

September 07, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Submittal of Response to Design Specification Audit Issue No. 92-99

During an August 8, 2018 public Design Specification Audit Phase 2 teleconference with NRC Project Manager Marieliz Vera and NRC audit reviewer Jim Strnisha, NuScale Power, LLC (NuScale) discussed a proposed response to Audit Issue No. 92-99. Audit Issue No. 92-99 addresses compliance with Appendix QR-B in ASME QME-1-2007 with exceptions to ASME QME-1 2007, Appendix QR-B for the valve design specifications. As a result of this discussion, NuScale agreed to formally submit its detailed response to Issue 92-99 for further NRC review, identifying the alternatives to ASME QME-1 2007, Appendix QR-B and the basis for their suitability.

The Enclosures to this letter provide the response to the Design Specification Audit Issue No. 92-99, addressing alternatives and basis for each of the following.

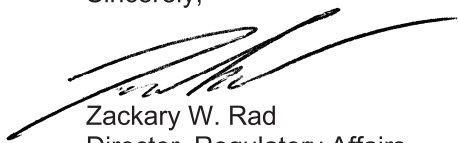
1. Identification of activation energy
2. Determination and recording of shelf life for nonmetallics
3. Qualification Report that documents the tests performed on the nonmetallic parts, and
4. Shelf life preservation requirements

This response includes FSAR pages incorporating revisions to Table 1.9-2, Section 3.11.6, and Appendix 3C in redline/strikeout format. NuScale will include these changes as part of a future revision to the NuScale Design Certification Application.

This letter makes no regulatory commitments or revisions to any existing regulatory commitments.

If you have any questions, please feel free to contact Marty Bryan at 541.452.7172 or at mbryan@nuscalepower.com.

Sincerely,



Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Samuel Lee, NRC, OWFN-8G9A
Prosanta Chowdhury, NRC, OWFN-8G9A
Marieliz Vera, NRC, OWFN-8G9A

Enclosure 1: "Alternatives to ASME QME-1 2007 Appendix QR-B Exceptions and Basis for Suitability"

Enclosure 2: "Changes to NuScale Final Safety Analysis Report Table 1.9-2, Conformance with Regulatory Guides"

Enclosure 3: "Changes to NuScale Final Safety Analysis Report Section 3.11.6, Qualification of Mechanical Equipment"

Enclosure 4: "Changes to NuScale Final Safety Analysis Report Section 3.11.8, References"

Enclosure 5: "Changes to NuScale Final Safety Analysis Report Appendix 3C, Section 3C.4, Aging"



Enclosure 1:

“Alternatives to ASME QME-1 2007, Appendix QR-B Exceptions and Basis for Suitability”

Alternatives to ASME QME-1 2007, Appendix QR-B Exceptions and Basis for Suitability

NuScale complies with ASME QME-1 2007, Appendix QR-B for the environmental qualification of nonmetallic in active mechanical components with the following exceptions noted below.

1. *QR-B5200, Identification and Specification of Qualification Requirements, (g) material's activation energy (in conjunction with one of the above identification methods only and that is based on the material's critical failure mechanism in the intended service).*

Alternative:

Listing the activation energy as a required identification method for commercial grade item dedication purposes has been shown to conflict with existing industry guidance regarding dedication activities (see ADAMS ML18208A208). Identification methods identified per QR-B5200 items (a) through (g) are acceptable for identification purposes for qualification, and no alternative is therefore provided.

Basis:

ASME QME-1, 2007, Appendix QR-B5200, item (g) requires identification of a material activation energy (in conjunction with one of the above identification methods only and that is based on the material's critical failure mechanism in the intended service). To be clear, NuScale is not taking exception to using the material activation energy as part of the qualification and testing. As stated in FSAR, Tier 2, Appendix 3C, Section 3C.4.2, Aging, NuScale recognizes the Arrhenius Methodology is considered an acceptable method of addressing accelerated aging. The development of the accelerated thermal aging parameters and activation energies are considered based upon the IEEE standards referenced in Section 3C.4.2.

NuScale does however, take exception to the need to have the material's activation energy used as a method to properly identify nonmetallics. This approach is not consistent with the industry practice to keep qualification separate from dedication. If this requirement is interpreted as meaning that in order to identify a non-metallic material, one needs to validate or establish the activation energy, then this would be inconsistent with the fundamental approach in EPRI 3002002982, Revision 1 to EPRI NP-5652 and TR102260, "Plant Engineering: Guideline for the Acceptance of Commercial-Grade Items in Nuclear Safety Related Applications" as endorsed by RG 1.164, "Dedication of Commercial-Grade Item for Use I Nuclear Power Plants." In Appendix I, of EPRI 3002002982, it is stated that qualification activities are separate from commercial grade dedication activities, and insights are provided as to why these activities should not be blended together. Qualification is a verification of design as part of Criterion III to Appendix B, whereas commercial grade dedication is an activity performed under Criterion VII of Appendix B.

Further, the position in QR-B5200 is also in potential conflict with the widely used industry guidance found in Generic Letter 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs." Generic Letter 91-05 specifically states, "If the licensee can demonstrate that the replacement item is identical, then the licensee need not identify the safety function or review and verify the design requirements and critical characteristics," which would include verification of activation energy.

The issue noted above regarding the misinterpretation of requiring a material's activation energy being needed for identification as part of commercial grade dedication activities is the subject of recent NRC Design Basis EQ Program Inspections. This issue was recently discussed on July 31, 2018 during a public meeting titled, Discussion of Comments Detailed in Nuclear Utility Group on Equipment Qualification (NUGEQ) Letter of June 29, 2018, "Comments of NUGEQ on NRC Draft Questions and Answers Regarding Unresolved Issued in DBA EQ Program Inspections." There was no resolution reached between the NRC staff or Licensees and the issue remains open.

This response addresses NRC question 1 (Identification of activation energy).

2. *QR-B5300, Selection of Qualification Methods, last paragraph which states, "The shelf life of all nonmetallics, and any applicable storage limitations, should be determined and recorded in the qualification documentation."*

Alternative:

Shelf life and storage limitations are documented in accordance with the NQA-1 2008, Requirement 13 and Subpart 2.2, in lieu of ASME QME-1 2007, Appendix QR-B5300. These requirements will not be included in the environmental qualification record file, but will be documented separately.

Basis:

ASME QME-1, 2007, Appendix QR-B5300 states that shelf life needs to be part of the qualification documentation. Shelf life and qualified life are not necessarily linked and the basis for shelf life should be allowed to exist outside of the EQ documentation. This would be a unique requirement that is not imposed on the qualification of electrical equipment.

Linking shelf life to Qualified Life (QL) also is contrary to current industry practice. It can also significantly complicate the establishment and management of EQ replacement activities since the QL (or replacement due dates) become item specific (e.g. each item issued from the warehouse for the same application would likely have a unique due date if shelf life is considered as part of QL).

This response addresses NRC question 2 (Determination and recording of shelf life for nonmetallic).

3. *QR-B5500, Documentation, (d) the Qualification Report*

NuScale has reconsidered this requirement and will comply with providing a qualification report for nonmetallic items that were tested as part of their qualification process.

This response addresses NRC question 3 (Qualification Report that documents the tests performed on the nonmetallic parts, and).

4. *QR-B5500, Documentation, (h) shelf life preservation requirements.*

Alternative:

Shelf life preservation requirements are documented in accordance with the NQA-1 2008, Requirement 13 and Subpart 2.2 in lieu of ASME QME-1 2007, Appendix QR-B5500, item h). These requirements will not be included in the environmental qualification record file, but will be documented separately.

Basis:

ASME QME-1, 2007, Appendix QR-B5500 states that shelf life preservation requirements need to be part of the qualification documentation. Shelf life and qualified life are not necessarily linked and the basis for shelf life preservation should be allowed to exist outside of the EQ documentation. This would be a unique requirement that is not imposed on the qualification of electrical equipment.

This response addresses NRC question 4 (Shelf life preservation requirements).

Enclosure 2:

“Changes to NuScale Final Safety Analysis Report Table 1.9-2, Conformance with Regulatory Guides”

Table 1.9-2: Conformance with Regulatory Guides (Continued)

RG	Division Title	Rev.	Conformance Status	Comments	Section
1.100	Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants	3	Partially Conforms	This RG is applicable except for aspects related to: (1) when site-specific spectra exceed the certified design spectra (e.g., Position C1.2.1.g); and (2) qualification of new and replacement equipment in older unresolved safety issue A46 plants (e.g., Position C.1.2.2.j). Not applicable to electrical equipment. Site-specific guidance is the responsibility of the COL applicant. RG 1.100 endorses ASME QME-1 2007. NuScale complies with the non-mandatory Appendix QR-B with the following exceptions: QR-B5200, Identification and Specification of Qualification Requirements, (g) material activation energy. QR-B5300 Selection of Qualification Methods for determination and recording of shelf life of nonmetallics. QR-B5500 Documentation, (h) shelf life preservation requirements. Appendix 3C describes the exceptions cited.	3.9 3.10 3.11 5.2 14.3 3C
1.101	Emergency Response Planning and Preparedness for Nuclear Power Reactors	5	Not Applicable	This RG is limited to providing emergency response guidance for co-located licensees. As such, this RG is the responsibility of the COL applicant proposing to site a power plant such that the definition of co-located is met. Since RG 1.101, Revision 4, is the most current revision that endorses NUREG-0654/FEMA-REP-1, Revision 1, Revision 4 of RG 1.101 is applicable to the extent that it endorses (through NUREG-06554/FEMA-REP-1) the design-specific aspects of NUREG-0696.	Not Applicable
1.102	Flood Protection for Nuclear Power Plants	1	Applicable	The design assumes the NPP is located above the maximum flood height (including wind induced wave run-up).	2.4 3.4

Enclosure 3:

“Changes to NuScale Final Safety Analysis Report Sections 3.11.6, Qualification of Mechanical Equipment”

accident, and post-accident conditions as required by GDC 4 and 10 CFR 50 Appendix B. Mechanical equipment qualification verifies the design is capable of functioning during normal, abnormal and accident conditions and includes the effects of the fluid medium (e.g., borated water) on the environmental conditions.

RAI 03.11-13

For mechanical equipment located in a mild environment, acceptable environmental design is demonstrated by the design and purchase specifications for the equipment. The specifications contain a description of the functional requirements for a specific environmental zone during normal environmental conditions and anticipated operational occurrences. The programs identified in Section 3.11.2.1 for verifying that electrical equipment located in a mild environment are capable of performing their intended function will also be applied to mechanical equipment located in a mild environment. For mechanical equipment that must function during or following exposure to a harsh environment, compliance with the environmental design provisions of GDC 4 are generally achieved by demonstrating that the non-metallic parts/components of the equipment suitable for the postulated design basis environmental conditions. Safety-related mechanical equipment that performs an active function during or following exposure to harsh environmental conditions ~~will be~~is qualified in accordance with ASME QME-1, Appendix QR-B (Reference 3.11-13) as endorsed by RG 1.100, Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants, Revision 3 with the following exceptions noted below.

- 1) Exception to QR-B5200, Identification and Specification of Qualification Requirements, (g) material activation energy.
- 2) Exception to QR-B5300, Selection of Qualification Methods for determination and recording of shelf life of nonmetallics.
- 3) Exception to QR-B5500 Documentation, (h) shelf life preservation requirements.

Documentation and the status of the testing and analysis are performed in accordance with the processes presented in Appendix 3.C.

Mechanical equipment located in harsh environmental zones is designed to perform under all appropriate environmental conditions. The primary focus with mechanical equipment is on materials that are sensitive to environmental effects (e.g., seals, gaskets, lubricants, fluids for hydraulic systems, and diaphragms). A list of the mechanical components that contain non-metallic or consumable parts located in harsh environment areas that require EQ is provided in Table 3.11-1.

RAI 12.03-751

There can be no environmentally induced debris inside the CNV that could interfere with the proper functioning of the ECCS. This requirement is addressed as a generic requirement to ensure that all SSCs inside the CNV that have the potential to generate debris during the course of an accident have been qualified to demonstrate that no debris is generated or released that could impair the performance of the ECCS.

RAI 03.11-14

Enclosure 4:

“Changes to NuScale Final Safety Analysis Report Section 3.11.8, References”

- 3.11-6 IEEE Std. 7-4.3.2-2003, Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations.
- 3.11-7 IEEE Std. 603-1991, Criteria for Safety Systems for Nuclear Power Generating Stations.
- 3.11-8 IEEE Std. 572-2006, IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations.
- 3.11-9 IEEE Std. 535-1986, IEEE Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations.
- 3.11-10 Topical Report TR-0915-17565-P, Accident Source Term Methodology.
- 3.11-11 IEEE Std. 383-2003, IEEE Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations.
- 3.11-12 IEEE Std. 323-2003, IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- 3.11-13 American Society of Mechanical Engineers, ASME QME-1-2007~~12~~, Qualification of Active Mechanical Equipment Used In Nuclear Facilities.

[CP2-1289](#)

Enclosure 5:

“Changes to NuScale Final Safety Analysis Report Appendix 3C, Section 3C.4, Aging”

The following plant areas contain equipment that performs a design function related to safety for equipment qualification:

- Reactor Building (RXB)
- Control Building (CRB)

The CRB and the electrical equipment rooms on RXB elevations 75'-0" and 86'-0" are, by design, considered mild environments.

This section provides background for the EQ program and presents a summary of the program objectives, a program outline, and definitions for terms used in this document. Section 3C.4 identifies qualification criteria. Section 3C.5 presents design specifications. Section 3C.6 presents the equipment qualification methods, which includes: type-testing, analyses, operating experience, a combination of methods, and supplemental methods to aid qualification. Section 3C.7 and Section 3C.8 describe the documentation, including data packages, test reports, and maintenance records needed to support the equipment qualification program.

3C.4 Qualification Criteria

General Design Criteria (GDC) 1, 2, 4, and 23 of 10 CFR 50, Appendix A; Quality Assurance Criteria III, XI, and XVII of 10 CFR 50, Appendix B; and 10 CFR 50.49 establish the regulatory requirements for this program.

RAI 03.11-13

Electrical and active mechanical equipment required to perform design functions related to safety, including instrumentation, must be qualified to operate in environments associated with design basis conditions. GDC 4 requires that structures, systems, and components that perform design functions related to safety be designed to accommodate the environmental effects associated with normal operation, maintenance, testing, and postulated accidents, such as a loss-of-coolant accident (LOCA). The primary objective of environmental qualification is to demonstrate with reasonable assurance that equipment for which a qualified life or condition has been established can perform its design function related to safety without experiencing common-cause failures before, during, and after applicable design basis events. The environmental design requirements apply to equipment required to perform their design function related to safety, including both mild and harsh environments. The environmental qualification procedures described in this appendix define the conditions for which equipment required to perform a design function related to safety must be qualified. Electrical equipment required to perform a design function related to safety located in a harsh environment is qualified in accordance with the requirements of 10 CFR 50.49. Active mechanical equipment required to perform a design function related to safety located in a harsh environment is qualified to comply with the requirements of GDC 4 by incorporating the design-basis environmental conditions into the design process. Mechanical equipment that performs an active design function related to safety during or following exposure to harsh environmental conditions is qualified in accordance with ASME QME-1, Appendix QR-B (Reference 3C-4): with the following exceptions:

QR-B5200, Identification and Specification of Qualification Requirements, (g) material activation energy.

QR-B5300 Selection of Qualification Methods for determination and recording of shelf life of nonmetallics.

QR-B5500 Documentation, (h) shelf life preservation requirements.

These exceptions are addressed with the following alternatives:

QR-B5200, Identification and Specification of Qualification Requirements, (g) material's activation energy (in conjunction with one of the above identification methods only and that is based on the material's critical failure mechanism in the intended service).

Alternative:

Listing the activation energy as a required identification method for commercial grade item dedication purposes has been shown to conflict with existing industry guidance regarding dedication activities (see ADAMS ML18208A208). Identification methods identified per QR-B5200 items (a) through (g) are acceptable for identification purposes for qualification, and no alternative is therefore provided.

QR-B5300, Selection of Qualification Methods, last paragraph which states, "The shelf life of all nonmetallics, and any applicable storage limitations, should be determined and recorded in the qualification documentation."

Alternative:

Shelf life and preservation requirements are documented in accordance with the NOA-1 2008, Requirement 13 and Subpart 2.2, in lieu of ASME QME-1 2007, Appendix QR-B5300. These requirements are not included in the environmental qualification record file, but are documented separately.

QR-B5500, Documentation, (h) shelf life preservation requirements.

Alternative:

Shelf life preservation requirements are documented in accordance with the NOA-1 2008, Requirement 13 and Subpart 2.2 in lieu of ASME QME-1 2007, Appendix QR-B5500, item (h). These requirements are not included in the environmental qualification record file, but are documented separately.

Mechanical and electrical equipment required to perform a design function related to safety located in mild environments is qualified in accordance with the provisions of GDC 4. For each piece of equipment selected for environmental qualification, the environmental parameters and the qualification process is listed in the associated equipment qualification record file (EQRF).