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[7590-01-P]

## NUCLEAR REGULATORY COMMISSION

[NRC-2014-0023]

### Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Draft NUREG; request for comment.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) is issuing for public comment a draft NUREG, NUREG/CR-6909, Revision 1, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials." This report summarizes the results of NRC research efforts and work performed at Argonne National Laboratory on the fatigue of piping and pressure vessel steels in light water reactor environments. Revision 1 of this report provides updates and improvements to the environmental fatigue correction factor approach based on an extensive update to available laboratory fatigue data from testing and results available since this report was first published in 2007.

**DATES:** Submit comments by **[INSERT DATE 45 DAYS FROM DATE OF PUBLICATION]**.

Comments received after this date will be considered if it is practical to do so, but the Commission is able to ensure consideration only for comments received before this date.

**ADDRESSES:** You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0023**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: [Carol.Gallagher@nrc.gov](mailto:Carol.Gallagher@nrc.gov). For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **Mail comments to:** Cindy Bladey, Chief, Rules, Announcements, and Directives Branch, Office of Administration, Mail Stop: 3WFN-06-44M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

For additional direction on accessing information and submitting comments, see “Accessing Information and Submitting Comments” in the SUPPLEMENTARY INFORMATION section of this document.

**FOR FURTHER INFORMATION CONTACT:** Gary Stevens, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; telephone: 301-251-7569, e-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov).

## **SUPPLEMENTARY INFORMATION:**

### **I. Accessing Information and Submitting Comments.**

#### *A. Accessing Information.*

Please refer to Docket ID **NRC-2014-0023** when contacting the NRC about the availability of information regarding this document. You may access publicly-available information related to this document by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0023**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may access publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov). The draft of NUREG/CR-6909, Revision 1 is available in ADAMS under Accession No. ML14087A068.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

*B. Submitting Comments.*

Please include Docket ID **NRC-2014-0023** in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

## II. Discussion.

The American Society of Mechanical Engineers Boiler and Pressure Vessel Code (Code) provides rules for the design of Class 1 components of nuclear power plants. Appendix I to Section III of the Code contains fatigue design curves for applicable structural materials. However, the effects of light water reactor coolant environments are not explicitly addressed by the Code design curves. The existing fatigue strain-vs.-life data illustrate potentially significant effects of light water reactor coolant environments on the fatigue resistance of pressure vessel and piping steels. Under certain environmental and loading conditions, fatigue lives in water relative to those in air can be significantly lower for austenitic stainless, nickel alloy, carbon and low-alloy steels. In March 2007, Revision 0 of NUREG/CR-6909 (ADAMS Accession No. ML070660620) was issued and it was the technical basis document for NRC Regulatory Guide 1.207, "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." Revision 0 of NUREG/CR-6909 summarized the work performed at Argonne National Laboratory on the fatigue of piping and pressure vessel steels in light water reactor coolant environments. In that document, the existing laboratory fatigue data were evaluated to identify the various materials, environmental, and loading parameters that influence fatigue crack initiation, and document the effects of key parameters on the fatigue lives of pressure vessel and piping steels. The report presented fatigue life models for estimating fatigue lives as a function of material, loading, and environmental conditions, and described the environmental fatigue correction factor for incorporating the effects of light water reactor coolant environments into Code fatigue evaluations.

Revision 1 of NUREG/CR-6909 provides updates and improvements to the environmental fatigue correction factor approach based on an extensive update to the

laboratory fatigue data from testing and results available since 2007. The NRC is particularly interested in stakeholder feedback on the following three areas:

- i. The extension of the best-fit mean air curve for ferritic steels discussed in Section 3.1.10.
- ii. The air fatigue design curve adjustment factors summarized in Section 5.5.
- iii. Accuracy check of the technical content of the NUREG, particularly with respect to all of the numerical content of the report.

Dated at Rockville, Maryland, this 9<sup>th</sup> day of April, 2014.

For the Nuclear Regulatory Commission.

David L. Rudland, Chief,  
Component Integrity Branch,  
Division of Engineering,  
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