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# PUBLIC SUBMISSION

**Docket:** NRC-2020-0245

Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants

**Comment On:** NRC-2020-0245-0007

Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants

**Document:** NRC-2020-0245-DRAFT-0011

Comment on FR Doc # 2021-03220

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## Submitter Information

**Email:** agurr@nuscalepower.com

**Organization:** NuScale Power, LLC

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## General Comment

Please see attached NuScale Power, LLC letter with comments

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## Attachments

LO-101884 - Comments on DG-1361 -Signed

April 15, 2021

Docket No. NRC-2020-0245

Office of Administration  
ATTN: Program Management, Announcements and Editing Staff  
Mailstop: TWFN-7A06  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** Submission of Comments on Draft Regulatory Guide, DG-1361, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” Docket ID NRC-2020-0245

**REFERENCES:**

1. Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants, 86 Fed. Reg. 10133, Feb. 18, 2021
2. Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants, 85 Fed. Reg. 81958, Dec. 17, 2020
3. NuScale Letter, “Request for an Extension of Comment Period on Draft Regulatory Guide, DG-1361, “Environmental Qualification of Certain Electric Equipment Important To Safety for Nuclear Power Plants,” LO-0221-73984, February 9, 2021

In a Federal Register Notice dated February 18, 2021 (Reference 1), the U.S. Nuclear Regulatory Commission (NRC) reopened the comment period for the document published on December 17, 2020 (Reference 2), requesting that comments be submitted no later than April 19, 2021.

The attachment to this letter provides NuScale Power, LLC’s (NuScale’s) comments on DG-1361. NuScale appreciates NRC’s reopening of the comment period.

In Reference 3 NuScale requested an opportunity to meet with the NRC Staff in a public meeting well in advance of the end of the reopened comment period. While that has not occurred, a future public meeting on this proposed revision to Regulatory Guide 1.89 would help to ensure these comments are complete and responsive to the NRC Staff’s intentions and may yield additional feedback from NuScale.

Please feel free to contact Liz English at (541) 452-7333 or at [EEnglish@nuscalepower.com](mailto:EEnglish@nuscalepower.com) if you have any questions.

Sincerely,



Carrie Fosaaen  
Director, Regulatory Affairs  
NuScale Power, LLC

Attachment:   Comments and Review of U.S. Nuclear Regulatory Commission Draft  
Regulatory Guide DG-1361 (Proposed Revision 2 to Regulatory Guide 1.89)  
Environmental Qualification of Certain Electric Equipment Important to Safety  
for Nuclear Power Plants

<b>Comments and Review of</b> <b>U.S. Nuclear Regulatory Commission Draft Regulatory Guide DG-1361</b> <b>(Proposed Revision 2 to Regulatory Guide 1.89)</b> <b>Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants</b>			
No.	Page/Section/Paragraph	Comment	Proposed Resolution
1	No page number Generic Comment	This proposed revision exceeds the scope of the original stated purpose of RG 1.89, which is to ensure equipment important to safety remains functional during and following design basis accidents. Expanding the scope of this RG could lead, as suggested by comments below, to unintended consequences such as back-fitting and forward-fitting implications.	Align RG with the scope and intent of 10 CFR 50.49, and clarify as needed to ensure the revision is within the scope of the stated purpose of 10 CFR 50.49. Resolutions for specific instances are identified in subsequent comments.
2	Pages 1-2, applicable regulations	The applicable regulations list is confusing and potentially misleading. Separating into Part 50 and Part 52 creates the impression the requirements for different applicants/licensees are different. Note that design approval applicants (SDA and DC) need only provide an equipment list per 10 CFR 50.49, while license applicants (OL, COL, and ML) must also describe the EQ program and license holders must establish the program. Furthermore, the introduction to the Part 52 regulations makes reference to “design control measures, such as testing” which is not supported by a regulation in Part 52.	Consolidate the applicable regulations into a single list and clarify applicability for various types of applicants.
3	Page 2, 3 <sup>rd</sup> bullet from bottom	Incorrect citation. Reads in part, “. . . For a manufacturing license as defined in 10 CFR 52.157, only electric equipment defined in 10 CFR 50.49(b) which is within the scope of the manufactured reactor must be included in the EQ program.” A manufacturing license is not “defined by” 10 CFR 52.157, and that reference is unnecessary. 10 CFR 52.157 does require an ML applicant to provide a list of electric equipment important to safety and would be appropriate to address in a separate bullet.	Revise to state: “For a manufacturing license, only electric equipment defined in 10 CFR 50.49(b) which is within the scope of the manufactured reactor must be included in the EQ program.”

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4	Page 4, 3 <sup>rd</sup> bullet from top	RG 1.180 is not relevant to environmental qualification under 10 CFR 50.49. Keep the focus of this RG to satisfying the requirements of 10 CFR 50.49 by removing unrelated RGs that are beyond the scope of 50.49.	Remove reference to RG 1.180 and other RGs that are not related to compliance with 10 CFR 50.49.
5	Page 7, 2 <sup>nd</sup> paragraph from bottom	<p>The DG states:            “Chapter 11 and Appendix A to the Electric Power Research Institute’s (EPRI’s) “Plant Support Engineering: Nuclear Power Plant Equipment Qualification Reference Manual,” Revision 1, issued September 2010 (Ref. 26), provides a detailed regulatory history of electrical and mechanical equipment qualification. While the agency has not officially endorsed this EPRI document, the NRC staff has reviewed Chapter 11 and Appendix A and found that it reflects an accurate representation of the regulatory history of electrical and mechanical equipment qualification.”</p> <p>EPRI’s EQ Reference Manual is widely used in the industry. NRC’s endorsement of that document would support regulatory efficiency and clarity.</p>	Endorse either in part or whole the EPRI EQ Reference Manual (Reference 26). Specific endorsements should include the criteria for determining significant aging mechanisms as found in the EPRI Reference Manual, Page 4-3 and 4-4, first formalized in IEEE 627-1980.

<b>Comments and Review of</b> <b>U.S. Nuclear Regulatory Commission Draft Regulatory Guide DG-1361</b> <b>(Proposed Revision 2 to Regulatory Guide 1.89)</b> <b>Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants</b>			
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6	Page 7, 2 <sup>nd</sup> paragraph from bottom	<p>In the “Background” section, the proposed RG states, “For the purposes of this guide, the primary objective of “qualification” is to demonstrate that equipment important to safety can perform its safety function(s) without experiencing common-cause failures before, during, and after applicable design-basis events.</p> <p>Note that 10 CFR 50.49 is not associated with preventing common cause failures before a design basis accident, and it does not address the environmental conditions of events other than design basis accidents. Although all design basis events are relevant to the scope of electric equipment addressed (see 10 CFR 50.49(b)(1)), the qualification program required by 10 CFR 50.49 is specific to precluding environmentally-induced common cause failures during or following exposure to harsh environmental conditions that result from a design basis accident (see 10 CFR 50.49(d)(1) and (e)).</p>	Revise to state “. . . common-cause failures during and following applicable design-basis accidents.”

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7	Page 8, first paragraph, last sentence	<p>In the “Background” section, the proposed revision to the RG makes the following statement: “The qualification specifications in IEC/IEEE 60780-323, Edition 1, 2016-02, when met, demonstrate and document the ability of equipment to perform safety function(s) under applicable service conditions, including design-basis events, reducing the risk of common-cause equipment failure.” This statement implies that the NRC is increasing the scope of 10 CFR 50.49 and RG 1.89 to more than design basis accidents, to envelope other applicable service conditions.</p> <p>While aging is required as part of the EQ program, 10 CFR 50.49 is intended to prevent environmentally-induced common cause failures of electrical equipment important to safety during and following design basis accidents. Note that 10 CFR 50.49(d) and (e) require qualification to parameters for DBAs and not other DBEs.</p>	Revise to state “. . . perform safety function(s) during and following design basis accidents by reducing the risk of common-cause equipment failure.”
8	Page 10, paragraph 1.b	<p>The proposed revision to the RG states, “10 CFR 50.49 requires safety-related electric equipment (Class 1E) as defined in 10 CFR 50.49(b)(l) to be qualified to perform its intended safety functions.”</p> <p>While correct, this description and other aspects of the proposed revision do not recognize 10 CFR 50.69, which excludes Risk-Informed Safety Class (RISC)-3 components from EQ 10 CFR 50.49 (RISC-3 structures, systems and components (SSCs) means <i>safety-related</i> SSCs that perform low safety significant functions).</p>	Revise RG 1.89 to include provisions for licensees conforming to 10 CFR 50.69.

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9	Page 10, paragraph 1.d, and page 11 carryover	<p>Reads in part, “. . . however, the period before the operational phase of the SSC (i.e., shelf life) could also adversely impact the qualified life.”</p> <p>This language implies that the proposed revision to RG 1.89 is invoking shelf life requirements as part of the qualified life determination.</p> <p>Shelf life is not required per 10 CFR 50.49(e)(5). The commonly applied industry standard is that qualified life starts once the equipment is operational, and does not consider shelf life. Shelf life is managed in accordance with 10 CFR 50 Appendix B, Criterion 13.</p>	Revise statements to indicate that shelf life is not to be considered as part of compliance with 10 CFR 50.49.
10	Page 11, paragraph e	This paragraph recognizes that mild environments are beyond the scope of 10 CFR 50.49, but the proposed provision includes EMC and seismic in the list of requirements that must be considered. EMC and seismic are not in the scope of 10 CFR 50.49.	Revise statements to indicate that EMC and seismic requirements are not required for compliance with 10 CFR 50.49 and are addressed per other regulations.

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11	Page 11, Paragraph g	Paragraph g. lists methods acceptable to the NRC staff for calculating and establishing containment pressure and temperature envelopes. Subparagraph (2) states “For pressurized water reactors (PWRs) with a dry containment, LOCA or MSLB containment environment should be calculated using CONTEMPT-LT or equivalent industry codes.” Identifying a specific code and its “equivalent” is unduly restrictive. Similar statements are in subparagraphs (3) and (4).	Revise the guidance on acceptable codes and replace with statement technology-neutral discussion such as: “Containment pressure and temperature environment should be calculated using codes which are consistent with the licensee’s design and licensing basis. Containment response methodologies are reviewed and accepted by the NRC as part of the application.”
12	Page 12, paragraph i	Remove this paragraph. “Electromagnetic conditions are generally independent of aging and design-basis events. Therefore, qualification can be established on a different sample than the sample subjected to aging and design-basis events.” As stated in comment 9, EMC is not in the scope of 10 CFR 50.49. And it is not needed since the dual logo standard already contains this clarification in the note in Section 7.4.1.8.c.	Delete this paragraph

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13	Page 12, paragraph j.(3)	<p>The guidance related to activation energy is restrictive and could result in requiring new tests to derive activation energy values in lieu of use of conservatively-established activation energy values that are justified as being appropriate for the application. If followed as written, this restriction could lead to unnecessary effort to evaluate activation energies without a benefit to safety.</p> <p>Additionally, the paragraph states, “The selected activation energy values should be traceable to a specific test report for which these values were established.” Material properties that have historically been used in industry do not all have traceable test reports, because some come from research papers from labs and other facilities.</p>	Revise paragraph to allow use of conservatively-established activation energy values that have been found to be acceptable, and to clarify need for traceable test reports.
14	Page 16, paragraph b	The guidance related to commercial grade dedication is out of place in RG 1.89. Supply chain-related activities are beyond the scope of 10 CFR 50.49.	Remove guidance related to commercial grade dedication.

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15	Page 16, paragraph c	<p>This paragraph introduces requirements that are beyond the scope of 10 CFR 50.49. The scope of 50.49 is qualification for electric equipment in a harsh environment, not mild. A mild environment is defined as an environment that would at no time be significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences. Therefore, by defining a mild radiation environment using a fixed threshold without respect to the normal operating environment of electronic equipment, this paragraph c. conflicts with the terms of 10 CFR 50.49(c) and broadens the scope of EQ. Furthermore, smoke from an electrical fire is not a condition during or following a design basis accident, and therefore not within the scope of the EQ program required by 10 CFR 50.49.</p>	<p>Delete paragraph c. as it conflicts with and exceeds the requirements of 10 CFR 50.49.</p>

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16	Page 16, paragraph d	<p>The draft guide introduces a new term, “inverse temperature,” without explaining what it is or how to comply. “Inverse Temperature Effects” is first published in NUREG/CR-7153, Volume 5. This publication was focused on cables and cable systems only. Therefore, it is not established whether “inverse temperature effects” does or does not impact other broad types of elastomers. There is no existing NRC guidance on how to address inverse temperature effects. If Staff intend to address inverse temperature effects, it should be fully and transparently considered by Staff in an appropriate regulatory action. The mention of inverse temperature effects in DG-1361 implies additional requirements outside the normal regulatory process.</p> <p>Additionally, Item (2) of paragraph d. states, “. . . concurrent radiation and thermal aging or sequential aging, as well as the order of radiation and thermal aging, based on which produces the worst-case degradation; and . . .” The phrase “worst-case” is ambiguous and inconsistent with requirements of 10 CFR 50.49(e)(5) for aging to end-of-installed-life condition. This requirement was not present in RG 1.89 Rev 1. This statement may create unintended back-fit/forward-fit consequences.</p>	<p>Remove discussion about inverse temperature effects.</p> <p>Remove item (2).</p>
17	Page 20, item 26	<p>Incorrect citation. Reads in part “. . . Electric Power Research Institute, (EPRI) Nuclear Energy Institute (NEI) EPRI/NEI Report No. 1021067. . .”</p> <p>This is an EPRI report only.</p>	Delete NEI from report title

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18	Appendix A	The list of “typical safety-related electric equipment or systems” is typical only for operating power reactors (large, non-passive LWRs). Additionally for such designs, containment combustible gas control is no longer required to be safety-related function (pursuant to revised 10 CFR 50.44). “Emergency systems to achieve safe shutdown” is also unclear, because beyond those systems already listed, it would appear to only include the system for residual heat removal.	Clarify list is not applicable for passive designs and other new technologies, and revise combustible gas control and safe shutdown bullets.

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19	Appendix B, Page B-1	<p>This introduction to this appendix provides a confusing description for its regulatory basis, suggesting the example equipment is explicitly within the scope of 10 CFR 50.49. Rather, these are examples of “nonsafety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of” the specified safety functions, pursuant to 10 CFR 50.49(b)(2).</p> <p>Additionally, this version of the proposed RG removed the following language from the previous version:</p> <p>“Associated circuits, as defined in Regulatory Guide 1.75, "Physical Independence of Electric Systems," need only be qualified to ensure that they will not fail under postulated environmental conditions in a manner that could prevent satisfactory accomplishment of safety functions by safety-related equipment.”</p> <p>This statement accurately describes the purpose and acceptance criterion for the qualification of the nonsafety-related electric equipment within the scope of 10 CFR 50.49(b)(2).</p>	Clarify the basis and intent of Appendix B. Re-insert deleted provision in RG 1.89 Rev 2.

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No.	Page/Section/Paragraph	Comment	Proposed Resolution
20	Appendix C, Page C-1	<p>The list of acceptable methods for calculating mass and energy releases could be misconstrued as limiting for applicants.</p> <p>Mass and energy release methodologies are reviewed as part of plant licensing. This Appendix should be generically applicable to all reactor designs. For example, NuScale’s use of NRELAP5 code was found acceptable by the staff. If a list of currently acceptable methods is to be included, it should be clarified as only examples of methods the Staff have previously evaluated for existing designs.</p> <p>Also, there is no mention of other design basis accidents that may require methods for calculating mass and energy release.</p>	<p>Include a generic position in Appendix C that mass and energy releases are developed using a methodology that is consistent with the licensing basis of the plant. Clarify that the list of existing methods are examples for existing designs and not intended to restrict future methods.</p>
21	Appendix D, Generic Comment	<p>Appendix D is dedicated to RG 1.183 which does not apply to all facilities. The DG makes no mention of source term for non-AST source term for EQ and is silent on the guidance in RG 1.195.</p>	<p>Revise Appendix D to address both existing and new designs.</p>
22	Appendix D, Page D-1, paragraph D-2.1	<p>This discussion refers to the “survivability period.” Equipment survivability has a defined meaning with respect to beyond design basis events (see 10 CFR 50.44 and RG 1.7), so the term may introduce confusion within the context of 10 CFR 50.49 compliance.</p>	<p>Revise to use a different term, such as post-accident operating time or mission time.</p>
23	No page number	<p>Appendix E was eliminated from this proposed version of RG 1.89. Appendix E contains valuable qualification documentation requirements and categories for equipment. See RG 1.89 Rev 1, Page 1.89-17.</p>	<p>Restore Appendix E to RG 1.89</p>

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No.	Page/Section/Paragraph	Comment	Proposed Resolution
24	No page number Generic comment	Neither the joint logo nor the proposed RG revision addresses that, if a licensee or entity has previously met provisions of IEEE 323-1974, whether the joint logo and RG would accept the previous testing per IEEE 323-1974 as being equivalent from an environmental qualification perspective. Without these endorsements it would be incumbent upon an entity to reconcile the differences each time. This reconciliation would add burden and cost to not only the entities using the IEEE 323-1974 versions, but also to the staff during inspections and other activities. It might even require additional testing, which may lead to forward-fit implications. Further, if a component is replaced with a component that is tested to the joint logo standard and an IEEE 323-1974 applicant wants to use it, it is uncertain if this would be allowed without reconciliations.	Clarify such that the joint logo and RG apply to both scenarios: RG 1.89 to endorse the use of IEEE 323-1974 as acceptable to meeting the joint logo, and RG 1.89 to endorse the joint logo as meeting the requirements for IEEE 323-1974.
25	No page number Generic comment	A design specific review standard was issued to NuScale for the DCA application. This DSRS 3.11 included additional guidance that was not in RG 1.89.	Conduct a reconciliation between the DSRS 3.11 and RG 1.89 to ensure the RG encompasses updated requirements.
26	No page number Generic comment	10 CFR 50.49 footnote 4 refers to RG 1.97 Rev. 2. In BTP 7-10 the staff provided guidance for RG 1.97 Rev. 3 and 4 as it relates to intent of 10 CFR 50.49.	Revise BTP 7-10 to update 1.97 revision and provide staff interpretation for meeting 10 CFR 50.49. Include correct revision of RG 1.97, which is Rev 5.
27	No page number Generic comment	10 CFR Part 52 licensees must address ITAAC. The DG does not speak to ITAAC-related EQ.	Revise RG 1.89 to reference RG 1.215 for EQ-related ITAAC closures.