

**Response to Public Comments on Draft Regulatory Guide (DG)-1393
 “Guide for Assessing, Monitoring, and Mitigating Aging Effects on Electrical Equipment Used
 in Nuclear Power Plants.”
 Proposed New Regulatory Guide (RG) 1.248**

On February 3, 2022, the NRC published a notice in the *Federal Register* (87 FR 6204) that Draft Regulatory Guide, DG-1393 (Proposed New RG 1.248), was available for public comment. The Public Comment period ended on March 7, 2022. The NRC received comments from the organizations listed below. The NRC has combined the comments and NRC staff responses in the following table.

Comments were received from the following:

<u>Comment Document 1</u> Carrie Fosaaen Director, Regulatory Affairs NuScale Power, LLC 1100 NE Circle Blvd., Suite 200 Corvallis, Oregon 97330 ADAMS Accession No. ML22068A162	<u>Comment Document 2</u> Alan Cox United States acox@ct1.us ADAMS Accession No. ML22068A163	<u>Comment Document 3</u> William Horin Nuclear Utility Group on Equipment Qualification - Winston & Strawn LLP 1901 L Street N.W. Washington, DC, 20036-3506 ADAMS Accession No. ML22068A164
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Commenter	Section of DG-1393	Specific Comments	NRC Resolution
		Comment Document 1: ML22068A162	
Carrie Fosaaen	Section A	<u>Comment 1</u> The applicability section states the regulatory guide (RG) is applicable to "holders of and applicants for combined licenses, standard design certifications, standard design approvals..." The Applicable Regulations identify only 10 CFR 52.137(a)(13), which requires an applicant for a standard design approval to provide the list of electric equipment that is important to safety as defined by 10 CFR 50.49(d), as establishing the applicability of this RG to applicants for design certifications (DCs) and standard	The staff agreed with the comment and proposed recommendation. The staff removed the reference to 10 CFR Part 52.137(a)(13) from DG-1393. No additional changes were made to DG-1393 as a result of this comment.

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		<p>design approvals (SDAs) (the equivalent regulation for DC applicants is not listed).</p> <p>The requirements for DC and SDA applicants to identify electric equipment that is important to safety does not necessitate the conduct of maintenance and aging management or the development of an aging management program at the design approval stage. Accordingly, IEEE 1205-2014 and RG 1.248 are not applicable to SDA and DC applicants.</p> <p><u>Recommendation</u> Revise the applicability and applicable regulations to remove applicability to holders of and applicants for standard design certifications and standard design approvals.</p>	
Carrie Fosaaen	Section C	<p><u>Comment 2</u> Part C of the DG-1393 endorses IEEE 1205-2014 without any exception or clarification. The endorsement of IEEE 1205-2014 should clarify the criteria comprising a significant aging mechanism (SAM). Absent clarification, the endorsement guidance and its references will contain the following conflict:</p> <ul style="list-style-type: none"> • ASME QME-1-2017, endorsed by RG 1.100, provides that an aging mechanism is considered significant if it satisfies “<u>any one of</u>” four criteria. • IEEE 1205-2014 provides a definition of SAM as "An aging mechanism that, under normal and abnormal service conditions, causes degradation of equipment that progressively and appreciably renders the equipment vulnerable to failure to perform its specified function(s)." IEEE 1205-2014 includes 	<p>The staff did not agree with the comment and the proposed recommendation. The endorsement of IEEE 1205-2014 in DG-1393 constitutes an approach that is acceptable to the NRC staff to meet regulatory requirements for assessing, monitoring, and mitigating the aging effects on electrical equipment. Other methods including those that are endorsed elsewhere may be used and found acceptable. Additionally, as a result of Comment 3, RG 1.89 was added to DG-1393 as related guidance on meeting the equipment qualification (EQ) requirements of 10 CFR 50.49.</p> <p>Addressing variances between different revisions of other standards (e.g., IEEE 627-2010, and IEEE 627-2018) is outside the scope of this proposed RG.</p>

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		<p>undated IEEE 627 as a normative reference, i.e. one that is "indispensable for the application of" IEEE-1205.</p> <ul style="list-style-type: none"> • IEEE 627-2010, which was in effect at the time of issuing IEEE 1205-2014, includes the same definition of SAM as IEEE 1205-2014, and provides further that aging is significant if it satisfies "<u>all of</u> the same four criteria as listed in QME-1-2017. • IEEE 627-2018, the current version in effect, maintains the same SAM definition, but no longer provides the list of four criteria. <p>Thus, without clarification, the endorsed guidance will further an inconsistency as to whether and how the four SAM criteria apply. This discrepancy is essential to compliance with 10 CFR 50.49(e)(5), which requires that "consideration must be given to all significant types of degradation which can have an effect on the functional capability of the equipment," and therefore important to the implementation of RG 1.248. NRC's endorsement of IEEE- 1205-2014 should resolve this discrepancy with an exception to the standard, including a definition and discussion of the rationale</p> <p>The history, content, and context of the four SAM criteria indicate that the list was intended to be conjunctive, as originally provided in IEEE 627 up through IEEE 627-2010. Accordingly, RG 1.248 should provide the same conjunctive list.</p> <p><u>Recommendation</u> Revise the endorsement to IEEE 1205-2014 to include an exception defining and discussing the rationale for criteria</p>	<p>No changes were made to DG-1393 as a result of this comment.</p>

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		constituting a significant aging mechanism, as per IEEE 627-2010.	
Carrie Fosaaen	Section C	<p><u>Comment 3</u> IEEE 1205-2014 brings up synergistic effects as a "concern" yet the standard doesn't actually provide any guidance on how to best address it. RG 1.89 R1 does indicate that any known synergistic effects should be addressed at the time when a qualification effort is initiated (e.g., in the development of the test specification, test plan, & test procedure).</p> <p><u>Recommendation</u> Revise RG 1.248 to reflect the results of research on synergistic effects. This should include the basis and any actions needed to address the synergistic effects beyond those included in RG 1.89.</p>	<p>The staff did not agree with the comment and proposed recommendation. RG 1.89 provides guidance on EQ and information on synergistic effects. Hence, staff did not re-state those positions in this proposed RG. However, the staff revised DG-1393 to add RG 1.89 as a reference in related guidance.</p> <p>No additional changes were made to DG-1393 as a result of this comment.</p>
Carrie Fosaaen	Section C	<p><u>Comment 4</u> The list of references in IEEE 1205-2014 Annex that covers the NRC sponsored research into aging and synergisms is incomplete and should be supplemented by RG 1.248.</p> <p><u>Recommendation</u> Update references in RG 1.248 to include the following NRC sponsored research into aging and synergisms:</p> <p>NUREG/CP-0036, NUREG/CR-0401, NUREG/CR-0275 & -0276, NUREG/CR-2156 & -2157, and NUREG/CR-2877.</p>	<p>The staff did not agree with the comment and the proposed recommendation. With the exception of NUREG/CR-2877, the references mentioned in the recommendation were not located and may no longer be available as public documents. NUREG/CR-2877 is a limited focus study prepared in 1982. Other relevant research documents are included in the respective reference sections of documents mentioned in DG-1393, such as NUREG 2191.</p> <p>The staff believes that the additional references would not add significant value and no changes to DG-1393 were made as a result of this comment.</p>
Carrie Fosaaen	Section C.1.e	<p><u>Comment 5</u> Related Guidance does not list RG 1.89 or RG</p>	<p>The staff partially agreed with this comment and recommendation. RG 1.89 is relevant to this proposed RG, and therefore the staff revised the RG and added it</p>

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		<p>1.209. RG 1.89 and RG 1.209 should be listed as they are relevant to aging of electrical equipment.</p> <p><u>Recommendation</u> List RG 1.89 and RG 1.209 as related guidance.</p>	<p>as a reference per Comment 3. RG 1.209 has a narrow focus applying to EQ of computer-based instrumentation and control systems and is already referenced in RG 1.89 accordingly. The staff does not agree that RG 1.209 needs to be added to DG-1393.</p> <p>No additional changes were made to DG-1393 as a result of this comment.</p>
Carrie Fosaaen	Section C.1.f	<p><u>Comment 6</u> 10 CFR 50.69 is not identified as an Applicable Regulation. Aging effects are part of 10 CFR 50.69 considerations for RISC-3 components.</p> <p><u>Recommendation</u> Add language about applicability of 10 CFR 50.69.</p>	<p>The staff did not agree with the comment and recommendation to include 10 CFR 50.69 in the applicability section of DG-1393. RG 1.201 discusses how to meet the requirements of 10 CFR 50.69 with respect to the categorization of structures, systems and components that are considered in risk-informing special treatment requirements. The staff does not agree that 10 CFR 50.69 and RG 1.201 are within the scope of DG-1393.</p> <p>No changes were made to DG-1393 as a result of this comment.</p>
		Comment Document 2: ML22068A163	
Alan Cox	General	<p><u>Comment 7</u> I have over 20 years of experience preparing and supporting license renewal applications for US and international utilities.</p> <p><u>Recommendation</u> See attached file(s) for three comments to improve wording for the Reg. Guide.</p>	See responses to Comments 8, 9, and 10 below.
Alan Cox	Pg. 3/ Section A.	<p><u>Comment 8</u> NUREG-1801, “Generic Aging Lessons Learned (GALL) Report,” Revision 2, issued December 2010 (Ref. 10),</p>	The staff partially agreed with the comment and with the proposed recommendation. The staff prefers the addition of, “managing the effects of aging” to clarify

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		<p>provides recommendations for aging management of in-scope SSCs for the initial renewal of an operating license.</p> <p>Recommendation:</p> <p>The license renewal rule discusses managing the effects of aging, not aging management of SSCs. This and the next bullet would be made consistent with the rule if this was changed to read “managing the effects of aging on in-scope SSCs.”</p>	<p>the intent of the NUREG-1801. The description of NUREG-1801 in DG-1393 was revised to read: “... provides recommendations for managing the effects of aging on in-scope SSCs...”</p> <p>No additional changes to DG-1393 were made as a result of this comment.</p>
Alan Cox	Pg. 5/ Section B.	<p><u>Comment 9</u></p> <p>This RG provides guidelines and methods acceptable to the NRC staff for assessing, monitoring, and mitigating aging effects on electrical equipment in nuclear generating stations.</p> <p>Recommendation:</p> <p>This would be simplified and made more consistent with the license renewal rule if replace with “managing.”</p>	<p>The staff agreed with the comment and the proposed recommendation to replace “assessing” with “managing”. Using the term “managing” instead of “assessing,” is appropriate to clarify the intent of DG-1393. DG-1393 was revised to change this bullet to read: “ ...NRC staff for managing, monitoring, and ...”</p>
Alan Cox	Pg. 7 / Section C.	<p><u>Comment 10</u></p> <p>The NRC staff considers conformance with the requirements in IEEE Standard 1205-2014 to constitute an acceptable method for use in satisfying the Commission’s regulations with respect to maintenance and aging management of applicable SSCs subject to aging stressors, aging mechanisms, and aging effects to ensure facility safety throughout the period of initial license operation, extended operation, and subsequent extended operation.</p> <p>Recommendation:</p>	<p>The staff agreed with the comment and proposed recommendation to use the term “provisions” instead of “requirements,” which is more appropriate as to the intent and purpose of the subject standard. DG-1393 was revised to change this bullet to read: “ ... conformance with the provisions in IEEE standard”</p> <p>No additional changes to DG-1393 were made as a result of this comment.</p>

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		<p>Previous paragraph indicates that the provisions of the IEEE standard are not requirements, but constitute an acceptable method for satisfying regulations. Therefore, seems it might be appropriate to say “provisions” rather than “requirements.”</p>	
		<p>Comment Document 3: ML22068A164</p>	
<p>William Horin of NUGEQ</p>	<p>All</p>	<p><u>Comment 11</u> The NRC Staff should consider delaying the issuance of DG-1393 to endorse IEEE Std 1205-2014 because the IEEE Subcommittee Working Group (WG) 3.4, “Aging Assessment” is currently in the process of revising that standard.</p> <p>According to the IEEE website (https://site.ieee.org/npec-sc3/working-group-3-4-aging-assessment/), WG 3.4 met in December 2021 to develop a Project Authorization Request (PAR) for the next revision IEEE 1205. A PAR is the “means by which standards projects are started within the IEEE ...” A revision to IEEE 1205 is planned for publication in the 2023-2024 timeframe. As such, a delay in issuing DG- 1393 until the standard is revised is in keeping with the goal of Alternative 2 of the Regulatory Analysis for DG-1393 to “ensure that up-to-date regulatory guidance is available ... for use by licensees and applicants, and that the guidance accurately reflects the staff’s position.”</p> <p><u>Recommendation</u> By delaying issuance of DG-1393 until IEEE completes its revision to IEEE 1205, the Staff would better achieve its goal of “afford[ing] value to the NRC staff, and agency licensees and future applicants, due to the benefits associated with enhanced efficiency and effectiveness in</p>	<p>The staff did not agree with the comment and proposed recommendation. IEEE 1205-2014 as well as IEEE 1205-2000 have been referenced in RG 1.218, NUREG-1801, and NUREG-2191. NRC has committed to provide a formal position and endorsement for use by the NRC staff as well as other stake holders. Industry standards are routinely revised and changed. Delaying DG-1393, as recommended, is not necessarily justified due to the unknown nature of all the standard’s potential changes, including the depth and nature of which are not known at this time. The staff notes that versions of IEEE 1205, are already widely used in license renewal, therefore, an agency position on the standard should be formally explained in a RG. The impact of not endorsing the standard is that the associated agency position is not clearly delineated, even though the standard is widely referenced in NRC documents. Further, the Regulatory Analysis (ML21288A112) provides the staff’s rationale for endorsing IEEE Std. 1205-2014 at this time.</p> <p>There were no changes made to DG-1393 as a result of this comment.</p>

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		<p>using a common guidance document as the technical basis for maintenance practices and aging management of the subject SSCs for license applications and other interactions with the NRC.” None of the cost saving for the industry with respect to Staff review times, responding to RAIs, etc., would be realized by endorsing an 8-year-old standard that is soon to be outdated.</p>	
William Horin of NUGEQ	Section C	<p><u>Comment 12</u> General Observation: The Staff Regulatory Guidance in Part C makes no specific clarification and takes no exceptions to the guidance in IEEE 1205-2014.</p> <p>Should the staff decide to proceed with endorsement of IEEE 1205-2014, the following observations and comments are provided as suggested areas where specific clarification or exception is considered appropriate in the proposed new Regulatory Guide 1.248.</p>	See responses for each comment below (13 thru 17)
William Horin of NUGEQ	Section C.1.c	<p><u>Comment 13</u> General Observation: DG-1393 would be an appropriate vehicle to address an industry recognized issue related to a discrepancy in the criteria used by IEEE and ASME to identify significant aging mechanisms (SAM). We feel that it is appropriate for a SAM to satisfy all four criteria from IEEE 627-2010.</p> <p>The criteria for a SAM from IEEE 627-2010 states: “Aging is significant for the purpose of an aging program if it satisfies <u>all</u> of the following criteria:</p> <p>a) <i>In the normal service environments, an aging mechanism promotes the same failure mode as that resulting from exposure to abnormal or DBE service conditions.</i></p>	<p>The staff did not agree with the comment and the proposed recommendation. See the NRC resolution to Comment 2.</p> <p>No changes to DG-1393 were made as a result of this comment.</p>

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		<p>b) <i>The aging mechanism adversely affects the ability of the equipment to perform its required function in accordance with its specification requirements.</i></p> <p>c) <i>The deterioration caused by the aging mechanism is not amenable to assessment by in-service inspection or surveillance activities that provide confidence in the equipment's ability to function in accordance with its specification requirements during the intervals between surveillance.</i></p> <p>d) <i>In the normal service environment, the aging mechanism causes degradation during the design life of the equipment that is appreciable compared to degradation caused by the DBE.</i> [Emphasis Added]</p> <p>The NRC has previously used very similar criteria presented in Section 3.4.5 of Technical Evaluation Report TER-C5257-532, "Implementation Guidance for New and Corrective Equipment Environmental Qualification" dated 04/22/1983 [ML20244C266].</p> <p>However, the criteria from Section QR-5310 of ASME QME-1-2017 (endorsed by RG 1.100 R4) is inconsistent with the definition of a SAM since it can identify an aging mechanism as being significant even if the degradation has no effect on the equipment's ability to perform its required function.</p> <p><u>Recommendation</u> IEEE and ASME use the same four criteria for a SAM but differ in whether a SAM needs to meet all four criteria (e.g., IEEE position) or any one of the four criteria (e.g.,</p>	

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		<p>ASME position). Satisfying all four criteria is consistent with the definition of a significant aging mechanism provided in IEEE 1205- 2014. Section 3 of IEEE 1205-2014 defines a SAM as: “<i>An aging mechanism that, under normal and abnormal service conditions, causes degradation of equipment that progressively and appreciably renders the equipment vulnerable to failure to perform its specified function(s).</i>”</p> <p>Having clear and consistent criteria on what constitutes a significant aging mechanism is directly related to the requirement in 10 CFR 50.49(e)(5) that consideration must be given to all significant types of degradation which can have an effect on the functional capability of the equipment.</p> <p>DG-1393 should endorse the position that a SAM needs to satisfy all four criteria from IEEE 627-2010.</p>	
William Horin of NUGEQ	Section C	<p><u>Comment 14</u> IEEE 1205-2014 expanded the scope to include all electrical equipment instead of only Class 1E equipment. DG-1393 should be specific as to the applicability of the staff’s endorsement being limited to important to safety electrical equipment that has not been classified as RISC-3 or RISC-4 under 10 CFR 50.69.</p> <p><u>Recommendation</u> The scope of IEEE 1205-2014 goes beyond the scope of equipment subject to 10 CFR Part 50 (e.g., §50.49, §50.65, GDC-4 of 10 CFR 50 Appendix A), the important to safety equipment subject to 10 CFR Part 52, or the electrical equipment subject to 10 CFR Part 54.</p>	<p>The staff did not agree with the comment and proposed recommendation. Applicants/licensees can apply risk informed-categorization of electrical equipment per 10 CFR 50.69 and subsequently, the NRC staff will review and evaluate on a site-specific basis accordingly. RG 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance,” provides guidance on risk-informed categorization. Addressing risk classification of electrical equipment is beyond the scope of the endorsement of IEEE 1205-2014 in DG-1363.</p> <p>The scope of electrical equipment addressed in DG-1363 is the electrical equipment subject to the regulations in the “Applicable Regulations” section.</p>

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			<p>DG-1363 provides one acceptable method of meeting the regulations.</p> <p>No changes were made to DG-1363 as a result of this comment.</p>
William Horin of NUGEQ	Section C	<p><u>Comment 15</u> Part C of DG-1393 should clarify that Section C.5.a of RG 1.89 R1 (or the equivalent section of the proposed revision to RG 1.89 in DG- 1361) provides guidance on how to address synergistic effects for equipment subject to 10 CFR 50.49.</p> <p>Section 4.1 “Stressors” of IEEE 1205-2014 (pg 4) states the following:</p> <p><i>“Aging degradation due to a single stressor is often represented as a first-order relationship involving stressor intensity and time as described for thermal aging in 6.6.3, however, aging degradation due to a combination of more than one stressor may exceed the sum of the individual effects and may result in conditions that are not appropriately modeled by this simple representation. Typically, the concern is associated with the potential for synergistic effects between temperature and radiation in some polymers.”</i></p> <p>DG-1393 is the appropriate place for the NRC to reference for consideration the results and conclusions from the NRC’s research into aging and synergistic effects because Annex G of IEEE 1205-2014 only refers to references that should be consulted for additional information on this topic. Consistent with the resolution of the EQ TAP and GSI-168, this summary should specifically characterize</p>	<p>The staff did not agree with the comment and proposed recommendation. See the NRC resolution for Comment 4. However, as a result of Comment 3, the staff has added a reference to RG 1.89, which contains considerations in simulating an end-of-installed life.</p> <p>No additional changes to DG-1393 were made as a result of this comment.</p>

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		<p>the significance of potential synergistic effects from the perspective of the overall uncertainties in simulating an “end-of- installed life” condition during a qualification/test program.</p> <p><u>Recommendation</u> There is no specific guidance in IEEE 1205-2014 on how to address “synergistic effects” instead it simply refers to references listed in Annex G that IEEE 1205 states “should be consulted for additional information on this topic.” The reference citations in Annex G are a partial listing of the NRC’s research into aging and synergistic effects. DG-1393 should clarify that there are additional documents related to NRC sponsored research into aging and synergistic effects that are not currently cited in IEEE 1205-2014. Some examples include:</p> <p>NUREG/CR-0401 NUREG/CR-0275 & 0276 NUREG/CR-2156 & -2157 NUREG/CR-2877</p> <p>Additionally, DG-1393 should also expand on the information contained in some of the references in Annex G, such as NUREG/CR-6384 as well as identify those documents associated with EQ Task Action Plan (EQ-TAP) and the resolution of GSI-168 such as the June 28, 2002 Technical Assessment of Generic Safety Issue (GSI) 168, “Environmental Qualification of Low-Voltage Instrumentation and Control (I&C) Cables” (ML021790551).</p>	

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William Horin of NUGEQ	Section C	<p><u>Comment 16</u> IEEE 1205-2014 uses the term “qualified life” throughout the standard without being defined or providing any distinction or clarification between harsh or mild environment applications. The term “qualified life” is specific to equipment requiring qualification to harsh design basis accident conditions.</p> <p>DG-1393 should clarify or reinforce the position in RG 1.209 that “because of ready accessibility for monitoring and maintenance in mild environments, the need to establish a qualified life does not apply.”</p> <p><u>Recommendation</u> This comment is intended to ensure consistency between RG 1.248 and RG 1.209.</p>	<p>The staff did not agree with the comment and the proposed recommendation. RG 1.209 discusses computer-based I&C systems. RG 1.89 addresses environmental qualification as well as qualified life and RG 1.89 is now referenced in DG-1393. Therefore, qualified life does not need to be addressed in this RG.</p> <p>No changes to DG-1393 were made as a result of this comment.</p>
William Horin of NUGEQ	Section C	<p><u>Comment 17</u> DG-1393 should take exception or provide clarification to Section 2 “Normative references” of IEEE 1205-2014 such that the endorsement of IEEE 1205-2014 clearly indicates that the use of these normative references should be as applicable and consistent with the current licensing basis of the plant.</p> <p>The current wording in IEEE 1205-2014 indicates the need to apply the latest edition of IEEE 323 and IEEE 627, which could conflict with the current licensing basis of the plant.</p> <p><u>Recommendation</u> Section 2 of IEEE 1205-2014 provides undated references to IEEE Std 323 and IEEE Std 672, which goes on to state that these “<i>documents are indispensable for the</i></p>	<p>The staff did not agree with the proposed recommendation. Endorsement of IEEE Std. 1205-2014 provides one method acceptable to comply with the regulations. The facilities’ current licensing basis determines the codes, standards, and regulatory guides a facility conforms to and is plant-specific. The listing of normative references in IEEE Std. 1205-2014 does not indicate that a plant must include those references in the licensing basis. A regulatory guide is one acceptable method of meeting the regulations. Furthermore, endorsing IEEE Std. 1205-2014 does not imply tacit endorsement of IEEE 627 or IEEE Std 323 in this RG. In addition, DG-1393 discusses the use of “secondary references” in an endorsed standard at the end of Section B; and, licensees and applicants may consider and use information in the secondary references, if appropriately justified, consistent with current regulatory practice, and</p>

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		<p><i>application of this document (i.e., they <u>must be understood and used</u>: therefore, each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.”</i></p>	<p>consistent with applicable NRC requirements. In response to Comment 3, the staff added a reference to RG 1.89, which contains staff’s position on IEEE 323.</p> <p>No changes to DG-1393 were made as a result of this comment.</p>