

U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-3055



Proposed new Regulatory Guide 3.76

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IMPLEMENTATION OF AGING MANAGEMENT REQUIREMENTS FOR SPENT FUEL STORAGE RENEWALS

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 the format and content of applications for renewals of specific licenses for independent spent fuel storage installations (ISFSIs) and certificates of compliance (CoCs) for spent fuel storage cask designs, and implementation of aging management programs (AMPs) for holders of CoCs and specific and general ISFSI licensees subject to renewal requirements. It endorses, with clarifications, the Nuclear Energy Institute (NEI) guidance in NEI 14-03, Revision 2, "Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management," issued December 2016 (Ref. 1).

Applicability

This RG applies to applicants for renewal of CoCs and specific ISFSI licenses, and to holders of CoCs and specific and general licenses subject to the regulatory requirements for spent fuel storage renewals in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste" (Ref. 2). This guidance addresses requirements for the renewal of specific ISFSI licenses and CoCs for spent fuel storage cask designs in 10 CFR 72.42, "Duration of license; renewal," and 10 CFR 72.240, "Conditions for spent fuel storage cask renewal," respectively.

Applicable Regulations

- 10 CFR Part 72 provides requirements, procedures, and criteria for the issuance of licenses to receive, transfer, and possess power reactor spent fuel, power reactor-related greater-than-Class-C waste, and other radioactive materials associated with spent fuel storage in an ISFSI and the terms and conditions under which the Commission will issue these licenses. The regulations in this part

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 Web site, <http://www.regulations.gov>, by searching for draft regulatory guide DG-3055. 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.

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also establish requirements, procedures, and criteria for the issuance of CoCs approving spent fuel storage cask designs.

- 10 CFR 72.42 provides requirements for the renewal of ISFSI specific licenses and license renewal applications, including requirements for time-limited aging analyses (TLAAs) and AMPs.
- 10 CFR 72.240 provides requirements for the renewal of spent fuel storage cask designs and CoC renewal applications, including requirements for TLAAAs and AMPs.

Related Guidance

- NUREG-1927, Revision 1, “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel,” issued June 2016 (Ref. 3), provides guidance for the NRC’s safety review of renewal applications for ISFSI specific licenses and CoCs for spent fuel storage cask designs.
- NUREG-2214, Revision 0, “Managing Aging Processes In Storage (MAPS) Report,” issued July 2019 (Ref. 4), provides a generic technical basis for renewal of ISFSI specific licenses and CoCs for spent fuel storage cask designs.

Purpose of Regulatory Guides

The NRC issues RGs to describe methods that are acceptable to the staff for implementing specific parts of the agency’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. Regulatory guides 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 Part 72 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), approval number 3150-0132. Send comments regarding this information collection to the Information Services Branch (T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the OMB reviewer at: OMB Office of Information and Regulatory Affairs (3150-0010), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street, NW Washington, DC 20503; e-mail: oir_submission@omb.eop.gov.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

B. DISCUSSION

Reason for Issuance

This RG provides guidance to industry for complying with and implementing the requirements for spent fuel storage renewals in 10 CFR Part 72. This guidance addresses the format and content of applications for renewal of ISFSI specific licenses and CoCs for spent fuel storage cask designs in 10 CFR 72.42 and 10 CFR 72.240, respectively, and the implementation of AMPs. The guidance uses an operations-focused approach to aging management, in which operating experience is shared through an industry database and continually assessed to adjust AMPs, as needed and within regulatory limits, to ensure the effectiveness of aging management activities during the period of extended operation (PEO) and the continued safe storage of spent fuel.

Background

Based on lessons learned from reviews of storage renewal applications and input received from the public, industry, and other stakeholders, the NRC identified a need for guidance on storage renewals. The NRC held public meetings with stakeholders in 2014 and 2015 to discuss the NRC's and industry's plans to develop such guidance. In response to the stakeholder input, the NRC developed NUREG-1927, Revision 1, in June 2016. In parallel with the NRC's efforts, NEI developed industry guidance in NEI 14-03. This guidance is intended to complement the NRC staff guidance in NUREG-1927, Revision 1, and provide specific guidance to industry on the preparation of spent fuel storage renewal applications and the implementation of AMPs.

NEI 14-03 provides an operations-based, learning approach to aging management for the storage of spent fuel, which builds on the lessons learned from industry's experience with aging management for reactors. Specifically, NEI 14-03 provides a framework for sharing operating experience through an industry-developed database called the ISFSI Aging Management Institute of Nuclear Power Operations Database (AMID). NEI 14-03 also includes a framework for learning AMPs through the use of "tollgates," which offer a structured approach for periodically assessing operating experience and data from applicable research and industry initiatives. AMID provides operating experience information and a basis to support licensees' future changes to AMPs. AMID and tollgates are considered key elements in ensuring the effectiveness of aging management activities during the PEO and continued safe storage of spent fuel.

NEI developed NEI 14-03, Revision 2, with consideration of NRC comments on prior revisions of the document. NEI submitted NEI 14-03, Revision 0, for NRC review on September 23, 2014 (Ref. 5), and the NRC sent NEI comments on January 21, 2015 (Ref. 6). NEI submitted NEI 14-03, Revision 1, on September 24, 2015 (Ref. 7), and the NRC sent NEI comments on August 18, 2016 (Ref. 8). NEI submitted NEI 14-03, Revision 2, on December 21, 2016. On January 2, 2019 (Ref. 9), the NRC sent NEI comments on NEI 14-03, Revision 2, and communicated its desire to proceed with the development of guidance that partially endorses NEI 14-03, Revision 2, as was stated at that time. On February 1, 2019, NEI responded in a letter agreeing with the NRC's approach (Ref. 10). This RG endorses NEI 14-03, Revision 2, with clarifications, as discussed in Section C of this RG.

Following the issuance of NUREG-1927, Revision 1, and NEI's submittal of NEI 14-03, Revision 2, the NRC published NUREG-2214, Revision 0, in July 2019. NUREG-2214 establishes a generic technical basis for the safety review of spent fuel storage renewal applications, in terms of evaluating (1) aging mechanisms and effects that could affect the ability of ISFSI and spent fuel storage cask structures, systems, and components (SSCs) to fulfill their safety functions in the PEO (i.e., credible

aging mechanisms and effects) and (2) aging management approaches to address credible aging effects, including examples of AMPs that are considered generically acceptable to address the credible aging effects to ensure that the design bases will be maintained during the PEO. The guidance is intended for use by industry applicants to develop spent fuel storage renewal applications, and by the NRC staff to review the applications.

NEI 14-03 does not address the details of technical issues, but rather it notes that NUREG-2214, when issued, was expected to be a technical resource for renewal applicants, much like NUREG-1801, “Generic Aging Lessons Learned (GALL) Report” (Ref. 11), for nuclear power plant aging management. NUREG-2214 provides guidance that, if an applicant references the generic technical basis in that NUREG, the application should clearly identify any differences between the proposed technical approach and that in the NRC guidance. In this way, the renewal applications may focus on those areas for which the generic technical basis in NUREG-2214 does not apply or for which applicants propose an alternative approach. The NRC will compare the applicant’s technical basis for its aging management review (AMR) and proposed AMPs to the generic technical basis in NUREG-2214.

Through the NRC’s oversight function, the agency will inspect licensees’ implementation of AMP elements and TLAAs as described in the updated final safety analysis report (UFSAR) during the PEO.

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 Standards and Safety Guides for protecting people and the environment from harmful effects of ionizing radiation. These standards and guides provide a system of safety fundamentals, safety requirements, and safety guides reflecting an international perspective on what constitutes a high level of safety. The NRC staff has reviewed such IAEA documents and did not identify any relevant information related to the topics in this RG.

Documents Discussed in Staff Regulatory Guidance

This RG endorses the use of guidance developed by an external organization (NEI). This NEI document 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 a 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 a 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 NRC staff endorses NEI 14-03, Revision 2, as generally acceptable for use in complying with the requirements in 10 CFR 72.42 and 10 CFR 72.240. However, the NRC staff provides clarifications to specific sections in NEI 14-03, Revision 2, as described below.

1. NEI 14-03, Revision 2, Section 3.6.2.2, on Surrogate Inspections

NEI 14-03, Section 3.6.2.2, states, “Baseline inspections for general licensees need not be conducted at every ISFSI using the same storage technology. Appropriately justified use of surrogate inspections for bounding components may be used by multiple general licensees.” The guidance then provides a discussion on how surrogate inspections could be used for stainless steel canisters based on susceptibility to chloride-induced stress-corrosion cracking (CISCC). The guidance states that the concepts laid out in the discussion on canister surrogate inspections should be applied to other potential SSCs and degradation mechanisms, as appropriate, such as concrete spalling/cracking or carbon steel corrosion. The guidance further recognizes the use of surrogate inspections in Sections 4.2 and 4.3. Finally, the guidance references the NRC’s position on surrogate inspections discussed in NUREG-1927, Revision 1.

Clarification—NUREG-1927, Revision 1, notes that surrogate inspections may be acceptable only when substantial operating experience provides a basis for their use. The NRC has not approved the use of surrogates for AMPs for any spent fuel storage cask SSCs, such as canisters and overpacks, as of the date this RG was issued. For example, there is currently insufficient operating experience from canister examinations for the various rankings of susceptibility to CISCC to understand how the susceptibility assessments may be applied, and surrogates used, across the ISFSI fleet.

An example AMP for localized corrosion and stress-corrosion cracking of welded stainless steel dry storage canisters, provided in Table B-1 of NUREG-1927, Revision 1, and Table 6-2 of NUREG-2214, gives additional clarification on the use of surrogates. The example AMP notes that an approach of using surrogates would need to be justified on a case-by-case basis for each ISFSI site, considering canister examination results for the various rankings of susceptibility to CISCC.

For SSCs other than welded stainless steel canisters, there are limited AMP inspection results and no industry or NRC guidance for determining which SSCs may be appropriate for the use of surrogate inspections. An approach that considers variability in the materials of construction, the effects of environmental and operational parameters on aging effects, and operational experience gained from conducting AMP inspections is necessary for identifying potential surrogates for SSCs other than storage canisters.

2. NEI 14-03, Revision 2, Section 1.6, Applicability to a Consolidated Interim Storage Facility

NEI 14-03, Section 1.6, discusses the applicability of the guidance to a consolidated interim storage facility (CISF) in terms of when “aging management” applies to certain SSCs that have been in service for some period of time at another storage location before they are stored at a CISF.

Clarification—The use of the terms “aging management” or “period of extended operation” for these SSCs is not appropriate in the context of an initial application for a CISF because such an application is for an initial license term and not a renewed term that would be subject to the aging management requirements in 10 CFR 72.42. The NRC notes that a CISF license application would need to address the design and performance, including materials performance, of SSCs during the requested

license term, including for SSCs that have been in service at a previous storage location. To address issues associated with materials aging degradation and to demonstrate adequate materials performance in the requested initial license term, a CISF applicant should describe maintenance programs (e.g., monitoring, inspections) to address materials aging degradation, consistent with the guidance in Section 8.5.14 of NUREG-2215, “Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities,” issued April 2020 (Ref. 12). The proposed maintenance activities should provide for the timely identification of materials degradation such that corrective actions can be implemented before a loss of intended function.

3. NEI 14-03, Revision 2, Chapter 2, Renewal Application Format and Content

- a. Section 2.2.1 discusses the cover letter for renewal applications.

Clarification—The NRC staff notes that applicants are required to submit renewal applications under oath or affirmation, in accordance with 10 CFR 72.16, “Filing of application for specific license.”

- b. Section 2.2.2 states that the renewal application should include references not readily available in the open literature.

Clarification—The NRC does not require a renewal application to include references not readily available in the open literature. The NRC only expects such references to be provided upon NRC request.

- c. Section 2.2.2 states that applicants should provide a list of drawings for the licensed components applicable to each CoC amendment (i.e., part of the certification basis).

Clarification—The NRC staff notes that some applicants for CoC and specific license renewals have used and referenced fabrication drawings in their renewal applications (e.g., for the scoping evaluation or identification of materials in the AMR). If the renewal application uses fabrication drawings because they contain specific information on materials needed for the AMR, the licensing or design bases should capture this materials information (e.g., the renewal application may include the AMR tables, with subcomponents and materials information, in the proposed UFSAR supplement).

- d. Section 2.2.2.2 discusses the scoping evaluation.

Clarification—The renewal application should be clear on the basis for the safety classification of SSCs reported in the scoping results (e.g., include a cross-check to the UFSAR information, such as a table, drawing, or calculation, that confirms the reported safety classification). In addition, the scoping tables should clearly identify the SSCs that are in scope and are included in the AMR, and which SSCs are not in scope and are not included in the AMR. For not-important-to-safety SSCs that are included in scope, the application should provide the bases for that determination (e.g., the reliance on an SSC’s performance in the assumptions for a design-basis calculation or analysis).

- e. Section 2.2.2.3.a discusses the identification of in-scope SSCs and notes that active and short-lived components do not require an AMR.

Clarification—The AMR can exclude active or short-lived components if they do not meet either of the scoping criteria in NUREG-1927, Revision 1, Section 2.4.2.

- f. Section 2.2.2.3.b discusses “flexible AMPs” for CoCs.

Clarification—Such AMPs should include specific conditions for a general licensee to determine how the AMP activities are to be applied to its site (e.g., selection of the site-specific inspection frequency or inspection coverage). This differs from a “learning AMP,” which may be adjusted (by a CoC holder, general licensee, or specific licensee) in the PEO to respond to operating experience to ensure the AMP remains adequate, as discussed in NEI 14-03, Sections 2.2.5, 3.6.5, and 4.2. Applicants for CoC renewals should consider the discussion in Appendix E to NUREG-1927, Revision 1.

- g. Section 2.2.2.7 and the “tollgate” definition state that the renewed license or CoC should include a requirement to perform tollgate assessments.

Clarification—Alternatively, an applicant may include its use of a tollgate assessment in the proposed UFSAR supplement.

- h. Section 2.2.2.8 states that the renewal application should summarize the proposed UFSAR changes.

Clarification—The renewal application should include the specific UFSAR proposed changes, not just a summary of the proposed changes. The NRC typically adds a condition to a renewed license or CoC to update the UFSAR with the proposed changes within a certain amount of time following the renewal, and this condition may reference the submittal of the specific UFSAR proposed changes.

- i. Section 2.2.3.1 discusses changes made under 10 CFR 72.48, “Changes, tests, and experiments,” and states that the drawings and UFSAR information provided in the renewal application should reflect all changes included in updates to the UFSAR required by 10 CFR 72.70 or 10 CFR 72.248, both titled “Safety analysis report updating.”

Clarification—The NRC staff notes that changes may have been made to the UFSAR since the last biennial submittal of the UFSAR in accordance with 10 CFR 72.70 or 10 CFR 72.248 (e.g., as a result of amendments or 10 CFR 72.48 changes). Therefore, the applicant should (1) discuss the changes made to the UFSAR since the last biennial submittal to the NRC, or (2) submit the current version of the UFSAR (even if outside of biennial submittal window) to reflect the current design bases (including all 10 CFR 72.48 changes) to support the renewal application.

4. NEI 14-03, Revision 2, Sections 3.6.2.1, 3.6.2.2, and 4.3, on the Selection of SSCs for Inspection

Sections 3.6.2.1, 3.6.2.2, and 4.3 discuss that the selection of SSCs for inspection should consider the accessibility of spent fuel storage cask SSCs and maintenance of personnel doses as low as is reasonably achievable (ALARA).

Clarification—The selection of SSCs for inspection should be based on factors that may contribute to potential aging mechanisms and effects and should not only be based on considerations of accessibility and maintaining personnel doses ALARA. The ALARA consideration should guide the methods, equipment, and procedures to perform the inspection.

5. NEI 14-03, Revision 2, Section 4.4.2, Fuel Performance and Internals

Section 4.4.2 states that licensees and CoC holders are expected to consider relevant research and development related to high burnup fuel integrity, including the demonstration program of the High Burnup Dry Storage Cask Research and Development Project.

Clarification—Applicants should also refer to Appendix D to NUREG-1927, Revision 1, on the use of a demonstration program to confirm the integrity of high burnup fuel during the PEO.

D. IMPLEMENTATION

The NRC staff may use this regulatory guide 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 regulatory guide to support NRC staff actions in a manner that would constitute backfitting as that term is defined in 10 CFR 72.62, “Backfitting,” and described in NRC Management Directive 8.4, “Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests,” issued September 2019 (Ref. 13). 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. The backfitting and forward fitting considerations in 10 CFR 72.62 and NRC Management Directive 8.4 apply to holders of general and specific licenses for ISFSIs and monitored retrievable storage installations issued under 10 CFR Part 72. However, the backfitting and forward fitting considerations in 10 CFR 72.62 and NRC Management Directive 8.4 do not apply to CoC holders. If a licensee believes that the NRC is using this regulatory guide 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.

REFERENCES¹

1. Nuclear Energy Institute (NEI), “Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,” NEI 14-03, Revision 2, Washington, DC, December 2016, ADAMS Accession No. ML16356A204.
2. *U.S. Code of Federal Regulations* (CFR), “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste,” Part 72, Chapter 1, Title 10, “Energy.”
3. U.S. Nuclear Regulatory Commission (NRC), “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel,” NUREG-1927, Revision 1, June 2016, ADAMS Accession No. ML16179A148.
4. NRC, “Managing Aging Processes In Storage (MAPS) Report,” NUREG-2214, July 2019, ADAMS Accession No. ML19214A111.
5. NEI, “Guidance for Operations-Based Aging Management for Dry Cask Storage,” NEI 14-03, Revision 0, Washington, DC, September 2014, ADAMS Accession No. ML14266A224.
6. NRC, “Response to September 23, 2014, Nuclear Energy Institute Submittal: NEI 14-03, ‘Guidance for Operations-Based Aging Management for Dry Cask Storage,’ Revision 0,” January 21, 2015, ADAMS Accession No. ML15013A201.
7. NEI, “Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,” NEI 14-03, Revision 1, Washington, DC, September 2015, ADAMS Accession No. ML15272A329.
8. NRC, “Response to September 2015, Nuclear Energy Institute Submittal: NEI 14-03, ‘Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,’ Revision 1,” August 18, 2016, ADAMS Accession No. ML16180A018.
9. NRC, “Response to December 21, 2016, Nuclear Energy Institute Submittal: NEI 14-03, ‘Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,’ Revision 2,” January 2, 2019, ADAMS Accession No. ML18325A207.
10. NEI, “Industry Comments Regarding NRC Response to December 21, 2016, Nuclear Energy Institute Submittal: NEI 14-03, ‘Format, Content and Implementation Guidance for Dry Cask Storage Operations-Based Aging Management,’ Revision 2,” February 1, 2019, ADAMS Accession No. ML19192A141.
11. NRC, “Generic Aging Lessons Learned (GALL) Report,” NUREG-1801.

¹ Publicly available NRC published documents are available electronically through the NRC Library on the NRC’s public Web site 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>. The documents can also be viewed online or printed for a fee in the NRC’s Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD. For problems with ADAMS, contact the PDR staff at 301-415-4737 or (800) 397-4209; fax (301) 415-3548; or e-mail pdr.resource@nrc.gov.

12. NRC, "Standard Review Plan for Spent Fuel Dry Storage Systems and Facilities," NUREG-2215, April 2020, ADAMS Accession No. ML20121A190.
13. NRC, Management Directive 8.4, "Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests," September 20, 2019, ADAMS Accession No. ML18093B087.