U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-1427

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QUALIFICATION OF FIBER-OPTIC CABLES, CONNECTIONS, AND OPTICAL FIBER SPLICES FOR USE IN SAFETY SYSTEMS FOR PRODUCTION AND UTILIZATION FACILITIES

A. INTRODUCTION

Purpose

This regulatory guide (RG) describes an approach that is acceptable to the staff of the U.S. Nuclear Regulatory Commission (NRC) for use in complying with NRC regulations that address the environmental qualification (EQ) of fiber-optic cables, connections, and optical fiber splices in safety systems in production and utilization facilities. This RG endorses, subject to the conditions described in Section C of this RG, the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 1682-2023, "IEEE Standard for Qualifying Fiber Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems in Nuclear Power Generating Stations" (Ref. 1).

Applicability

This RG applies to applicants and licensees subject to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities" (Ref. 2), or 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants" (Ref. 3). Under 10 CFR Part 50, this RG applies to applicants for and holders of licenses, as defined in 10 CFR 50.2, "Definitions." Under 10 CFR Part 52, this RG applies to applicants for and holders of combined licenses, standard design certifications, and standard design approvals for nuclear power plants.

Applicable Regulations

- 10 CFR Part 50 requires, among other things, that structures, systems, and components (SSCs) that are important to safety in a nuclear power plant must be designed to accommodate the effects of environmental conditions (i.e., remain functional under postulated design basis events (DBEs)).
    - 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," requires that holders or applicants for an operating license for a nuclear power plant issued under 10 CFR Part 50 shall establish a program for the environmental qualification (EQ) of electric equipment as defined in 10 CFR 50.49.

This RG is being issued in draft form to involve the public in the development of regulatory guidance in this area. It has not received final staff review or approval and does not represent an NRC final staff position. Public comments are being solicited on this DG and its associated regulatory analysis. Comments should be accompanied by appropriate supporting data. Comments may be submitted through the Federal rulemaking website, http://www.regulations.gov, by searching for draft regulatory guide DG-1427. Alternatively, comments may be submitted to the Office of Administration, Mailstop: TWFN 7A-06M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Program Management, Announcements and Editing Staff. Comments must be submitted by the date indicated in the *Federal Register* notice.

Electronic copies of this DG, previous versions of DGs, and other recently issued guides are available through the NRC's public website under the Regulatory Guides document collection of the NRC Library at https://nrc.gov/reading-rm/doc-collections/reg-guides/index.html. The DG is also available through the NRC's Agencywide Documents Access and Management System (ADAMS) at https://www.nrc.gov/reading-rm/adams.html, under Accession No. ML24201A068. The regulatory analysis may be found in ADAMS under Accession No. ML24201A069.

Under 10 CFR 50.49, holders of a combined license or a manufacturing license issued under 10 CFR Part 52 are also required to establish a program for the EQ of electric equipment as defined in 10 CFR 50.49.

- 10 CFR 50.55a(h) states that protection systems must meet the requirements of IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations" (Ref. 4), or IEEE Std. 279-1971, "IEEE Standard: Criteria for Protection Systems for Nuclear Power Generating Stations" (Ref. 5), contingent on the date of construction permit issuance. The design basis criteria identified in those standards or, for plants with construction permits issued before January 1, 1971, the criteria identified in the licensing basis for such facilities, include the range of transient and steady state environmental conditions during normal, abnormal, and accident conditions during which the equipment must perform its safety functions.

- 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires that each holder of an operating license for a nuclear power plant under 10 CFR Part 50 and each holder of a combined license under 10 CFR Part 52 (after the Commission makes the finding under 10 CFR 52.103(g)) monitor the performance or condition of SSCs against licensee-established goals, in a manner sufficient to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. These goals shall be established commensurate with safety and, where practical, take into account industrywide operating experience. When the performance or condition of an SSC does not meet established goals, appropriate corrective action shall be taken. For a nuclear power plant for which the licensee has submitted the certifications specified in 10 CFR 50.82(a)(1) or 10 CFR 52.110(a)(1), as applicable, 10 CFR 50.65 shall only apply to the extent that the licensee shall monitor the performance or condition of all SSCs associated with the storage, control, and maintenance of spent fuel in a safe condition, in a manner sufficient to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions.

- 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems and components for nuclear power reactors," states in part that a holder of a license to operate a light-water reactor nuclear power plant under 10 CFR Part 50; an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52 may voluntarily comply with the requirements in 10 CFR 50.69 as an alternative to compliance with 10 CFR 50.49 for risk-informed safety class (RISC)-3 and RISC-4 SSCs.

  In the *Federal Register* (FR) notice (69 FR 68008 (Ref. 6)) for the final rule establishing 10 CFR 50.69, the Commission stated that RISC-3 (safety-related, low-safety-significant) and RISC-4 (non-safety-related, low-safety-significant) SSCs will be exempt from the special treatment requirements for qualification methods for environmental conditions and effects and seismic conditions. Nevertheless, the Commission stated that RISC-3 SSCs continue to be required to be capable of performing their safety-related functions under applicable environmental conditions and effects and seismic conditions, albeit at a lower level of confidence compared to RISC-1 (safety-related, safety-significant) SSCs. As specified by the Commission in the FR notice, a licensee implementing 10 CFR 50.69 must consider operating life (aging) and combinations of operating life parameters (synergistic effects) in the design of RISC-3 electrical equipment. The Commission noted that this is particularly important if the equipment contains materials that are known to be

susceptible to significant degradation due to thermal, radiation, and/or wear (cyclic) aging, including any known synergistic effects that could impair the equipment's ability to meet its design-basis function. The Commission direction in the FR notice regarding the capability of RISC-3 SSCs to be able to perform their safety functions under applicable environmental and seismic conditions is clear for licensees who have received a license amendment to implement a 10 CFR 50.69 program. With respect to both RISC-3 and RISC-4 SSCs, the Commission decided to remove the RISC-3 and RISC-4 SSCs from detailed, specific requirements that provide a high level of assurance. However, the Commission stated in the FR notice that the functional requirements for these SSCs remain.

- General Design Criterion (GDC) 4, "Environmental and Dynamic Effects Design Bases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, states in part that SSCs important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.

- General requirements associated with equipment qualification appear in GDC 1, "Quality Standards and Records"; GDC 2, "Design Bases for Protection Against Natural Phenomena"; and GDC 23, "Protection System Failure Modes," of Appendix A to 10 CFR Part 50.

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires, in part, that the pertinent requirements of this appendix apply to all activities affecting the safety-related functions of SSCs that prevent or mitigate the consequences of postulated accidents that could cause undue risk to public health and safety. These activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying.

- 10 CFR Part 52 requires that SSCs important to safety in a nuclear power plant be designed to accommodate the effects of environmental conditions.

  - 10 CFR 52.47(a)(13) requires that an applicant for a certified design must provide the list of electrical equipment important to safety, as mandated by 10 CFR 50.49(d).

  - 10 CFR 52.79(a)(10) requires that an application for a combined license must provide a description of an EQ program for electrical equipment and its implementation, in accordance with 10 CFR 50.49(a). The applicant must also provide the list of electric equipment that is important to safety, as required by 10 CFR 50.49(d).

  - 10 CFR 52.97(b) requires that combined licenses must contain inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in accordance with the license; the Atomic Energy Act of 1954, as amended (Ref. 7); and NRC rules and regulations.

  - 10 CFR 52.99(c)(1) requires that each combined license holder notify the NRC that the prescribed inspections, tests, and analyses have been performed and that the prescribed acceptance criteria are met for each ITAAC included in their combined license.

- 10 CFR 52.137(a)(13) requires that an applicant for a standard design approval must provide the list of electric equipment that is important to safety, as mandated under 10 CFR 50.49(d).

- 10 CFR 52.157(f)(6) requires that an applicant for a manufacturing license provide a list of electric equipment important to safety, as mandated under 10 CFR 50.49(d).

Related Guidance

- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 3.11, Revision 3, "Environmental Qualification of Mechanical and Electrical Equipment," issued March 2007 (Ref. 8), identifies staff guidance for determining that all items of equipment that are important to safety (mechanical, electrical, and instrumentation and control equipment) are capable of performing their design safety functions under all normal environmental conditions, anticipated operational occurrences, and accident and postaccident environmental conditions. Environmental qualification, as discussed in NUREG-0800, includes all environmental conditions that may result from any normal mode of plant operation, anticipated operational occurrences, DBEs (as defined in 10 CFR 50.49(b)(1)(ii)), post-DBEs, and containment tests.

- Before the 1983 issuance of the 10 CFR 50.49 final rule, the Commission (in CLI-80-21, "Petition for Emergency and Remedial Action," dated May 23, 1980 (Ref. 9)) directed the staff to use NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," Revision 1, issued July 1981 (Ref. 10), and the Division of Operating Reactors (DOR) Guidelines, "Guidelines for Evaluating Qualification of Class 1E Electrical Equipment in Operating Reactors," dated November 13, 1979 (Ref. 11), as requirements that licensees and applicants must meet in order to satisfy the equipment qualification requirements of 10 CFR Part 50. At that time, NUREG-0588 consisted of what is now Part I of NUREG-0588 (i.e., only the "for comment version" of NUREG-0588).

  Upon its issuance, 10 CFR 50.49, which is based on Part I of NUREG-0588 (hereinafter "NUREG-0588") and the DOR Guidelines, did not require requalification of electric equipment by applicants for and holders of operating licenses for nuclear power plants previously required by the NRC to qualify equipment in accordance with the DOR Guidelines or NUREG-0588 (Category I or II).

  According to NUREG-0588, all nuclear reactors with operating licenses as of May 23, 1980, would be evaluated by the staff against the DOR Guidelines. As the Commission stated in the 10 CFR 50.49 final rule preamble, Category I requirements of NUREG-0588, which supplement the recommendations of and apply to equipment qualified in accordance with IEEE Std. 323/323a-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations" (Ref. 12), apply to nuclear power plants for which the construction permit safety evaluation report was issued after July 1, 1974. Category II requirements, which supplement the recommendations of and apply to equipment qualified in accordance with IEEE Std. 323-1971, "IEEE Trial-Use Standard: General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations" (Ref. 13), apply to nuclear power plants for which the construction permit safety evaluation report was issued before July 1, 1974. For plants whose safety evaluation reports for construction permits were issued since July 1, 1974, the NRC has used RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants" (Ref. 14).

- RG 1.63, “Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants,” (Ref. 15) describes a method acceptable to the NRC staff for complying with the regulatory requirements for the design, construction, testing, qualification, installation, and external circuit protection of electric penetration assemblies in containment structures.

- RG 1.73, “Qualification of Safety-Related Actuators in Production and Utilization Facilities” (Ref. 16), describes a method acceptable to the NRC staff for use in complying with the regulatory requirements with respect to the qualification of safety-related actuators.

- RG 1.89, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” describes a method acceptable to the NRC staff to meet regulatory requirements for EQ of certain electric equipment important to safety for nuclear power plants.

- RG 1.97, “Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants” (Ref. 17), describes a method that is acceptable to the NRC staff for use in complying with the regulatory requirements with respect to satisfying criteria for accident monitoring instrumentation in nuclear power plants.

- RG 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants” (Ref. 18), describes methods that the NRC staff considers acceptable for use in the seismic qualification of electrical and active mechanical equipment and the functional qualification of active mechanical equipment for nuclear power plants.

- RG 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors” (Ref. 19), provides guidance to licensees of operating power reactors on acceptable applications of alternative source terms; the scope, nature, and documentation of associated analyses and evaluations; consideration of impacts on analyzed risk; and content of submittals related to the use of alternative source terms in radiological consequence analyses at operating power reactors. RG 1.183 can be used in radiological accident analysis and provides acceptable accident source term methodologies that may be used for EQ, as applicable. Therefore, for those applicants and licensees to which RG 1.183 is applicable, this guide references RG 1.183 to describe acceptable source term methodologies to be used for EQ. However, RG 1.183 is not the only approved methodology for accident source terms, and additional source term methodologies may be approved in the future. While this guide does not specifically reference other accident source term methodologies, approved accident source term methodologies for EQ may continue to be used (provided that they remain applicable) and the staff may consider new methodologies. The source term methodologies used should be applicable to the specific applicant or licensee and adequate to address EQ requirements.

- RG 1.189, “Fire Protection for Nuclear Power Plants,” (Ref. 20) describes methods acceptable to the NRC staff to meet the regulatory requirements related to a fire protection program.

- RG 1.215, “Guidance for ITAAC Closure Under 10 CFR Part 52” (Ref. 21), describes a method for documenting the completion of ITAAC.

- RG 1.248, “Guide for Assessing, Monitoring, and Mitigating Aging Effects on Electrical Equipment Used in Production and Utilization Facilities” (Ref. 22), describes an approach that is acceptable to the NRC staff to meet regulatory requirements for managing, monitoring, and mitigating the aging effects on electrical equipment.

Purpose of Regulatory Guides

The NRC issues RGs to describe methods that are acceptable to the NRC staff for implementing specific parts of the NRC's regulations, to explain techniques that the staff uses in evaluating specific issues or postulated events, and to describe information that the staff needs in its review of applications for permits and licenses. RGs are not NRC regulations and compliance with them is not required. Methods and solutions that differ from those set forth in RGs are acceptable if supported by a basis for the issuance or continuance of a permit or license by the Commission.

Paperwork Reduction Act

This RG provides voluntary guidance for implementing the mandatory information collections in 10 CFR Parts 50 and 52 that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et. seq.). These information collections were approved by the Office of Management and Budget (OMB), under control number 3150-0011 and 3150-0151, respectively. Send comments regarding this information collection to the FOIA, Library, and Information Collections Branch, (T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by email to Infocollects.Resource@nrc.gov, or to the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0011 and 3150-0151), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street, NW, Washington, DC, 20503.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the document requesting document displays a valid OMB control number.

B. DISCUSSION

Reason for Issuance

This RG endorses, subject to the conditions described in Section C of this RG, IEEE Std. 1628-2023, which provides methods, directions, and documentation for the qualification of fiber-optic cables, connections, and optical fiber splices in safety systems of production and utilization facilities.

Background

This RG describes a method acceptable to the NRC staff for complying with the regulations for the qualification of fiber-optic cables, connections, and optical fiber splices in safety systems in production and utilization facilities. IEEE Std. 1682-2023 was prepared by IEEE Nuclear Power Engineering Committee Working Group 2.15 and was approved by the IEEE Standards Board on June 29, 2023.

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 during and after applicable DBEs. The NRC defines DBEs in 10 CFR 50.49(b)(1)(ii) as conditions of normal operation, including anticipated operational occurrences, design-basis accidents, external events, and natural phenomena for which the plant must be designed to ensure the functions listed in 10 CFR 50.49(b)(1)(i)(A) through (C).

In relation to the installation of fiber-optic cables, IEEE Std. 1428-2004, "IEEE Guide for Installation Methods for Fiber Optic Cables in Electric Power Generating Stations and in Industrial Facilities" (Ref. 23), provides guidance on selecting, applying, and installing fiber-optic cable. The NRC staff reviewed IEEE Std. 1428-2004 and found that this document contains information on installation methods for fiber-optic cables. However, this RG does not endorse IEEE Std. 1428-2004.

Consideration of International Standards

The International Atomic Energy Agency (IAEA) works with member states and other partners to promote the safe, secure, and peaceful use of nuclear technologies. The IAEA develops Safety Requirements and Safety Guides for protecting people and the environment from harmful effects of ionizing radiation. This system of safety fundamentals, safety requirements, safety guides, and other relevant reports, reflects an international perspective on what constitutes a high level of safety. To inform its development of this RG, the NRC considered IAEA Safety Requirements and Safety Guides pursuant to the Commission's International Policy Statement (Ref. 24) and Management Directive and Handbook 6.6, "Regulatory Guides" (Ref. 25).

The following IAEA Safety Guide and International Electrotechnical Commission (IEC)/IEEE Standard were considered in the development of this RG:

- IAEA Specific Safety Guide No. SSG-69, "Equipment Qualification for Nuclear Installations," issued 2021 (Ref. 26)

- IEC/IEEE Std. 60780-323, Edition 1, 2016-02, "IEC/IEEE International Standard—Nuclear facilities—Electrical equipment important to safety—Qualification" (Ref. 27) created based on a collaborative international effort to harmonize standard qualification practices developed

from IEC 60780:1998, “Nuclear Power Plants—Electrical Equipment of the Safety System—Qualification,” issued October 1998 (Ref. 28), and IEEE Std. 323-2003, “IEEE Standard for Qualifying Class 1E Electrical Equipment for Nuclear Power Generating Stations” (Ref. 29)

Documents Discussed in Staff Regulatory Guidance

This RG endorses, in part, the use of one or more codes or standards developed by external organizations, and other third-party guidance documents. These codes, standards and third-party guidance documents may contain references to other codes, standards or third-party guidance documents (“secondary references”). If a secondary reference has itself been incorporated by reference into NRC regulations as a requirement, then licensees and applicants must comply with that standard as set forth in the regulation. If the secondary reference has been endorsed in an RG as an acceptable approach for meeting an NRC requirement, then the standard constitutes a method acceptable to the NRC staff for meeting that regulatory requirement as described in the specific RG. If the secondary reference has neither been incorporated by reference into NRC regulations nor endorsed in an RG, then the secondary reference is neither a legally binding requirement nor a “generic” NRC approved acceptable approach for meeting an NRC requirement. However, licensees and applicants may consider and use the information in the secondary reference, if appropriately justified, consistent with current regulatory practice, and consistent with applicable NRC requirements.

C. STAFF REGULATORY GUIDANCE

The guidance in IEEE Std. 1682-2023 provides an acceptable approach to the NRC staff for meeting the NRC's regulatory requirements for the qualification of fiber-optic cables, connections, and optical fiber splices in safety systems in production and utilization facilities, subject to the following.

1. This RG does not endorse Section 2, "Normative references," of IEEE Std. 1682-2023. The following RGs contain additional information:

   - RG 1.63 endorses IEEE Std. 317, with clarifications.
   - RG 1.89 endorses IEC/IEEE 60780-323, with clarifications.
   - RG 1.100 endorses IEEE Std. 344, with clarifications.
   - RG 1.189 endorses IEEE Std. 1202, with clarifications.
   - RG 1.248 endorses IEEE Std. 1205.

2. Revise the fifth paragraph in Section 4, "Principle qualification criteria," of IEEE Std. 1682-2023 to remove extreme natural events and severe accident conditions, such that:

   > Degradation with time followed by exposure to environmental extremes of temperature, pressure, humidity, radiation, vibration, and if applicable, chemical spray and submergence resulting from a design basis event (DBE), can precipitate common-cause failures of fiber optic cable and/or connection assemblies. For this reason, it is necessary to establish a qualified life for fiber-optic cable and/or connection assemblies with significant aging mechanisms.

3. Revise Section 5.2, "Qualification by type testing," item b) in IEEE Std. 1682-2023 to remove extreme natural events and severe accident conditions: "The test conditions are at least as severe as the service conditions, plus margin, including DBEs, defined in the qualification plan."

4. Supplement Section 6.1, "General" of IEEE 1682-2023, regarding the guidance on the use and application of margins, with the following addition:

   > Margins should be applied in addition to any conservatism used during the derivation of local environmental conditions of the equipment unless these conservatisms can be quantified and shown to contain appropriate margins. The margins should account for variations in commercial production of the equipment and the inaccuracies in the test equipment.
   >
   > The design may require some electric equipment to perform its safety function only within the first 10 hours of the event. This equipment should remain functional in the accident environment for a period of at least 1 hour in excess of the time assumed in the accident analysis unless a time margin of less than 1 hour can be justified. This justification for each piece of equipment should include the following:
   >
   > (1) consideration of a spectrum of breaks,
   >
   > (2) the potential need for the equipment later in an event or during recovery operations,

(3) a determination that failure of the equipment after performance of its safety function will not be detrimental to plant safety or mislead the operator, and

(4) a determination that the margin applied to the minimum operability time, when combined with the other test margins, will account for the uncertainties associated with the use of analytical techniques in the derivation of environmental parameters, the number of units tested, production tolerances, and test equipment inaccuracies.

For all other equipment (e.g., post-accident monitoring), the 10 percent margin for equipment operating time should be used.

5. Remove the testing for extreme natural events and severe accidents in Section 6.2, "Type test sample selection," in IEEE Std. 1682-2023, such that fiber-optic cable and connection assemblies exposed to DBE conditions are tested, preferably as an assembly.

6. Remove extreme natural events and severe accidents in Section 6.4, "Age Conditioning," in IEEE Std. 1682-2023, such that normal operating conditions over time may influence the ability of fiber-optic cables and connection assemblies to withstand the extreme environments imposed during the DBE.

7. Regarding vibration (non-seismic) aging, as discussed in Section 6.5.3.2, "Vibration (non-seismic) aging" of IEEE Std. 1682-2023, additional information appears in RG 1.100 and RG 1.73. Regarding seismic tests in section 6.5.4, "Seismic Tests," of IEEE Std.1682-2023, additional information appears in RG 1.100.

8. This RG does not endorse Section 6.5.6, "Design extension conditions," of IEEE Std. 1682-2023.

9. Annex A, "Cable families," is informative; the endorsement of IEEE Std. 1682-2023 does not include endorsement of Annex A.

D. IMPLEMENTATION

The NRC staff may use this RG as a reference in its regulatory processes, such as licensing, inspection, or enforcement. However, the NRC staff does not intend to use the guidance in this RG to support NRC staff actions in a manner that would constitute backfitting as that term is defined in 10 CFR 50.109, "Backfitting", and as described in NRC Management Directive 8.4, "Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests," (Ref. 30), nor does the NRC staff intend to use the guidance to affect the issue finality of an approval under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The staff also does not intend to use the guidance to support NRC staff actions in a manner that constitutes forward fitting as that term is defined and described in Management Directive 8.4. If a licensee believes that the NRC is using this RG in a manner inconsistent with the discussion in this Implementation section, then the licensee may file a backfitting or forward fitting appeal with the NRC in accordance with the process in Management Directive 8.4.

REFERENCES[1]

These references indicate the versions of the documents available at the time of issuance of this RG. Licensees or applicants using this RG should check all referenced documents to verify that no change has occurred since the issuance of the RG.

1. Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 1682-2023, "IEEE Standard for Qualifying Fiber Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems in Nuclear Power Generating Stations," Piscataway, New Jersey, December 15, 2023.[2]

2. *U.S. Code of Federal Regulations* (CFR), "Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter 1, Title 10, "Energy."

3. CFR, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Part 52, Chapter 1, Title 10, "Energy."

4. IEEE Std. 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations" [including the correction sheet dated January 30, 1995], Piscataway, New Jersey, December 31, 1991.

5. IEEE Std. 279-1971, "IEEE Standard: Criteria for Protection Systems for Nuclear Power Generating Stations," Piscataway, New Jersey, November 30, 1970.

6. NRC, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors," *Federal Register*, Vol. 69, No. 225: pp. 68008 (69 FR 68008), Washington, DC, November 22, 2004.

7. Atomic Energy Act of 1954, as amended.

8. U.S. Nuclear Regulatory Commission (NRC), NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment," Revision 3, Washington, DC, March 2007 (Agencywide Documents Access and Management System Accession No. ML063600397).

9. NRC, CLI-80-21, "Petition for Emergency and Remedial Action," Washington, DC, May 23, 1980 (ML13282A699)

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[1] Publicly available NRC published documents are available electronically through the NRC Library on the NRC's public website at http://www.nrc.gov/reading-rm/doc-collections and through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html. For problems with ADAMS, contact the Public Document Room staff at 301-415-4737 or (800) 397-4209, or email pdr.resource@nrc.gov. The NRC Public Document Room (PDR), where you may also examine and order copies of publicly available documents, is open by appointment. To make an appointment to visit the PDR, please send an email to PDR.Resource@nrc.gov or call 1-800-397-4209 or 301-415-4737, between 8 a.m. and 4 p.m. eastern time (ET), Monday through Friday, except Federal holidays.

[2] Copies of IEEE documents may be purchased from the Institute of Electrical and Electronics Engineers Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, New Jersey 08855, or through the IEEE's public website at http://www.ieee.org/publications_standards/index.html.

10. NRC, NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," Washington, DC, July 1981 (ML031480402).

11. NRC, Division of Operating Reactors Guidelines, "Guidelines for Evaluating Qualification of Class 1E Electrical Equipment in Operating Reactors," Washington, DC, November 13, 1979

12. IEEE Std. 323/323a-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations," New York, New York, November 30, 1973.

13. IEEE Std. 323-1971, "IEEE Trial-Use Standard: General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations," New York, New York, April 1, 1971.

14. NRC, Regulatory Guide (RG) 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Washington, DC.

15. NRC, RG 1.63, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants," Washington, DC.

16. NRC, RG 1.73, "Qualification of Safety-Related Actuators in Production and Utilization Facilities," Washington, DC.

17. NRC, RG 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," Washington, DC.

18. NRC, RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," Washington, DC.

19. NRC, RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," Washington, DC.

20. NRC, RG 1.189, "Fire Protection for Nuclear Power Plants," Washington, DC.

21. NRC, RG 1.215, "Guidance for ITAAC Closure Under 10 CFR Part 52," Washington, DC.

22. NRC, RG 1.248, "Guide for Assessing, Monitoring, and Mitigating Aging Effects on Electrical Equipment Used in Production and Utilization Facilities," Washington, DC.

23. IEEE Std. 1428-2004, "IEEE Guide for Installation Methods for Fiber Optic Cables in Electric Power Generating Stations and in Industrial Facilities," Piscataway, New Jersey, July 18, 2005.

24. NRC, "Nuclear Regulatory Commission International Policy Statement," *Federal Register*, Vol. 79, No. 132: pp. 39415 (79 FR 39415), Washington, DC, July 10, 2014.

25. NRC, Management Directive and Handbook 6.6, "Regulatory Guides," Washington, DC.

26. International Atomic Energy Agency (IAEA) Specific Safety Guide No. SSG-69, "Equipment Qualification for Nuclear Installations," Vienna, Austria, 2021.[3]

27. International Electrotechnical Commission (IEC)/IEEE 60780-323:2016, "IEC/IEEE International Standard—Nuclear facilities—Electrical equipment important to safety—Qualification," Geneva, Switzerland, February 2016.[4]

28. IEC 60780:1998, "Nuclear Power Plants—Electrical Equipment of the Safety System—Qualification," Geneva, Switzerland, October 1998.

29. IEEE Std. 323-2003, "IEEE Standard for Qualifying Class 1E Electrical Equipment for Nuclear Power Generating Stations," New York, New York, January 23, 2004.

30. NRC, Management Directive 8.4, "Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests," Washington, DC.

[3] Copies of International Atomic Energy Agency (IAEA) documents may be obtained through their Web site: WWW.IAEA.Org/ or by writing the International Atomic Energy Agency, P.O. Box 100 Wagramer Strasse 5, A-1400 Vienna, Austria.

[4] Copies of IEC documents may be obtained through the IEC website at http://www.iec.ch/ or by writing the IEC Central Office at P.O. Box 131, 3 Rue de Varembé, 1211 Geneva, Switzerland, telephone +41 22 919 02 11.