ANS

Non-Real-Time, High-Integrity Software for the Nuclear Industry—User Requirements

An American National Standard

American National Standard
Non-Real-Time, High-Integrity Software for the
Nuclear Industry—User Requirements

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American Nuclear Society

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American National Standard

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Foreword

(This foreword is not a part of American National Standard "Non-Real-Time, High-Integrity Software for the Nuclear Industry—User Requirements," ANSI/ANS-10.8-2015.)

The purpose of this standard is to provide quality assurance requirements for the users of non-real-time, high-integrity software developed for nuclear industry applications. This standard is intended to complement ANSI/ANS-10.7-2013, "Non-Real-Time, High-Integrity Software for the Nuclear Industry—Developer Requirements," which provides requirements for the development of such software. The standard does not recommend a specific approach to software deployment and use but does recommend that for a specific project, the project sponsor should determine the level of effort to be applied. Compliance with this standard does not automatically guarantee compliance with any other standard.

The standard complements the following ANS-10 standards related to computer program development. *Any references in this document to the standards listed below refer to the version given here:*

ANSI/ANS-10.2-2000 (R2009), "Portability of Scientific and Engineering Software";
ANSI/ANS-10.3-1995 (withdrawn), "Documentation of Computer Software";
ANSI/ANS-10.4-2008, "Verification and Validation of Non-Safety-Related Scientific and Engineering Computer Programs for the Nuclear Industry";
ANSI/ANS-10.5-2006 (R2011), "Accommodating User Needs in Scientific Engineering Computer Software Development";
ANSI/ANS-10.7-2013, "Non-Real-Time, High-Integrity Software for the Nuclear Industry—Developer Requirements."

This standard builds upon NUREG/CR-6263, "High-Integrity Software for Nuclear Power Plants: Candidate Guidelines, Technical Basis and Research Needs," which was prepared for the U.S. Nuclear Regulatory Commission to assist with development of a technical basis for regulatory positions related to the use of high-integrity software in nuclear power plants. NUREG/CR 6263 and NUREG/CR-5930, "High Integrity Software Standards and Guidelines," were developed for application to nuclear power plants, and this standard is primarily applicable to nuclear power plants and other nuclear facilities and operations with similar high consequences and hazards.

NUREG/CR-6263 was the result of a comprehensive review of the state of software engineering processes and design attributes. While the focus of that effort was on real-time, high-integrity software, the standard ANSI/ANS-10.7-2013 and this standard focus on non-real-time, high-integrity software, such as for design and analysis. Therefore, the requirements of NUREG/CR-6263 were carefully adapted, and new requirements were developed and added for model development and validation, which are a key aspect of analytical, non-real-time software.

In addition to calculation correctness, cybersecurity is an important aspect of high-integrity software and is addressed in this standard by the identification of activities that affect cybersecurity. The requirements in this standard for cybersecurity were derived from U.S. Nuclear Regulatory Commission Regulatory Guide 1.152, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants." The regulatory guide ensures satisfaction of the requirements outlined in 10 CFR 50, 50.55a (h) and Appendix A [Title 10, "Energy," Part 50, "Domestic Licensing of Production and Utilization Facilities, Sec. 50.55a, "Codes and Standards," (h), "Protection and Safety Systems," Appendix A], and 10 CFR 73.54 [Title 10, "Energy," Part 73, "Physical Protection of Plants and Materials, Sec. 54, "Protection of Digital Computer and Communication Systems and Networks"].

Additional discussions of cybersecurity requirements may be found in NEI 08-9, "Cyber Security Plan for Nuclear Power Reactors"; NEI 10-04, "Identifying Systems and Assets Subject to the Cyber Security Rule"; and NRC Regulatory Guide 5.71, "Cyber Security Programs for Nuclear Facilities."

An effort has been made to maintain consistency in terminology and concepts with various software standards being developed under the sponsorship of the Institute of Electrical and Electronics Engineers, Inc., and the American Society of Mechanical Engineers.

This standard might reference documents and other standards that have been superseded or withdrawn at the time the standard is applied. A statement has been included in the references section that provides guidance on the use of references.

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard. For example, the software requirements of ANSI/ANS-10.7-2013 and this standard, which are applicable for high-consequence applications, could be appropriately tailored or graded for applications of lower consequence.

This standard has been written by Working Group ANS-10.8 of the American Nuclear Society's Standards Committee. The membership of this group during the preparation of the final drafts consisted of the following:

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B. R. Frank, *Westinghouse Electric Company*
P. Hulse, *Sellafield Ltd.*
C. R. Martin, *National Security Technologies, LLC*
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Subcommittee ANS-10, Mathematics and Computation, had the following membership at the time of its approval of this standard:

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Non-Real-Time, High-Integrity Software for the Nuclear Industry—User Requirements

1 Scope and objective

1.1   Scope

This standard establishes the minimum requirements for the acceptance and use of non-real-time, high-integrity software used for design and analysis in the nuclear industry. This standard is directly related to ANSI/ANS-10.7-2013 [1],[1] which provides requirements for the developer of non-real-time, high-integrity software.

The activities described in this standard enable an end user of complex simulation software to assure, when software has been developed in accordance with appropriate requirements [1], that the software will meet the specific identified needs of the end user and that the software is installed and used in a correct manner.

The type of software discussed in this standard is software used for the analysis, design, and simulation of complex physical systems and phenomena. This type of software requires a high degree of functional reliability in order to reduce the risk of undetected errors.

1.2   Objective

The objective of this standard is to specify user requirements for software acceptance, deployment, use, and retirement. These requirements include activities that, when executed, will provide high confidence in the correctness and quality of non-real-time, high-integrity software and its use. This standard does not impose constraints on the implementation or performance of those activities but does refer to other standards, where appropriate.

1.3   Areas of application

The software considered by this standard includes software that performs calculations or simulations requiring high functional reliability in order to avoid errors that could have serious consequences if not detected.

It is important that this standard be followed in cases where the complexity of the calculations is such that some errors may not be identified by traditional verification techniques (e.g., peer reviews and design reviews).

This type of software includes, but is not limited to, the following:

- nuclear reactor analysis;
- analysis of postulated accidents;

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[1] Numbers in brackets refer to corresponding numbers in Sec. 15, "References."