U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE 1.207, REVISION 1

Issue Date: June 2018
Technical Lead: Robert Tregoning

GUIDELINES FOR EVALUATING THE EFFECTS OF LIGHT-WATER REACTOR WATER ENVIRONMENTS IN FATIGUE ANALYSES OF METAL COMPONENTS

A. INTRODUCTION

Purpose

This regulatory guide (RG) describes methods and procedures that the staff of the U.S. Nuclear Regulatory Commission (NRC) considers acceptable for use in determining the acceptable fatigue lives of components evaluated by a cumulative usage factor (CUF) calculation in accordance with the fatigue design rules in Section III, "Rules for Construction of Nuclear Power Plant Components," of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereinafter "Code") (Ref. 1), to account for the effects of light-water reactor (LWR) water environments.

Applicability

This guide supports reviews of applications for new nuclear reactor construction permits or operating licenses under *U.S. Code of Federal Regulations*, Title 10, "Energy" (10 CFR), Part 50, "Domestic Licensing of Production and Utilization Facilities" (Ref. 2); design certifications and combined licenses under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," (Ref. 3); and renewed operating licenses under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (Ref. 4).

Applicable Rules and Regulations

- General Design Criterion (GDC) 1, "Quality Standards and Records," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires, in part, that structures, systems, and components that are important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function performed. In addition, GDC 30, "Quality of Reactor Coolant Pressure Boundary," requires, in part, that components that are part of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest practical quality standards.

Written suggestions regarding this guide or development of new guides may be submitted through the NRC's public Web site under the Regulatory Guides document collection of the NRC Library at http://www.nrc.gov/reading-rm/doc-collections/reg-guides/contactus.html.

Electronic copies of this regulatory guide, previous versions of RGs, and other recently issued guides are available through the NRC's public Web site under the Regulatory Guides document collection of the NRC Library at http://www.nrc.gov/reading-rm/doc-collections/. The regulatory guide is also available through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html, under ADAMS Accession No. ML16315A130. The regulatory analysis may be found in ADAMS under Accession No. ML14171A585 and the staff responses to the public comments on DG-1309 may be found under ADAMS Accession No. ML16315A127.

- Section 50.55a(c), “Reactor Coolant Pressure Boundary,” requires, in part, that components of the reactor-coolant pressure boundary meet the requirements for Class 1 components in Section III of the ASME Code, except as provided in that section. Specifically, the ASME Class 1 requirements contain provisions, including fatigue design curves, for determining a component’s suitability for cyclic service. These provisions are used for those components that are exposed to reactor coolant and are required by regulation to have a fatigue CUF calculation or have an existing current licensing basis (CLB) fatigue CUF calculation.

Related Guidance

- U.S. NRC, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” NUREG-1800 (Ref. 5), provides guidance to NRC staff reviewers for performing safety reviews of applications to renew nuclear power plant.

- U.S. NRC, “Generic Aging Lessons Learned (GALL) Report,” NUREG-1801 (Ref. 6), contains the staff's generic evaluation of existing plant programs and documents the technical basis for determining where existing programs are adequate without modification and where existing programs should be augmented for the period of extended operation.

- U.S. NRC, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” NUREG-2191 (Ref. 7), provides guidance for SLR applicants and contains the NRC staff’s generic evaluation of plant aging management programs (AMPs) and establishes the technical basis for their adequacy. The GALL-SLR Report contains recommendations on specific areas for which existing AMPs should be augmented for SLR

- U.S. NRC, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” NUREG-2192 (Ref. 8), provides guidance to NRC staff reviewers for performing safety reviews of applications to renew nuclear power plant licenses for the subsequent license renewal period.

Purpose of Regulatory Guides

The NRC issues RGs to describe to the public methods that the staff considers acceptable for use in implementing specific parts of the agency’s regulations, to explain techniques that the staff uses in evaluating specific problems or postulated events, and to provide guidance to applicants. Regulatory guides are not substitutes for regulations and compliance with them is not required. Methods and solutions that differ from those set forth in regulatory guides will be deemed acceptable if they provide an acceptable basis for the findings required for the issuance or continuance of a permit or license by the Commission.

Paperwork Reduction Act

This RG provides guidance for implementing the mandatory information collections in 10 CFR Parts 50, 52, and 54 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 numbers 3150-0011, 3150-0151, and 3150-0155. Send comments regarding this information collection to the Information Services Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0011, 3150-0151, 3150-0155), Office of Management and Budget, Washington, DC 20503.

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 Revision

This revision of the RG (Revision 1) consolidates, updates, and replaces previous NRC staff guidance on the effects of LWR water environments on the fatigue lives of nuclear power plant components. This revision updates previous guidance for new reactors provided in Revision 0 of this guide, and previous guidance for the license renewal of operating reactors provided in the GALL Report and the Standard Review Plan for License Renewal (SRP-LR).

Background

This RG provides guidance for determining the acceptable fatigue lives of components using a CUF calculation performed in accordance with the fatigue design provisions in Section III of the ASME Code, and incorporates the effects of LWR water environments. An LWR water environment is defined within this guidance as any transient or steady-state environment in a light water commercial nuclear power plant where the component of interest is exposed to water above 50^{o}C.

The guidance in Revision 0 of this RG, the GALL Report, and the SRP-LR was developed in response to the closeout of Generic Safety Issue (GSI) 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life" (Ref. 9), which documented the NRC staff's selection of the environmental fatigue correction factor (F_{en}) method as an acceptable method to properly incorporate LWR environmental effects into fatigue CUF calculations for ASME Code components. For operating reactors, the NRC staff's closeout of GSI-190 identified that, because of significant conservatism in quantifying other plant-related variables involved in CUF calculations (such as cyclic behavior, including stress and loading rates), the 40-year design of the current fleet of reactors was satisfactory. Therefore, the NRC staff concluded that backfitting a new regulatory requirement on operating reactors was not necessary. However, the calculations that supported the resolution of this issue indicated the potential for an increase in the frequency of pipe leaks as plants continue to operate. Thus, applying a risk-informed perspective, the staff concluded that applicants for renewed licenses should address the effects of LWR water environments on component fatigue lives as they develop aging management programs for license renewal. These findings were documented in the initial versions of the GALL Report and the SRP-LR as guidance for plants pursuing license renewal. The NRC staff's closeout of GSI 190 and associated research also led to the development of Revision 0 of RG 1.207 (Ref. 10) to document guidance related to the evaluation of environmental effects for new reactors. The guidance provided in Revision 1 of RG 1.207 is a consolidation and update of the staff's previous guidance and may be used to address the effects of the LWR water environment in a CUF calculation in licensing applications associated with reactor designs submitted for NRC approval, operating reactors pursuing license renewal, and plants where addressing such effects is part of their licensing basis.

In the late 1960s and early 1970s, ASME developed design fatigue curves for Section III of the ASME Code based on laboratory tests conducted in air environments at room temperature. The original ASME Code developers applied a margin of two on strain (or stress) and a margin of twenty on cyclic life to develop design fatigue curves that accounted for variations in materials, size, surface finish, data scatter, minor differences between laboratory and industrial air environments, and temperature differences between specimen test conditions and reactor operating conditions. However, the developers lacked sufficient data to evaluate and account for fatigue life degradation attributable to component exposure to aqueous coolants. Reflecting this circumstance, Paragraph NB-3121, "Corrosion," in Section III of the ASME Code from 1971 onward, states that the design fatigue curves do not include tests in the presence of corrosive environments that might accelerate fatigue failure. Paragraph NB-3121 further states that provisions for the presence of corrosive environments that might accelerate fatigue failure shall be included in the design or specified life of components. More recent fatigue test data from the United States (including the results of NRC research activities), Japan, and elsewhere show that LWR water environments can have a significant impact on the fatigue lives of laboratory test specimens made from carbon, low-alloy, austenitic stainless steel (both wrought and cast), and nickel-chromium-iron (Ni-Cr-Fe) alloy steels and welds.

In the 1990s, as a part of NRC research activities on fatigue, the staff evaluated two distinct methods for incorporating LWR environmental effects into the fatigue analysis of ASME Code, Class 1 components. The first method involved developing new fatigue curves that were applicable to LWR water environments. Given that the fatigue life of ASME Code, Class 1 components in LWR water environments is a function of several parameters, this method necessitated the development of several fatigue curves to address potential parameter variations. Alternatively, a single *bounding* fatigue curve could be developed, but this approach might be overly conservative for most applications. The second method involved using an environmental factor (F_{en}) to adjust the CUF calculated with the design fatigue curves in Section III of the ASME Code to account for LWR water environments. The second method affords the designer greater flexibility to calculate the appropriate impacts for specific environmental parameters. Based on the results of the NRC's efforts, the staff elected to develop guidance that used the F_{en} method.

In developing the underlying F_{en} models, researchers from Argonne National Laboratory (ANL) analyzed laboratory data to predict fatigue lives as a function of temperature, strain rate, dissolved oxygen level in water, and sulfur content of the steel. ANL defined F_{en} as the ratio of the component fatigue life in a room temperature air environment to its fatigue life in an LWR water environment at operating temperature. The resultant F_{en} method also postulated a strain threshold below which environmental effects on fatigue lives did not occur. Calculating CUF using the provisions set forth in Section III of the ASME Code and multiplying the CUF by F_{en} provided a means of incorporating the environmental effects identified in Paragraph NB-3121 of Section III of the ASME Code when warranted.

The NRC staff initially published the F_{en} method in NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," for carbon and low-alloy steel materials and NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels," for austenitic stainless steel materials. In 2001, the NRC staff endorsed the F_{en} methods in NUREG/CR-6583 and NUREG/CR-5704 for use by licensees pursuing license renewal in the initial versions of the GALL Report and the SRP-LR. Additional data evaluation subsequent to the publication of these two documents resulted in a revised F_{en} method for new reactors that the staff documented in Revision 0 of NUREG/CR-6909. The staff published guidance for the revised F_{en} methodology for new reactors in 2007 in Revision 0 of RG 1.207. The staff published Revision 0 of NUREG/CR-6909, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials—Final Report," as an alternative to NUREG/CR-6583 and NUREG/CR-5704 for use by licensees pursuing license renewal in 2010 as documented in Revision 2 of the GALL Report and the SRP-LR. Because the methods for addressing environmental effects in NUREG/CR-6583 and NUREG/CR-5704 are generally conservative compared to the methods in Revision 0 of NUREG/CR-6909, Revision 2 of the GALL Report and the SRP-LR endorsed the use of the methods in either NUREG/CR-6583 and NUREG/CR-5704 or NUREG/CR-6909 in license renewal applications.

As part of further NRC-funded research efforts performed since the publication of Revision 0 of RG 1.207, the NRC staff evaluated additional fatigue data (primarily from Japan), incorporated relevant data in the staff's previously developed database, and updated the fatigue life models. The NRC staff also evaluated and incorporated relevant feedback from interested stakeholders based on the use of the F_{en} methods published in NUREG/CR-6583, NUREG/CR-5704, and Revision 0 of NUREG/CR-6909.

The results of the NRC staff's most recent research efforts on this topic are documented in Revision 1 of NUREG/CR-6909 (Ref. 11). Those results identified the need to revise and consolidate the previously published guidance for incorporating the effects of LWR water environments in fatigue life evaluations. This revision of the regulatory guide generally maintains as acceptable the previously endorsed methods for establishing fatigue design curves and defines updated F_{en} factors for use in evaluating the fatigue lives of reactor components exposed to LWR water environments.

In Revision 0 of RG 1.207, the NRC staff identified a non-conservatism in the ASME Code fatigue design curve with respect to existing fatigue data for austenitic stainless steels and endorsed a separate stainless steel fatigue design curve, as documented in Revision 0 of NUREG/CR-6909. ASME modified the fatigue design curve in Section III for austenitic stainless steels in the 2009b Addenda to adopt the fatigue design curve developed in Revision 0 of NUREG/CR-6909. Section 3.2.11 of Revision 1 of NUREG/CR-6909 provides an updated and comprehensive review of, and technical basis for, continued use of the stainless steel fatigue design curve previously developed in Revision 0 of NUREG/CR-6909 for both wrought and cast austenitic stainless steels. The F_{en} defined for stainless steels in Revision 1 of NUREG/CR-6909 should be used in conjunction with this more recent stainless steel fatigue design curve when evaluating environmental effects in austenitic stainless steel components that require an ASME CUF calculation. Use of the austenitic stainless steel design curve also applies to the fatigue analyses for all Ni-Cr-Fe alloys (e.g., Alloys 600, 690, and 800) and their associated weld metals (except for Inconel 718, for which fatigue data is not currently available). As described in Section 4.3.3 of Revision 1 of NUREG/CR-6909, the F_{en} defined for Ni-Cr-Fe alloys in Revision 1 of NUREG/CR-6909 should be used in conjunction with the stainless steel fatigue design curve when evaluating environmental effects in Ni-Cr-Fe alloy components that require an ASME CUF calculation.

Section 5 of Revision 1 of NUREG/CR-6909 evaluates margins in the ASME Code fatigue design curves. In conducting that evaluation, the ANL researchers reviewed data available in the literature to assess the subfactors (excluding environment) that are necessary to account for the effects of various uncertainties and differences between actual components and laboratory test specimens. The ANL researchers also performed statistical analyses using Monte Carlo simulations to develop fatigue design curves using the "95/95 criterion." In other words, the curves should provide 95% confidence that the fatigue life of 95% of the population of laboratory test specimens will be greater than that predicted by the design curves.

The NRC staff finds this criterion acceptable because the fatigue design curves are based on crack initiation, rather than component failure or through-wall crack leakage, and, therefore, additional margin exists between crack initiation and actual component failure or leakage. The staff recognizes that additional margin may be present in components where the dominant loading consists of a significant though-wall strain gradient, as opposed to the membrane loading typically applied in small-scale laboratory fatigue test specimens. Methods to account for this additional margin may be considered by the staff on a case-by-case basis, provided sufficient basis and information is provided to the staff to verify that the proposed alternative demonstrates compliance with all applicable NRC regulations.

The results of the Monte Carlo simulations indicated that for carbon, low-alloy, austenitic stainless, and Ni-Cr-Fe alloy steels, the ASME Code procedure of adjusting the mean test data by a factor of twenty for cyclic life is conservative compared to the 95/95 criterion. Revision 1 of NUREG/CR-6909 chose to use a factor of 12 on life in the development of the air fatigue design curves to be consistent with the ASME Code Section III fatigue design curve for austenitic materials. In Revision 1 of NUREG/CR-6909, the resulting new fatigue design curves using margins of twelve for cyclic life and two for strain (whichever is more conservative) are provided in Section 3.1.11 and Figures 36 and 37 for carbon steels and low-alloy steels, and in Section 3.2.11 and Figure 49 for austenitic stainless steels. This Regulatory Guide uses these new air design curves; thus, an applicant or licensee that chooses to adopt the procedures discussed in this Regulatory Guide to determine the fatigue lives of carbon, low-alloy, austenitic stainless, and all Ni-Cr-Fe alloys (except for Inconel 718) should use the air design curves in Revision 1 of NUREG/CR-6909. Additionally, the fatigue design curves for carbon and low-alloy steels and austenitic stainless steels in Section III of the 2013 Edition of the ASME Code may also be used with the procedures in this Regulatory Guide to determine the fatigue lives of those materials because their use will yield the same or more conservative results.

The F_{en} calculation options for carbon and low-alloy steels, austenitic stainless steels, and all Ni-Cr-Fe alloys (except for Inconel 718) depend on the complexity of the analyzed transient conditions and the details of the evaluation. For example, in an evaluation in which the results of detailed transient analyses are available to determine the necessary parameters (e.g., strain rate and temperature), the "modified rate approach" (presented in Section 4.4 of Revision 1 of NUREG/CR-6909) is an acceptable method for determining the F_{en} values. This method involves using a strain-based integral to evaluate conditions for which temperature and strain rate change, resulting in the variation of F_{en} over time. This detailed approach calculates the F_{en} values based on the strain history for each load set pair in the fatigue analysis evaluation, considering the effects of strain rate and temperature variations for each incremental segment in the strain history. Such results may be used to reduce the conservatism in the calculated F_{en} values. For a simplified calculation yielding more conservative results for complex or poorly defined transients, the temperature can be set equal to the maximum temperature in the transient or segment, and the average strain rate can be determined as described in Section 4.4 of NUREG/CR-6909, Revision 1.

Appendix C to Revision 1 of NUREG/CR-6909 provides a sample problem showing one method of calculating and applying F_{en} to a CUF calculation using the NB-3200 methodology. This problem addresses some of the practical issues associated with F_{en} calculations.

Harmonization with International Standards

The NRC staff searched for guidance from the International Atomic Energy Agency (IAEA) and the International Organization for Standardization (ISO), and did not identify any standards that provided additional guidance to NRC staff, applicants, or licensees.

Documents Discussed in Staff Regulatory Guidance

This regulatory guide 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 in NRC regulations as a requirement, licensees and applicants must comply with that standard as set forth in the regulation. If the secondary reference has been endorsed in a regulatory guide as an acceptable approach for meeting an NRC requirement, the standard constitutes a method acceptable to the NRC staff for meeting that regulatory requirement as described in the specific regulatory guide. If the secondary reference has neither been incorporated by reference in NRC regulations nor endorsed in a regulatory guide, 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 it is appropriately justified, consistent with current regulatory practice, and consistent with applicable NRC requirements.

C. STAFF REGULATORY GUIDANCE

This section describes the methods that the NRC staff considers acceptable for use in performing fatigue evaluations that consider the effects of LWR water environments on those carbon and low-alloy steels, wrought and cast austenitic stainless steels, Ni-Cr-Fe alloys (except for Inconel 718), and the weld metals associated with these materials that are evaluated in NUREG/CR-6909. Specifically, these methods include calculating the CUF in air using ASME Code, Section III analysis procedures, and then employing the environmental fatigue correction factor (F_{en}), as described in NUREG/CR-6909, Revision 1. In particular, Appendix A to that report includes the specifics of the F_{en} method for incorporating the effects of LWR water environments in CUF evaluations of metal components. The methods described in this regulatory guide may be used to address the effects of the LWR water environment in a CUF calculation in license applications associated with reactor designs submitted for NRC approval, operating reactors pursuing license renewal, and plants where addressing such effects is part of their licensing basis.

1. Carbon and Low-Alloy Steels and Welds

Calculate the environmental CUF for components exposed to LWR water environments and manufactured with carbon and low-alloy steel and their associated weld metals using the procedures in Sections 1.1 through 1.3.

1.1. CUF in Air

Calculate the CUF in air using ASME Code, Section III analysis procedures (Subarticle NB-3200, "Design by Analysis," or Subarticle NB-3600, "Piping Design") and the fatigue design curves in air provided in Figures A.1 and A.2 (i.e., curves identified as "ANL Model and Eq. 27" in figure legend) and Table A.1 in Appendix A to NUREG/CR-6909, Revision 1. Alternatively, the fatigue design curve for carbon and low-alloy steel in Appendix I to Section III of the 2013 Edition of the ASME Code may be used.

1.2. Environmental Factor (F_{en})

Calculate the environmental factor F_{en} for carbon and low-alloy steels and associated welds using Equation A.2 in NUREG/CR-6909, Revision 1. In the same document, Equations A.3 through A.6 should be used to calculate the parameters used in Equation A.2; Equation A.7 defines the strain threshold and the corresponding threshold stress amplitude.

1.3. Environmental CUF

Calculate the environmental CUF using Equation A.19 in NUREG/CR-6909, Revision 1.

2. Wrought and Cast Austenitic Stainless Steels and Welds

Calculate the environmental CUF for components exposed to LWR water environments and manufactured with wrought and cast austenitic stainless steel components and their associated weld metals using the procedures in Sections 2.1 through 2.3, below.

2.1. CUF in Air

Calculate the CUF in air using ASME Code, Section III analysis procedures (Subarticle NB-3200, "Design by Analysis," or Subarticle NB-3600, "Piping Design") and the fatigue design curve for austenitic stainless steels in air provided in Figure A.3 (i.e., curve identified as "Based on ANL Model" in figure legend) and Table A.2 in Appendix A to NUREG/CR-6909, Revision 1. Alternatively, the fatigue design curve for austenitic stainless steel in Section III of the 2013 Edition of the ASME Code may be used.

2.2. Environmental Factor (F_{en})

Calculate F_{en} using Equation A.8 in NUREG/CR-6909, Revision 1. In the same document, Equations A.9 through A.11 should be used to calculate the parameters used in Equation A.8; Equation A.12 defines the strain threshold and the corresponding threshold stress amplitude.

2.3. Environmental CUF

Calculate the environmental CUF using Equation A.19 in NUREG/CR-6909, Revision 1.

3. Ni-Cr-Fe Alloys and Welds

Calculate the environmental CUF for components exposed to LWR water environments and manufactured with Ni-Cr-Fe alloy components (e.g., Alloys 600, 690, and 800) and their associated weld metals using the procedures in Sections 3.1 through 3.3. Note that these procedures are not applicable to Inconel 718 materials due to a current lack of environmental fatigue data.

3.1. CUF in Air

Calculate the CUF in air using ASME Code, Section III analysis procedures (Subarticle NB-3200, “Design by Analysis,” or Subarticle NB-3600, “Piping Design”) and the stainless steels in air provided in Figure A.3 (i.e., curve identified as “Based on ANL Model” in figure legend) and Table A.2 in Appendix A to NUREG/CR-6909, Revision 1. Alternatively, the fatigue design curve for Ni-Cr-Fe alloys in Section III of the 2013 Edition of the ASME Code may be used.

3.2. Environmental Factor (F_{en})

Calculate F_{en} using Equation A.13 in NUREG/CR-6909, Revision 1. In the same document, Equations A.14 through A.16 should be used to calculate the parameters used in Equation A.13; Equation A.17 defines the strain threshold and the corresponding threshold stress amplitude.

3.3. Environmental CUF

Calculate the environmental CUF using Equation A.19 in NUREG/CR-6909, Revision 1.

D. IMPLEMENTATION

The purpose of this section is to provide information on how applicants and licensees[1] may use this guide and information regarding the NRC's plans for using this regulatory guide. In addition, it describes how the NRC staff complies with 10 CFR 50.109, "Backfitting," and any applicable finality provisions in 10 CFR Part 52.

Use by Applicants and Licensees

Applicants and licensees may voluntarily[2] use the guidance in this document to demonstrate compliance with the underlying NRC regulations. Methods or solutions that differ from those described in this regulatory guide may be deemed acceptable if sufficient basis and information is provided for the NRC staff to verify that the proposed alternative demonstrates compliance with the appropriate NRC regulations. Current licensees may continue to use guidance the NRC found acceptable for complying with the identified regulations as long as their current licensing basis remains unchanged.

Licensees may use the information in this regulatory guide for actions that do not require NRC review and approval such as changes to a facility design under 10 CFR 50.59, "Changes, Tests, and Experiments." Licensees may use the information in this regulatory guide (in whole or part, as applicable), to resolve regulatory or inspection issues.

Use by NRC Staff

The NRC staff does not intend or approve any imposition or backfitting of the guidance in this regulatory guide. The NRC staff does not expect any existing licensee to use or commit to using the guidance in this regulatory guide unless the licensee makes a change to its licensing basis. The NRC staff does not expect or plan to request licensees to voluntarily adopt this regulatory guide to resolve a generic regulatory issue. The NRC staff does not expect or plan to initiate NRC regulatory action which would require the use of this regulatory guide. Examples of such unplanned NRC regulatory actions include issuance of an order requiring the use of the regulatory guide, requests for information under 10 CFR 50.54(f) as to whether a licensee intends to commit to use of this regulatory guide, generic communication, or promulgation of a rule requiring the use of this regulatory guide without further backfit consideration.

During regulatory discussions on plant-specific operational issues, the staff may discuss with licensees various actions consistent with staff positions in this regulatory guide as one acceptable means of meeting the underlying NRC regulatory requirement. Such discussions would not ordinarily be considered backfitting even if prior versions of this regulatory guide are part of the licensing basis of the facility. However, unless this regulatory guide is part of the licensing basis for a facility, the staff may not represent to the licensee that the licensee's failure to comply with the positions in this regulatory guide constitutes a violation.

If an existing licensee voluntarily seeks a license amendment or change and (1) the NRC staff's consideration of the request involves a regulatory issue directly relevant to this new or revised regulatory guide and (2) the specific subject matter of this regulatory guide is an essential consideration in the staff's

---

1 In this section, "licensees" refers to licensees of nuclear power plants under 10 CFR Parts 50 and 52 and "applicants" refers to applicants for licenses and permits for (or relating to) nuclear power plants under 10 CFR Parts 50, 52, and 54, as well as applicants for standard design approvals and standard design certifications under 10 CFR Part 52.

2 In this section, "voluntary" and "voluntarily" mean that the licensee is seeking the action of its own accord, without the force of a legally binding requirement or an NRC representation of further licensing or enforcement action.

determination of the acceptability of the licensee's request, the staff may request that the licensee either follow the guidance in this regulatory guide or provide an equivalent alternative process that demonstrates compliance with the underlying NRC regulatory requirements. This is not considered backfitting as defined in 10 CFR 50.109(a)(1) or a violation of any of the issue-finality provisions in 10 CFR Part 52.

Additionally, an existing applicant may be required to comply with new rules, orders, or guidance if 10 CFR 50.109(a)(3) applies.

If a licensee believes that the NRC is either using this RG or requesting or requiring the licensee to implement the methods or processes in this RG in a manner inconsistent with the discussion in this Implementation section, then the licensee may file a backfit appeal with the NRC in accordance with the guidance in NRC Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection" (Ref. 12), and in NUREG-1409, "Backfitting Guidelines," (Ref. 13).

REFERENCES[3]

1. ASME, *Boiler and Pressure Vessel Code*, 2013 edition, Section III, "Rules for Construction of Nuclear Power Plant Components," New York, NY.[4]

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

3. *U.S. Code of Federal Regulations*, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Part 52, Chapter I, Title 10, "Energy."

4. *U.S. Code of Federal Regulations*, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Part 54, Chapter I, Title 10, "Energy."

5. U.S. Nuclear Regulatory Commission (NRC), "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," NUREG-1800.

6. U.S. NRC, "Generic Aging Lessons Learned (GALL) Report," NUREG-1801.

7. U.S. NRC, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," NUREG-2191.

8. U.S. NRC, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," NUREG-2192.

9. Thadani, Ashok C., Director of the Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, memorandum to William D. Travers, Executive Director for Operations, U.S. Nuclear Regulatory Commission, "Closeout of Generic Safety Issue 190, 'Fatigue Evaluation of Metal Components for 60-Year Plant Life'," August 26, 1999, ADAMS Accession No. ML003673136.

10. U.S. NRC, "Guidelines for Evaluating Fatigue Analyses Incorporating the Life Reduction of Metal Components Due to the Effects of the Light-Water Reactor Environment for New Reactors," Regulatory Guide 1.207, Revision 0, March 2007.

11. U.S. NRC, "Effect of LWR Water Environments on Fatigue Life of Reactor Materials," NUREG/CR-6909 (ANL-12/60).

12. U.S. NRC, "Management of Facility-Specific Backfitting and Information Collection," Management Directive 8.4.

13. U.S. NRC, "Backfitting Guidelines," NUREG-1409, July 1990.

---

3 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.

4 Copies may be purchased from ASME, Three Park Avenue, New York, NY 10016-5990; phone 212-591-8500; fax 212-591-8501; www.asme.org.