and 10 CFR Part 10, Appendix A (GDC 1, 2, 4, and 23) which uses important to safety in its title and definitions, and (2) the above replaced phrase "specified nonsafety-related," is not in the above cited regulations. The staff finds this phrase in MUAP-08015 does not adequately describe the equipment that is required to be environmentally qualified under 10 CFR 50.49. Therefore, the staff requests that the applicant describe the SSCs in the environmental qualification program consistent with the regulations, e.g. using language in SRP Section 3.11.

ANSWER:

MHI will remove the phrase "safety-related and specified nonsafety-related" from DCD Section 3.11, Appendix 3D, and MUAP 08015 when referring to the scope of equipment addressed by the environmental qualification program. The term "important to safety" will not be added to the environmental qualification equipment scope description because the term does not have a single definition in either in the DCD or in NRC regulatory guidance. Instead, MHI will revise DCD Section 3.11, *Introduction*, to replace the existing description of the environmental qualification program equipment scope with text from Standard Review Plan (SRP) Section 3.11, paragraph I.1, to read as follows:

Mechanical, electrical, and I&C equipment associated with systems described in this paragraph are included within the scope of this environmental qualification program:

- a. Equipment associated with systems that are essential for emergency reactor shutdown, containment isolation, reactor core cooling, and containment and

- reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment,
- b. Equipment that initiates the above functions automatically,
 - c. Equipment that is used by the operators to initiate the above functions manually,
 - d. Equipment whose failure can prevent the satisfactory accomplishment of one or more of the above safety functions,
 - e. Other electrical equipment important to safety, as described in 10 CFR 50.49(b)(1) and (2), and
 - f. Certain post-accident monitoring equipment, as described in 10 CFR 50.49(b)(3) and Regulatory Guide 1.97.

Other locations in DCD Section 3.11 and Appendix 3D, and MUAP-08015 that describe the scope of equipment addressed by the environmental qualification program will reference the above discussion in DCD Section 3.11.

Additional text from SRP Section 3.11 will also be added to DCD Section 3.11, *Introduction*, to clarify the program's scope as described below:

- Text added to more clearly define what is meant by "environmental qualification"
- State that compliance with the environmental design provisions of GDC 4 for active mechanical equipment meeting the equipment scope described above and located in a harsh environment is generally achieved by demonstrating that the non-metallic parts/components are suitable for the postulated design basis environmental conditions
- State that for electrical and active mechanical devices located in mild environments, compliance with the environmental design provisions of GDC 4 are generally achieved and demonstrated by proper incorporation of relevant environmental conditions into the design process, including the equipment specification

Impact on DCD

DCD Section 3.11 and Appendix 3D will be revised as shown in the attachment-1.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

MUAP-08015 will be revised as shown in the attachment-2.

This completes MHI's response to the NRC's question.

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APPLICATION SECTION: 3.11, APPENDIX 3D

DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-64:

In the supplemental response to RAI 805-5915, dated September 10, 2012, in the context of discussing the application of 10CFR 50 Appendix B requirements to the environmental qualification program prescribed under DCD Tier 2 Section 3.11, MHI added the phrase, "for safety-related equipment and augmented quality assurance requirements for non-safety related equipment," to two DCD Tier 2 Sections, namely Section 3.11.1.4, "Standard Review Plan Evaluation," in the discussion of Design Control (10 CFR 50, Appendix B Criterion III) and Section 3.11.3, "Qualification Test Results," in the discussion of Testing Control (10 CFR Part 50, Appendix B Criterion XI). In addition, MHI added the phrase, "equipment, and certain nonsafety-related electrical equipment with special seismic qualification requirements," to DCD Tier 2, Section 3D.1.6, "Determination of Seismic Requirements," MHI clarified that selected elements of the quality assurance program described in Chapter 17 will be applied to nonsafety-related electrical equipment with special seismic qualification requirements. Under 10 CFR 50.49, 10 CFR 50.49(a) requires an applicant to establish an environmental qualification program for qualifying the electrical equipment important to safety and 10 CFR 50.49(b) defines the electrical equipment important to safety as safety-related and nonsafety related equipment. 10 CFR 50.49(d) requires an applicant to prepare a list of electrical safety-related and non-safety-related equipment. The staff is not clear what is the "augmented quality assurance requirements for non-safety related equipment," that is referred in the above DCD sections and why they were reviewed under the requirements of 10 CFR Part 50 Appendix B.

Therefore, the applicant is requested to identify those equipment and define what is the "augmented quality assurance requirements for non-safety related equipment" and "certain non-safety related electrical equipment" used in the above DCD Tier 2 and in Appendix 3D and explain its relationship with non-safety-related equipment defined 10 CFR 50.49 (b)(2). Also, the applicant is requested to justify why: (1) the safety-related equipment and augmented quality assurance requirements for non-safety related equipment can be reviewed under 10 CFR Part 50 Appendix B, despite it falling within

the purview of 10 CFR 50.49 and (2) the augmented quality non-safety equipment is not listed in the Table 3D-2 in Appendix 3D.

ANSWER:

As described in the response to question 03.11-63, the term “safety-related and specified nonsafety-related” will be removed from DCD Section 3.11, Appendix 3D, and MUAP 08015 when referring to the scope of equipment addressed by the environmental qualification program. Instead, text from SRP Section 3.11 will be added to DCD Section 3.11 to describe the scope of the environmental qualification program.

DCD Appendix 3D, Table 3D-2 includes the list of specific equipment that meets the revised scope definition for the environmental qualification program. No changes to this list were necessary.

Additionally, text referring to augmented quality controls in DCD Section 3.11 when describing quality controls related to the environmental qualification program will be deleted and descriptions of quality controls will reference 10 CFR 50 Appendix B and 10 CFR 50.49.

Impact on DCD

DCD Section 3.11 and Appendix 3D will be revised as shown in the attachment-1.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

MUAP-08015 will be revised as shown in the attachment-2.

This completes MHI’s response to the NRC’s question.

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APPLICATION SECTION: 3.11, APPENDIX 3D
DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-65:

In the supplemental response to RAI 805-5915, dated November 1, 2012, Section 1.0, "Purpose," of MUAP-08015 (page 8), the applicant modified by adding a sentence to state:

The US-APWR EQP provides a structured approach to complying with these requirements as an integrated US-APWR equipment qualification program that includes an environmental qualification program required by 10 CFR 50.49.

The applicant in previous paragraphs identified applicability GDC 1, 2, and 4 and 10 CFR 50.49 to environmental qualification, but then only mentions 10 CFR 50.49 in the above statement. The whole paragraph should address equipment qualification beyond the scope of 10 CFR 50.49 so this statement should be clarified in MUAP-08015 and in Section 3.11 of DCD Tier 2 how MHI equipment qualification program satisfies requirements 10 CFR 50.49, and 10 CFR Part 50 Appendices A and B.

ANSWER:

As described in the response to question 03.11-63, the environmental qualification program scope description in DCD Section 3.11 will be revised to utilize text from SRP Section 3.11.

MHI will revise the referenced sentence in MUAP-08015, Section 1.0, *Purpose*, to remove the text "required by 10 CFR 50.49," to read as follows (the term "these requirements" now refers to 10 CFR 50 references in the previous paragraph):

The US-APWR Equipment Qualification Program provides a structured approach to complying with these requirements as an integrated US-APWR equipment qualification program that includes an environmental qualification program.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

MUAP-08015 will be revised as shown in the attachment-2.

This completes MHI's response to the NRC's question.

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APPLICATION SECTION: 3.11, APPENDIX 3D
DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-66:

In the response to RAI 805-5915, Question 3.11-41, dated September 10, 2012, the applicant provided a markup of DCD Tier 2, Section 3.11. The applicant added a new sentence at the bottom of page 3.11-1.

This Technical Report [MUAP-08015] addresses the environmental qualification required by 10 CFR 50.49 ...

However, the staff understands that the equipment qualification program (MUAP-08015) also includes the environmental qualification requirements for electrical, I&C, and mechanical equipment. The applicant is requested to clarify that the above equipment is capable of performing design safety functions under normal environmental conditions, containment test conditions, anticipated operational occurrences, accident, and post-accident environmental conditions by satisfying with the requirements of 10 CFR 50.49, 10 CFR 50 Appendix A (GDC 1, 2, 4, and 23), and 10 CFR 50 Appendix B, (Quality Assurance Criteria III, XI, and XVII) in both DCD and MUAP-08015.

ANSWER:

MHI will revise the referenced sentence in DCD Section 3.11 to read as follows:

Technical report MUAP-08015 addresses the relevant environmental design and qualification requirements of 10 CFR 50.49; 10 CFR Part 50, Appendix A, General Design Criteria 1, 2, 4, and 23; and 10 CFR Part 50, Appendix B, Quality Assurance Criteria III, XI, and XVII; with respect to systems and components being designed to withstand the effects of, and being capable of performing their safety function, in the environmental conditions associated with normal operation, maintenance, testing, and accident conditions.

Impact on DCD

DCD Section 3.11 will be revised as shown in the attachment-1.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on a Technical/Topical Report.

This completes MHI's response to the NRC's question.

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RAI NO.: NO. 1034-7055

SRP SECTION: 03.11 - ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT

APPLICATION SECTION: 3.11, APPENDIX 3D

DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-67:

The Amended Response to RAI 688-5273, Question 7.7-32, dated February 27, 2012 indicates that "Equipment Qualification Program" (MUAP-08015) is applied to non-safety systems designated as Equipment Class 5. The applicant has identified a number of Class 5 systems in a new DCD Tier 2, Table 3.2-5 and it included: reactor control system, Unit bus, Alarm VDU Computer, Alarm logic computer, operator console, DAS, and HSI panel, and MG set.

- a. MUAP-08015 does not contain any description for an augmented quality system (similar to Section 7.1.3.20 of the above RAI). Therefore, describe in MUAP-08015 what aspects (i.e., environmental, functional, or seismic) of the equipment qualification program will be applied to these systems.
 - b. The staff is unable to verify that the above Class 5 systems are listed in the new DCD Tier 2, and items in Table 3.2-5 have been included in Table 3D-2 of DCD Tier 2, Appendix 3D. For example, the staff is unable to identify where the "Reactor Control System" identified as Class 5 has been included in Appendix 3D, even considered for new Table 3D-4 that was added for electrical cabinets in the response to RAI 805-8915, Question 3.11-41. Identify where each Class 5 system has been included and discussed in DCD Tier 2, Section 3.11, Appendix 3D, and MUAP-08015. Also, if class 5 items have not been included, explain it or revise the Table if necessary.
 - c. Identify if any Class 5 systems are located in harsh environments. For each of the systems located in harsh environments, briefly describe their important to safety functions (i.e., non safety-related equipment that requires to be environmentally qualification) and why these functions do not meet the requirements of 10 CFR 50.49(b)(2). Also identify any of those non-safety-related SSCs (10 CFR 50.49(b)(2)) that have been considered to be qualified as safety-related SSCs for environmental qualification purpose in Table 3D-2 of DCD Tier 2, Appendix 3D.
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ANSWER:

- a. Refer to the response to question 03.11-64. References to augmented quality have been removed from environmental qualification program descriptions. Equipment requiring environmental qualification is listed in DCD Table 3D-2. Equipment requiring seismic qualification is listed in DCD Table 3.2-2 for mechanical equipment and Tables 3D-2 and 3D-4 for electrical equipment. Active mechanical components required to be functionally qualified are listed in DCD Tables 3.9-7, 3.9-13, and 3.9-14.

In response to question 03.11-68, MHI agreed to incorporate into MUAP-08015 a “roadmap” as a new table to clarify the application of various equipment qualification program requirements to the environmental qualification program, seismic qualification program, and functional qualification program.

- b. As described in the response to Question 03.11-63, the environmental qualification program scope description in DCD Section 3.11 will be revised to incorporate text from SRP Section 3.11. The specific equipment that falls within this revised scope description is included in DCD Table 3D-2.

While the scope description does include equipment that would meet 10 CFR 50.49(b)(2), DCD Section 3.11 states that there is no nonsafety-related electrical equipment, located in a harsh environment, whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by the safety-related equipment.

- c. Refer to “b” above. MHI has evaluated nonsafety-related SSCs in harsh environments and determined that none of these SSCs meets the definition of 10 CFR 50.49(b)(2).

Reactor control system, Unit bus, Alarm VDU Computer, Alarm logic computer, operator console, DAS, and HSI panel, and MG set are Equipment Class 5 non-safety systems, but perform the important I&C functions (e.g., signal selection, alarms credited manual action, diverse reactor trip, diverse ESF actuation). These systems are not safety systems and not in the scope of the equipment defined in 10CFR50.49. Thus, the augmented quality with selected software QA requirement and selected or pertinent EQ specification requirement (e.g., EMI/EMC) are applied to these systems, but the full compliance with the EQ program and the full EQ specification requirements defined in the Equipment Qualification Program Technical Report (MUAP-08015) is not required.

Therefore,

- MUAP-08015 does not contain any description for these Equipment Class 5 I&C systems.
- These Equipment Class 5 I&C systems are not listed in the Table 3D-2.
- These Equipment Class 5 I&C systems are not in the scope of 10 CFR 50.49(b)(2) and not listed in the Table 3D-2. These systems are also not located into the harsh environments.

The description in RAI 688-5273, Question 7.7-32 and the markups did not clearly stated the scope and applicability of environmental qualification for these non-safety I&C systems. Therefore, RAI 688-5273, Question 7.7-32 will be revised.

Impact on DCD

A revised response will be submitted to RAI 688-5273, Question 7.7-32 that includes changes to DCD Section 7.1.3.20.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on a Technical/Topical Report.

This completes MHI's response to the NRC's question.

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APPLICATION SECTION: 3.11, APPENDIX 3D
DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-68:

In response to RAIs No. 805-5915, Question 03.11-41 and No. 880-6142, Question 03.11-43, the staff has the following supplemental question:

10 CFR 50.49 requires specific requirements for each applicant to develop environmental qualification of electrical equipment important to safety, which consist of: Environmental Qualification Program (EQP), a list of equipment (Table 3D-2) that requires qualifying, methods used for qualifying, and maintaining auditable documentations. Acceptance criteria for Section 3.11 of US APWR DCD should include MHI's approach and methodology for satisfying 10 CFR 50.49, Appendix A (GDC-1, 2, 4, and 23), and Appendix B (Criterion III, XI, and XVII) for its environmental qualification requirements for electrical, I&C, as well as mechanical equipment. In the latest response in US APWR DCD Section 3.11, MHI proposed to revise EQP to be a part of an equipment qualification program that consolidates three programs for seismic, functional qualification, and environmental qualification. Since each program has special and distinct requirements, the staff finds that consolidating three programs into the equipment qualification could represent confusion over specific requirements applicable each program, especially, for 10 CFR 50.49. MHI provided a road map for discussion and information purpose only to identify all equipment qualification requirements within MHI Technical Report (TR) MUAP-08015. The staff requests that the road map information should be included in the equipment qualification program (i.e., MHI TR MUAP-08015). In addition, the abbreviated word "EQ" has been used to refer both the environmental qualification in US APWR DCD and the equipment qualification in MHI TR MUAP-08015 in the applicant's documents. Choose the abbreviated word "EQ" in one qualification document, so that there would be no confusion over which program it refers.

ANSWER:

The MUAP-08015 “roadmap,” previously provided informally as a reference guide for the staff, will be added to the MUAP as a new table to clarify the application of various equipment qualification program requirements to the environmental qualification program, seismic qualification program, and functional qualification program.

Currently in DCD Section 3.11, the acronym “EQ” means “environmental qualification.” In MUAP-08015 the acronym “EQ” means “equipment qualification” and “EQP” means “equipment qualification program.”

MHI has determined that with respect to DCD and MUAP terminology the acronym “EQ” will apply only to “environmental qualification.” Hence, MUAP-08015 will be revised to use the term “equipment qualification” in lieu of “EQ” and use “Equipment Qualification Program” in lieu of “EQP.”

Impact on DCD

There is no impact of the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

MUAP-08015 will be revised as shown in the attachment-2.

This completes MHI’s response to the NRC’s question.

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Docket No. 52-021

RAI NO.: NO. 1034-7055
SRP SECTION: 03.11 - Environmental Qualification of Mechanical and Electrical Equipment
APPLICATION SECTION: 3.11, APPENDIX 3D
DATE OF RAI ISSUE: 05/16/2013

QUESTION NO. 03.11-69:

In response to RAIs No. 805-5915, Question 03.11-41 and No. 880-6142, Question 03.11-43, the staff has the following supplemental question:

US-APWR DCD Tier 2, Section 3.11.1.4, "Standard Review Plan Evaluation" contains statements that explain design control aspect of the US-APWR environmental qualification requirements based on 10 CFR Part 50, Appendix B, Criterion III (Design Control) for safety-related equipment and augmented quality assurance requirements for non-safety-related equipment. 10 CFR 50.49 requirements are addressed in RG 1.89 and together they reference IEEE Std 323 as an acceptable methodology to follow qualifying electrical equipment. However, RG 1.89 does not include the above mentioned Criterion III of Appendix B for safety-related equipment and augmented quality assurance requirements for non-safety-related equipment. Explain what aspect of Criteria III of Appendix B is used for satisfying qualifications (10 CFR 50.49(f)) and documentations (10 CFR 50.49(j)) for the electrical (important to safety) equipment located in the harsh environment. For electrical equipment, shouldn't this equipment be relying on 10 CFR 50.49 requirements, rather than 10 CFR Part 50, Appendix B requirements, or are they the same?

ANSWER:

MHI will clarify DCD Section 3.11 to state that environmental qualification program requirements for qualifications and documentation will meet the requirements of 10 CFR 50.49(f) and 10 CFR 50.49(j), respectively, as well as 10 CFR 50 Appendix B.

Appendix B, Criterion III (Design Control) requirements are typically higher level, quality control requirements that apply generically to programs involving safety-related equipment, such as ensuring that appropriate quality standards are specified and included in design documents.

Impact on DCD

DCD Section 3.11 will be revised as shown in the attachment-1.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on a Technical/Topical Report.

This completes MHI's response to the NRC's question.