



# American Nuclear Society

## Standards Committee Report of Activities

# 2023

Standards Committee Report of Activities 2023

Published by the  
American Nuclear Society  
1111 Pasquinelli Drive  
Suite 350  
Westmont, IL 60559



# **STANDARDS COMMITTEE**

## **Report of Activities**

# **2023**

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**Report updated information to [standards@ans.org](mailto:standards@ans.org)**

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Kent Welter, *ANS-30.3*  
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# INTRODUCTION

The Report of Activities of the American Nuclear Society (ANS) Standards Committee represents a record of the Committee's achievements for the calendar year 2023. The Report provides information on ANS standards projects.

Nearly 950 volunteer members participate in the development of ANS-sponsored nuclear standards and guidance documents, of which there are over 120 in various phases of maintenance and development. As of the end of 2023, there were 88 current standards approved by the American National Standards Institute as American National Standards.

The ANS Standards Committee develops standards in accordance with the accredited organization method for developing evidence of consensus for their approval as American National Standards.

The work of the Standards Committee is managed by eight consensus committees:

**ESCC: Environmental and Siting Consensus Committee**

**FWDC: Fuel, Waste, and Decommissioning Consensus Committee**

**LLWRCC: Large Light Water Reactor Consensus Committee**

**NRNFCC: Nonreactor Nuclear Facilities Committee**

**NCSCC: Nuclear Criticality Safety Consensus Committee**

**RARCC: Research and Advanced Reactors Consensus Committee**

**SRACC: Safety and Radiological Analyses Consensus Committee**

**JCNRM: Joint Committee on Nuclear Risk Management**

This report is presented in eight individual sections, each of which sets forth the details on those subcommittees and working groups active under its respective consensus committee.

## ANS Standards Development Process

The mission of the American Nuclear Society (ANS) Standards Committee is to develop voluntary consensus standards to be certified by the American National Standards Institute (ANSI) as American National Standards. The ANSI has served as administrator and coordinator of the United States private sector voluntary standardization system for close to 100 years. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations. Its prescribed process is set forth in the ANS Standards Committee Rules and Procedures, and it is also illustrated in the following flow chart presented as Figure 1.

The National Technology Transfer and Advancement Act of 1995 (NTTAA) requires all federal agencies and departments to use technical standards that are developed or adopted by voluntary consensus standards bodies, unless such use is impractical or inconsistent with law. To implement the Act, the Office of Management and Budget issued Circular A-119, which provides guidance to promote consistent application of the Act across federal agencies and departments. The NTTAA is available at <https://www.gpo.gov/fdsys/granule/STATUTE-110/STATUTE-110-Pg775/content-detail.html>. OMB Circular A-119 can be found at [https://www.whitehouse.gov/wp-content/uploads/2020/07/revised\\_circular\\_a-119\\_as\\_of\\_1\\_22.pdf](https://www.whitehouse.gov/wp-content/uploads/2020/07/revised_circular_a-119_as_of_1_22.pdf).

The process to produce an American National Standard requires time, patience, most of all dedication of many professionals. The birth of a standard begins with recognizing a need for a particular standard. Any individual or committee within the ANS Standards Committee may identify this need by completing a Project Initiation Notification System (PINS) form, which declares the purpose and need of the proposed standard. The document is reviewed, discussed, and most often approved by a select subcommittee (SubC) and a consensus committee (CC) that will oversee the standard. Last, the Standards Board (SB) will review the PINS form before it is submitted to ANSI.

Once the PINS form is approved and submitted to ANSI, a working group (WG) is assembled to commence the standards development process. Working group members comprise a small number of individuals recognized for their expertise in the subject. Although there is no requirement for a balance of representation on a WG, as required for the CC, WG membership should include those organizations having a significant interest in the project.

Subcommittees consist of members who have been appointed due to their expertise in one or more areas. They manage the development of several standards in closely related disciplines. Each SubC member is expected to lend his/her special expertise in the development of standards. Subsequent to drafting the standard, a formal ballot process within the SubC is not required but is often used as a preliminary review.

The SB has established eight consensus committees — Environmental and Siting Consensus Committee (ESCC); Fuel, Waste, and Decommissioning Consensus Committee (FWDCC); Nonreactor Nuclear Facilities Consensus Committee (NRNFCC); Nuclear Criticality Safety Consensus Committee (NCSCC); Large Light Water Reactors Consensus Committee (LLWRCC); Research and Advanced Reactors Consensus Committee (RARCC); Safety and Radiological Analyses Consensus Committee (SRACC); and Joint Committee on Nuclear Risk Management (JCNRM) a joint consensus committee with the American Society of Mechanical Engineers (ASME). Consensus committees comprise a diverse balance of interest. Each CC supervises the development of proposed standards within their assigned scopes, and they achieve consensus approval of these projects. A formal ballot must be employed to ascertain each member's position on the standards brought before the committee.

The WG chair must respond to all “approved with comments” and “negative” comments received from the formal ballot period; the SubC may assist in resolving comments. Members who ballot negative, must review the attempted resolution of his/her negative ballot vote. If the negative balloter finds the response unacceptable, then the balloter may maintain that decision by formally stating his/her reasons for doing so. Any outstanding negative positions must be circulated to all members of the CC for review. A member holding an affirmative position may change his/her vote if he/she wishes to support negative balloters.

Simultaneous to the CC ballot, public review (PR) is conducted through the auspices of ANSI. ANSI announces a 45- or 60-day public review period for the proposed standard in its publication, *Standards Action*. As with CC comments, all comments from PR must be considered and resolved promptly.

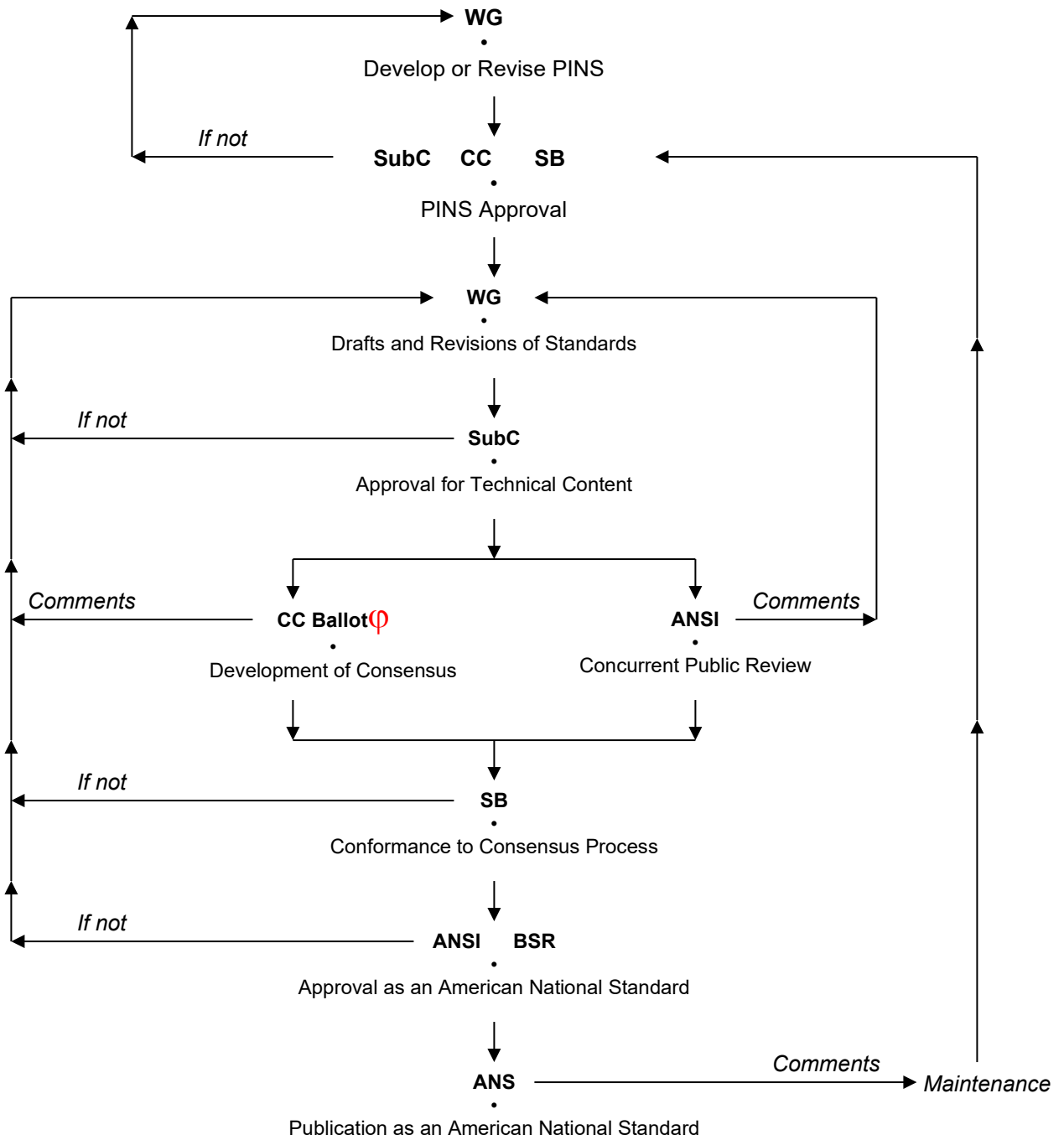
Upon completion of the consensus process, a Letter Ballot is created for the SB to review and certify that all ANS procedures have been implemented to finalize the standard. The SB Letter Ballot summarizes the CC ballot tallies and other details during the ballot period.

The final step in the development of a proposed standard is to gain approval by the ANSI Board of Standards Review (BSR). Once certification by the SB has been granted, documentation is sent to the ANSI BSR with details of the ballot results to carefully scrutinize the case.

After ANSI notifies ANS of its approval, the proposed standard emerges as an American National Standard—a remarkable achievement and a credit to all the volunteers who made it possible.

Once approved, an American National Standard must be maintained to keep its certification. ANSI dictates that current standards be reviewed at least every five years to determine if the standard should be reaffirmed (reapproved), revised, or withdrawn. Standards that are found to be current and are not in need of any changes can be reaffirmed. A reaffirmation requires a consensus ballot, public review, and recertification by ANSI. Absolutely no changes can be made to the formal portion of a standard through the reaffirmation process. If any changes are deemed necessary, a revision should be initiated. If the evaluation of technical content reveals that strict application of one or more criteria could result in equipment inoperability or a violation of a safety or technical specification, withdrawal shall be recommended.





<b>ANS:</b> American Nuclear Society	<b>SubC:</b> Subcommittee
<b>ANSI:</b> American National Standards Institute	<b>SB:</b> Standards Board
<b>BSR:</b> Board of Standards Review	<b>WG:</b> Working Group
<b>CC:</b> Consensus Committee	

**Figure 1 — Steps in the Development of a Standard**

*φ If a decision is made to issue a draft for trial use and application an additional CC ballot (w/o public review) as well as SB approval would be required. If approved by the CC & SB, the draft would be published and available for purchase. Once the trial-use period is completed, the working group would review the comments and determine the appropriate action. If seeking approval of the draft as an American National Standard, the draft would be revised to incorporate comments and continue to follow the process noted in the flow chart to gain ANSI certification.*

# STANDARDS BOARD ANNUAL REPORT

**Chair, Andrew Sowder, Ph.D.**

## **Update on the Advanced Reactor Codes & Standards Collaborative**

With support from the American Nuclear Society (ANS), the Advanced Reactor Codes & Standards Collaborative (ARCSC) came together in late 2022 to ensure the development, alignment, and timely availability of U.S., Canadian, and international codes and standards (C&S) needed to support large-scale advanced reactor deployment. The Collaborative's objectives are to facilitate information sharing between standards development organizations (SDOs) and industry, identify and gather advanced reactor developer standards needs, inform and complement international and national C&S efforts, and align actions with the NEI/EPRI North American Advanced Reactor Roadmap (NAARR). Membership on the Collaborative includes representatives from SDOs, industry organizations, and federal agencies including ACI, AISC, ANS, ASME, ASCE, CSA Group, IEEE, IEC/ISA, DOE, EPRI, NEI, and NRC. A follow up to the December 1, 2022, workshop was held November 30, 2023, at EPRI's offices in D.C. The workshop had over 200 participants either in person or via WebEx. The November 2023 workshop focused on feedback from the advanced reactor standards needs survey issued in September 2023 and allowed five advanced reactor developers to provide greater insight into their standards needs. Participants also heard about international activities from three international presenters. ARCSC's intent is to share survey feedback with the relevant SDOs in early 2024. ANS will use the Standard Board's Priority Task Group to disseminate survey feedback down to consensus committees, subcommittees, and working groups with directions on addressing and reporting.

## **Development of a New Standards Committee Strategic Plan**

The steps to develop a new Standards Committee Strategic Plan have been initiated. The new plan focuses on current themes, re-directed industry direction such as the NAARR and ARCSC initiatives noted above, the need for integration and innovation in thought and activities among stakeholders, among other initiatives. Comments from Standards Board members have been collected. Feedback will be sought from the ANS Executive Committee before finalizing the Standards Committee Strategic Plan for formal approval of the Standards Board in 2024.

## **Presentations Made on Behalf of ANS in 2023**

The following presentations were made:

- ARCSC Workshop Combined Presentation—ARCSC Workshop, November 30, 2023, EPRI's offices in D.C., Don Eggett, Andrew Sowder, Pat Schroeder
- "ANSI/ANS-30.3-2022, Light Water Reactor Risk-Informed, Performance-Based Design"—NRC Risk Forum, November 12, 2023, N. Prasad Kadambi
- ASME/ANS Non-LWR PRA Standards Implementation Experience"—NRC Standards Forum, November 13, 2023, David Grabaskas
- "Overview of ANS Activities to Support RIPB Standards"—NRC Standards Forum, November 13, 2023, N. Prasad Kadambi
- "ANS Advanced Reactor Activities"—NRC Standards Forum, November 13, 2023, Andrew Sowder
- "The History Behind ANS Standards Development and Its Impact on the Industry"—Mississippi Local Section, January 26, 2023, Donald Eggett and Andrew Sowder
- "An Overview of the ANS Standards Program"—U.S. Nuclear Industry Council, February 21, 2023, Donald Eggett

## **Meeting Held with NRC Standards Executive**

ANS Standards Board leadership held a meeting with NRC staff including new NRC Standards Executive, Michelle Sampson, on September 14, 2023, at NRC's offices in D.C. The time was used to discuss ANS standards activities and NRC staff participation in the ANS standards program. Additional meetings will be scheduled on a regular basis to improve communication.

### **Standards Forum Sites Created for Artificial Intelligence, Digital Twins, and Robotics**

Three standards forum sites have been created on ANS Collaborate to create a knowledge database on artificial intelligence, digital twins, and robotics. All Standards Committee members have been invited to join these sites to share files, knowledge, and to start discussions. It is the intent that these sites become good resources over time as more files and discussions are added to the sites.

### **Volunteer Engagement Including Utilization of Young and Emerging Professionals**

Membership of the ANS Standards Committee continues to grow. The collection of subject matter experts that participate in ANS standards is now 942—an increase of about 20% in the last three years due to aggressive actions, strong outreach efforts, and improved tracking of volunteers. The total number of volunteers includes 52 young professionals engaged as associate members. The Associate Member Program has placed 121 young professionals since 2015. The program has made a significant impact with 40 of these young professionals now in the full member role, several of which are taking on committee leadership positions. An additional 200 volunteers support the ANS/ASME Joint Committee on Nuclear Risk Management.

### **Modernization of ANS Standards through RIBP Methods**

The Risk-informed Performance-based Principles and Policy Committee (RP3C) has made significant progress in providing support to ANS working groups modernizing ANS standards through the use of risk-informed performance-based (RIBP) methods. Currently, twenty-four standards are in development incorporating RIBP principles or are being revised to include RIBP insights. The guidance document, issued in 2022, titled "[Incorporating Risk-Informed and Performance-Based Approaches/Attributes in ANS Standards](#)" is a resource developed by RP3C to aid working groups using RIBP methods in ANS standards. Training on the use of the guidance document has been provided to ensure the methods are understood and employed where needed. In addition, RP3C's Community of Practice (CoP) is another platform available to all individuals including non-ANS members to better understand RIBP methods. A CoP presentation is routinely offered on a monthly basis. Forty CoP sessions have been presented and recordings of each are available in a RIBP knowledge database on the [RP3C CoP webpage](#).

### **Ten (10) New Standards to Look for in the Near Future**

- ANS-2.35-202x, *Guidelines for Estimating Present & Projecting Future Socioeconomic Impacts from Construction, Operations, and Decommissioning of Nuclear Facilities*
- ANS-2.34-202x, *Characterization and Probabilistic Analysis of Volcanic Hazards*
- ANS-2.36-202x, *Accident Analysis for Aircraft Crash into Reactor and Nonreactor Nuclear Facilities*
- ANS-3.5.1-202x, *Nuclear Power Plant Simulators for Use in Simulation Assisted Engineering and Non-Operator Training*
- ANS-19.13-202x, *Initial Fuel Loading and Startup Tests for FOAK Advanced Reactors*
- ANS-20.2-202x, *Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt-Reactor Nuclear Power Plants*
- ANS-30.2-202x, *Categorization Classification of SSCs for New Nuclear Power Plants*
- ANS-60.1-202x, *Civilian Nuclear Export Controls*
- ASME/ANS RA-S-1.1-202x, *Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications*
- ASME/ANS RA-S-1.2-202x, *Severe Accident Progression and Radiological Release (Level 2) PRA Standard for Nuclear Power Plant Applications for Light Water Reactors (LWRs)*

### **ANS Standards in Full Compliance with ANSI with No Delinquent Standards**

All ANS standards have either been revised or reaffirmed in the last five years and fully comply with requirements of the American National Standards Institute (ANSI) to perform periodic maintenance within five years. Standards that have not completed maintenance within five years are considered delinquent by ANSI. ANS had 88 current American National Standards at the end of 2023.

### **Summary of Standards Actions for 2023 include:**

- 1 standard was published
- 11 current standards were reaffirmed
- 2 standards were formally initiated with the submittal of a Project Initiation Notification Systems form to ANSI

## ANS Standards Committee

**Scope:** *The American Nuclear Society Standards Committee is responsible for the development and maintenance of standards that address the design, analysis, and operation of components, systems, and facilities related to the application of nuclear science and technology. The scope of the Standards Committee includes the development and maintenance of standards on the following subjects and closely related activities:*

- a. *Definitions of terminology used in nuclear science and technology*
- b. *Siting requirements for nuclear facilities*
- c. *Nuclear facility design and operations, including safety criteria for facilities, operator selection, and training*
  - i. *Power production reactors*
  - ii. *Research reactors and critical facilities*
  - iii. *Nuclear fuel production, handling, and storage facilities*
- d. *Facilities for handling radioactive isotopes, including remote handling of radioactive materials*
- e. *Remediation and restoration of sites used for nuclear facilities*
- f. *Emergency preparedness*
- g. *Nuclear criticality safety*
- h. *Reactor physics and radiation shielding*
- i. *Computational analysis programs used in the nuclear field*
- j. *Probabilistic risk assessment, risk management, and risk criteria*
- k. *Fission product behavior*
- l. *Radioactive waste management*

*The Standards Committee does not develop standards for the application of radiation for medical purposes.*

*The Standards Committee reviews standards being developed or issued by other organizations on related topics to help ensure consistency and completeness and to avoid duplication.*

*Standards developed by the Standards Committee are intended to be issued as American National Standards.*

*The Standards Committee consists of consensus committees, subcommittees, and working groups, all of which are under the administrative control and policy direction of the ANS Standards Board.*

## Standards Board Membership

**Andrew G. Sowder, Chair**, Electric Power Research Institute  
**Todd Anselmi, Vice Chair**, Idaho National Laboratory  
**Robert Becse**, Member at Large, Westinghouse Electric Company, LLC  
**Robert J. Budnitz**, Member at Large, Consultant  
**Jennifer Call**, Member at Large, Tennessee Valley Authority  
**Brandon Chisholm**, Member at Large, Southern Nuclear Operating Company  
**Michelle French**, Ex Officio Member (LLWRCC), WECTEC  
**Gale Hauck**, Ex Officio Member (RARCC), Oak Ridge National Laboratory  
**Dennis Henneke**, Ex Officio Member (JCNRM), GE Hitachi  
**Mark Joseph**, Ex Officio Member (NRNFCC), Navarro Research & Engineering, Inc.  
**Robert Kalantari**, Engineering Planning and Management, Inc.  
**Jean-Francois Lucchini**, Ex Officio Member (FWDC), Los Alamos National Laboratory  
**Carl A. Mazzola**, Ex Officio Member (ESCC), Los Alamos National Laboratory (TRIAD National Security)  
**Frances Pimentel**, Member at Large, Nuclear Energy Institute  
**Mehdi Resi-Fard**, U.S. Nuclear Regulatory Commission  
**Andrew O. Smetana**, Ex Officio Member (SRACC), Individual  
**Kent Byron Welter**, Member at Large, NuScale Power  
**Larry L. Wetzel**, Ex Officio Member (NCSCC), Individual

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**Amir Afzali**, Observer, Individual  
**Scottman Ammons**, Liaison, Institute of Nuclear Power Operations  
**Kelsey Amundson**, ANS Board of Directors Liaison, Los Alamos National Laboratory  
**Douglas Bowen**, Observer, Oak Ridge National Laboratory  
**Jarvis Caffrey**, HPS Liaison, NASA - MSFC  
**Donald R. Eggett**, Observer Individual  
**George F. Flanagan**, Observer, Individual  
**Sudesh Gambhir**, Observer, Individual  
**Calvin M. Hopper**, Observer, Individual  
**N. Prasad Kadambi**, ANSI Liaison, Kadambi Engineering Consultants  
**Mark A. Linn**, Observer, Individual  
**Robert Roche-Rivera**, Observer, U.S. Nuclear Regulatory Commission  
**Donald Spellman**, NTAG/ISO/TC85/SC6 Liaison, Individual  
**Edward G. Wallace**, Observer, Individual

*Ex Officio Member = Consensus Committee Chair*

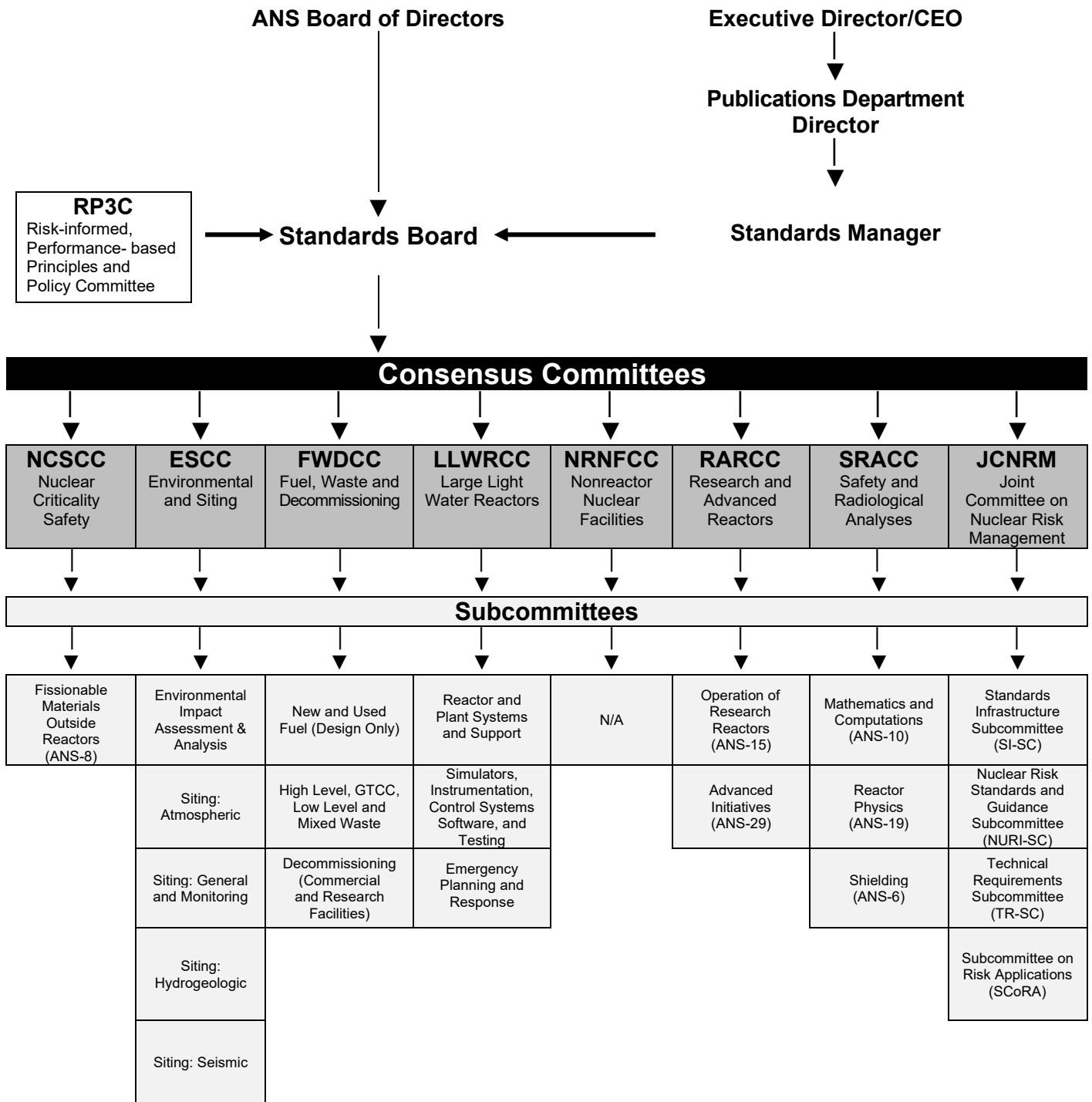


Figure 2 – ANS Standards Committee: Organizational Chart

## SUBCOMMITTEE CHAIRS

Advanced Initiatives (ANS-29) (RARCC)	Jason Andrus
Decommissioning (Commercial and Research Facilities) (FWDC)	OPEN
Emergency Planning and Response (LLWRCC)	Ronald Markovich
Environmental and Impact Assessment (ESCC)	Leah Parks
Fissionable Material Outside Reactors (ANS-8) (NCSCC)	Douglas Bowen
High Level, GTCC, Low Level, and Mixed Waste (FWDC)	Robert Howard
Mathematics and Computations (ANS-10) (SRACC)	Paul Hulse
New and Used Fuel (Design Only) (FWDC)	Mitchell Sanders
Operation of Research Reactors (ANS-15) (RARCC)	Thomas Newton
Reactor and Plant Systems and Support (LLWRCC)	Robert Burg
Reactor Physics (ANS-19) (SRACC)	Dimitrios Cokinos
Shielding (ANS-6) (SRACC)	Charlotta Sanders
Simulators, Instrumentation, Control Systems, Software and Testing (LLWRCC)	OPEN
Siting: Atmospheric (ESCC)	David Bruggeman
Siting: General and Monitoring (ESCC)	Leah Parks
Siting: Hydrogeologic (ESCC)	Yan Gao
Siting: Seismic (ESCC)	Brent Gutierrez
Nuclear Risk Standards and Guidance Subcommittee (NURI-SC)	Reed LaBarge
Standards Infrastructure Subcommittee (SI-SC)	Douglas Rapp
Subcommittee on Risk Applications (SCoRA)	Stuart Lewis
Technical Requirements Subcommittee (TR-SC)	Michelle Bensi

## **APPROVED AMERICAN NATIONAL STANDARDS**

### **Developed by the ANS Standards Committee**

(through December 2023)

ANS-1-2000; R2007; R2012; R2019	<i>Conduct of Critical Experiments</i> (reaffirmed 8/12/2019)—\$55.00
ANS-2.2-2016; R2020	<i>Earthquake Instrumentation Criteria for Nuclear Power Plants</i> (reaffirmed 11/13/2020)—\$192.00
ANS-2.3-2011; R2016; R2021	<i>Estimating Tornado, Hurricane, and Extreme Straight-Line Wind Characteristics at Nuclear Facility Sites</i> (reaffirmed 7/19/2021)—\$96.00
ANS-2.6-2018; R2023	<i>Guidelines for Estimating Present &amp; Forecasting Future Population Distributions Surrounding Nuclear Facility Sites</i> (reaffirmed 1/3/2023)—\$183.00
ANS-2.8-2019	<i>Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities</i> (approved 12/17/2019)—\$258.00
ANS-2.10-2017; R2022	<i>Criteria for Retrieval, Processing, Handling, and Storage of Records from Nuclear Facility Seismic Instrumentation</i> (approved 4/1/2022)—\$150.00
ANS-2.15-2013; R2017; R2021	<i>Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities</i> (reaffirmed 11/11/2021)—\$233.00
ANS-2.17-2010; R2016; R2021	<i>Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants</i> (reaffirmed 6/28/2021)—\$189.00
ANS-2.21-2022	<i>Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink</i> (approved 1/27/2022)—\$248.00
ANS-2.23-2016; R2020	<i>Nuclear Plant Response to an Earthquake</i> (reaffirmed 11/13/2020)—\$224.00
ANS-2.26-2004; R2010; R2017; R2021	<i>Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design</i> (reaffirmed 12/10/2021)—\$163.00
ANS-2.27-2020	<i>Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments</i> (approved 4/16/2020)—\$195.00
ANS-2.29-2020	<i>Probabilistic Seismic Hazard Analysis</i> (approved 4/16/2020)—\$230.00
ANS-2.30-2015; R2020	<i>Criteria for Assessing Tectonic Surface Fault Rupture and Deformation at Nuclear Facilities</i> (reaffirmed 5/4/2020)—\$311.00
ANS-3.1-2014; R2020	<i>Selection, Qualification and Training of Personnel for Nuclear Power Plants</i> (reaffirmed 2/4/2020)—\$175.00
ANS-3.2-2012; R2017; R2022	<i>Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants</i> (reaffirmed 5/26/2022)—\$175.00
ANS-3.4-2013; R2018; R2023	<i>Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants</i> (reaffirmed 7/19/2023)—\$189.00



ANS-3.5-2018	<i>Nuclear Power Plant Simulators for Use in Operator Training and Examination</i> (approved 10/10/2019)—\$171.00
ANS-3.11-2015; R2020	<i>Determining Meteorological Information at Nuclear Facilities</i> (reaffirmed 5/21/2020)—\$300.00
ANS-3.14-2021	<i>Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities</i> (approved 8/5/2021)—\$215.00
ANS-5.1-2014; R2019; R2023	<i>Decay Heat Power in Light Water Reactors</i> (reaffirmed 12/4/2023)—\$229.00
ANS-5.4-2011; R2020	<i>Method for Calculating the Fractional Release of Volatile Fission Products from Oxide Fuel</i> (reaffirmed 4/9/2020)—\$107.00
ANS-5.10-1998; R2006; R2013; R2019	<i>Airborne Release Fractions at Non-Reactor Nuclear Facilities</i> (reaffirmed 10/3/2019)—\$180.00
ANS-6.1.1-2020	<i>Photon and Neutron Fluence-to-Dose Conversion Coefficients</i> (approved 9/10/2020)—\$97.00
ANS-6.1.2-2013; R2018; R2023	<i>Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Power Plants</i> (reaffirmed 6/16/2023)—\$76.00
ANS-6.3.1-1987; R1998; R2007; R2015; R2020	<i>Program for Testing Radiation Shields in Light Water Reactors (LWR)</i> (reaffirmed 7/28/2020)—\$107.00
ANS-6.4-2006; R2016; R2021	<i>Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants</i> (reaffirmed 8/5/2021)—\$284.00
ANS-6.4.2-2006; R2016; R2021	<i>Specification for Radiation Shielding Materials</i> (reaffirmed 12/2/2021)—\$107.00
ANS-6.6.1-2015; R2020	<i>Calculation and Measurement of Direct and Scattered Gamma Radiation from LWR Nuclear Power Plants</i> (reaffirmed 4/23/2020)—\$197.00
ANS-8.1-2014; R2018; R2023	<i>Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors</i> (reaffirmed 6/5/2023)—\$131.00
ANS-8.3-2022	<i>Criticality Accident Alarm System</i> (approved 9/9/2022)—\$139.00
ANS-8.6-1983; R1988; R1995; R2001; R2010; R2017; R2022	<i>Safety in Conducting Subcritical Neutron-Multiplication Measurements In Situ</i> (reaffirmed 9/8/2022)—\$43.00
ANS-8.7-2022	<i>Nuclear Criticality Safety in the Storage of Fissile Materials</i> (approved 5/6/2022)—\$134.00
ANS-8.10-2015; R2020	<i>Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement</i> (reaffirmed 3/26/2020)—\$76.00
ANS-8.12-1987; R1993; R2002; R2011; R2016; R2021	<i>Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors</i> (reaffirmed 8/16/2021)—\$131.00
ANS-8.14-2004; R2011; R2016; R2021	<i>Use of Soluble Neutron Absorbers in Nuclear Facilities Outside Reactors</i> (reaffirmed 8/5/2021)—\$65.00

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ANS-8.15-2014; R2019	Nuclear Criticality Control of Special Actinide Elements (reaffirmed 9/12/2019)—\$150.00
ANS-8.17-2004; R2009; R2014; R2019	<i>Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors</i> (reaffirmed 9/12/2019)—\$65.00
ANS-8.19-2014; R2019	<i>Administrative Practices for Nuclear Criticality Safety</i> (reaffirmed 8/22/2019)—\$69.00
ANS-8.20-1991; R1999; R2005; R2015; R2020	<i>Nuclear Criticality Safety Training</i> (reaffirmed 5/8/2020)—\$65.00
ANS-8.21-2023;	<i>Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors</i> (approved 6/20/2023)—\$102.00
ANS-8.22-1997; R2006; R2011; R2016; R2021	<i>Nuclear Criticality Safety Based on Limiting and Controlling Moderators</i> (reaffirmed 12/7/2021)—\$77.00
ANS-8.23-2019	<i>Nuclear Criticality Accident Emergency Planning and Response</i> (approved 9/16/2019)—\$181.00
ANS-8.24-2017; R2023	<i>Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations</i> (reaffirmed 1/3/2023)—\$167.00
ANS-8.26-2007; R2012; R2016; R2022	<i>Criticality Safety Engineer Training and Qualification Program</i> (reaffirmed 2/18/2022)—\$55.00
ANS-8.27-2015; R2020	<i>Burnup Credit for LWR Fuel</i> (reaffirmed 8/7/2020)—\$127.00
ANS-10.4-2008; R2016; R2021	<i>Verification and Validation of Non-Safety Related Scientific and Engineering Computer Programs for the Nuclear Industry</i> (reaffirmed 6/15/2021)—\$177.00
ANS-10.5-2006; R2011; R2016; R2021	<i>Accommodating User Needs in Scientific and Engineering Computer Software Development</i> (reaffirmed 8/23/2021)—\$78.00
ANS-10.7-2013; R2018; R2023	<i>Non-Real Time, High-Integrity Software for the Nuclear Industry—Developer Requirements</i> (reaffirmed 4/19/2023)—\$150.00
ANS-10.8-2015; R2020	<i>Non-Real Time, High-Integrity Software for the Nuclear Industry—User Requirements</i> (reaffirmed 10/29/2020)—\$165.00
ANS-14.1-2004; R2009; R2014; R2019	<i>Operation of Fast Pulse Reactors</i> (reaffirmed 8/12/2019)—\$65.00
ANS-15.1-2007; R2007; R2013; R2018; R2023	<i>The Development of Technical Specifications for Research Reactors</i> (reaffirmed 4/27/2023)—\$131.00
ANS-15.2-1999; R2009; R2016; R2021	<i>Quality Control for Plate-Type Uranium-Aluminum Fuel Elements</i> (reaffirmed 1/28/2021)—\$87.00
ANS-15.4-2016; R2021	<i>Selection and Training of Personnel for Research Reactors</i> (approved 7/23/2021)—\$127.00
ANS-15.8-1995; R2005; R2013; R2018; R2023	<i>Quality Assurance Program Requirements for Research Reactors</i> (reaffirmed 11/27/2023)—\$87.00
ANS-15.11-2016; R2021	<i>Radiation Protection at Research Reactor Facilities</i> (approved 7/20/2021)—\$204.00
ANS-15.16-2015; R2020	<i>Emergency Planning for Research Reactors</i> (reaffirmed 1/23/2020)—\$97.00

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ANS-15.21-2012; R2018; R2023	<i>Format and Content for Safety Analysis Reports for Research Reactors</i> (reaffirmed 1/19/2023)—\$168.00
ANS-16.1-2019	<i>Measurement of the Leachability of Solidified Low-Level Radioactive Wastes Short-Term Test Procedure</i> (approved 2/22/2019)—\$174.00
ANS-18.1-2020	<i>Radioactive Source Term for Normal Operation of Light Water Reactors</i> (approved 7/24/2020)—\$139.00
ANS-19.1-2019	<i>Nuclear Data Sets for Reactor Design Calculations</i> (approved 3/8/2019)—\$130.00
ANS-19.3-2022	<i>Steady-State Neutronics Methods for Power Reactor Analysis</i> (approved 10/6/2022)—\$194.00
ANS-19.3.4-2022	<i>The Determination of Thermal Energy Deposition Rates in Nuclear Reactors</i> (approved 7/12/2022)—\$145.00
ANS-19.4-2017; R2022	<i>A Guide for Acquisition and Documentation of Reference Power Reactor Physics Measurements for Nuclear Analysis Verification</i> (reaffirmed 8/24/2022)—\$144.00
ANS-19.6.1-2019	<i>Reload Startup Physics Tests for Pressurized Water Reactors</i> (approved 12/19/2019)—\$172.00
ANS-19.10-2009; R2016; R2021	<i>Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals</i> (reaffirmed 10/7/2021)—\$73.00
ANS-19.11-2017; R2022	<i>Calculations and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Power Reactors</i> (reaffirmed 6/2/2022)—\$159.00
ANS-30.3-2022	<i>Advanced Light-Water Reactor Risk-Informed Performance-Based Design Criteria and Methods</i> (approved 7/21/2022)—\$211.00
ANS-40.37-2009; R2016; R2021	<i>Mobile Low Level Radioactive Waste Processing Systems</i> (reaffirmed 2/22/2021)—\$200.00
ANS-41.5-2012; R2018; R2023	<i>Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation</i> (reaffirmed 9/7/2023)—\$220.00
ANS-51.10-2020	<i>Auxiliary Feedwater System for Pressurized Water Reactors</i> (approved 10/23/2020)—\$183.00
ANS-53.1-2011; R2016; R2021	<i>Nuclear Safety Design Process for Modular-Helium Cooled Reactor Plants</i> (reaffirmed 10/7/2021)—\$318.00
ANS-54.1-2020	<i>Nuclear Safety Criteria and Design Process for Liquid-Metal-Cooled Nuclear Power Plants</i> (approved 3/23/2020)—\$199.00
ANS-55.1-2021	<i>Solid Radioactive Waste Processing Systems for Light Water Cooled Reactor Plants</i> (approved 12/2/2021)—\$215.00
ANS-56.8-2020	<i>Containment System Leakage Testing Requirements</i> (approved 12/11/2020)—\$192.00
ANS-57.1-1992; R1998; R2005; R2015; R2019	<i>Design Requirements for Light Water Reactor Fuel Handling System</i> (reaffirmed 12/6/19)—\$96.00

ANS-57.3-2018; R2023	<i>Design Requirements for New Fuel Storage Facilities at Light Water Reactor Plants</i> (reaffirmed 1/3/2023)—\$107.00
ANS-57.8-2020	<i>Fuel Assembly Identification</i> (approved 8/28/2020)—\$172.00
ANS-57.10-1996; R2006; R2016; R2021	<i>Design Criteria for Consolidation of LWR Spent Fuel</i> (reaffirmed 1/28/2021)—\$185.00
ANS-58.8-2019	<i>Time Response Criteria for Manual Actions at Nuclear Power Plants</i> (approved 8/8/2019)—\$118.00
ANS-58.9-2002; R2009; R2015; R2020	<i>Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems</i> (reaffirmed 7/23/2020)—\$65.00
ANS-58.14-2011; R2017 R2022	<i>Safety and Pressure Integrity Classification Criteria for Light Water Reactors</i> (reaffirmed 2/4/2022)—\$265.00
ANS-58.16-2014; R2020	<i>Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities</i> (reaffirmed 4/9/2020)—\$210.00
ANS-59.51-1997; R2007; R2015; R2020	<i>Fuel Oil Systems for Safety-Related Emergency Diesel Generators</i> (reaffirmed 7/27/2020)—\$107.00
ANS-59.52-1998; R2007; R2015; R2020	<i>Lubricating Oil Systems for Safety-Related Emergency Diesel Generators</i> (reaffirmed 7/24/2020)—\$96.00

### Approved ASME/ANS Joint American National Standard

ASME/ANS RA-S-1.1-2022	<i>Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications</i> (approved 5/11/2022)—\$610.00
ASME/ANS RA-S-1.4-2021	<i>Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants</i> (approved 1/28/2021)—\$590.00

### Approved ASME/ANS Joint Trial-Use Standards (not approved by ANSI)

ANS/ASME-58.22-2014	<i>Requirements for Low Power and Shutdown Probabilistic Risk Assessment</i> (approved for trial use by the JCNRM; not approved by ANSI)—\$440.00
ASME/ANS RA-S-1.2-2014	<i>Severe Accident Progression and Radiological Release (Level 2) PRA Standard for Nuclear Power Plant Applications for Light Water Reactors (LWRs)</i> (approved for trial use by the JCNRM; not approved by ANSI)—\$220.00
ASME/ANS RA-S-1.3-2017	<i>Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications</i> (approved for trial use by the JCNRM; not approved by ANSI)—\$220.00

## **Environmental and Siting Consensus Committee (ESCC)**

**Carl A. Mazzola, Chair**  
Los Alamos National Laboratory (TRIAD National Security)

**Scope:** *The ESCC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting all aspects of nuclear power plant and non-reactor nuclear facility siting, environmental assessment, environmental management, environmental monitoring, and the categorization and evaluation of natural phenomena hazards at these public and private sector nuclear facilities.*

*Many of the ESCC standards presently support the siting and environmental needs of the civilian nuclear industry and the Department of Energy (DOE) in meeting 10 CFR 50, 10 CFR 51 and 10 CFR 52 licensing requirements and assisting with compliance to 40 CFR enabling regulations associated with the Clean Air Act, Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response Compensation and Liability Act, Toxic Substances Control Act, and National Environmental Policy Act. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee. The ESCC supervises the work of the following subcommittees. They are as follows:*

- *Environmental and Impact Assessment*
- *Siting: Atmospheric*
- *Siting: General and Monitoring*
- *Siting: Hydrogeologic*
- *Siting: Seismic*

### **ESCC Membership:**

**Carl A. Mazzola, Chair**, Los Alamos National Laboratory (TRIAD National Security)

**Leah Parks, Vice Chair**, U.S. Nuclear Regulatory Commission

Amir Bahadori, Kansas State University

J. Matthew Barnett, Pacific Northwest National Laboratory

Thomas Bellinger, Consolidated Nuclear Security, LLC

David Bruggeman, Los Alamos National Laboratory (TRIAD National Security)

Jennifer Call, Tennessee Valley Authority

Andrew Dewhurst, RSL Safety Corporation

William Ebert, Argonne National Laboratory

Yan Gao, Dominion Energy

Brent Gutierrez, U.S. Department of Energy

Marsha Kinley, Duke Energy Corporation

Yong Li, Defense Nuclear Facility Safety Board

Daniel Menchaca, Texas A&M University College Station

Kit Ng, Bechtel Power Corporation

James O'Brien, U.S. Department of Energy

Samuel Rosenbloom, Individual

Michael Salmon (Liaison), International Atomic Energy Agency

Jean Savy, Individual

Ali Simpkins, Oak Ridge Associated Universities

Evan Swiker, United Engineers and Constructors

Cibi Sundaram, Atkins, Division of SNC Lavalin

Thomas Weaver, U.S. Nuclear Regulatory Commission

**Report of the ESCC:**

The ESCC held virtual meetings on April 5, 2023, July 20, 2023, and November 9, 2023. Carl Mazzola and Leah Parks were re-elected as ESCC chair and vice chair, respectively. Matthew Barnett, Daniel Menchaca, Evan Swiker, Cibi Sundaram, and Thomas Weaver were confirmed as members. Michael Salmon joined the ESCC as a liaison for IAEA.

**Approved in 2023:**

**ANSI/ANS-2.6-2018 (R2023)**, *Guidelines for Estimating Present & Forecasting Future Population Distributions Surrounding Nuclear Facility Sites* (reaffirmation of ANSI/ANS-2.6-2018)

**ANSI/ANS-41.5-2012 (R2023)**, *Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation* (reaffirmation of ANSI/ANS-41.5-2012; R2018)

**Active standards/projects (Approved PINS):**

**ANS-2.3**, *Estimating Tornado, Hurricane, and Extreme Straight-Line Wind Characteristics at Nuclear Facility Sites* (revision of ANSI/ANS-2.3-2011; R2021)

**ANS-2.15**, *Criteria for Modeling Atmospheric Dispersion of Radiological Releases from Nuclear Facilities* (revision of ANSI/ANS-2.15-2013; R2021)

**ANS-2.18**, *Evaluating Radionuclide Transport in Surface Water for Nuclear Facilities* (proposed new standard)

**ANS-2.22**, *Environmental Radiological Monitoring at Nuclear Facilities* (proposed new standard)

**ANS-2.26**, *Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design* (revision of ANSI/ANS-2.26-2004; R2021)

**ANS-2.32**, *Guidance on the Selection and Evaluation of Remediation Methods for Subsurface Contamination* (proposed new standard)

**ANS-2.34**, *Characterization and Probabilistic Analysis of Volcanic Hazards* (proposed new standard)

**ANS-2.35**, *Guidelines for Estimating Present & Projecting Future Socioeconomic Impacts from Construction, Operations, and Decommissioning of Nuclear Facilities* (proposed new standard)

**ANS-3.11**, *Determining Meteorological Data for Nuclear Facilities* (revision of ANSI/ANS-3.11-2005; R2020)

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**Environmental and Impact Assessment and Analysis Subcommittee**

**Membership:**

**Leah Parks, Chair**, U.S. Nuclear Regulatory Commission  
David Anderson, Pacific Northwest National Laboratory

The Environmental and Impact Assessment and Analysis Subcommittee manages the following project:

**ANS-2.35, *Guidelines for Estimating Present & Projecting Future Socioeconomic Impacts from the Construction, Operations, and Decommissioning of Nuclear Sites* (proposed new standard)**

**Scope:** *This standard provides civilian and government professionals with acceptable methodologies for determining and reporting potential socioeconomic impacts from constructing, operating, and decommissioning nuclear facilities including, but not limited to, LWRs, SMRs, advanced reactors, and nuclear fuel cycle facilities.*

**Membership:**

David Anderson, Chair, Pacific Northwest National Laboratory; Bandana Kar, U.S. Department of Energy; Leah Parks, U.S. Nuclear Regulatory Commission; Jerry Riggs, Enercon; Amy Rose, Oak Ridge National Laboratory; Rachel Turney-Work, Enercon Services, Inc.; Kevin Weinisch, KLD Engineering, P.C.; Trevor Wind (Associate Member); Daniel Yurman, Individual

**Status:** We are in the formative stages of developing ANS-2.35. PINS submitted to ANSI on 5/20/2019. The working group met approximately quarterly in 2022. In September 2022, the first draft text of the standard was developed and circulated among the working group for review and comment. At the October 2022 meeting, additional writing and review assignments were made with report outs in January 2023. The working group made incremental progress on the draft. A writing meeting was held at the June 2023 Annual Meeting. We anticipate moving the draft to completion in 2024.

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**Siting: Atmospheric Subcommittee**

**Membership:**

**David Bruggeman, Chair**, Los Alamos National Laboratory

**OPEN, Vice Chair**

Thomas Bellinger, Consolidated Nuclear Security, LLC

John Ciolek, Los Alamos National Laboratory

Sarah Davis, Argonne National Laboratory

Marsha Kinley, Duke Energy Corporation

Carl Mazzola, Los Alamos National Laboratory

Kevin Quinlan, U.S. Nuclear Regulatory Commission

The Siting: Atmospheric Subcommittee oversees the following projects:

**ANSI/ANS-2.3-2011 (R2021), *Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites* (proposed new standard, historical revision of ANSI/ANS-2.3-1983)**

**Scope:** *This standard defines site phenomena caused by (1) extreme straight winds, (2) hurricanes, and (3) tornados in various geographic regions of the U.S. These phenomena are used for the design of nuclear facilities.*

**Membership:**

OPEN, Chair; Adeola Adediran, Bechtel Corporation; Jeffrey Baum, ABSG Consulting Inc.; Ashley Bruggeman, Triad National Security, LLC; Mark Carroll, ChemStaff; Michelle Evans, Simpson Gumpertz & Heger Inc.; Antonio Godoy, Individual; Brent Gutierrez, U.S. Department of Energy; Charles Hunter, Individual; Shannon Jasim-Hanif, U.S. Department of Energy; Mark Levitan, National Institute of Standards & Technology; Alex Markivich, Westinghouse Electric Company, LLC; Carl Mazzola, Los Alamos National Laboratory; Gerald Meyers, Individual; Larry Twisdale, Applied Research Associates, Inc.; Steven Weinbeck, Savannah River National Laboratory; Elena Yegorova, U.S. Nuclear Regulatory Commission

**Status:**

This standard was reaffirmed 7/19/2021. A PINS was submitted to ANSI on 10/25/22. Steven Weinbeck stepped down as working group chair. The working group has been awaiting new and emerging tornado research conducted by the National Institute of Standards and Technology and ASCE before undertaking a major revision.

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**ANSI/ANS-2.15-2013 (R2021), *Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities* (new standard)**

**Scope:** *This standard establishes criteria for using meteorological data collected at nuclear facilities to evaluate the atmospheric effects on routine radioactive releases, including dilution, dispersion, plume rise, plume meander, aerodynamic effects of buildings, dry, deposition, and wet deposition (e.g., precipitation scavenging).*

**Membership:**

John Ciolek, Co-Chair, Los Alamos National Laboratory; Sarah Davis, Co-Chair, Argonne National Laboratory; Mark Abrams, ABS Consulting, Inc.; Thomas Bellinger, Consolidated Nuclear Security, LLC; David Brown, National Institute of Standards & Technology; Mark Carroll, ChemStaff; Toree Cook, Tennessee Valley Authority; Cliff Glantz, Pacific Northwest National Laboratory; Chuck Hunter, Individual; Marsha Kinley, Duke Energy Corporation; Michael Mazaika, U.S. Nuclear Regulatory Commission; Carl Mazzola, Los Alamos National Laboratory; Doyle Pittman, Individual; Jeremy Rishel, Pacific Northwest National Laboratory; Brian Shay, Argonne National Laboratory; Ali Simpkins, Oak Ridge Associated Universities

**Status:** This standard was reaffirmed on 11/11/2021. A PINS for the next revision was submitted to ANSI on 10/25/22. The ESCC and the Standards Board approved a ballot to terminate work on ANS-2.16 and ANS-3.8.10. Relevant material will be included in the next revision of ANS-2.15. Sarah Davis was appointed as co-chair. John Ciolek presented at the GMU 27th Atmospheric Transport and Dispersion Modeling Conference on June 20, 2023, to solicit support for the working group.

**ANSI/ANS-2.21-2022, Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink (revision of ANSI/ANS-2.21-2012; R2016)**

**Scope:** *This standard establishes criteria for the use of meteorological and hydrological data by nuclear facilities to evaluate the atmospheric effects from meteorological parameters on ultimate heat sinks. These input parameters may include dry-bulb temperature; wet-bulb temperature; dewpoint, cloud-cover, relative humidity, precipitation, wind speed, incoming short-wave solar radiation, incoming long-wave radiation, surface water temperature, and atmospheric pressure.*

**Membership:**

Marsha Kinley, Chair, Duke Energy Corporation; Chuck Bowman, Chuck Bowman Associates, Inc.; Edward Buchak, Environmental Resources Management; Jennifer Call, Tennessee Valley Authority.; Mark Carroll, Chemstaff; Richard Codell, Individual; Andrew Dewhurst, RSL Safety Corporation, Inc.; Chang Li, U.S. Nuclear Regulatory Commission; Michael Mazaika, U.S. Nuclear Regulatory Commission; Carl Mazzola, Los Alamos National Laboratory; Rajiv Prasad, Pacific Northwest National Laboratory; Kevin Quinlan, U.S. Nuclear Regulatory Commission

**Status:** The revision was approved by ANSI on 1/27/2022. The working group was not active in 2023. Maintenance will be needed by 2027.

**ANSI/ANS-3.11-2015 (R2020) Determining Meteorological Information at Nuclear Facilities (revision of ANSI/ANS-3.11-2005; R2010)**

**Scope:** *The standard includes the identification of which meteorological parameters should be measured, parameter accuracies, meteorological tower siting considerations, data monitoring methodologies, data reduction techniques and quality assurance requirements.*

**Membership:**

Thomas Bellinger, Co-Chair, Consolidated Nuclear Solutions, LLC; David Bruggeman, Co-Chair, Los Alamos National Laboratory; Mark Abrams, ABS Consulting; Kevin Birdwell, Oak Ridge National Laboratory; Patrick Brennan, Meteorological Evaluation Services; Jennifer Call, Tennessee Valley Authority; Mark Carroll, ChemStaff; John Ciolek, Los Alamos National Laboratory; Thomas Coulter, Coulter Air Quality Services; Paul Fransioli, Kleinfelder; Cliff Glantz, Pacific Northwest National Laboratory; Frank Hickey, Susquehanna Nuclear, LLC; James Holian, Holian Environmental, LLC; Charles Hunter, Individual; Rachael Ishaya, BRYZA Wind Laboratory; Marsha Kinley, Duke Energy Corporation; Stanton Lanham, Duke Energy; Stanley Levinson, Individual; Stanley Marsh, Southern California Edison; Michael Mazaika, U.S. Nuclear Regulatory Commission; Carl Mazzola, Los Alamos National Laboratory; Edward McCarthy, E.F. McCarthy & Associates; Doyle Pittman, Individual; Kevin Quinlan, U.S. Nuclear Regulatory Commission; Walter Schalk, U.S. Department of Energy; Sanjoy Sircar, Defense Nuclear Facilities Safety Board; Adam Smith, Tennessee Valley Authority; Ping Wan, Individual; Ken Wastrack, Tennessee Valley Authority; Steve Weinbeck, Savannah River National Laboratory



**Status:** The standard was approved by ANSI on 8/20/2015 and was reaffirmed on 5/21/2020. This standard was moved from the subcommittee Siting: General & Monitoring to the subcommittee Siting: Atmospheric in 2018. A PINS to initiate the revision of the standard was submitted to ANSI on 12/3/2020, and a PIP was prepared in 2021. The working group is in the process of editing the standard.

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### **Siting: General and Monitoring Subcommittee**

#### **Membership:**

**Leah Parks, Chair**, U.S. Nuclear Regulatory Commission  
Teresa Eddy, Savannah River Nuclear Solutions  
Andrew Garrabrants, Vanderbilt University  
David Kosson, Vanderbilt University  
Brooke Stagich, Savannah River National Laboratory

The Siting: General and Monitoring Subcommittee manages the following projects and current standards:

#### **ANSI/ANS-2.6-2018 (R2023), *Guidelines for Estimating Present and Projecting Future Population Distributions Surrounding Nuclear Facility Sites* (new standard)**

**Scope:** *This standard provides civilian and government professionals with generally accepted demographic methodologies for the estimation and projection of human population distributions and densities near nuclear facility sites in order to facilitate the regulatory authority's review of site suitability relative to population considerations.*

#### **Membership:**

OPEN, Chair; Leah Parks, Vice Chair, U.S. Nuclear Regulatory Commission; David Anderson, Pacific Northwest National Laboratory; Linda Andrews, Framatome, Inc.; Nate Bixler, Sandia National Laboratories; Olufemi Omtaomu, Oak Ridge National Laboratory; Mary Richmond, Bechtel Corporation; Amy Rose, Oak Ridge National Laboratory; Robert Sachs, Individual; Bo Saulsbury, Oak Ridge National Laboratory; Harold Stiles, Enercom Services Inc.; Seshagiri Tammara, U.S. Nuclear Regulatory Commission; Rachel Turney, Enercon Services, Inc.; Kevin Weinisch, KLD Engineering, P.C.

**Status:** The standard was reaffirmed on 1/3/2023. Daniel Mussatti stepped down as working group chair.

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#### **ANS-2.22, *Environmental Radiological Monitoring at Nuclear Facilities* (proposed new standard)**

**Scope:** *This standard establishes criteria for use in developing and implementing an integrated radiological environmental monitoring program focusing on ambient air, surface water, and biota. It also provides criteria on the use of resultant environmental data collected near nuclear facilities to evaluate the impact of facility operations on the surrounding population and environment.*

#### **Membership:**

Teresa Eddy, Co-Chair, Savannah River Nuclear Solutions; Brooke Stagich, Co-Chair, Savannah River National Laboratory; Janet Aremu-Cole, Duke Energy Corporation; Amir Bahadori, Kansas State University; James Bland, Chesapeake Nuclear Services, Inc.; Zachary Harvey, Lawrence Berkeley National Laboratory; Jerry Hiatt, Individual; Frank Hickey, Susquehanna Nuclear, LLC; Gary Huff, Gilbert Consulting Services Inc.; Xiaodong Jiang, Defense Nuclear Facilities Safety Board; James Key, Key Solutions, Inc.; Karen Kim-Stevens, Electric Power Research Institute; Michael McDonald, RSI EnTech, LLC; Erik Merchant, American Electric Power; Brittany Owensby, Savannah River Nuclear Solutions; Tanya Oxenberg, TPO Technical Services, LLC; Ralph Perona, Neptune and Company Inc.; Michael Stewart, U.S. Department of Energy; Wendy Thompson, Hanford Mission Integration Solutions; Nebiyu Tiruneh, U.S. Nuclear Regulatory Commission; Jared Wicker, Savannah River Nuclear Solutions; Kevin Witt, U.S. Department of Energy

**Status:** The PINS was submitted to ANSI on 4/24/2018. Theresa Eddy and Brooke Stagich are co-chairing the working group. The working group has completed an annotated outline and a majority of the draft document to be submitted for review. The group met at the 2023 ANS Annual Meeting and completed some technical discussions

on the content including differences in applications and methodologies. The working group continues to work toward submittal of the draft for review during 2024.

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**ANSI/ANS-16.1-2019, Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure (revision of ANSI/ANS-16.1-2003; R2017)**

**Scope:** *This standard provides a procedure to measure and index the release rates of non-volatile radionuclides from low-level radioactive waste forms in demineralized water over a test period. It can be applied to any material from which test specimens can be prepared by casting or cutting into a shape for which the surface area and volume can be determined. The results of this procedure do not represent waste form degradation in any specific environmental situation or represent waste form performance. The test method presented in this standard is an adaptation of the method published in the 1986 version of this standard but constrains test parameter values and data analyses to support direct comparisons of test responses of different waste form materials.*

**Membership:**

David Kosson, Co-chair, Vanderbilt University; Andrew Garrabrants, Co-chair, Vanderbilt University; Leah Parks, Vice Chair, U.S. Nuclear Regulatory Commission; Kevin Brown, Vanderbilt University; William Ebert, Argonne National Laboratory; Albert Kruger, U.S. Department of Energy

**Status:** This standard was approved by ANSI on February 22, 2019. A reaffirmation ballot will be issued in early 2024.

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**ANSI/ANS-41.5-2012 (R2023), Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation (new standard)**

**Scope:** *This standard establishes criteria and processes for determining the validity of radioanalytical data for waste management and environmental remediation. These applications include site characterization, waste acceptance, waste certification, waste treatment design, process control, risk communication, litigation, and other applications as deemed necessary.*

**Membership:**

OPEN

**Status:** This standard was reaffirmed by ANSI on 9/7/2023.

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**Siting: Hydrogeologic Subcommittee**

**Membership:**

**Yan Gao, Chair**, Dominion Energy  
Matt Darois, Radiation Safety & Control Services, Inc.  
Todd Rasmussen, University of Georgia  
Lisa Schleicher, U.S. Geological Survey  
Raymond Schnieder, Westinghouse Electric Company, LLC  
Nebiyu Tiruneh, U.S. Nuclear Regulatory Commission

The Siting: Hydrogeologic Subcommittee manages the following projects and current standards:

**ANSI/ANS-2.8-2019, Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities (new standard, historical revision of ANSI/ANS-2.8-1992)**

**Scope:** *This standard addresses necessary external flood conditions, technical parameters, and applicable methodologies required to evaluate/determine external flooding hazards for nuclear facilities.*

**Membership:**

Yan Gao, Co-Chair, Dominion Energy; Raymond Schnieder, Co-Chair, Westinghouse Electric Company, LLC, Victoria Anderson, Nuclear Energy Institute; James August, Individual; Meredith Carr, U.S. Nuclear Regulatory Commission; Lawrence Cieslik, HDR Company; Jemie Dababneh, U.S. Army Core of Engineers; David Finnicum, Consultant; Quazi Hossain, Individual; LLC; Kevin Hyde, Individual; Sharon Jasim-Hanif, Department of Energy;

Joseph Kanney, Individual; Gregory Lowe, Consultant; Carl Mazzola, Los Alamos National Laboratory; Marty McCann, Jack Benjamin & Associates, Inc.; Gerald Meyers, Individual; Kit Ng, Bechtel Power Corporation; Robert Rishel, Duke Energy Corporation; Jerry Stedinger, Cornell University

**Status:** The standard was approved by ANSI on 12/17/2019. A reaffirmation will be considered in 2024.

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**ANS-2.9, Evaluation of Ground Water Supply for Nuclear Facilities (proposed new standard, historical revision of ANSI/ANS-2.9-1980; R1989)**

**Scope:** *This standard presents guidelines for the determination of the availability of ground water supplies for nuclear power plant operations with respect to both safety and non-safety related aspects.*

**Membership:**

OPEN, Chair; Janet Aremu-Cole, Institute of Nuclear Power Operations; Lifeng Guo, U.S. Nuclear Regulatory Commission; Thomas J. Nicholson, U.S. Nuclear Regulatory Commission; Todd Rasmussen, University of Georgia

**Status:** The project has not been active due to the lack of a working group chair.

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**ANS-2.13, Evaluation of Surface-Water Supplies for Nuclear Power Sites (proposed new standard, historical revision of ANSI/ANS-2.13-1979; R1988)**

**Scope:** *From historical standard: This standard presents criteria for determining: The availability of a surface water supply for plant operation with respect to both safety and nonsafety-related aspects. Water supply related effects of low flows and low levels on plant operation with respect to both safety and nonsafety-related systems.*

**Membership:**

OPEN, Chair; Edward Bruce, Duke Energy Corporation; Fehmida Mesania, NuScale Power, LLC; Nebiyu Tiruneh, U.S. Nuclear Regulatory Commission

**Status:** Revision of historical standard being considered. A chair is needed to initiate the revision.

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**ANSI/ANS-2.17-2010 (R2021), Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants (new standard, historical revision of ANSI/ANS-2.17-1980; R1989)**

**Scope:** *This standard establishes the requirements for evaluating the occurrence and movement of radionuclides in the subsurface resulting from abnormal radionuclide releases at commercial nuclear power plants. This standard applies to abnormal radionuclide releases that affect groundwater, water supplies derived from groundwater, and surface waters affected by subsurface transport, including exposure pathways across the groundwater–surface-water transition zone.*

**Membership:**

Todd Rasmussen, Chair, University of Georgia; James Bollinger, Savannah River National Laboratory; Philip Meyer, Pacific Northwest National Laboratory; Thomas Nicholson, U.S. Nuclear Regulatory Commission;

**Status:** This standard was reaffirmed on 6/28/2021.

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**ANS-2.18, Evaluating Radionuclide Transport in Surface Water for Nuclear Facilities (proposed new standard)**

**Scope:** *This new standard aims at establishing the requirements and providing a framework and recommended methodologies for the evaluation of the surface water transport and dilution of radionuclides in liquid effluent releases from nuclear power sites and nuclear facilities to demonstrate regulatory compliance of the dose limits. The approach can also be used to evaluate transport and migration of radionuclides from other reactor facilities that do not need to meet 10CFR20 dose limits.*

**Membership:** Nebiyu Tiruneh, Chair, U.S. Nuclear Regulatory Commission; Janet Aremu-Cole, Institute of Nuclear Power Operations; David Fukuyama (associate member), Sandia National Laboratory; Joseph Kanney, U.S. Nuclear Regulatory Commission; Kit Ng, Bechtel Power Corporation; Kevin O’Kula, Individual

**Status:** A PINS was submitted to ANSI on 3/9/2022. The working group has prepared a schedule for publication of the draft standard, drafted the table of contents of the standard, assigned section drafting responsibilities to working group members on voluntary basis, and conducted monthly virtual status update meetings. Drafting of sections is progressing as planned and the monthly status virtual meetings will continue. Documents and meeting minutes are shared in the working group shared workspace.

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**ANS-2.19, Guidelines for Establishing Site-Related Parameters for Site Selection and Design of ISFSIs (proposed new standard, historical revision of ANSI/ANS-2.19-1981; R1990)**

**Scope:** *From historical standard: This standard presents guidelines for establishing site-related parameters for site selection and design of an independent spent fuel storage installation (ISFSI). This installation provides storage of spent light water reactor (LWR) fuel that has aged a minimum of one year after discharge from the reactor core in a water basin type structure. Such an installation may be independent of both a nuclear power station and a reprocessing facility, or located adjacent to these facilities in order to share selected support systems. Aspects considered include flooding, geology, seismology, ground water, foundation engineering, earthwork engineering, and extreme wind conditions. These guidelines identify the basic site-related parameters to be considered in site evaluation, and in the design, construction, and operation of the ISFSI.*

**Membership:**  
OPEN

**Status:** Revision of historical standard is being considered.

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**ANS-2.32, Guidance on the Selection and Evaluation of Remediation Methods for Subsurface (proposed new standard)**

**Scope:** *Draft scope from unapproved PINS: This guidance would address how to determine whether or not to remediate subsurface residual radioactivity sources within defined hydrogeologic systems at nuclear facilities both for operational and decommissioning stages. This standard would build on ANS-2.17 and provide decision criteria for evaluating when, where and how to remediate subsurface contamination at nuclear facilities in accordance with risk and performance-based considerations. Specific guidance would be provided for identifying, selecting, implementing, and monitoring the efficacy of remediation methods.*

**Membership:**  
Matthew Darois, Chair, Radiation Safety and Control Services Inc.; Kate Amrhein, U.S. Department of Energy; Kim Anthony, Energy Solutions; Janet Aremu-Cole, Institute of Nuclear Power Operations; Joseph Carlson, U.S. Department of Energy; Randall Fedors, U.S. Nuclear Regulatory Commission; Yan Gao, Dominion Energy; Jerry Hiatt, Individual; Chris Johnson, Pacific Northwest National Laboratory; Karen Kim-Stevens, Electric Power Research Institute; Hilary Lane, Nuclear Energy Institute; Jack McCarthy, Holtec–Oyster Creek; Thomas Nicholson, U.S. Nuclear Regulatory Commission; Michael Smith, Nuclear Energy Institute; Nebiyu Tiruneh, U.S. Nuclear Regulatory Commission; Haruko Wainwright, Massachusetts Institute of Technology; Stuart Walker, U.S. Environmental Protection Agency

**Status:** The PINS was submitted to ANSI on 1/25/21. The working group has been meeting monthly on the last Thursday of every month to discuss progress and challenges on assigned sections that are being written. Progress has been slower than anticipated due to extremely busy schedules and workloads attributed to the commercial D&D projects currently being executed across the industry. The draft completion date may need to be moved to August 2024.

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## **Siting: Seismic Subcommittee**

### **Membership:**

**Brent Gutierrez, Chair**, U.S. Department of Energy  
**Yong Li, Vice Chair**, Defense Nuclear Facility Safety Board  
Douglas Clark, Consolidated Nuclear Security, LLC  
Emily Gibson, Schnabel Engineering  
Vladimir Graizer, U.S. Nuclear Regulatory Commission  
Kathryn Hanson, KL Hanson Consulting LLC  
Stephen McDuffie, U.S. Department of Energy  
Hanh Phan, U.S. Nuclear Regulatory Commission  
Ivan Wong, Lettis Consultants International

The Siting: Seismic Subcommittee manages the following projects and current standards:

### **ANSI/ANS-2.2-2016 (R2020), *Earthquake Instrumentation Criteria for Nuclear Power Plants* (new standard, historic revision of ANSI/ANS-2.2-2002)**

**Scope:** *This standard specifies the required earthquake instrumentation for the site and structures of light water cooled, land based nuclear power plants. It may be used for guidance at other types of nuclear facilities. This standard does not address the following: (a) Instrumentation to automatically shut down a nuclear power plant at a predetermined ground acceleration. (b) Procedures for evaluating records obtained from seismic instrumentation and instructions for the treatment of data. These procedures and instructions are specified in American National Standard, Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation, ANSI/ANS-2.10-2003.*

### **Membership:**

Vladimir Graizer, Chair, U.S. Nuclear Regulatory Commission; John Ake, U.S. Nuclear Regulatory Commission; Roger Kenneally, Individual; Richard Lee, Los Alamos National Laboratory; Robert Nigbor, University of California-Los Angeles; Farhang Ostadan, Bechtel Corporation

**Status:** The standard was reaffirmed on 11/16/2020. The working group plans to start discussing updates at the end of 2024. Updates will be needed to address SMRs and advanced reactors.

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### **ANSI/ANS-2.10-2017 (R2022), *Criteria for the Retrieval, Processing, Handling and Storage of Records from Nuclear Power Plant Seismic Instrumentation* (new standard, historical revision of ANSI/ANS-2.10-2003)**

**Scope:** *This standard provides criteria for retrieval, processing, handling, and storage of data obtained from seismic instrumentation specified in ANSI/ANS 2.2-2016. The criteria will address both digital and analog seismic instrumentation. The standard focuses on strong ground motion data and is intended for use at nuclear power plants, and non-power nuclear facilities that utilize strong ground motion instrumentation.*

### **Membership:**

OPEN, Chair; Tarek Elkhoraibi, Bechtel National Inc.; Vladimir Graizer, U.S. Nuclear Regulatory Commission; Brent Gutierrez, U.S. Department of Energy; Alidad Hashemi, Bechtel National Inc.; Robert Kassawara, Individual; Roger Kenneally, Individual; Robert Nigbor, University of California-Los Angeles; Lisa Schleicher, U.S. Geological Survey

**Status:** A reaffirmation of the standard was approved on 4/1/2022. Jim Xu retired from NRC and resigned from the chair role and the working group.

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### **ANSI/ANS-2.23-2016 (R2020), *Nuclear Plant Response to an Earthquake* (revision of ANSI/ANS-2.23-2002; R2009)**

**Scope:** *This standard specifies actions that the owner of a nuclear power plant should take in the event of an earthquake. The requirements of this standard supplement those given in American National Standard Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation, ANSI/ANS-2.10-2003. The application of these standards provides a complete evaluation of the need for post-earthquake plant shutdown in a timely manner. This standard also provides guidelines that will enable the owner to develop plant-specific procedures for determining the condition of*

*components, systems, and structures needed for shutdown and criteria for restart when a nuclear power plant is required to shut down following an earthquake. This standard does not cover those operator actions performed in connection with the operation and control of the nuclear power plant following an earthquake. These actions are specified in plant operating procedures, emergency operating procedures, and alarm response procedures.*

**Membership:**

OPEN, Chair; Greg Hardy, Simpson, Gumpertz and Heger, Inc.; Robert Kassawara, Individual; Robert Kenneally, Individual; Carl Mazzola, Los Alamos National Laboratory; Frederick Sock, U.S. Nuclear Regulatory Commission

**Status:** The standard was reaffirmed on 11/16/2020. Jim Xu retired from NRC and resigned from the chair role and the working group.

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**ANSI/ANS-2.26-2004 (R2021), Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design (new standard)**

*Scope: This standard provides: (a) criteria for selecting the seismic design category for nuclear facility structures, systems, and components (SSCs) to achieve earthquake safety and (b) criteria and guidelines for selecting Limit States for these SSCs to govern their seismic design. The Limit States are selected to ensure the desired safety performance in an earthquake.*

**Membership:**

Douglas Clark, Co-Chair, Consolidated Nuclear Security, LLC; Hahn Phan, Co-Chair, U.S. Nuclear Regulatory Commission; Amir Afzali, Individual; David Andersen, Defense Nuclear Facilities Safety Board; Todd Anselmi, Idaho National Laboratory ; Chris Chaves, U.S. Department of Energy; Nilesh Chokshi, Individual; LLC; Bradley Dolphyn, Simpson Gumpertz & Heger Inc.; Brent Gutierrez, U.S. Department of Energy; Nicholas Hansing, U.S. Nuclear Regulatory Commission; Greg Hardy, Simpson Gumpertz & Heger Inc.; Rahsean Jackson, Defense Nuclear Facilities Safety Board; Sharon Jasim-Hanif, U.S. Department of Energy; Brian McDonald, Exponent, Inc.; Heather Morgan, International Atomic Energy Agency; Lisa Schleicher, U.S. Geological Survey; Shilp Vasavada, U.S. Nuclear Regulatory Commission; Andrew Whittaker, University at Buffalo

**Status:** The standard was reaffirmed on 12/10/2021. A PINS was submitted to ANSI 10/1/2019. A revision of this standard is underway.

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**ANSI/ANS-2.27-2020, Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments (revision of ANSI/ANS-2.27-2008; R2016)**

*Scope: This standard provides criteria and guidelines for conducting geological, seismological, geophysical, and geotechnical investigations needed to provide information to support the following: (1) seismic source characterization input to a probabilistic seismic hazard analysis (PSHA); (2) evaluation of tectonic permanent ground deformation (PGD) hazard using probabilistic fault displacement hazard analysis (PFDHA) for surface-faulting sources and probabilistic tectonic deformation hazard analysis (PTDHA) for blind fault sources; (3) site response analysis input to PSHAs; (4) nontectonic, earthquake-induced ground failure hazard; (5) foundation stability.*

**Membership:**

Kathryn Hanson, Chair, KL Hanson Consulting LLC; William Savage, Vice Chair, Individual; Jon Ake, U.S. Nuclear Regulatory Commission; M. Logan Cline, Rizzo International, Inc.; Carl Costantino, Carl J. Costantino & Associates; C.B. Crouse, AECOM N&E Technical Services, LLC; Emily Gibson, National Nuclear Security Administration; Kathryn Hanson, Individual; Richard Lee, Los Alamos National Laboratory; Yong Li, Defense Nuclear Facilities Safety Board; Clifford Munson, U.S. Nuclear Regulatory Commission; Robert Nigbor, Individual; Susan Olig, Olig Seismic Geology, Inc.; Ellen Rathje, University of Texas–Austin; ;Adrian Rodriguez-Marek, Virginia Tech; Lisa Schleicher, U.S. Geological Survey; Kenneth Stokoe, University of Texas–Austin; Stephen Thompson, Lettis Consultants International

**Status:** The revised standard was approved by ANSI on 4/16/2020. No activity in 2023.

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**ANSI/ANS-2.29-2020, Probabilistic Seismic Hazard Analysis (revision of ANSI/ANS-2.29-2008; R2016)**

**Scope:** *This standard provides criteria and guidance for performing a Probabilistic Seismic Hazard Analysis (PSHA) that is used in the design and construction of nuclear facilities, i.e., facilities that store, process, test, or fabricate radioactive materials in such form and quantity that a nuclear risk to the workers, to the off-site public, or to the environment may exist. These include, but are not limited to, nuclear fuel manufacturing facilities; nuclear material waste processing, storage, fabrication, and reprocessing facilities; uranium enrichment facilities; tritium production and handling facilities; radioactive materials laboratories; and nuclear reactors.*

**Membership:**

Emily Gibson, Chair, National Nuclear Security Administration; Lisa Schleicher, Vice Chair, U.S. Geological Survey; Jon Ake, U.S. Nuclear Regulatory Commission; Nilesh Chokshi, Individual; Kevin Coppersmith, Coppersmith Consulting Inc.; Carl Costantino, Individual; C.B. Crouse, AECOM Technical Services, Inc.; Russell Green, Virginia Tech; Nicholas Gregor, Individual; Thomas Houston, Individual; Annie Kammerer, Individual; Jeffrey Kimball, Rizzo International, Inc.; Yong Li, Defense Nuclear Facilities Safety Board; James Marrone, Bechtel Corporation; Stephen McDuffie, U.S. Department of Energy; Clifford Munson, U.S. Nuclear Regulatory Commission; Suzette Payne, Idaho National Laboratory; Jean Savy, Individual; John Stamatakos, Southwest Research Institute; Gabriel Toro, Individual; Ivan Wong, Lettis Consultants International; Robert Youngs, Wood Environmental & Infrastructure Solutions

**Status:** A revision of this standard was approved by ANSI on 4/16/2020. No activity in 2023.

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**ANSI/ANS-2.30-2015 (R2020), Criteria for Assessing the Tectonic Surface Fault Rupture and Deformation at Nuclear Facilities (new standard)**

**Scope:** *This standard provides criteria and guidelines for investigations to assess potential for surface and near-surface faulting and associated near-fault deformation at nuclear facilities, referencing considerable new experience. The standard is an up-to-date compilation of techniques to evaluate fault offset potential and a valuable resource for planning and conducting site characterization studies for future nuclear facilities. It supplements a group of standards (i.e., ANS-2.26, -2.27, -2.29, ASCE 43-05) whose focus is on vibratory ground motion rather than fault offset hazard.*

**Membership:**

Ivan Wong, Chair, Lettis Consultants International; Rui Chen, California Geological Survey; Timothy Dawson, California Geological Survey; Keith Kelson, U.S. Army Corps of Engineers; Jeffrey Kimball, Rizzo Associates; Joseph Litehiser, Individual; Susan Olig, Olig Seismic Geology Inc.; David Schwartz, U.S. Geological Survey; Stephen Thompson, Lettis Consultants International, Inc.

**Status:** A reaffirmation was approved on 5/4/2020. No activity in 2023. The plan is to begin updating of the standard in 2024 with finalization in 2025.

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**ANS-2.34, Characterization and Probabilistic Analysis of Volcanic Hazards (proposed new standard)**

**Scope:** *This standard provides criteria and guidance for performing a probabilistic volcanic hazard analysis (PVHA) for the design and construction of nuclear facilities. Criteria provided in this standard address several aspects of conducting PVHAs, including 1) selection of the methodology and level of investigative and analytical rigor appropriate for an analysis, including a deterministic screening; 2) characterization of the hazards posed by existing volcanic vents and potential newly emerging volcanic vents; and 3) characterization of the unique hazards posed by several volcanic phenomena including ashfall, lava flows, lahars, and asphyxiating gases.*

**Membership:**

Stephen McDuffie, Chair, U.S. Department of Energy; Michael Cline, Rizzo International, Inc.; Charles Connor, University of South Florida; Kevin Coppersmith, Coppersmith Consulting Inc.; Mihai Diaconeasa, North Carolina State University; Brent Gutierrez, U.S. Department of Energy; William Hackett, Individual; Brittain Hill, Individual; Larry Mastin, U.S. Geological Survey; Suzette Payne, Idaho National Laboratory; Frank Perry, Individual; Lisa Schleicher, U.S. Geological Survey; Emily Schultz-Fellenz, Los Alamos National Laboratory; John Stamatakos, Southwest Research Institute; Jenise-Marie Thompson, U.S. Nuclear Regulatory Commission; Arash Zandieh, Lettis Consultants International, Inc.

**Status:** The PINS was submitted to ANSI on 9/28/2017. The project plan to develop the standard, and an initial outline, were finalized in May 2019. In 2020, several sections of the draft standard were completed and reviewed by the team. In March 2022, the working group chair provided the group an updated version of the document that incorporated working group comments. A further update including a section on quality assurance was provided in December 2022. The majority of this standard has been drafted. However, during 2023, efforts were suspended pending completion of two volcanic hazard analysis projects in the Western U.S. Several working group members are involved with one or both of these studies. The more significant is a probabilistic volcanic hazards assessment (VHA) for the Idaho National Laboratory (INL) site that is being conducted as a SSHAC (Senior Seismic Hazard Analysis Committee) level 3 project. During the conduct of the two studies, significant new knowledge and techniques for conducting VHAs has been developed. Delaying completion of the standard will result in a much-improved final product. The INL project is slated for completion in mid-2024, and once it is done, the working group can focus on revising the draft standard to incorporate the newly developed knowledge and techniques.

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<b>Environmental and Siting Consensus Committee (ESCC)</b>				
<b>Organizational Chart</b>				
<b>Chair: Carl A. Mazzola</b>			<b>Vice Chair: Leah Parks</b>	
<i>Siting: Atmospheric</i>	<i>Siting: Hydrogeologic</i>	<i>Siting: Seismic</i>	<i>Siting: General and Monitoring</i>	<i>Environmental Impact Assessment &amp; Analysis</i>
<b>David Bruggeman (Chair)</b>	<b>Yan Gao (Chair)</b>	<b>Brent Gutierrez (Chair)</b>	<b>Leah Parks (Chair)</b>	<b>Leah Parks (Chair)</b>
<b>OPEN (Vice Chair)</b>	<b>OPEN (Vice Chair)</b>	<b>Yong Li (Vice Chair)</b>	<b>OPEN (Vice Chair)</b>	<b>OPEN (Vice Chair)</b>
© = PINS submitted to ANSI				
2.3-2011 (R2021) Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites <a href="#">RF 7/19/2021</a> (WGC: OPEN)	2.8-2019 Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities <a href="#">App'd: 12/17/2019</a> (WGC: Y. Gao & R. Schneider)	2.26-2004 (R2021) © (A1) Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design <a href="#">RF 12/10/2021</a> (WGC: D. Clark & H. Phan)	2.6-2018 (R2023) (A2) Guidelines for Estimating Present & Projecting Future Population Distributions Surrounding Nuclear Facility Sites <a href="#">RF 1/3/2023</a> (WGC: OPEN)	2.35 (NEW) © (B1) Estimating the Socioeconomic Impacts of Construction, Operation, and Decommissioning at a Nuclear Facility (WGC: D. Anderson)
2.15-2013 (R2021) Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities <a href="#">RF 11/1/2021</a> (WGC: J. Ciolek & S. Davis)	2.17-2010 (R2021) Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants <a href="#">RF 6/28/2021</a> (WGC: T. Rasmussen)	2.2-2016 (R2020) (A2) Earthquake Instrumentation Criteria for Nuclear Power Plants <a href="#">RF 11/16/2020</a> (WGC: V. Graizer)	16.1-2019 (A2) Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure <a href="#">App'd 2/22/2019</a> (WGCs: D. Kosson & A. Garbrabants)	
3.11-2015 (R2020) © Determining Meteorological Information at Nuclear Facility Sites <a href="#">RF 5/21/2020</a> (WGC: T. Bellinger & D. Bruggeman)	2.18 (NEW) Evaluating Radionuclide Transport in Surface Water for Nuclear Facilities (WGC: N. Tiruneh)	2.10-2017 (R2022) (A2) Criteria for Retrieval, Processing, Handling, and Storage of Records from Nuclear Facility Seismic Instrumentation <a href="#">RF 4/1/2022</a> (WGC: OPEN)	41.5-2012 (R2023) (A2) V&V of Radiological Data for Use in Waste Management and Environment <a href="#">RF 9/7/2023</a> (WGC: L. Parks)	
2.21-2022 (A2) Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink <a href="#">App'd 2/4/2022</a> (WGC: M. Kinley)	2.32 (NEW) Guidance on the Selection and Evaluation of Remediation Methods for Subsurface Contamination (WGC: M. Darois)	2.23-2016 (R2020) (A2) Nuclear Power Plant Response to an Earthquake <a href="#">RF 11/16/2020</a> (WGC: OPEN)	2.22 (NEW) © (B1) Environmental Radiological Monitoring at Operating Nuclear Facilities (WGC: T. Eddy & B. Stagich)	
	2.9 (W2000) © (C2) Evaluation of Ground Water Supply for Nuclear Facilities (WGC: OPEN)	2.27-2020 (A2) Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments <a href="#">App'd 4/16/2020</a> (WGC: K. Hanson)		
	2.13 (W1998) (C2) Evaluation of Surface-Water Supplies for Nuclear Power Sites (project being considered) (WGC: OPEN)	2.29-2020 (A2) Probabilistic Seismic Hazard Analysis <a href="#">App'd 4/16/2020</a> (WGC: E. Gibson)		
	2.19 (W2001) (C2) Guidelines for Establishing Site-Related Parameters for Site Selection and Design of ISFSIs (Water Pool Type) (project being considered) (WGC: OPEN)	2.30-2015 (R2020) (A2) Criteria for Assessing Tectonic Surface Fault Rupture and Deformation at Nuclear Facilities <a href="#">RF 5/4/2020</a> (WGC: I. Wong)		
		2.34 (NEW) © (B1) Characterization and Probabilistic Analysis of Volcanic Hazards (WGC: S. McDuffie)		
(A1) Current Being Worked On Standards				
(A2) Current Not Being Worked On Standards				
(B1) Proposed Being Worked On Standards				
(B2) Proposed Not Being Worked On Standards				
(C1) Withdrawn Being Worked On Standards				
(C2) Withdrawn Not Being Worked On Standards				

**Table 1 – ESCC Organizational Chart**

## **Fuel, Waste, and Decommissioning Consensus Committee (FWDC)**

**Jean Francois Lucchini, Chair**  
Los Alamos National Laboratory

**Scope:** *The FWDC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting the design, operation, maintenance, operator selection and training, quality requirements of new and used fuel transport, storage and related handling facilities; including high level/transuranic, greater-than-Class C, low level, and mixed waste processing and facilities, and for the decommissioning of commercial, educational, research and government facilities. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee. The FWDC supervises the work of the following three subcommittees:*

- *New and Used Fuel (Design Only)*
- *High Level GTCC, Low Level and Mixed Waste*
- *Decommissioning (Commercial and Research Facilities)*

*Each subcommittee has established various working groups to develop specific proposed standards and maintain existing standards within its respective area of responsibility. These working groups create the text of FWDC standards and resolve review and ballot comments.*

### **FWDC Membership:**

**Jean Francois Lucchini, Chair**, Los Alamos National Laboratory

**Maryanne Stasko, Vice Chair**, Duke Energy Corporation

Kim Anthony, Energy Solutions

Sven O. Bader, Orano USA

Sam Brinton, Core Solutions Consulting

Harry D. Felsher, U.S. Nuclear Regulatory Commission

Steven Frey, Individual

Jerry Golden, Individual

Gale Hauck, Oak Ridge National Laboratory

Robert Howard, Spectra Tech, Inc.

Robert Joseph, Idaho National Laboratory

D. Wayne Lewis, Westinghouse Government Services, LLC

Michael Lico, Individual

Coleman C. Miller, Pacific Gas & Electric Company

Jon Mitchell, Westinghouse Electric Company, LLC

Corey Munz, TLG Services Inc.

Mitchell Sanders, Individual

Steven W. Schithelm, BWX Technologies, Inc.

Thomas Smedra, Westinghouse Electric Company, LLC

John Stamatakos, Southwest Research Institute

### **Observer:**

Anoop Kota, Individual

Roulette Nader, Duke Energy

### **Report of FWDC:**

The FWDC held hybrid meetings on June 14, 2023, and November 15, 2023. Robert Howard, Robert Joseph, Michael Lico, and John Stamatakos were confirmed as new FWDC members. Jef Lucchini and Mary Ann Stasko were re-elected as Chair and Vice Chair, respectively.

**Approved in 2023:**

**ANSI/ANS-57.3-2018 (R2023), Design Requirements for New Fuel Storage Facilities at Light Water Reactor Plants** (reaffirmation of ANS-57.3-2018)

**Active Standards/Projects (Approved PINS):**

**ANS-55.6, Liquid Radioactive Waste Processing System for Light-Water Cooled Reactor Plants** (new standard/historical revision of ANS-55.6-1993; R2007)

**ANS-57.2, Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants** (proposed new standard, historical revision of ANSI/ANS-57.2-1983)

**ANS-57.9, Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)** (new standard, historical revision of ANSI/ANS-57.9-1992; W2010)

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**New and Used Fuel (Design Only) Subcommittee**

**Membership:**

**Mitchell Sanders, Chair**, Individual  
Donald Lewis, Westinghouse Government Services  
Rosemary Montgomery, Oak Ridge National Laboratory  
John Scaglione, Spectra Tech, Inc.  
John Stamatakos, Southwest Research Institute  
Vivek Thangham, U.S. Department of Energy

The New and Used Fuel (Design Only) Subcommittee manages the following projects and standards:

**ANSI/ANS-57.1-1992 (R2019), Design Requirements for Light Water Reactor Fuel Handling Systems** (revision of ANSI/ANS-57.1-1980)

*Scope: This standard sets forth the required functions of fuel handling systems at light water reactor nuclear power plants. It provides minimum design requirements for equipment and tools to handle nuclear fuel and control components safely.*

**Membership:**

Mitchell Sanders, Chair, Individual; Timothy Ake, Framatome, Inc.; Douglas Eisterhold, Westinghouse Electric Company, LLC; Wayne Lewis, Westinghouse Government Services, Robert Pinkston, Westinghouse Electric Company, LLC; Thomas Smedra, Individual

**Status:** Reaffirmation was approved by ANSI on 12/6/2019. A PINS is in the process of being developed to revise this standard.

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**ANS-57.2, Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants** (proposed new standard, historical revision of ANSI/ANS-57.2-1983)

*Scope: This standard defines design requirements for spent fuel pool storage and handling facilities at nuclear power plants for pool storage and preparation for shipment of spent fuel from light-water reactor nuclear power stations. It contains requirements for the design of: Fuel storage pool; Fuel storage racks; Pool makeup, instrumentation / cleanup systems; Pool structure / integrity; Radiation shielding; Residual heat removal; Ventilation, filtration and radiation monitoring systems; Shipping cask handling and decontamination; Building structure and integrity; Fire protection and communication.*

**Membership:**

Mitchell Sanders, Chair, Individual; Wayne Lewis, Vice Chair, Westinghouse Government Services; Timothy Ake, Framatome, Inc.; Gordon Bjorkman, U.S. Nuclear Regulatory Commission; Paul Cantonwine, Oak Ridge National Laboratory; Harry Felsher, U.S. Nuclear Regulatory Commission; Brian Gutherman, Gutherman Technical Services;

Nathan Hottle, Framatome, Inc.; Ed Knuckles, Individual; Christian Lobscheid, NuScale Power; Mark Peres, Individual; Justin Schulte, Energy Solutions; Maryanne Stasko, Duke Energy Corporation; Robert Tucker, Individual

**Status:** The PINS was submitted to ANSI 2/8/13. Mitchell Sanders took over as working group chair to continue with the revision of this standard.

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**ANSI/ANS-57.3-2018 (R2023), *Design Requirements for New Fuel Storage Facilities at LWR Plants (new standard, historical revision of ANSI/ANS-57.3-1983)***

**Scope:** *This standard defines the required functions of wet or dry storage facilities for new fuel at light water reactor nuclear power plants. It provides minimum design requirements for safe storage of new nuclear fuel and control components at such plants. The fuel storage facilities covered by this standard are used for receiving, inspecting and storing fuel containing new and recycled uranium and mixed oxides.*

**Membership:**

Mitchell Sanders, Acting Chair, Individual; Brian Gutherman, Vice Chair, Gutherman Technical Services; Timothy Ake, Framatome, Inc.; Gordan Bjorkman, U.S. Nuclear Regulatory Commission; Nathan Hottle, Framatome Inc.; Brian Gutherman, Gutherman Technical Services; Edward Knuckles, Individual; Wayne Lewis, Westinghouse Government Services; Christian Lobscheid, NuScale Power; Mark Peres, Individual; Justin Schulte, Energy Solutions; Maryanne Stasko, Duke Energy Corporation; Robert Tucker, Individual

**Status:** This standard was reaffirmed by ANSI on 1/3/2023.

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**ANS-57.5, *Light Water Reactors Fuel Assembly Mechanical Design and Evaluation (proposed new standard, historical revision of ANSI/ANS-57.5-1996; R2006; W2016)***

**Scope:** *This standard sets forth a series of design conditions and functional requirements for the design of fuel assemblies for light water cooled commercial power reactors. It includes specific requirements for design, as well as design criteria to ensure adequate fuel assembly performance. The standard establishes a procedure for performing an evaluation of the mechanical design of fuel assemblies. It does not address the various aspects of neutronic or thermal-hydraulic performance except where these factors impose loads or constraints on the mechanical design of the fuel assemblies.*

**Membership:**

Rosemary Montgomery, Chair, Oak Ridge National Laboratory

**Status:** This standard was administratively withdrawn by ANSI on 2/27/2016 for lack of maintenance. There was no activity in 2023.

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**ANS-57.7, *Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type), (proposed new standard, historical revision of ANSI/ANS-57.7-1998; W2007)***

**Membership:**

OPEN

**Status:** Revision of historical standard being considered.

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**ANSI/ANS-57.8-2020, *Fuel Assembly Identification (revision of ANSI/ANS-57.8-1995; R2017)***

**Scope:** *This standard provides requirements and detailed information for uniquely identifying nuclear fuel assemblies/elements, and the corresponding fuel plates or rods inside the assemblies. Detailed recommendations and*

requirements are provided for the numbering of the geometric orientation for the fuel plates, or fuel rods, inside the fuel assemblies. This standard is a detailed revision of ANSI/ANS-57.8-1995 (R2017).

**Membership:**

John Scaglione, Chair, Spectra Tech, Inc.; Caroline Duncan, Westinghouse Electric Company, LLC; Josh Jarrell, Idaho National Laboratory; Steven Maheras, Pacific Northwest National Laboratory; Robert Sachs, Individual

**Status:** A revision was approved by ANSI on 8/28/2020. No activity in 2023.

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**ANS-57.9, Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type) (proposed new standard, supersedes ANSI/ANS-57.9-1992)**

**Scope:** This standard is intended to be used by the owner and operator of a dry storage-type independent spent fuel storage installation (ISFSI) in specifying the design requirements and by the designer in meeting the minimum requirements of such installations. The standard includes requirements for the following: the design of major buildings and structures, shipping cask unloading and handling facilities, cask decontamination, loading and unloading areas, spent fuel storage areas and racks, fuel handling equipment, radiation shielding, special equipment and area layout configurations, air or gas quality, storage area integrity, air or gas cleanup, fuel inspection, ventilation, residual heat removal, radiation monitoring, prevention of criticality, radwaste control and monitoring systems, provisions to facilitate decommissioning, quality assurance, materials accountability, and physical security. This standard continues the set of American National Standards on spent fuel storage. Similar standards are: (1) Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants, ANSI/ANS-57.2-1983. (2) Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type), ANSI/ANS-57.7-1988. (3) Guidelines for Establishing Site-Related Parameters for Site Selection and Design of an independent Spent Fuel Storage Installation (Water Pool Type), ANSI/ANS-2.19-1988(R1990); and (4) Design Criteria for Consolidation of LWR Spent Fuel, ANSI/ANS-57.10-1987.

**Membership:**

Wayne Lewis, Co-Chair, Westinghouse Government Services; John Stamatakos, Co-Chair, Southwest Research Institute; Stephan Anton, Holtec International; Kaushik Banerjee, Pacific Northwest National Laboratory; Justin Clarity, Pacific Northwest National Laboratory; Gabriel Grant, Southern Nuclear Operating Company; Harish Reddy Gadey, Pacific Northwest National Laboratory; Brian Gutherman, Gutherman Technical Services, LLC; Kurt Harris, Flibe Energy Inc.; Robert Howard, Spectra Tech, Inc.; William Murphy, Duke Energy Corporation; Mark Richter, Nuclear Energy Institute; Javier Royo-Villanova, IDOM Consulting; Peter Stefanovic, Pacific Northwest National Laboratory

**Status:** A PINS was submitted to ANSI on 2/12/2020. Wayne Lewis and John Stamatakos are now co-chairs of the working group and have re-established work on this project.

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**ANSI/ANS-57.10-1996 (R2021), Design Criteria for Consolidation of LWR Spent Fuel (revision of ANSI/ANS-57.10-1987)**

**Scope:** This standard provides design criteria for the process of consolidating LWR spent nuclear fuel in either a wet or a dry environment. It addresses processes for consolidating fuel either horizontally or vertically. The standard sets forth requirements for utilizing equipment and systems to perform consolidation, handle fuel rods and nonfuel-bearing components, and handle broken fuel rods. This standard also contains requirements for facility or installation interfaces, nuclear safety, structural design, thermal design, accountability, safeguards, decommissioning, and quality assurance. The standard is not concerned with the storage of the spent fuel either before or after the consolidation process. These areas are covered in the following American National Standards: Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants, ANSI/ANS-57.2-1992. Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type), ANSI/ANS-57.7-1992. Design Criteria for an Independent Spent Fuel Storage Installation (Dry Storage Type), ANSI/ANS-57.9-1992.

**Membership:**

Vivek Thangam, Chair, U.S. Department of Energy; Debasish Chowdhury, Lappeenranta University of Technology; Harish Reddy Gadey, Pacific Northwest National Laboratory; Dale Lancaster, NuclearConsutlants.com; David Orr, Duke Energy Corporation; Ryan Smith, UCOR United Cleanup Oak Ridge; Sai Zhang, Idaho National Laboratory

**Status:** Reaffirmation was approved by ANSI on 1/28/2021. Vivek Thangam was appointed as working group chair. A PINS has been prepared and will be issued to the FWDC for approval in 2024. The previous version of the standard will be reviewed for potential changes once the PINS is approved.

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### **High Level, GTCC, Low Level and Mixed Waste Subcommittee**

**Membership:**

**Robert Howard, Chair**, Spectra Tech, Inc.  
Sven O. Bader, Vice Chair, Orano Federal Services  
D. Mark Gerboth, Washington River Protection Solutions  
Robert Joseph, Idaho National Laboratory  
Coleman Miller, Pacific Gas & Electric Company

The High Level, GTCC, Low Level and Mixed Waste Subcommittee manages the following projects and standards:

#### **ANS-15.19, *Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactor* (historical standard considered for reinvigoration)**

**Scope from historical standard:** *This standard provides the necessary information for the shipping, receiving, and storing of fuel and other fabricated special nuclear material for research reactors. The areas addressed are data collection and analysis, packaging selection, preparation of the package or shipment, or both, safeguards, internal material control, records, and quality assurance for shipping.*

**Membership:**

OPEN

**Status:** Historical standard to be considered for reinvigoration.

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#### **ANS-40.35, *Volume Reduction of Low-Level Radioactive Waste or Mixed Waste* (proposed new standard, historical revision of ANSI/ANS-40.35-1991)**

**Scope from historical standard:** *This standard sets forth the general design specifications, procurement, and performance requirements for operation of low-level waste (LLW) and mixed waste (MW) volume reduction (VR) processing systems for nuclear power plants and other nuclear facilities. This standard may be applied to the specification of other LLW VR systems (such as government nuclear facilities) if consideration is given to any additional design features required by the hazardous nature of the wastes to be processed by them. For the purpose of this standard, a nuclear facility's LLW VR processing systems begin at the point where treatment of aqueous waste generates a solid waste, or where solid, slurry, or liquid organics wastes are collected, and ends at a waste storage, shipping, or disposal area. VR techniques may include processes such as drying, incineration, chemical decomposition, flash boiling, mechanical, or high-temperature reduction or destruction techniques, or both. Some VR systems may include, as an integral part of the system, a means for immobilization of the waste. Compaction and solidification techniques are in the scope of American National Standard Solid Radioactive Waste Processing Systems for Light Water Reactor Plants, ANSI/ANS-55.1-1992.*

**Membership:**

Mark Gerboth, Chair, Washington River Protection Solutions; Mike Akins, Worley Parsons

**Status:** Inactive project to be considered for revision.

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#### **ANSI/ANS-40.37-2009 (R2021) *Mobile Low-Level Radioactive Waste Processing Systems* (new standard, historical revision of ANSI/ANS-40.37-1993)**

**Scope:** *This standard sets forth design, fabrication, and performance recommendations and requirements for mobile low-level radioactive waste processing (MRWP) systems (including components) for nuclear facilities that generate low-level radioactive wastes (LLWs) as defined by the Atomic Energy Act as amended. The purpose of this standard is to provide guidance to ensure that the MRWP systems are designed, fabricated, installed, and operated in a manner commensurate with the need to protect the health and safety of the public and plant personnel.*

**Membership:**

Coleman Miller, Chair, Pacific Gas & Electric Company; Paul Saunders, Suncoast Solutions, Inc.

**Status:** Reaffirmation was approved by ANSI on 2/22/2021. No activity in 2023.

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**ANSI/ANS-55.1-2021, Solid Radioactive Waste Processing System for Light Water Cooled Reactor Plants (revision of ANSI/ANS-55.1-1992; R2017)**

**Scope:** *This standard sets forth the design, construction, and performance requirements for a solid radioactive waste processing system for light water cooled reactor plants. For the purposes of this standard, the solid radioactive waste system begins at the interface with the liquid radioactive waste processing system boundary and at the inlets to the spent resin, filter sludge, evaporator concentrate, and phase separator tanks. In addition, this standard pertains to dry active waste, mixed waste, and other solid radioactive waste forms that are generated as part of the operation and maintenance of light water cooled reactor plants. The system includes facilities for temporary (up to 30 days of anticipated normal waste generation) on-site storage of packaged waste but terminates at the point of loading the filled drums and other containers on a vehicle for shipping off-site to a licensed disposal site or transfer to interim (up to 5 yr) on-site storage facilities. The solid radioactive waste processing system is not a safety-class system as defined by American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 (R1988) or as defined in American National Standard Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, ANSI/ANS-52.1-1983 (R1988).*

**Membership:**

Coleman Miller, Chair, Pacific Gas & Electric Company; Paul Saunders, Vice Chair, Suncoast Solutions, Inc.; Calvin Hendrix, AVANTech, Inc.; Chad Hendrix, Atkins, SNC Lavalin; Stephen Liebenow, Energy Solutions; Kent Novotny, Sargent & Lundy; Nidamarthi Saikiran, Bureau Veritas India Pvt. Ltd.

**Status:** The revision of the standard was approved by ANSI on 12/2/2021. No activity in 2023.

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**ANS-55.4, Gaseous Radioactive Waste Processing System for Light Water Cooled Reactor Plants (proposed new standard, historical revision of ANSI/ANS-55.4-1993)**

**Scope:** *This standard sets forth minimum design, construction, and performance requirements, with due consideration for operation, for gaseous radioactive waste processing systems (GRWPS) for light water reactor (LWR) plants. It is applicable for routine operation, design basis fuel leakage, and other design basis occurrences.*

**Membership:**

OPEN

**Status:** This standard was administratively withdrawn on 5/14/2017 for lack of maintenance. The FWDC does not feel there is a current need to reinvigorate this standard. No activity in 2023.

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**ANS-55.6, Liquid Radioactive Waste Processing System for Light Water Reactor Plants (proposed new standard, historical revision of ANSI/ANS-55.6-1993)**

**Scope:** *This standard sets forth minimum design, construction, and performance requirements, with due consideration for operation, of the Liquid Radioactive Waste Processing System (LRWPS) for light water reactor (LWR) plants for design basis inputs. It is applicable to routine operation, including design basis fuel leakage and other design basis occurrences.*

**Membership:**

Coleman Miller, Chair, Pacific Gas & Electric; Calvin Hendrix, AVANTech Inc.; Chad Hendrix, Atkins-SNC Lavalin; Stephen Liebenow, Energy Solutions; Kent Novatny, Sargent & Lundy; Nidamarthi Saikiran, TUV-India Pvt Ltd.; George Wilhelmsen, Sargent & Lundy, LLC

**Status:** This standard was administratively withdrawn on 5/13/2017 for lack of maintenance. A PINS was submitted to ANSI on 5/4/2021 to resurrect this standard. A draft has been completed for large reactors. The working group is seeking input on liquid quantities for light water SMRs to finish the work.

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**Decommissioning (Commercial and Research Facilities) Subcommittee**

**Membership:**

OPEN, Subcommittee Chair  
Rounette Nader, Duke Energy Corporation

The Decommissioning (Commercial and Research Facilities) Subcommittee manages the following standard:

**ANS-15.10, *Decommissioning of Research Reactors* (proposed new standard, revision of historical standard under consideration)**

**Scope from historical standard:** *This standard provides requirements and criteria for the decommissioning of research reactors and includes decommissioning alternatives, planning, radiation criteria, surveillance and maintenance, environmental impacts, quality assurance, and reports and documentation.*

**Status:** Revision of historical standard being considered.

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## Fuel, Waste, and Decommissioning Consensus Committee (FWDCC) Organizational Chart

Chair: Jean Francois Lucchini

Vice Chair: Maryanne Stasko

<i>New and Used Fuel (Design Only)</i>	<i>High Level, GTCC, Low Level, and Mixed Waste</i>	<i>Decommissioning (Commercial and Research Facilities)</i>
<b>Mitchell Sanders, Chair Vice Chair (TBD)</b>	<b>Robert Howard, Chair Sven Bader, Vice Chair</b>	<b>OPEN, Chair Vice Chair (TBD)</b>
<b>Ⓢ = PINS submitted to ANSI</b>		
ANS-57.1-1992 (R2019) (A2) Design Requirements for LWR Fuel Handling Systems <a href="#">RF 12/6/19</a> (WGC: M. Sanders)	ANS-40.37-2009 (R2021) (A2) Mobile Low-Level Radioactive Waste Processing Systems <a href="#">RF 2/22/21</a> (WGC: C. Miller)	ANS-15.10 (W2004) (C2) Decommissioning of Research Reactors (reinvigoration being considered)
ANS-57.3-2018 (R2023) (A2) Design Requirements for New Fuel Storage Facilities at LWR Plants <a href="#">RF 1/3/23</a> (Acting WGC: M. Sanders)	ANS-55.1-2021 (A2) Solid Radioactive Waste Processing Systems for Light Water Cooled Reactor Plants <a href="#">App'd 12/2/21</a> (WGC: C. Miller)	
ANS-57.8-2020 (A2) Fuel Assembly Identification <a href="#">App'd 8/8/20</a> (WGC: J. Scaglione)	ANS-55.6 (W2017) Ⓢ (C1) Liquid Radioactive Waste Processing Systems for Light Water Reactor Plants (WGC: C. Miller)	
ANS-57.10-1996 (R2021) (A2) Design Criteria for Consolidation of LWR Spent Fuel <a href="#">RF 1/28/21</a> (WGC: V. Thangam)	ANS-15.19 (W2001) (C2) Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactor (reinvigoration being considered)	
ANS-57.2 (W1993) Ⓢ (C1) Design Requirements for LWR Spent Fuel Facilities at Nuclear Power Plants (Acting WGC: M. Sanders)	ANS-40.35 (W2001) (C2) Volume Reduction of Low-Level Radioactive Waste or Mixed Waste (WGC: M. Gerboth)	
ANS-57.9 (W2010) Ⓢ (C1) Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type) (Acting WGC: M. Sanders)	ANS-55.4 (W2017) (C2) Gaseous Radioactive Waste Processing Systems for Light Water Cooled Reactor Plants (WGC: OPEN)	
ANS-57.5 (W2016) (C2) LWR Fuel Assembly Mechanical Design and Evaluation (WGC: R. Montgomery)		
ANS-57.7 (W2007) (C2) Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type) (reinvigoration being considered) (WGC: OPEN)		
(A1) Current Being Worked On Standards		
(A2) Current Not Being Worked On Standards		
(B1) Proposed Being Worked On Standards		
(B2) Proposed Not Being Worked On Standards		
(C1) Withdrawn Being Worked On Standards		
(C2) Withdrawn Not Being Worked On Standards		

**Table 2 – FWDCC Organizational Chart**

## Large Light Water Reactor Consensus Committee (LLWRCC)

**Michelle French, Chair**  
Westinghouse Government Services

**Scope:** *The LLWRCC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting the design, operation, maintenance, operator selection and training, and quality requirements for current operating nuclear power plants and future nuclear power plants that employ large station light water moderated, water-cooled reactors. The standards include the reactor island, balance of plant, and other systems within the plant boundary that affect safety and operations. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee.*

*The LLWRCC supervises the work of the following subcommittees:*

- *Reactor and Plant Systems and Support Subcommittee*
- *Simulators, Instrumentation, Control Systems, Software and Testing*
- *Emergency Planning and Response*

*Each subcommittee has established various working groups to develop specific proposed standards and maintain existing standards within its respective area of responsibility. These working groups create the text of LLWRCC standards and resolve review and ballot comments.*

### **LLWRCC Membership:**

**Michelle French, Chair**, Westinghouse Government Services  
OPEN, Vice Chair  
Ahmad Al Rashdan, Idaho National Laboratory  
Robert Becse, Westinghouse Electric Company, LLC  
(Alternate: Larkin Ison, Jr., Westinghouse Electric Company, LLC)  
Robert Burg, Engineering Planning and Management, Inc.  
David Desauliniers, U.S. Nuclear Regulatory Commission  
James Florence, Individual  
Robert Fuller, Entergy Corporation  
Darrell Gardner, Kairos Power LLC  
Steven Gebers, Quantum Nuclear Services  
James Glover, Fluxion Technologies  
Franklin Hope, Jensen Hughes Inc.  
Earnestine Johnson-Turnipseed, Entergy Corporation  
Richard Lagdon, Bechtel National, Inc.  
Svetlana Lawrence, Idaho National Laboratory  
Mark A. Linn, Individual  
Ronald Markovich, Contingency Management Consultant

### Observers:

Charles H. Moseley, Jr., Edgewater Technical Associates, LLC  
James C. Saldarini, Eden Radioisotopes LLC  
Donald Spellman, Individual

### **Report of LLWRCC:**

The LLWRCC held five virtual meetings: March 8, 2023, May 3, 2023, July 24, 2023, August 9, 2023, and November 8, 2023. Michelle French was re-elected as Chair. Ahmad Al Rashdan, Robert Fuller, Franklin Hope, and Svetlana Lawrence were confirmed as LLWRCC members.

**Approved in 2023:**

**ANSI/ANS-3.4-2013 (R2023)**, *Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants* (reaffirmation of ANSI/ANS-3.4-2013; R2018)

**Active Standards/Projects (Approved PINS):**

**ANS-3.5.1**, *Nuclear Power Plant Simulators for Use in Simulation Assisted Engineering and Non-Operator Training* (proposed new standard)

**ANS-3.13**, *Nuclear Facility Reliability Assurance Program (RAP) Development* (proposed new standard)

**ANS-3.15**, *Cyber Security Criteria for Critical Digital Assets (CDAs) for Nuclear Power Plant Systems* (proposed new standard)

**ANS-56.2**, *Containment Isolation Provisions for Fluid Systems after a LOCA* (proposed new standard, historic revision of ANSI/ANS-56.1984; W1999)

**ANS-60.1**, *Civilian Nuclear Export Controls* (new standard)

**ANS-GD-3.8.X** *Guidance for Risk-Informing Emergency Preparedness Programs for Nuclear Facilities* (proposed new guidance document)

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**Reactor and Plant Systems and Support Subcommittee**

*The Light Water Reactor & Reactor Auxiliary Systems Design Subcommittee and the Power Generation & Plant Systems Subcommittee have been combined into the Reactor and Plant Systems and Support Subcommittee.*

***Membership:***

**Robert Burg**, Chair, EPM, Inc.  
Franklin Hope, Vice Chair, Jensen Hughes  
Kenneth Geelhood, Pacific Northwest National Laboratory  
James Glover, Fluxion Technologies  
Margaret Harding, 4 Factor Consulting, LLC  
Franklin Hope, Jensen Hughes Inc.  
Earnestine Johnson-Turnipseed, Entergy Corporation  
Mark Linn, Individual  
Kent Welter, Nuscale Power, Inc.  
Dong Zheng, U.S. Nuclear Regulatory Commission

The Reactor and Plant Systems and Support Subcommittee manages the following projects and current standards:

**ANSI/ANS-18.1-2020**, *Radioactive Source Term for Normal Operation of Light Water Reactors* (revision of ANSI/ANS-18.1-2016)

**Scope:** *This standard provides a set of typical radionuclide concentrations for estimating the radioactivity in the principal fluid systems of light water reactors and for projecting the expected releases of radioactivity from nuclear plants. It is not intended that the values be used as the sole basis for design but be used in environmental reports and elsewhere where expected operating conditions over the life of the plant would be appropriate.*

***Membership:***

Kenneth Geelhood, Chair, Pacific Northwest National Laboratory; Luis Benevides, U.S. Navy; Elijah Dickson, U.S. Nuclear Regulatory Commission; David Hinderer, GE Hitachi; Dennis Hussey, Electric Power Research Institute; Timothy Lloyd, Westinghouse Electric Company, LLC; Mark Shaver, NuScale Power Inc.

**Status:** A response to an inquiry on ANSI/ANS-18.1-2020 received 11/21/22 is in development.

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**ANSI/ANS-30.3-2022, Light-Water Reactor Risk-Informed Performance-Based Design (new standard)**

**Scope:** This standard provides requirements for using RIPB methods to support (1) definition of safety requirements; (2) licensing-basis event (LBE) selection; (3) design-basis safety analysis; (4) probabilistic risk assessments (PRAs); (5) severe accident analysis; (6) classification and categorization of structures, systems, and components (SSCs); (7) systematic defense-in-depth (DID) evaluations; and (8) performance-based decision analysis.

The plant designer is responsible for selecting and implementing specific design requirements necessary for implementation of this standard, including support for defining accidents and expected operational characteristics through design analyses, models, conformance with applicable industrial codes and standards, or experience gained from similar designs. The designer is also responsible for the use of alternate or additional criteria and requirements to accommodate unique technologies, designs, or site characteristics not covered (or referenced) by this standard or its related documents. The inclusion of RIPB practices also supports a greater understanding of uncertainties surrounding deterministic safety evaluations and establishing compensatory actions for risk-significant uncertainties.

**Membership:**

Kent Welter, Chair, NuScale Power, LLC; David Blanchard, Vice Chair, Applied Reliability Engineering, Inc.; James August, Individual; Donald Dube, Individual; Mark Linn, Individual; Gary Locklear, Kinectrics AES Inc.; Paul Sicard, Entergy Corporation; Douglas Van Bossuyt, Naval Postgraduate School; Sunil Weerakody, U.S. Nuclear Regulatory Commission; Patrick White, Nuclear Innovation Alliance; Cindy Williams, NuScale Power LLC

**Status:** The standard was approved by ANSI on 7/22/2023 and published the next day. The standard was approved and issued after 5 years of hard work by the working group. A letter was sent from the ANS Standards Board to the NRC for endorsement via RG 1.206 and RG 1.233. Responses to NRC concerns are being developed with hopes of an in-person meeting with NRC.

**ANSI/ANS-51.10-2020, Auxiliary Feedwater System for Pressurized Water Reactors (revision of ANSI/ANS-51.10-1991; R2018)**

**Scope:** This standard sets forth the safety-related functional requirements, performance requirements, design criteria, design requirements for testing and maintenance, and interfaces for the safety-related portion of the auxiliary feedwater system (AFS) of pressurized water reactor (PWR) plants. This standard is written for new facilities that rely on an auxiliary (emergency) feedwater system for a safety-related function.

**Membership:**

Earnestine Johnson-Turnipseed, Chair, Entergy Corporation

**Status:** The revision was approved by ANSI on 10/23/2020. No activity in 2023.

**ANS-56.1, Containment Hydrogen Control (proposed title) (proposed new standard)**

**Scope:** TBD

**Membership:**

James Glover, Chair, Fluxion Technologies; James Gleason, GLSEQ, LLC; Sam Gyepi-Garbrah, Canadian Nuclear Safety Commission; Wison Luangdilok, H2Technology, LLC; Robert Pinkston, Westinghouse Electric Company, LLC; Edward Rodriguez, Global Nuclear Network Analysis LLC.; James Scobel, Westinghouse Electric Company, LLC; Andrew Smirnov, Individual

**Status:** The LLWRCC is considering the need and direction for this proposed standard.

**ANS-56.2, Containment Isolation Provisions for Fluid Systems After a LOCA (proposed new standard, supersedes ANSI/ANS-56.2-1984; R1989; W1999)**

**Scope:** This standard specifies minimum design, actuation, testing, and maintenance requirements for the containment isolation of fluid systems after a loss-of-coolant accident (LOCA). These fluid systems penetrate the primary containment of light water reactors and include piping systems (including instrumentation and control) for all fluids entering or leaving the

containment. Electrical systems are not included. The provisions for containment isolation impose additional requirements which are not required for the fluid system function. This standard does not consider any isolation requirements that may exist for controlled leakage areas either enclosing the primary containment or contiguous to the primary containment. Also, this standard does not address containment isolation requirements for events other than LOCAs.

This standard presents requirements and conditions that are needed for the isolation of the containment and covers requirements for isolation barriers, their actuation, their operators, and connecting piping between isolation barriers. The standard does not cover penetration assemblies, protection systems, power supplies, and equipment qualification.

**Membership:**

Earnestine Johnson-Turnipseed, Chair, Entergy Corporation; Robert McGowan, Vice Chair, True North Consulting, Robert Binz, Sunshine Consulting; James Bradford, Southern Nuclear Operating Company; Robert Fuller, Entergy Operations, Inc.; Jonathan Gomes, Duke Energy Corporation; Nicholas Laine, Individual; Gary McGee, NuScale Power; LLC; Lana Miller, Entergy; Paul Nichols, GE Hitachi; Glenda Patzch-Velasquez, DTE Energy; Wyatt Schuldheiss (Associate Member)

**Status:** A PINS was submitted to ANSI on 6/27/2019. The standard has been revised to incorporate outstanding comments from the NRC and updated info and terminology considering the positions also of new technology. The working group is incorporating comments to prepare the draft to start the approval process in early 2024.

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**ANS-58.2, Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture (proposed new standard, historic revision of ANSI/ANS-58.2-1988; W1998)**

**Scope:** This standard addresses the design basis for the protection of light water reactor nuclear power plants from the potentially adverse effects of postulated pipe ruptures.

**Membership:**

Dong Zheng, Chair, U.S. Nuclear Regulatory Commission; Temi Adeyeye, NuScale Power; Butch Bornt, Southern Nuclear Operating Company; Joseph Halackna, Westinghouse Electric Company, LLC; Julie Jarvis, Defense Nuclear Facilities Safety Board; Manoj Karki, Duke Energy Corporation; Wai Law, Tennessee Valley Authority; Simona Miteva (Associate Member), Technical University of Sofia; Anthony Trupiano, Westinghouse Electric Company, LLC; Oscar Vinals Atienza, Westinghouse Electric Company, LLC

**Status:** A PINS is needed to initiate a historical revision. Eq. D-10 in ANSI/ANS-58.2-1988 needs to be verified. Discussing collaboration with universities to revise the withdrawn standard.

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**ANS-58.3, Physical Protection for Nuclear Safety-Related Systems and Components (proposed new standard, historical revision of revision of ANS-58.3-1992; W2019)**

**Scope:** This standard sets forth physical protection criteria for nuclear safety-related systems and components in stations using light water reactors (LWRs). This standard includes an identification of potential hazards to nuclear safety-related systems and components and acceptable means of ensuring the protection of this equipment from these hazards.

**Membership:**

OPEN, Chair; Robert Burg, EPM, Inc.; Anthony Trupiano, Westinghouse Electric Company, LLC

**Status:** The standard was administratively withdrawn on 2/21/2019. Further discussion has determined that a revised standard on physical protection for safety-related systems and components is unnecessary since ANS-30.1, ANS-30.2 and ANS-30.3 will include these criteria as the new standards are developed. Inactive project.

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**ANS-58.6, Criteria for Remote Shutdown for Light Water Reactors Facilities (proposed new standard, historical revision of ANSI/ANS-58.6-1996; R2001)**

**Scope from historical standard:** This standard provides design criteria for controls and monitoring instrumentation necessary to shut down a reactor and maintain it in a safe shutdown condition from outside the control room. The design criteria require that: (a) specific controls and monitoring instrumentation be provided; (b) these controls be installed at a location (or locations) that is physically separate from the control room and cable spreading areas; (c) simultaneous control from both

locations be prevented by devices for transfer of control from the control room to the remote location(s); and (d) the remote controls be used as a defense-in-depth measure in addition to the control room shutdown controls and as a minimum provide for one complete channel of shutdown equipment.

**Membership:**

OPEN

**Status:** Inactive project to be considered for reinvigoration.

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**ANSI/ANS-58.9-2002; (R2020), Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems (new standard, historical revision of ANSI/ANS-58.9-1981; R1987)**

**Scope:** *This standard provides criteria for the designer which interpret the requirements of Title 10, Code of Federal Regulations, Part 50, "Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," with respect to design against single failures in safety-related Light Water Reactor (LWR) fluid systems. Means of treating both active and passive failures are addressed for safety-related fluid systems following various initiating events. Current acceptable practice is used as a basis for these criteria.*

*Failure criteria for the electric power systems and the protection systems are provided in IEEE Std 308-1980 "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations", IEEE Std 279-1971 "IEEE Standard Criteria for Protection Systems for Nuclear Power Generating Stations" (N42.7-1972), IEEE Std 379-1977 "IEEE Standard for Application of the Single-Failure Criterion to Nuclear Power Generating Station Class IE Systems", and IEEE Std 603-1980 "Standard Criteria for Safety Systems for Nuclear Power Generating Stations." Failures of structural components, such as braces, supports, or restraints, as well as occurrences involving common mode failures, are excluded.*

**Membership:**

OPEN, Chair; Robert Burg, EPM, Inc.; Tim Dodson, Engineering Planning & Management, Inc.; Matthew Hertel, X-Energy, LLC; Ethan Hunt, Nuclear Energy Consultants, Inc.; Earnestine Johnson-Turnipseed, Entergy Corporation; Prasad Kadambi, Individual; Cherie Paugh, Westinghouse Electric Company, LLC

**Status:** Reaffirmation was approved by ANSI on 7/23/2020. The reaffirmation of ANSI/ANS-58.9-1981 (R1987) was not completed before the standard was administratively withdrawn; therefore, ANSI/ANS-58.9-1981 (R1987) was processed as new standard receiving the designation of ANSI/ANS-58.9-2002. No activity in 2023.

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**ANS-58.11, Design Criteria for Safe Shutdown Following Selected Design Basis Events in Light Water Reactors (proposed new standard, revision of historical ANSI/ANS-58.11-1995; R2002)**

**Scope from historical standard:** *This standard provides design criteria for systems that perform the safety-related functions necessary to shut down a reactor and maintain it in a safe shutdown condition for selected design basis events; i.e., any design basis events that do not require operation of engineered safety features. For design basis events that require operation of engineered safety features, this standard can be selectively applied because of plant features specifically designed for these conditions. For systems that serve multiple functions, the design criteria associated with the most limiting function shall be applied.*

*The following safety-related functions are required for safe shutdown and are addressed in this standard: (1) Reactor core reactivity control; (2) Reactor core heat removal; (3) Reactor coolant pressure boundary integrity provided by: (a) Temperature control (b) Pressure control, and (c) Inventory control.*

**Membership:**

OPEN, Chair; Robert Kalantari, EPM, Inc.

**Status:** The standard was administratively withdrawn by ANSI on 7/23/2012 for lack of maintenance. A new working group chair and members are needed to update the standard. No activity in 2023.

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**ANSI/ANS-58.14-2011 (R2022), Safety and Pressure Integrity Classification Criteria for Light Water Reactors (new standard, historical revision of ANSI/ANS-58.14-1993)**

**Scope:** *This standard specifies deterministic criteria for the safety classification of items (SSCs and parts, including consumables) in a light water reactor (LWR) nuclear power plant as either safety-related (Q), non-safety-related (N), or*

supplemented (S). In addition, pressure integrity classification criteria are provided for the assignment of Classes 1 to 5 to the pressure-retaining portions of items.

**Membership:**

Mark Linn, Chair, Individual; David Blanchard, Applied Reliability Engineering; Paul Sicard, Entergy Corporation

**Status:** The standard was reaffirmed by ANSI on 2/4/2022. No activity in 2023.

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**ANS-59.3, Nuclear Safety Criteria for Control Air Systems (proposed new standard, historical revision of ANSI/ANS-59.3-1992; R2002)**

**Scope:** This standard provides criteria for the control air system that furnishes compressed air to nuclear safety-related components and other equipment that could affect any nuclear safety-related function in nuclear power plants. This standard provides: (1) the system nuclear safety design requirements and the non-nuclear safety design recommendations for equipment, piping, instruments, and controls that constitute the control air system; and (2) the nuclear safety design requirements and the non-nuclear safety design recommendations to accommodate the testing and maintenance necessary to ensure adequate performance of the control air system.

**Membership:**

OPEN, Chair; Todd Anselmi, Idaho National Laboratory; James August, Individual; Chad Boyer, Electric Power Research Institute; Robert Burg, EPM, Inc.; Raul Hernandez, U.S. Nuclear Regulatory Commission; Matthew Hertel, X-Energy, LLC; Edward Knuckles, Individual

**Status:** The PINS was submitted to ANSI 1/10/2019. The project is currently on hold. No activity in 2023.

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**ANSI/ANS-59.51-1997 (R2020) Fuel Oil Systems for Safety-Related Emergency Diesel Generators (revision of ANSI/ANS-59.51-1989)**

**Scope:** This standard provides functional, performance, and initial design requirements for the fuel oil system for diesel generators that provide safety-related emergency onsite power for light water reactor nuclear power plants. This standard addresses the mechanical equipment associated with the fuel oil system, with the exception of the engine mounted components. These components, which are mounted directly to the engine structure itself, are excluded except to define interface requirements. It also includes the instrumentation and control functional requirements. The standard excludes motors, motor control centers, switchgear, cables, and other electrical equipment used in the operation of the fuel oil system, except to define interface requirements.

**Membership:**

OPEN, Chair

**Status:** Reaffirmation received ANSI approval 7/27/2020. No activity in 2023.

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**ANSI/ANS-59.52-1998 (R2020) Lubricating Oil Systems for Safety-Related Emergency Diesel Generators (new standard)**

**Scope:** This standard provides functional, performance, and design requirements for lubricating oil systems for diesel generators that provide emergency onsite power for light water reactor nuclear power plants. The standard addresses all mechanical equipment associated with the lubricating oil system, with the exception of engine mounted components. These components, which are mounted directly to engine structure itself, are excluded, except to define interface requirements. This standard also includes the lubricating oil system instrumentation and control functional requirements. It excludes motors, motor control centers, switchgear, cables, and other electrical equipment used in the operation of the lubricating oil system, except to define interface requirements.

**Membership:**

OPEN, Chair

**Status:** Reaffirmation received ANSI approval 7/27/2020. No activity in 2023.

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### **ANS-60.1, Civilian Nuclear Export Controls (proposed new standard)**

**Scope:** *This standard addresses the requirements for compliance with U.S. export control regulations for civilian nuclear technology, equipment, and materials, as governed by 10 CFR Part 110 and 10 CFR Part 810. This includes various types of export information required by the NRC and DOE and reporting requirements that exist before and after an export has occurred. The standard also provides guidance for establishing and maintaining internal compliance programs, including as related to classification and jurisdictional determinations, personnel, security, information technology, records management, contractual provisions and certifications, and training.*

**Membership:**

Margaret Harding, Chair, 4 Factor Consulting, LLC; Elina Teplinsky, Vice Chair, Pillsbury Winthrop Shaw Pittman LLP; Jennifer Hart, Secretary, Pacific Northwest National Laboratory; Georgia Adams, Pacific Northwest National Laboratory; Stefani Buster, Duke University; Adam Deatherage, AMS Corporation; Paul Dickman, Argonne National Laboratory; Tom Gray, Pacific Northwest National Laboratory; Chelsea Gunter, Global Nuclear Energy Advisory; Peter Habighorst, U.S. Nuclear Regulatory Commission; Andrea Jones, U.S. Nuclear Regulatory Commission; Prasad Kadambi, Kadambi Engineering Consultants; Ajay Kuntamukkala, Hogan Lovells US LLP; Trudy Overlin, NuScale Power; Mark Peters, Pacific Northwest National Laboratory; Jo Anna Sellen Bredenkamp, Oak Ridge National Laboratory; William Wharton; Studsvik Scandpower

**Status:** The PINS was submitted to ANSI on 8/5/2021. Jennifer Hart led weekly meetings to develop the draft in 2023.

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### **Simulators, Instrumentation, Control Systems, Software and Testing Subcommittee**

**Membership:**

**OPEN, Chair**, Individual  
**Ahmad Al Rashdan, Vice Chair**, Idaho National Laboratory  
James August, Individual  
Aaron England, Tennessee Valley Authority  
Sarah Esparza, Constellation Nuclear  
James Florence, Individual  
James Glover, Fluxion Technologies  
Huafei (Harry) Liao, X-energy, LLC  
Michael Muhlheim, Oak Ridge National Laboratory  
Timothy Riti, Nuclear Energy Institute  
Kashmir Singh, EDF Energy  
Barbara Stevens, Individual

The Simulators, Instrumentation, Control Systems, and Software Testing Subcommittee manages the following current standards and projects:

#### **ANSI/ANS-3.1-2014 (R2020), Selection, Qualification, and Training of Personnel for Nuclear Power Plants (new standard, historic revision of ANSI/ANS-3.1-1993; R1999)**

**Scope:** *This standard provides criteria for the selection, qualification, and training of personnel for nuclear power plants. The qualifications of personnel in the operating organizations appropriate to safe and efficient operation of a nuclear power plant are addressed in terms of the minimum education, experience, and training requirements.*

**Membership:**

Timothy Riti, Chair, Nuclear Energy Institute; Ahmad Al Rashdan, Idaho National Laboratory; Heather Davis, Constellation Nuclear; Michael Petersen, Xcel Energy; Brian Tindell, U.S. Nuclear Regulatory Commission

**Status:** Reaffirmation was approved by ANSI on 2/4/2020. Revision 4 of RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," was issued in June of 2019 endorsing ANSI/ANS-3.1-2014. The working group completed the formal response to an inquiry for ANSI/ANS-3.1-2014 (R2020) in support of Crane Nuclear valve high school vocational program to assist with related experience. The response to the inquiry was approved



and sent to the inquirer. The working group held initial discussions to consider a future revision to add clarification to areas based on implementation lessons learned over the past 4 years that may help to eliminate some areas of confusion/concerns due to changes in industry workforce and pipelines.

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**ANSI/ANS-3.2-2012 (R2022), Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants (revision of ANSI/ANS-3.2-2006)**

**Scope:** *This standard provides requirements and recommendations for managerial and administrative controls to ensure that activities associated with operating a nuclear power plant are carried out without undue risk to the health and safety of the public.*

*This standard provides requirements for implementing managerial and administrative controls consistent with requirements of 10 CFR 50, Appendix B.*

*This standard is not specifically intended for application to test, mobile, or experimental reactors, nor reactors not subject to U.S. Nuclear Regulatory Commission (NRC) licensing. Although this standard is based on NRC requirements, the approach is applicable with modifications to reflect the regulatory requirements in the country of application. Applicable sections of this standard may be used in those cases for activities similar to those addressed herein.*

**Membership:**

Aaron England, Chair, Tennessee Valley Authority; Clint Eldridge, Vice Chair, Furgo USA Land Inc.; Ahmad Al Rashdan, Idaho National Laboratory; Eva Brown, U.S. Nuclear Regulatory Commission; Isaiah Morgan, University of Idaho; Charles H. Moseley, Individual; Rob Radulovich, Constellation Generation; Kerry Rhoads, Individual; David Taggart, Taggart Quality Consulting; Gordon Vytacil, Kairos Power LLC; Dennis Winchester, Winchester Nuclear Consulting Inc.

**Status:** Reaffirmation approved by ANSI on 5/26/2022. Aaron England accepted the appointment as chair in February 2023. The team is reviewing previous revisions. Currently identifying redundant requirements with the other NCR regulatory requirements.

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**ANSI/ANS-3.4-2013 (R2023), Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants (revision of ANSI/ANS-3.4-1996; R2002)**

**Scope:** *This standard defines and updates medical, mental health, and physical requirements for licensing of nuclear power plant reactor operators and senior operators. It also addresses the content, extent, methods of examination, and continual monitoring of licensed operators' medical health.*

**Membership:**

Sarah Esparza, Co-Chair, Constellation Nuclear; Barbara Stevens, Co-Chair, Individual; George Rombold, Vice Chair, Scientech Inc.; Ahmad Al Rashdan, Idaho National Laboratory; Bernard Litkett, U.S. Nuclear Regulatory Commission

**Status:** This standard was reaffirmed by ANSI on 7/19/2023. ANSI/ANS-3.4-2013 was endorsed by the U.S. Nuclear Regulatory Commission in Regulatory Guide (RG) 1.134, *Medical Assessment of Licensed Operators or Applicants for Operator Licenses at Nuclear Power Plants*, (Revision 4), published September 2014.

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**ANSI/ANS-3.5-2018, Nuclear Power Plant Simulators for Use in Operator Training and Examination (new standard, supersedes ANSI/ANS-3.5-2009)**

**Scope:** *This standard establishes the functional requirements for full scope nuclear power plant control room simulators that are subject to U.S. Nuclear Regulatory Commission Regulation for use in operator training and examination. The standard also establishes criteria for the scope of simulation, performance, and functional capabilities of nuclear power plant control room simulators. This standard does not establish criteria for the use of simulators in operator training programs.*

**Membership:**

James Florence, Chair, Individual; Michael Peterson, Acting Vice Chair, Xcel Energy; Ahmad Al Rashdan, Idaho National Laboratory; William Fraser, Individual; David Goodman, NuScholar, LLC; Jody Lawter, Dominion Energy;

Bernard Litkett, U.S. Nuclear Regulatory Commission; George McCullough, Exitech Corporation; Michael Petersen, Xcel Energy; Pablo Rey, Tecnatom S.A.; Jesse Seymour, U.S. Nuclear Regulatory Commission

**Status:** ANSI approved ANSI/ANS-3.5-2018 on 10/10/2019. The American Nuclear Society is currently coordinating with the NRC for a review of ANSI/ANS-3.5-2018 with a request for endorsement (via RG 1.149).

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### **ANS-3.5.1, Nuclear Power Plant Simulators for Use in Simulation-Assisted Engineering and Non-Operator Training (proposed new standard)**

**Scope:** *This standard establishes the requirements for the use of nuclear power plant control room simulators in applications other than operator training and examination. Applications considered in this Standard include plant engineering design and modification verification and validation, engineering design optimization, plant performance optimization, control loop tuning, trip risk reduction, power uprate/ downrate pre-testing, human-factors engineering, safety assessment studies, procedure development and verification, and training of plant personnel other than operators. This standard does not establish criteria for the use of simulators in operator training programs.*

#### **Membership:**

Kashmir Singh, Chair, EDF Energy; Ossama Ashy, WSC, Inc.; Mark Cunningham, Bluestone Power Consulting; Rama Deljouravesh, Ontario Power Generation; David Desauliniers, U.S. Nuclear Regulatory Commission; Brandon Elliott, Candu Energy Inc.; James Florence, Individual; Gil Grady, GSE Systems; Wayne Marquino, Bluestone Power Consulting; George McCullough, Exitech Corporation; Donald Mitchell, Individual; Bernard Panfil, Corys Inc.; Hal Paris, L3 MAPPS Inc.; David Rahn, U.S. Nuclear Regulatory Commission; Jose Antonio Ruiz, Tecnatom S.A.; Dong (Allen) Wang, Shandong Nuclear Power Company Ltd.; Joseph Yarbrough, Xcel Energy

The following highly technically qualified individuals provided additional expert assistance and advice to the working group during the development of this draft standard: S. Freel, Ultra Electronics Energy Group; B. Holl, KSG Essen, Germany; E. M. Lloyd, Exitech Corporation; A. Linsell, EDF Energy (UK); E. Rau, Duke Energy; D. E. Spielman, Southern Nuclear Operating Company

*Note: Evan Lloyd passed away on October 13, 2022. Steven Freel passed away March 8, 2023. Working group members recorded their appreciation of their contribution to the nuclear industry over many years, other ANS committees, and to the Utility Simulator Users Group (USUG) Executive.*

**Status:** The PINS was submitted to ANSI on 12/14/2018. Copies of the draft standard were sent out widely to increase awareness of the multi-million-dollar benefits experienced by other nuclear utilities and review comments were welcomed, e.g. Utility Simulator Users Group (USUG) nuclear industry members worldwide, PWR Users Group, BWR User Group, and EPRI.

The draft standard was presented at a number of international conferences, e.g., Nuclear Power Plant Simulation Conference in Las Vegas in January 2022, and the European Union Nuclear Power Plant Simulation Forum in Barcelona, October 2022.

All sections have been written. Work continued to review, revise, and finalize the draft throughout the year. Revisions were reviewed every 3 months through video conferences during 2023; in person meetings are planned during 2024 at the Nuclear Power Plant Simulation Conference February 11-15, 2024, Surrey Nuclear Power Station in May/June 2024, and there will also be 3 monthly video conferences. On May 26, 2023, a presentation was made to a major company operations directors on how engineering simulator models could be used as digital twins for operations and maintenance to achieve generation load capability factors of 99% as done by Rolls Royce in real time for aircraft whilst flying, so that there were no plant failures or power reductions.

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### **ANS-3.13, Nuclear Facility Reliability Assurance Program (RAP) Development (proposed new standard)**

**Scope:** *This standard provides criteria to describe nuclear facility reliability assurance programs and to perform scheduled maintenance and/or monitoring of operating conditions. This standard identifies and provides for scheduled maintenance based upon design principles. It provides guidance on how to select components' failure modes and maintenance requirements.*

**Membership:**

James August, Chair, Individual; Ettore Anselmi, Individual; Todd Anselmi, Idaho National Laboratory; John Dowling, Ameren Missouri-Callaway Energy Center; Aaron England, Tennessee Valley Authority; James Halderman, Bechtel Power Corporation; Prasad Kadambi, Individual; Majeed Khan, National Institute of Standards & Technology; Mark Linn, Individual; Alissa Neuhausen, U.S. Nuclear Regulatory Commission; Dong Thai Nguyen, Southern Nuclear Operating Company; J. Brandon Norris, X-Energy, LLC; James O'Brien, U.S. Department of Energy; Vincent Paglioni, Colorado State University; Mark Paul, Dominion Energy; Gregory Schoenebeck, U.S. Department of Energy; Andrei Smirnov, Individual

**Status:** A lengthy draft (~150 pages) was developed in 2014 but was overly focused on NRC expectations and not industry need. Little progress was made in 2016-2020 due to working group member work commitments. Renewed focus needs to establish appropriate goals and cut the original draft materials down. The original goal and work were too regulatory oriented to be useful to industry. We have reconstituted the approach to "RAP" and have reformed the working group. The entire process has been reviewed and evaluated for continued need and utility. The working group continued to meet bi-monthly in 2023 to develop an outline that will provide framework for the draft.

**ANS-3.15, Risk-Informing Critical Digital Assets (CDAs) for Nuclear Power Plant Systems (proposed new standard)**

**Scope:** *This standard will establish the principle criteria for achieving a level of cyber security that provides reasonable assurance for safe operation of a nuclear power plant. This approach takes advantage of the unique features of nuclear systems, including, reactor physics such as reactivity feedback mechanisms; mechanical systems design, such as safety valves; operator response, such as manual trip actions; non-digital I&C, such as interlocks; and structural features, such as shielding structures.*

**Membership:**

Michael Muhlheim, Chair, Oak Ridge National Laboratory; Gregory Hudson, Vice Chair, Metcalfe PLLC; Robert Youngblood, Vice Chair, Idaho National Laboratory; Ahmad Al Rashdan, Idaho National Laboratory; Eric Ball, Energy Research, Inc.; Ralph Branscomb, Florida Power & Light; Andrew Clark, Sandia National Laboratories; Ronald Cole, Enercon Federal Services; Shannon Eggers, Idaho National Laboratory; Nathan Faith, Constellation Generation Corporation, LLC; George Flanagan (Observer), Individual; Matthew Hertel, X-Energy, LLC; Jodine Jansen-Vehec, JTV Nuclear Consultants; Gary Locklear, Kinetics AES, Inc.; Frederich McCrory, Individual; Edward Quinn, Paragon Energy Solutions; Michael Rowland, Sandia National Laboratories; Michael Woodridge, Curtiss-Wright Corporation; Fan Zhang, Georgia Institute of Technology

**Status:** The working group is collaborating with JCNRM to produce a guidance document for nuclear power plants. In 2019, The PINS was submitted to ANSI on 5/26/2020. In 2022, the working group reviewed and had presentations on 14 methodologies for consideration for risk-informing the selection of critical digital assets (CDAs). Based on this work, the working group is evaluating 3 paths forward: use of current plant PRAs with existing event trees/fault trees for selected plant systems, modify those ETs/FTs to include CDAs, and determine the path sets to risk-inform the selection of CDAs; perform a prevention analysis of the same systems evaluated using event trees/fault trees with the minimal cut sets; and using a list of CDAs identified at an existing NPP use event analysis to risk-inform that selection. The working group continued to make progress. Developing the standard is a more difficult problem than we anticipated. We learn that if the problem you are analyzing is simple, you get a simple answer that really isn't an answer and does not help in analyzing the problem. Over the last year, the working group has increased the complexity, and thus reality, of the problem for risk-informing the selection of CDAs. Our third problem is based on a complex system and uses the fault tree for a now shutdown plant. The working group should have preliminary results soon. We expect to know if two of our methods work by July 2024 with the 3<sup>rd</sup> evaluation being done by the end of the year. The standard is being developed in two parts. Part 1 is what to protect, and Part 2 is how to protect it. A draft standard for Part 1 may be a little over a year away if the current problem appears fruitful. Part 2 could be completed one year after Part 1.

**ANSI/ANS-56.8-2020, Containment System Leakage Testing Requirements (revision of ANSI/ANS-56.8-2002; R2016)**

**Scope:** *This standard provides design criteria for controls and monitoring instrumentation necessary to shut down a reactor and maintain it in a safe shutdown condition from outside the control room. The design criteria require that: (a) specific controls and monitoring instrumentation be provided; (b) these controls be installed at a location (or locations) that is physically separate from the control room and cable spreading areas; (c) simultaneous control from both locations be prevented by devices for transfer of control from the control room to the remote location(s); and (d) the remote controls be used as a defense-in-depth measure in addition to the control room shutdown controls and as a minimum provide for one complete channel of shutdown equipment.*

**Membership:**

James Glover, Chair, Fluxion Technologies; Ahmad Al Rashdan, Idaho National Laboratory; Jerome Bettel, U.S. Nuclear Regulatory Commission; Kenneth Clark, Individual; Alexis Courtois, Electricite de France; Mark Gowin, Tennessee Valley Authority; Kelvin Green, Tennessee Valley Authority; Jeremy Gustafson, BWX Technologies, Inc.; Howard Hill, BCP Technical Services, Inc.; Gary Holtz, Pacific Gas & Electric Company; Earnestine Johnson-Turnipseed, Entergy Corporation; Daniel Oakley, Constellation Corporation; Babul Patel, Individual

**Status:** The revision was approved by ANSI on 12/11/2020. No activity in 2023

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**ANSI/ANS-58.8-2019, Time Response Criteria for Manual Actions at Nuclear Power Plants (revision of ANSI/ANS-58.8-1994; R2017)**

**Scope:** *This standard establishes criteria and methods for identifying, calculating, validating, tracking, and documenting time requirements for the performance of nuclear power plant time-limited manual actions that are associated with either design basis events (DBEs) or licensing basis.*

**Membership:**

Huafei (Harry) Liao, Chair, X-energy LLC; Ahmad Al Rashdan, Idaho National Laboratory; David Desaulniers, U.S. Nuclear Regulatory Commission; Stephen Fleger, U.S. Nuclear Regulatory Commission; Jonathan Ford, Framatome; Robert Fuld, Individual; Susan Sallade, Constellation Corporation; Logan Schulze, Xcel Energy; Rachel Vail, AECOM; Michael Weiner, Duke Energy

**Status:** This standard was approved by ANSI on 8/8/2019. No activity in 2023.

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**Emergency Planning and Response Subcommittee**

**Membership:**

**Ronald Markovich, Chair**, Contingency Management Consulting  
**Steven Gebers, Vice Chair**, Quantum Nuclear Services  
Manit Shah, Canadian Nuclear Laboratories

The Emergency Planning and Response Subcommittee manages the following projects and current standards:

**ANS-GD-3.8-202x, Guidance for Risk-Informing Emergency Preparedness Programs for Nuclear Facilities (proposed Guidance Document)**

**Scope:** *The Guidance Documents will provide recommended practices for using risk analysis methods and insights to influence the properties of emergency preparedness and response functions for nuclear power plants and non-power nuclear facilities. Initial work products will focus on risk-informing development of site Emergency Response Organizations (e.g., identification of necessary functions, positions and response times) and technical bases for sizing Emergency Planning Zones (including the selection of accident sequences). This guidance may be provided as a logically integrated set of work products rather than a single document. In the event the Work Group identifies a need for EP Standards, a PINS form will be completed for each proposed Standard. All other RIEP work products will be prepared with concurrence of the sponsoring consensus committees.*

**Membership:**

Ronald Markovich, Co-Chair, Contingency Management Consulting; Gregory Hudson, Co-Chair, Metcalf PLLC; Amir Afzali, Individual; Bradley Dolan, Tennessee Valley Authority; Jeremiah Doyle, NuScale Power; John Egdorf, Proactive Planning, LLC; David Grabaskas, Argonne National Laboratory; Jordan Hagaman, Kairos Power LLC; Justin Hawkins, Holtec International; Gary Hayner, Jensen Hughes Inc.; Kyle Hope, Westinghouse Electric Company; Svetlana Lawrence, Idaho National Laboratory; Roy Linthicum, Constellation Energy Corporation; Herbert Massie, Massie Consulting, LLC; Scott McCain, Emergency Planning Technical Consultants, Inc.; Matthew Nee, Nebraska Public Power District—Cooper; Michael Norris, U.S. Nuclear Regulatory Commission; Robert Rishel, Duke Energy Corporation; Susan Sallade, Framatome, Inc.; Raymond Schneider, Westinghouse Electric Company LLC; Julia Sharma, X-Energy LLC; David Young, Nuclear Energy Institute

**Status:** The Standards Board approved the ANS-GD-3.8 RIEP PINS without comment.

A Risk-Informed Emergency Preparedness Working Group (RIEP WG) has been established as a collaborative effort between the ANS Large Light Water Consensus Committee's (LLWRCC) Emergency Planning and Response Subcommittee and the ASME/ANS Joint Committee on Nuclear Risk Management's (JCNRM) Subcommittee on Risk Applications. The RIEP WG mission is to develop guidance for using risk analysis methods and insights to influence emergency preparedness and response functions for nuclear facilities.

The initial two task groups and their draft scope statements are:

- EPZ Task Group (Chair: J.Doyle): Risk-inform technical bases for sizing Emergency Planning Zones including spectrum of accident sequences to be considered.
- ERO Task Group (Chair: E. Collins): Risk-inform site Emergency Response Organizations (e.g., identification of necessary functions, positions and response times to the event at hand, etc.)

The working group and both task groups conducted meetings throughout 2023 focusing on outlining a proposed approach to the guidance documents. To date, each task group has developed their mission statements and outlined the initial key deliverables. Assignments for each deliverable are anticipated in 2024 initiating the development of the guidance documents.

As the task groups move toward starting guidance document development, the details of developing guidance documents are being hashed out. This involves defining the format, numbering, and content of the RIEP Guidance Documents. RIEP guidance documents would generally follow the format of ANS standards except that the document specifies recommended practices instead of requirements (not using should/shall wording).

### **ANS-3.8.1, *Properties of Radiological Emergency Response Functions and Organizations for Nuclear Facilities* (proposed new standard, historic revision of ANSI/ANS-3.8.1-1995)**

**Scope:** *This standard establishes properties for identifying emergency response functions and subsequently developing an overall pre-planned emergency response organization for nuclear facilities. The properties address a) basic emergency response functions, b) emergency response support functions, c) emergency response organization, and d) personnel responsibilities.*

**Membership:**

Ronald Markovich, Contingency Management Consulting Group, LLC; Steve Hook, Individual

**Status:** Project Initiation Notification System (PINS) forms were approved and submitted to ANSI for historical revisions to seven emergency preparedness standards; ANS-3.8.1, ANS-3.8.2, ANS-3.8.3 (to incorporate ANS-3.8.4), ANS-3.8.6 (to incorporate ANS-3.8.5), and ANS-3.8.7. These projects are not currently active.

### **ANS-3.8.2, *Properties of Functional and Physical Characteristics of Radiological Emergency Response Facilities at Nuclear Facilities* (proposed new standard, historic revision of ANSI/ANS-3.8.2-1995)**

**Scope:** *This standard establishes functional and physical properties for facilities needed to provide an adequate overall emergency response. The properties address a) emergency response facilities, b) facility features and requirements, and c) parameters needed to provide a basis for determining an adequate inventory of equipment and supplies for anticipated emergency responses.*

**Membership:**

Ronald Markovich, Chair, Contingency Management Consulting Group, LLC; Steve Hook, Individual

**Status:** Project Initiation Notification System (PINS) forms were approved and submitted to ANSI for historical revisions to seven emergency preparedness standards; ANS-3.8.1, ANS-3.8.2, ANS-3.8.3 (to incorporate ANS-3.8.4), ANS-3.8.6 (to incorporate ANS-3.8.5), and ANS-3.8.7. These projects are not currently active.

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**ANS-3.8.3, Properties of Radiological Emergency Response Plans and Implementing Procedures and Maintaining Emergency Response Capability for Nuclear Facilities (proposed new standard, historic revision and consolidation of ANSI/ANS-3.8.3-1995 and ANSI/ANS-3.8.4-1995)**

**Scope:** *This standard establishes properties for developing a radiological emergency response plan, emergency plan implementing procedures, and emergency plan administrative procedures for nuclear facilities. Properties include exercises, drills, surveillance, and training.*

**Membership:**

Ronald Markovich, Chair, Contingency Management Consulting Group, LLC; Steve Hook, Individual

**Status:** Project Initiation Notification System (PINS) forms were approved and submitted to ANSI for historical revisions to seven emergency preparedness standards; ANS-3.8.1, ANS-3.8.2, ANS-3.8.3 (to incorporate ANS-3.8.4), ANS-3.8.6 (to incorporate ANS-3.8.5), and ANS-3.8.7. These projects are not currently active.

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**ANS-3.8.6 Properties of the Conduct of Offsite Radiological Assessment for Emergency Response and Emergency Radiological Field Monitoring, Sampling and Analysis for Nuclear Facilities (proposed new standard, historic revision and consolidation of ANSI/ANS-3.8.5-1992 and ANSI/ANS-3.8.6-1995)**

**Scope:** *This standard establishes properties for consequence assessment properties, as well as field monitoring, and sampling and analysis strategy during all phases of and after an emergency to be used for Protective Action Recommendations for nuclear facilities.*

**Membership:**

Ronald Markovich, Chair, Contingency Management Consulting Group, LLC

**Status:** Project Initiation Notification System (PINS) forms were approved and submitted to ANSI for historical revisions to seven emergency preparedness standards; ANS-3.8.1, ANS-3.8.2, ANS-3.8.3 (to incorporate ANS-3.8.4), ANS-3.8.6 (to incorporate ANS-3.8.5), and ANS-3.8.7. These projects are not currently active.

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**ANS-3.8.7, Properties of Planning, Development, Conduct, and Evaluation of Drills and Exercises for Emergency Preparedness at Nuclear Facilities (proposed new standard, historic revision of ANSI/ANS-3.8.7-1998)**

**Scope:** *This standard establishes properties for the planning, development, conduct and evaluation of radiological emergency response drills and exercises in support of emergency preparedness at nuclear facilities. In addition, this standard will incorporate the requirements for the conduct of Hostile Action-Based Emergency Response drills.*

**Membership:**

Ronald Markovich, Chair, Contingency Management Consulting Group, LLC; Steve Hook, Individual; Eric Schrader, U.S. Nuclear Regulatory Commission

**Status:** ANS-3.8.7 was initiated as a pilot for the proposed emergency preparedness standards. It was to be used by both the commercial nuclear industry and DOE. The concept was to develop the standard (since the NRC new rulemaking addressed this area) and then present for incorporation of their requirements. Unfortunately, push back was received by the commercial nuclear industry, and the working group was unable to engage DOE to provide input. Issuance of this standard without DOE involvement would not serve a purpose as the commercial nuclear industry is not supportive of its development/issuance. This project is currently on hold.

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## Large Light Water Reactor Consensus Committee (LLWRCC) Organizational Chart

Chair: Michelle French

Vice Chair: OPEN

Reactor and Plant Systems and Support		Simulators, Instrumentation, Control Systems, Software and Testing	Emergency Planning and Response
Chair: Robert Burg Vice Chair: Franklin Hope		Chair: Pranab Guha Vice Chair: OPEN	Chair: Ronald Markovich Vice Chair: Steven Gebers
Ⓢ = PINS submitted to ANSI			
ANS-18.1-2020 (A2) Radioactive Source Term for Normal Operation of Light Water Reactors <a href="#">App'd 7/24/2020</a> (WGC: K. Geelhood)	ANS-30.3-2022 (A2) Light-Water Reactor Risk-Informed Performance-Based Design <a href="#">App'd 7/21/2022</a> (WGC: K. Welter)	ANS-3.1-2014 (R2020) (A2) Selection, Qualification, and Training of Personnel for Nuclear Power Plants <a href="#">RF 2/4/2020</a> (WGC: T. Riti)	ANS-GD-3.8.x Ⓢ (B1) Guidance for Risk-Informing Emergency Preparedness Programs for Nuclear Facilities (new guidance document) (WGCs: R. Markovich & G. Hudson)
ANS-51.10-2020 (A2) Auxiliary Feedwater System for Pressurized Water Reactors <a href="#">App'd 10/23/2020</a> (WGC: E. Johnson-Turnipseed)	ANS-58.9-2002 (R2020) (A2) Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems <a href="#">RF 7/23/2020</a> (WGC: OPEN)	ANS-3.2-2012 (R2022) (A2) Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of NPPs <a href="#">RF 5/26/22</a> (WGC: A. England)	ANS-3.8.1 (W2005) Ⓢ (C2) Properties of Radiological Emergency Response Functions and Organizations for Nuclear Facilities (WGC: R. Markovich) ON HOLD
ANS-58.14-2011 (R2022) (A2) Safety and Pressure Integrity Classification Criteria for Light Water Reactors <a href="#">RF 2/4/2022</a> (WGC: M. Linn)	ANS-59.51-1997 (R2020) (A2) Fuel Oil Systems for Safety-Related Emergency Diesel Generators <a href="#">RF 7/27/2020</a> (WGC: OPEN)	ANS-3.4-2013 (R2018) (A2) Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants <a href="#">RF 7/2/2018</a> (WGC: B. Stevens & S.Esparza)	ANS-3.8.2 (W2005) Ⓢ (C2) Properties of Functional and Physical Characteristics of Radiological Emergency Response Facilities at Nuclear Facilities (WGC: R. Markovich) ON HOLD
ANS-59.52-1998 (R2020) (A2) Lubricating Oil Systems for Safety-Related Emergency Diesel Generators <a href="#">RF 7/24/2020</a> (WGC: OPEN)	ANS-60.1 (NEW) Ⓢ (B1) Civilian Nuclear Export Controls (WGC: M. Harding)	ANS-3.5-2018 (A2) Nuclear Power Plant Simulators for Use in Operator Training and Examination <a href="#">App'd 10/10/2019</a> (WGC: J. Florence)	ANS-3.8.3 (W2005) Ⓢ (C2) Properties of Radiological Emergency Response Plans and Implementing Procedures and Maintaining Emergency Response Capability for Nuclear Facilities (WGC: R. Markovich) ON HOLD
ANS-56.1 (NEW) (B2) Containment Hydrogen Control (WGC: J. Glover) (project in consideration)	ANS-56.2 (W1999) Ⓢ (C1) Containment Isolation Provisions for Fluid Systems After a LOCA (WGC: E. Johnson-Turnipseed)	ANS-56.8-2020 (A2) Containment System Leakage Testing Requirements <a href="#">App'd 12/11/2020</a> (WGC: J. Glover)	ANS-3.8.6 (W2005) Ⓢ (C2) Properties of the Conduct of Offsite Radiological Assessment for Emergency Response and Emergency Radiological Field Monitoring, Sampling and Analysis for Nuclear Facilities (WGC: R. Markovich) ON HOLD
ANS-58.2 (W1998) (C2) Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture (WGC: D. Zheng)	ANS-58.3 (W2019) (C2) Physical Protection for Nuclear Safety-Related Systems and Components (WGC: OPEN)	ANS-58.8-2019 (A2) Time Response Criteria for Manual Actions at Nuclear Power Plants <a href="#">App'd 8/8/2019</a> (WGC: H. Liao)	
ANS-58.6 (W2011) (C2) Criteria for Remote Shutdown for Light Water Reactors Facilities (WGC: OPEN)	ANS-59.3 (W2012) Ⓢ (C2) Nuclear Safety Criteria for Control Air Systems (WGC: OPEN) ON HOLD	ANS-3.5.1 (NEW) Ⓢ (B1) Nuclear Power Plant Simulators for Use in Simulation Assisted Engineering and Non-Operator Training (WGC: K. Singh)	
	ANS-58.11 (W2012) (C2) Design Criteria for Safe Shutdown Following Selected Design Basis Events in Light Water Reactors (project being considered) (WGC: OPEN)	ANS-3.13 (NEW) Ⓢ (B1) Nuclear Facility Reliability Assurance Program Development (WGC: J. August)	
		ANS-3.15 (NEW) Ⓢ (B1) Risk-Informing Critical Digital Assets (CDAs) for Nuclear Power Plant Systems (WGC: M. Muhlheim)	
(A1) Current Being Worked On Standards			
(A2) Current Not Being Worked On Standards			
(B1) Proposed Being Worked On Standards			
(B2) Proposed Not Being Worked On Standards			
(C1) Withdrawn Being Worked On Standards			
(C1) Withdrawn Being Worked On Standards			

**Table 3 – LLWRCC Organizational Chart**

## **Nonreactor Nuclear Facilities Consensus Committee (NRNFCC)**

**Mark Joseph, Chair  
Navarro Research & Engineering, Inc.**

**Scope:** *The NRNFCC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting the safety analysis, design, maintenance, operator selection and training, and quality requirements for nonreactor nuclear facilities including facilities using radioactive isotopes, remote handling of radioactive materials, fuel processing, mixed oxide fuel processing and other fuel cycle facilities other than spent fuel handling and storage. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee.*

### **NRNFCC Membership:**

**Mark Joseph, Chair**, Navarro Research & Engineering, Inc.  
**Andrew De La Paz, Vice Chair**, U.S. Department of Energy  
David Andersen, Defense Nuclear Facilities Safety Board  
Todd M. Anselmi, Idaho National Laboratory  
Kim Anthony, Energy Solutions  
Nima Ashkeboussi, Nuclear Energy Institute  
Lawrence Berg, U.S. Department of Energy  
Daniel Eggers, Simpson Gumpertz & Heger, Inc.  
Mukesh K. Gupta, Amentum Technical Services  
H. M. Hashemian, AMS Corporation  
(Alternate: Adam Deatherage, AMS Corporation)  
Kevin Kimball, Individual  
Herbert Massie, Jr., Massie Consulting, LLC  
Carl A. Mazzola, Los Alamos National Laboratory  
Ryan McClarren, University of Notre Dame  
James O'Brien, U.S. Department of Energy  
Tracy Radel, SHINE Medical Technologies

### **Observers and Associate Members:**

Margaret Kotzalas, Observer, U.S. Department of Energy  
Alexander Kunz, Associate Member, Terrapower Isotopes

### **Report of NRNFCC:**

The NRNFCC held a virtual meeting on June 7, 2023, and a hybrid meeting on November 15, 2023. Mark Joseph was elected NRNFCC Chair; Andrew De La Paz was re-elected NRNFCC Vice Chair. Kim Anthony, Kevin Kimball, Ryan McClarren, and Tracy Radal became members of the NRNFCC.

### **Approved in 2023:**

No standards were approved in 2023.

### **Active Standards/Projects (Approved PINS):**

**ANS-2.36**, *Accident Analysis for Aircraft Crash into Reactor and Nonreactor Nuclear Facilities* (proposed new standard)

**ANS-57.11**, *Integrated Safety Assessments for Fuel Cycle Facilities* (proposed new standard)



The NRNFFC supervises the work of the following projects:

**ANS-2.36, Accident Analysis for Aircraft Crash into Reactor and Nonreactor Nuclear Facilities (proposed new standard)**

*Scope: This standard's broad reactor and nonreactor nuclear facility applicability provides the user the requirements and guidance to evaluate and assess the significance of aircraft crash risk on nuclear facility safety and provides a framework of stepwise increases in analytical sophistication aimed to demonstrate that an aircraft crash either does or does not exceed a risk level of concern equivalent to other generally applied sources of risk from the operation of nuclear facilities.*

**Membership:**

Mark Joseph, Chair, Navarro Research & Engineering, Inc.; William Walker, Secretary, Oak Ridge National Laboratory; David Andersen, Defense Nuclear Facilities Safety Board; Firdu Bati, Federal Aviation Administration; Ronald Beaulieu, Mission Support & Test Services; Kermit Bunde, U.S. Department of Energy; Nestor Castaneda, Simpson Gumpertz & Heger Inc.; Andrew De La Paz, U.S. Department of Energy; Daniel Eggers, Simpson Gumpertz & Heger Inc.; Patrick Frias, U.S. Department of Energy; Nancy Fujikado, Los Alamos National Laboratory; Richard Funk, Naval Nuclear Laboratory–Bettis; Amitava Ghosh, U.S. Nuclear Regulatory Commission; Ian Goethert, Oak Ridge National Laboratory; Loren Groff, National Transportation Safety Board; Paul Kalowski, Federal Aviation Administration; Roman Kazban, National Nuclear Security Administration; Oscar Martinez, Individual; Devlan Maxwell, Federal Aviation Administration; John McAllister, Hukari Ascendent; Jinsuo Nie, Individual; Kevin O’Kula, Individual; David Pinkston, Lawrence Livermore National Laboratory; Jacob Platfoot, Oak Ridge National Laboratory; Troy Reiss, Idaho National Laboratory; Samuel Rosenbloom, Individual; Kristofer Torgerson, Oak Ridge National Laboratory; Peter Washburn, U.S. Department of Energy

Status: PINS submitted to ANSI 7/13/2021. The working group has the following 5 subgroups:

- Subgroup 1 - Implementation Guidance, Methodology Overview;
- Subgroup 2 - Methodology for Evaluating Aircraft Impact Frequency;
- Subgroup 3 - Methodology for Evaluating Integrity of Structures, Systems, and Components Subjected to Aircraft Impact;
- Subgroup 4 - Methodology for Evaluating Exposure Due to Aircraft Impact-Consequence
- Subgroup 5 - Methodology for Evaluation of Unmanned Aerial Systems - Drones

Subgroups 2, 3, 4, and 5 met on a monthly basis in 2023. The current draft of ANS-2.36 includes draft sections for subgroups 1, 2, 3, and 4, Subgroup 5 draft is in development. The chairs of Subgroup 2, 3, and 4 provided presentations at the 2023 Nuclear & Facility Safety Programs Workshop and the 2023 ANS Winter Meeting. Aircraft Crash Frequency calculation using ANS-2.36 FAA data methodology provided to LANL, which was approved by DOE for use at LANL site. DOE funding was approved and utilized for processing FAA data for 14 nuclear facility sites.

**ANSI/ANS-3.14-2021, Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities (new standard)**

*Scope: This standard addresses requirements for systematically evaluating structures, systems, and components (SSCs) for extending the life of nonreactor nuclear facilities. This standard is applicable to facilities that are 15 to 30 years old and expect to operate for an additional 20 to 30 years. This standard provides a systematic process to determine the scope of the aging management/life extension program in terms of SSCs. For those SSCs, a process for the evaluation of remaining lifetime and determining the need for additional analysis, repairs, inspections, and replacements is developed.*

**Membership:**

Todd Anselmi, Co-Chair, Idaho National Laboratory; Craig McMullin, Co-Chair, Individual; Brendan Burns, U.S. Department of Energy; Joseph Crociata, Consolidated Nuclear Security, LLC; Margie Kotzalas, U.S. Department of Energy; Herbert Massie, Massie Consulting, LLC; Michael Mudlock, Simpson Gumpertz & Heger, Inc.; James O’Brien, U.S. Department of Energy; Cameron Samuelson-Sanford, Simpson Gumpertz & Heger;

**Status:** This standard received ANSI approval on 8/5/2021. No specific revision activity in 2023; currently monitoring for questions and interpretation needs.

### **ANS-57.11, *Integrated Safety Assessments for Nonreactor Nuclear Facilities* (proposed new standard)**

**Scope:** *This standard provides an ISA method consistent with 10 CFR Part 70 regulations to identify credible accident sequences that can lead to “high” or “intermediate” consequences as outlined in performance requirements. The ISA also specifies safety controls to prevent or mitigate those potential accidents and assess the likelihood that the facilities would meet the performance requirements, and management measures a facility operator will rely on to ensure that safety controls are available to perform their function. ISAs evaluate not just radiological and nuclear criticality hazards, but chemical and fire hazards as well.*

*The emphasis of this standard is aimed at making nonreactor nuclear facility safety requirements more risk-informed, performance-based, predictable and objective. The results of this standard, i.e., identification of hazards and design events can be integrated into that of ANS-58.16 Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities.*

#### **Membership:**

Margaret Kotzalas, Chair, U.S. Department of Energy; Todd Anselmi, Idaho National Laboratory; Sven Bader, Orano Federal Services; Michael Dunlevy, Defense Nuclear Facilities Safety Board; Rani Franovich, The Breakthrough Institute; Chelsea Gunter, Global Nuclear Energy Advisory; Gary Kaplan, RSL Safety; Alexander Kunz, TerraPower Isotopes; Arielle Miller, Dr. Arielle Miller Coaching & Consulting; Tracy Radel, SHINE Medical Technologies; April Smith, The MITRE Corporation; Robert Youngblood, Idaho National Laboratory

**Status:** A PINS was submitted to ANSI on 2/27/2013 with a revision resubmitted to ANSI on 2/25/2015. A draft was issued to the NRNFCC for a preliminary review in November of 2015. A revised draft was issued to the NRNFCC for formal ballot on 4/3/2019. The draft was also provided to the RP3C and the NCSCC for review and comments. Significant comments and objections were received. The working group has completely revised the draft to address numerous ballot comments. Items left to be completed prior to re-balloting include formatting, making the references consistent, and making the definitions consistent within ANS standards.

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### **ANSI/ANS-58.16-2014 (R2020), *Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities* (new standard)**

**Scope:** *This standard provides guidance and criteria for safety categorization of items structures, systems, components (SSCs) and administrative controls associated with nuclear safety in nonreactor nuclear facilities such as: nuclear storage and processing facilities, nuclear material and radioactive waste facilities, and nuclear fuel examination facilities. This standard elaborates on how to derive safety functions and develop design and operational requirements to satisfy these functions. It also associates the safety categorization of items to engineering (e.g., civil/structural, mechanical, electrical) and programmatic (e.g., QA) classification levels. Finally, this Standard defines functional and boundary criteria for safety SSCs to include associated SSCs necessary for the operation of a safety SSC when called upon to provide its safety function.*

#### **Membership:**

Todd Anselmi, Chair, Idaho National Laboratory; Douglas Clark, Consolidated Nuclear Security; Jerry Golden, Individual; Alexander Kunz, TerraPower Isotopes; James O'Brien, U.S. Department of Energy; Hahn Phan, U.S. Nuclear Regulatory Commission; Reginald Seay, Jacobs Technology, Inc.

**Status:** ANSI approved the reaffirmation of this standard on 4/9/2020. The working group is currently monitoring work on the revision of ANSI/ANS-2.26-2004 (R2021), *Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design*, to determine whether a revision of ANS-58.16 is needed. Working group membership has been updated with new members to consider making changes (commencing in 2024) to reflect changes driven by ANS-2.26 and other actions the new membership identifies as needing update.

## Nonreactor Nuclear Facilities Consensus Committee (NRNFCC) List of Standards/Projects

Chair: Mark Joseph

Vice Chair: Andrew De La Paz

Ⓢ = PINS submitted to ANSI		
ANS-3.14-2021 (A2)	Process for Infrastructure Aging Management and Life Extension of Nonreactor Nuclear Facilities	APP'D 8/5/2021 (WGCs: T. Anselmi & C. McMullin)
ANS-58.16-2014 (R2020) (A2)	Safety Classification and Design Criteria for Nonreactor Nuclear Facilities	RF 4/9/2020 (WGC: T. Anselmi)
ANS-2.36 (NEW) Ⓢ (B1)	Accident Analysis for Aircraft Crash into Hazardous Facilities	Active Project (WGC: M. Joseph)
ANS-57.11 (NEW) Ⓢ (B1)	Integrated Safety Assessments for Nonreactor Nuclear Facilities	Active Project (WGC: M. Kotzalas)
ANS-3.6 (NEW) (B2)	Requirements for Preoperational and Startup Testing	(Project in Consideration) (WGC: OPEN)
(A1) Current Being Worked On Standards		
(A2) Current Not Being Worked On Standards		
(B1) Proposed Being Worked On Standards		
(B2) Proposed Not Being Worked On Standards		
(C1) Withdrawn Being Worked On Standards		
(C2) Withdrawn Not Being Worked On Standards		

**Table 4 – NRNFCC List of Standards/Projects**

## **Nuclear Criticality Safety Consensus Committee (NCSCC)**

### **Larry L. Wetzel, Chair Individual**

**Scope:** *The NCSCC (formerly known as N16) is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting the determination of the potential for nuclear criticality of fissile material outside reactors, for the prevention of accidental criticality, for mitigating consequences of accidents should they occur, and for the prevention of nuclear chain reactions in activities associated with handling, storing, transporting, processing, and treating fissionable nuclides. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee.*

#### **NCSCC Membership:**

**Larry L. Wetzel, Chair**, Individual  
**William R. Shackelford, Vice Chair**, Paschal Solutions Inc.  
Roger W. Bartholomay, C.S. Engineering, Inc.  
Lawrence J. Berg, U.S. Department of Energy  
Douglas Bowen, Oak Ridge National Laboratory  
Robert D. Busch, University of New Mexico  
William Doane, Framatome Inc.  
Ernest Elliott, BWX Technologies, Inc.  
Calvin M. Hopper, Individual  
Kevin Kimball, Individual  
Ronald A. Knief, INMM Representative (Individual)  
John A. Miller, Sandia National Laboratories  
Jeremy Munson, U.S. Nuclear Regulatory Commission  
Scott P. Murray, HPS Representative (employed by General Electric Co.)  
Robert E. Wilson, U.S. Department of Energy

#### Observer:

Andrew Prichard, TradeWind Services, Inc.

#### **Report of NCSCC:**

NCSCC is continuing its efforts to review and determine standard definitions for terms used in the ANS-8 standards. The working groups will then be given the list of definitions and will be requested to use the definitions unless there is a compelling reason not to. The committee has also begun a more in-depth review of RIPB principles in order to understand where the ANS-8 standards fall in this structure.

The NCSCC held a hybrid meeting on November 13, 2023, during the ANS Winter Meeting in Washington, DC, with 14 of the 15 members in attendance, either in person or virtually. The NCSCC had 10 ballots with an average participation of over 94%. The committee had three recirculation ballots on draft standards, a ballot on a draft standard, and one on a reaffirmation of a standard. The NCSCC balance of interest is good, but the committee does not have 20 members as has been suggested.

Membership changes for 2023 were limited to company affiliations. Larry Wetzel retired from BWX Technologies, Inc. in August 2023. Ernie Elliott returned to BWX Technologies, Inc., in April 2023.

#### **Approved in 2023**

**ANSI/ANS-8.1-2014 (R2023)**, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors* (reaffirmation of ANSI/ANS-8.1-2014; R2018)

**ANSI/ANS-8.21-2023**, *Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors* (revision of ANSI/ANS-1995; R2019). Incorporates ANS-8.5-1996 (W2023).

**ANSI/ANS-8.24-2017 (R2023)**, *Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations* (reaffirmation of ANSI/ANS-8.24-2017)

**Active Standards/Projects (Approved PINS):**

**ANS-8.1**, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors* (revision of ANSI/ANS-8.1-2014; R2018)

**ANS-8.12**, *Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors* (revision of ANSI/ANS-8.12-1987; R1993; R2002; R2016; R2021)

**ANS-8.20**, *Nuclear Criticality Safety Training* (revision of ANSI/ANS-8.20-1991; R1999; R2005; R2015; R2020)

**ANS-8.22**, *Nuclear Criticality Safety Based on Limiting and Controlling Moderators* (revision of ANSI/ANS-8.22-1997; R2016; R2021)

**ANS-8.26**, *Criticality Safety Engineer Training and Qualification Program* (revision of ANSI/ANS-8.26-2007; R2012; R2016; R2022)

**ANS-8.28**, *Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety* (proposed new standard)

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**Subcommittee 8 – Fissionable Material Outside Reactors Subcommittee**

*(This subcommittee is sponsored by the ANS Nuclear Criticality Safety Division.)*

**Scope:** *The aim of this committee is to establish standards providing guidance in the prevention of nuclear chain reactions in all procedures for handling, storing, transporting, processing, and treating fissionable nuclides. ANS-8 is responsible to the Nuclear Criticality Safety Consensus Committee.*

**Membership:**

**Douglas Bowen, Chair**, Oak Ridge National Laboratory  
**Kevin Reynolds, Vice Chair**, Consolidated Nuclear Security, LLC  
**Deborah Hill, Secretary**, National Nuclear Laboratory, U.K.  
James Baker, Spectra Tech, LLC  
Marvin Barnett, Savannah River Nuclear Solutions  
Nicholas Brown, Nuclear Fuel Services, Inc.  
Michael Crouse, Consolidated Nuclear Security  
Theresa Cutler, Los Alamos National Laboratory  
David Erickson, Individual  
Christopher Haught, Consolidated Nuclear Security  
Jerry Hicks, Individual  
Billy Lee, Oak Ridge National Laboratory  
Thomas McLaughlin, Individual  
James Morman, Argonne National Laboratory  
Lon Paulson, GE Hitachi Nuclear Energy  
Catherine Percher, Lawrence Livermore National Laboratory  
Andrew Prichard, TradeWind Services, LLC  
Tracy Stover, Savannah River Nuclear Solutions, LLC  
Dominic Winstanley, Sellafield Ltd. (UK)

**Observers:**

Peter Angelo, Consolidated Nuclear Security, LLC  
Jeffrey Chapman, National Nuclear Security Administration  
Ernest Elliott, BWX Technologies, Inc.  
Ronald Knief, Individual

James Kuropatwinski, Los Alamos National Laboratory  
Alex Lang, Oak Ridge National Laboratory  
William Marshall, Oak Ridge National Laboratory  
John Miller, Sandia National Laboratories  
Brandon O'Donnell, Spectra Tech, Inc.  
Charles Rombough, CTR Technical Services, Inc.  
Ellen Saylor, Individual  
Christopher Tripp, Tripp Nuclear Consulting Services  
Kristan Wessels, Consolidated Nuclear Security, LLC  
Larry Wetzel, Individual

### **Fissionable Material Outside Reactors Subcommittee (ANS-8) Report:**

The ANS-8 subcommittee met at the 2023 Annual ANS meeting in Indianapolis, IN, and the 2023 Winter Meeting in Washington, DC, at the ANS-8 Forum meeting. At these meetings, the ANS-8 subcommittee chair, Doug Bowen, provided a summary of the following:

1. Status report of all ANS-8 standards
2. Status of ANS-8 projects in progress
  - 2a. Basis statements to document the intent of recommendations and requirements in all standards
  - 2b. Updated glossary of ANS-8 standard definitions to complete an assigned action by the NCSCC
3. Working group chairs provide the subcommittee and the NCS community about work in progress at the working group level. Volunteers are sought for the upcoming revisions of ANS-8.14 and ANS-8.17. ANS-8.27 stakeholders should be aware a revision may be discussed in the near future.
4. Revisions or upcoming revisions were discussed: ANS-8.1, 8.10, 8.12, 8.19, 8.24
5. Discussed ballots for ANS-8.21, 8.20, 8.28, 8.26, and 8.22 standards for both ANS-8 and the NCSCC.

A 3-hour ANS-8 subcommittee working group chair meeting was held on October 30, 2023, to discuss working group chair business, including basis statements and working to develop the next generation of working group members. A 2-hour ANS-8 subcommittee meeting was held on November 8, 2023, to discuss new members, new chairs, and committee members, among other business.

Doug Bowen presented the current status of ANS-8 and projects in progress to the NCSCC at the NCSCC meeting at the ANS Winter Meeting in Washington, DC.

### **ANS-8 Subcommittee Membership Changes:**

Michael Crouse, ANS-8 Secretary, stepped down and Deb Hill took his spot. I added Theresa Cutler and Bill Lee to the roster of ANS-8 as voting members.

#### **ANS-8 Working Group Chair Changes:**

ANS-8.17 - Alex Lang agreed to be co-chair with Ellen Saylor.

ANS-8.27 - B.J. Marshall transitioned into the chair position. ANS-8 thanks Dale Lancaster for his years of service.

ANS-8.5 - Standard was withdrawn with the approval of ANS-8.21-2023. The leadership and working group were withdrawn.

ANS-8.7 - James Kuropatwinski transitioned into the chair position. ANS-8 thanks Kevin Kimball for his years of service.

ANS-8.23 - Brandon O'Donnell transitioned into the chair position. ANS-8 thanks Jim Baker for his years of service.

### **Current Standards and Active Projects:**

#### **ANSI/ANS-8.1-2014 (R2023), Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors (revision of ANSI/ANS-8.1-1998; R2007)**

**Scope:** *This standard is applicable to operations with fissionable materials outside nuclear reactors, except for the assembly of these materials under controlled conditions, such as in critical experiments. Generalized basic criteria are presented and limits are specified for some single fissionable units of simple shape containing  $^{233}\text{U}$ ,  $^{235}\text{U}$ , or  $^{239}\text{Pu}$ , but not for multiunit arrays. Requirements are stated for establishing the validity and areas of applicability of any calculational method used in assessing nuclear criticality safety. This standard does not include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process control, nor detailed criteria to be met in transporting fissionable materials.*

**Membership:**

Nicholas Brown, Chair, Paschal Solutions Inc.; Andrew Arend (Associate Member), NuScale Power; Lawrence Berg, U.S. Department of Energy; Douglas Bowen, Oak Ridge National Laboratory; Shane Broyles (Associate Member), Nuclear Fuel Services, Inc.; Chris Haught, Consolidated Nuclear Solutions, LLC; Jerry Hicks, Individual Tom Marenchin, National Nuclear Security Administration; Joshua Marshall, Grounded Engineering Consultants; Thomas McLaughlin (Observer), Individual; John Miller, Sandia National Laboratories; James Morman, Argonne National Laboratory; Dallas Moser, Y-12 National Security Complex; Jeremy Munson, U.S. Nuclear Regulatory Commission; Quentin Newell (Associate Member), Urenco USA; Katherine Norton, C.S. Engineering, Inc.; Christopher Odum (Associate Member), Nuclear Fuel Services, Inc.; Andrew Prichard, TradeWind Services, LLC; Kevin Reynolds, Consolidated Nuclear Security, LLC; Ellen Saylor, Individual; Matthew Wilson, Paschal Solutions, Inc., Dominic Winstanley, Sellafield Ltd.; Ning Zhang (Associate Member), Los Alamos National Laboratory

**Status:** Reaffirmation of this standard was approved on 6/5/2023. A PINS for the revision was submitted to ANSI on 12/8/17 and resubmitted after the 2023 reaffirmation. The working group continues to move forward with a revision to the standard to include additional subcritical limits for the intermediate enriched U-235 compounds. Final wording changes have been agreed upon to enhance the use and applicability of the standard. Additional subcritical limits have been calculated and changes to the limits are being drafted to extend the U-235 lower enrichment values up to 20 wt. %. The standard was reaffirmed in 2023 to allow the final technical editing of the revised standard and anticipated comment resolution during approval of the revision. Work continues on the next revision to add additional subcritical limits to include HALEU enrichments. Wording changes to address comments from the CSSG have been drafted as part of the next revision.

**ANSI/ANS-8.3-2022, Criticality Accident Alarm System (revision of ANSI/ANS-8.3-1997; R2017)**

**Scope:** *This standard is applicable to operations with fissionable materials in which inadvertent criticality leading to a radiation dose to personnel immediately dangerous to life and health could occur. This standard is not applicable to the operation of nuclear reactors or the conduct of critical experiments.*

**Membership:**

Jerry Hicks, Chair, Individual; Peter Angelo, Consolidated Nuclear Security, LLC; James Baker, Spectra Tech, Inc.; James Banfield, Global Nuclear Fuel; Lawrence Berg, U.S. Department of Energy; Debdas Biswas, Lawrence Livermore National Laboratory; Douglas Bowen, Oak Ridge National Laboratory; Kermit Bunde, U.S. Department of Energy; Konner Casanova, Idaho National Laboratory; Jeffrey Chapman, National Nuclear Security Administration; Joseph Christianson, U.S. Department of Energy; Theresa Cutler, Los Alamos National Laboratory; Matthieu Duluc, Institute for Radiological Protection & Nuclear Safety; Scott Finrock, Fluor Government Group; John Kirkpatrick, Mirion Technologies Inc.; Thomas McLaughlin, Individual; James Miller-Marquez, Naval Nuclear Laboratory; Hannah Morbach (Associate Member), Los Alamos National Laboratory; Bruce Pierson, Pacific Northwest National Laboratory; Andrew Prichard, TradeWind Services, LLC; Timothy Sippel, U.S. Nuclear Regulatory Commission; Daniel Speaker, Savannah River Nuclear Solutions; Jingjing Wang, Canadian Nuclear Laboratories; William Zywiec (Associate Member), Lawrence Livermore National Laboratory

**Status:** The revised standard was approved by ANSI on 9/9/2022 and published shortly after. Work on basis statements for the requirements and recommendations will begin soon. This work will serve the working group and consensus committee if interpretations are needed. The basis statements are not intended to be public.

**ANS-8.5-1996 (R2022) (W2023), Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material (revision of ANSI/ANS-8.5-1986)**

**Scope:** *This standard provides guidance for the use of borosilicate-glass Raschig rings as a neutron absorber for criticality control in ring-packed vessels containing solutions of  $^{235}\text{U}$ ,  $^{239}\text{Pu}$ , or  $^{233}\text{U}$ . The chemical and physical environment, properties of the rings and packed vessels, maintenance inspection procedures, and operating guidelines are specified.*

**Membership:**

Jerry Hicks, Chair, Individual

**Status:** ANSI/ANS-8.5-1996 (R2022) was incorporated into ANSI/ANS-8.21-2023.

**ANSI/ANS-8.6-1983 (R2022), Safety in Conducting Subcritical Neutron-Multiplication Measurements in Situ (revision of N16.3-1975)**

**Scope:** *This standard provides safety guidance for conducting subcritical neutron-multiplication measurements where physical protection of personnel against the consequences of a criticality accident is not provided. The objectives of in situ measurements are either to confirm an adequate safety margin or to improve an estimate of such a margin. The first objective may constitute a test of the criticality safety of a design that is based on calculations. The second may affect improved operating conditions by reducing the uncertainty of safety margins and providing guidance to new designs.*

**Membership:**

Theresa Cutler, Chair, Los Alamos National Laboratory; Ernie Elliott, Spectra Tech Inc.; Christopher Haught, Consolidated Nuclear Security, LLC; David Hayes, Los Alamos National Laboratory; Jerry Hicks, Individual; Jesson Hutchinson, Los Alamos National Laboratory; John Miller, Sandia National Laboratories; William Myers, Los Alamos National Laboratory; Norman Schwers, Sandia National Laboratories

**Status:** Reaffirmation received ANSI approval on 9/9/2022. No response to solicited feedback from anyone currently using the standard was received. The working group is monitoring for potential use but are not making any updates at this time.

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**ANSI/ANS-8.7-2022, Nuclear Criticality Safety in the Storage of Fissile Materials (revision of ANSI/ANS-8.7-1998; R2017)**

**Scope:** *This standard is applicable to the storage of fissile materials. Mass and spacing limits are tabulated for uranium containing greater than 30 wt-%  $^{235}\text{U}$ , and for plutonium, as metals and oxides. Criteria for the range of application of these limits are provided.*

**Membership:**

James Kuropatwinski, Chair, Los Alamos National Laboratory; Kermit Bunde, U.S. Department of Energy; Theresa Cutler, Los Alamos National Laboratory; Denise Edwards, U.S. Nuclear Regulatory Commission; Christy Gibson, Consolidated Nuclear Security, LLC; Kevin Kimball, Individual; Ellen Saylor, Individual; Trevor Stewart (Associate Member), Los Alamos National Laboratory; Brittany Williamson, Spectra Tech; Travis Wilson (Associate Member), X-Energy

**Status:** The revised standard was approved by ANSI on 5/6/2022 and published shortly after. James Kuropatwinski replaced Kevin Kimball as chair.

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**ANSI/ANS-8.10-2015 (R2020), Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement (revision of ANSI/ANS-8.10-1983; R2012)**

**Scope:** *This standard provides criteria that may be used for operations outside of nuclear reactors with  $^{235}\text{U}$ ,  $^{233}\text{U}$ ,  $^{239}\text{Pu}$ , and other fissile and fissionable materials in which shielding and confinement are provided for protection of personnel and the public, except for the assembly of these materials under controlled conditions (e.g., critical experiments). The standard does not include details of administrative procedures for control (i.e., management prerogatives) nor details regarding design of processes and equipment or descriptions of instrumentation for process control.*

**Membership:**

Andrew Prichard, Chair, TradeWind Services, LLC; Linda Andrews, Framatome, Inc.; James Baker, Spectra Tech, Inc.; Andrew Barto, U.S. Nuclear Regulatory Commission; Douglas Bowen, Oak Ridge National Laboratory; Nicholas Brown, Nuclear Fuel Services, Inc.; Joseph Christensen, GE-Hitachi; Jason Crye (Associate Member), Consolidated Nuclear Security, LLC; Theresa Cutler, Los Alamos National Laboratory; Jerry Hicks, Individual; Krista Kaiser (Associate Member), Pacific Northwest National Laboratory; Darby Kimball, Lawrence Livermore National Laboratory; Thomas McLaughlin, Individual; Lon Paulson, GE Hitachi, Nuclear Energy; Rebecca Rice, Savannah River Nuclear Solutions, LLC

**Status:** ANSI approved the reaffirmation of this standard on 3/26/2020. It is anticipated that a revision will be initiated.

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**ANSI/ANS-8.12-1987 (R2021), Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors (revision of ANSI/ANS-8.12-1978)**

**Scope:** *This standard is applicable to operations with homogeneous mixtures of plutonium and uranium. The mixtures may be solutions, suspended solids, precipitates, or may have been formed mechanically. Basic criteria are presented for plutonium-uranium fuel mixtures containing no more than 30 wt% plutonium combined with uranium containing no more than 0.71 wt% <sup>235</sup>U. This standard does not include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process control, or detailed criteria to be met in transporting fissionable materials. The limits of this standard are not applicable to heterogeneous systems such as lattices of rods in water, mixtures in which particles are large enough to introduce lumping effects, or mixtures in which the concentrations of components are nonuniform. The limits are applicable, however, to homogeneous mixtures and slurries in which the particles constituting the mixture are uniformly distributed and have a diameter no larger than 127 mm (0.005 in.), i.e., are capable of being passed through a 120 mesh screen.*

**Membership:**

Christopher Tripp, Co-Chair, Tripp Nuclear Consulting Services; Tracy Stover, Co-Chair, Savannah River Nuclear Solutions, LLC; Kermit Bunde, U.S. Department of Energy; Katherine McCurry, U.S. Nuclear Regulatory Commission; Dennis Mennerdahl, E. Mennerdahl Systems; Arielle Miller, Dr. Arielle Miller Coaching & Consulting; Quentin Newell (Associate Member), Urenco USA; Dominic Winstanley, Sellafield Limited

**Status:** Reaffirmation received ANSI approval 8/16/2021. A PINS for the revision was submitted to ANSI on 9/27/2007 and resubmitted after subsequent reaffirmations. The ANS-8.12 standard was first approved in July 1978 and was revised in 1987. It was reaffirmed in 2002, 2011, 2016, and most recently in 2021. A major revision activity was initiated. A decision was made to follow the ISO MOX standard specifications (related to MOX density and isotopics) and develop a new set of subcritical limits for homogeneous systems for the revision of ANS-8.12. The working group has completed MCNP and SCALE calculations for six (6) sets of subcritical data. This is a significant progress in generating subcritical limits by Monte Carlo calculations using the ISO MOX specifications. A set of critical benchmark experiments was selected for validation work. Paucity of benchmark experiments in certain energy region was identified. Work is continuing to validate the calculated values and to come up with a set of subcritical parameters.

**ANSI/ANS-8.14-2004 (R2021), Use of Soluble Neutron Absorbers in Nuclear Facilities Outside Reactors (new standard)**

**Scope:** *This standard provides guidance for the use of soluble neutron absorbers for criticality control. This standard addresses neutron absorber selection, system design and modifications, safety evaluations, and quality control programs.*

**Membership:**

Kristan Wessels, Consolidated Nuclear Security, LLC, Chair; Lawrence Berg, U.S. Department of Energy; Joshua Butler (Associate Member), Consolidated Nuclear Security, LLC; Justin Clarity, Pacific Northwest National Laboratory; Darwin Damba, U.S. Department of Energy; Victor Lollar, BWX Technologies, Inc.; Josiah Moore, U.S. Department of Energy; Jeremy Smith, U.S. Nuclear Regulatory Commission; Ryan Smith, UCOR; Clifford Stanley, Los Alamos National Laboratory; Clifford Stanley, Los Alamos National Laboratory

**Status:** The standard received ANSI approval of a reaffirmation on 8/5/2021. The chair is reforming the working group to initiate a revision of the standard.

**ANSI/ANS-8.15-2014 (R2019), Nuclear Criticality Control of Selected Actinide Nuclides (revision of ANSI/ANS-8.15-1981; R1987; R1995; R2005)**

**Scope:** *This standard is applicable to operations with the following nuclides: <sup>232</sup>U, <sup>234</sup>U, <sup>237</sup>Np, <sup>236</sup>Pu, <sup>238</sup>Pu, <sup>240</sup>Pu, <sup>241</sup>Pu, <sup>242</sup>Pu, <sup>241</sup>Am, <sup>242m</sup>Am, <sup>243</sup>Am, <sup>242</sup>Cm, <sup>243</sup>Cm, <sup>244</sup>Cm, <sup>245</sup>Cm, <sup>246</sup>Cm, <sup>247</sup>Cm, <sup>249</sup>Cf, and <sup>251</sup>Cf. Subcritical mass limits are presented for isolated units. The limits are not applicable to interacting units.*

**Membership:**

Charles Rombough, Chair, CTR Technical Services, Inc.; Andrew Barto, U.S. Nuclear Regulatory Commission; Giovanni Lozano (Associate Member), Los Alamos National Laboratory; Hiroshi Okuno, Japan Atomic Energy Research Institute; Timothy Sippel, U.S. Nuclear Regulatory Commission; Ning Zhang, Los Alamos National Laboratory

**Status:** The standard was approved by ANSI on 10/10/14 and reaffirmation on 9/12/2019. The ANS-8.15 standard was initially approved in 1981 (with reaffirmations in 1987, 1995, and 2005). The 2014 revision revises most of the subcritical limits for the original 14 nuclides in the 1981 standard and adds 5 additional nuclides bringing the total number of nuclides to 19.

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**ANSI/ANS-8.17-2004 (R2019), Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors (revision of ANSI/ANS-8.17-1984; R1989; R1997)**

**Scope:** *This standard provides nuclear criticality safety criteria for the handling, storage, and transportation of light water reactor fuel rods and units outside reactor cores.*

**Membership:**

Alex Lang, Co-Chair, Oak Ridge National Laboratory; Ellen Saylor, Co-Chair, Individual; Andrew Barto, U.S. Nuclear Regulatory Commission; Deborah Hill, National Nuclear Laboratory; Dale Lancaster, NuclearConsultants.com; Calvin Manning, Framatome, Inc.; William Marshall, Oak Ridge National Laboratory; Austin McGee, Consolidated Nuclear Facilities, LLC; Cecil Parks, Boston Government Services; Kristina Spencer (Associate Member), Idaho National Laboratory; Joshua Thomas, Global Nuclear Fuel

**Status:** A reaffirmation received ANSI approval on 9/12/2019. Alex Lang became co-chair with Ellen Saylor. During the past year the group has begun having meetings discussing the current and potential future use of the standard. Members have reached out for input on the current use of the standard. Work has begun on drafting a PINS form for a revision to the standard.

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**ANSI/ANS-8.19-2014 (R2019), Administrative Practices for Nuclear Criticality Safety (revision of ANSI/ANS-8.19-2005)**

**Scope:** *This standard provides criteria for the administration of a nuclear criticality safety program for outside-of-reactor operations in which there exists a potential for criticality accidents. Responsibilities of management, supervision, and the nuclear criticality safety staff are addressed. Objectives and characteristics of operating and emergency procedures are included.*

**Membership:**

John Miller, Chair, Sandia National Laboratories; Jeremy Munson, Vice Chair, U.S. Nuclear Regulatory Commission; Gary Ly (Secretary), U.S. Department of Energy; Kelsey Amundson, Los Alamos National Laboratory; James Baker, Spectra Tech, LLC; James Bunsen, Los Alamos National Laboratory; Matthew Chapa, Novare Solutions, LLC; Darwin Damba (Associate Member), U.S. Department of Energy; Jerry Hicks, Individual; Spencer Jordan, Y-12 National Security Complex; Ronald Knief, Individual; Sandi Larson, 21 Consulting Group Inc.; Jennifer Lyons, Pacific Northwest National Laboratory; Josiah Moore (Associate Member), U.S. Department of Energy; Andrew Prichard (Observer), TradeWind Services, LLC; Ellen Saylor, Individual

**Status:** A reaffirmation received ANSI approval on 8/22/2019. In 2021, the working group held regular online meetings focused on developing a “basis statements” document, per an ANS-8 Subcommittee request. This documentation is now in place for internal use only and will be maintained as necessary by the working group. This effort was time-consuming but very beneficial for the working group, as it helped build a common foundation and identified topics for consideration during a future revision. The working group is waiting on the chair to draft a PINS and Project Implementation Plan that should set the stage for both a reaffirmation (2024) and afterwards a future revision. In 2022, several associate members were promoted to full status and a new member was added. In 2023, the working group was not active but did add an associate member. The working group will be moving forward with a 2024 reaffirmation as well as submitting a PINS to start a future revision.

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**ANSI/ANS-8.20-1991 (R2020), Nuclear Criticality Safety Training (new standard)**

**Scope:** *This standard provides criteria for nuclear criticality safety training for personnel associated with operations outside reactors where a potential exists for criticality accidents. It is not sufficient for the training of nuclear criticality safety staff.*

**Membership:**

Deborah Hill, Chair, National Nuclear Laboratory (UK); Nichole Ellis, Vice Chair, Ellis Nuclear Engineering, Inc.; Kelsey Amundson, Los Alamos National Laboratory; Paul Burdick, C.S. Engineering, Inc.; Theresa Cutler, Los

Alamos National Laboratory; Christopher Haught, Consolidated Nuclear Security, LLC; Ronald Knief, Individual; Jesse McBurney-Rebol, Naval Nuclear Laboratory; Christine McNally, CALIAN; Catherine Percher, Lawrence Livermore National Laboratory; Randy Shackelford, Paschal Solutions, Inc.; Robert Taylor, Atkins Nuclear Solutions; Brittany Williamson, Spectra Tech/SRNS

**Status:** ANSI approved the reaffirmation of this standard on 5/8/2020. A PINS for the revision was submitted to ANSI on 3/10/2011 and resubmitted after subsequent reaffirmations. The working group has been actively working on a revision of ANSI/ANS-8.20-1991 for a number of years. The draft was issued to ANS-8 for ballot in 2019. In parallel with this, the existing standard was reaffirmed to allow more time to work on the revision. The key working group activity in 2021 was the resolution of the outstanding ANS-8 ballot comments. The latest version of the draft went to NCSCC for ballot in late January 2022, receiving 7 affirmative votes and 7 negative votes. An initial proposed response to the comments was formulated in late 2022, with working group meetings scheduled for January 2023 to work through those comments. Work has continued during 2023 on the latest revision of ANS-8.20. All outstanding negative ballot votes from the NCSCC (including the associated comments) have been satisfactorily resolved. The standard will now be put back through the NCSCC for approval of the substantive changes.

**ANSI/ANS-8.21-2023, Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors (revision of ANSI/ANS-8.21-1995; R2019)**

**Scope:** *This standard provides guidance for the use of fixed neutron absorbers as an integral part of nuclear facilities and fissionable material process equipment outside reactors, where such absorbers provide criticality safety control.*

**Membership:**

David Erickson, Chair, Savannah River Nuclear Solutions; James Bunsen, Los Alamos National Laboratory; Kevin Carroll, Pacific Northwest National Laboratory; Phillip Chou, Lawrence Livermore National Laboratory; Katherine Norton, C.S. Engineering, Inc.; Jerry Hicks, Individual; Dennis Mennerdahl, E. Mennerdahl Systems-Sweden; Jeremy Smith, U.S. Nuclear Regulatory Commission; Robert Wilson, U.S. Department of Energy

**Status:** The revision received ANSI approval on 6/20/2023. A recirculation ballot issued to NCSCC in 2023 for substantive changes was successful allowing consensus to be declared. In 2024, the working group is planning on working on basis statements for each of the requirements/recommendations in the standard.

**ANSI/ANS-8.22-1997 (R2021), Nuclear Criticality Safety Based on Limiting and Controlling Moderators (new standard)**

**Scope:** *This standard applies to limiting and controlling moderators to achieve criticality safety in operations with fissile materials in a moderator control area. This standard does not apply to concentration control of fissile materials.*

**Membership:**

Michael Crouse, Co-Chair, Consolidated Nuclear Security, LLC; Lon Paulson, Co-Chair, GE Power Portfolio; Brannen Adkins, U.S. Nuclear Regulatory Commission; Marvin Barnett, Savannah River Nuclear Solutions; Derrick Faunce, Nuclear Safety & Technology Services; Michael Fendler (Associate Member), Pacific Northwest National Laboratory; Chris Haught, Consolidated Nuclear Security, LLC; Deborah Hill, National Nuclear Laboratories, UK; Tom Lewis, Nevada National Security Site; Alan Wilkinson, Consolidated Nuclear Security, LLC

**Status:** This standard was reaffirmed on 8/5/2021. A PINS was submitted to ANSI on 11/22/2019 and was resubmitted after the reaffirmation was approved. This revision reduces duplication and ensures terminology consistency with other ANS standards on nuclear criticality safety, updates moderation control guidance, requirements, and references. A draft was submitted to ANS-8 for ballot at the end of 2021. The draft was revised to incorporate comments and issued to ANS-8 for a second ballot that closed 11/29/22. The second ballot received 11 Affirmative and 4 Negative votes. Working group meetings were held in 2023 to address second round comments. The intent of the proposed ANS-8.22-202x revision is to intentionally introduce more modern terminology; namely moderation controlled area (MCA) and moderation restricted area (MRA) definitions. In an MCA, you are controlling moderation as well as another parameter; in an MRA loss of control of moderation alone

could result in a criticality. These are both factual statements, as currently defined in the 8.22-202x ballot 2 version. Based on discussions with the former ANS-8.22 chair, the following statements are made:

- The current 1997 definition of moderator control area does not explicitly exclude the MCA or MRA approach to moderation control; it applies to both and is therefore generic.
- The current 1997 definition of moderator control area is not specific to current proposed MRA definition, which a select few ANS-8 members have inferred/commented as factual.

The working group will restart ballot two comment resolution in early 2024 to resolve remaining negative ballots. At present 11 of 15 affirmative votes have been received.

**ANSI/ANS-8.23-2019, Nuclear Criticality Accident Emergency Planning and Response (revision of ANSI/ANS-8.23-2007; R2012)**

**Scope:** *This standard provides criteria for minimizing risks to personnel during emergency response to a nuclear criticality accident outside reactors. This standard applies to those facilities for which a criticality accident alarm system, as specified in American National Standard Criticality Accident Alarm System, ANSI/ANS-8.3-1997 (R2017), is in use. This standard does not apply to nuclear power plant sites, or to those licensed research reactor facilities, which are addressed by other standards.*

**Membership:**

Brandon O'Donnell, Chair, Spectra Tech, LLC; Peter Angelo, Consolidated Nuclear Security, LLC; James Baker, Chair, Spectra Tech, LLC; Konner Casanova, Idaho National Laboratory; James Cole (Associate Member), Sandia National Laboratories; Theresa Cutler, Los Alamos National Laboratory; Patricia Glenn, U.S. Nuclear Regulatory Commission; Jerry Hicks, Individual; Timothy Jackson, ; Krista Kaiser, ; Ashley Luksic, : Patrick Moss, U.S. Department of Energy; Brandon O'Donnell, BWX Technologies, Inc.; Blaine Rice, Paschal Solutions, Inc.; Ellen Saylor, Oak Ridge National Laboratory; Jingjing Wang, Canadian Nuclear Laboratories; Ralph Winiarski, Paschal Solutions, Inc.; Dominic Winstanley, Sellafield Ltd.

**Status:** ANSI approved a revision of the standard on 9/16/2019. Jim Baker stepped down as chair and was replaced by Brandon O'Donnell. The working group was re-constituted and met to kick-off the next revision cycle in May 2023 in Oak Ridge, TN / videoconference, with subsequent videoconference in July 2023. The draft basis statements were reviewed and have been effectively completed for the time being. The working group has created a list of over 20 items or issues to consider as potential modifications to the standard. The working group met in Washington, DC on November 12, 2023, to continue addressing potential modifications. A PINS for a revision was drafted with a proposed schedule for this revision as well as action item assigned. The PINS is expected to be sent to ANS-8 for approval in 2024. The working group expects to meet several times either in person or by videoconference in 2024 to continue progressing on this next revision.

**ANSI/ANS-8.24-2017 (R2023), Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations (revision of ANSI/ANS-8.24-2007; R2012)**

**Scope:** *This standard provides requirements for validation, including establishing applicability, of neutron transport calculational methods used in determining critical or subcritical conditions for nuclear criticality safety analyses.*

**Membership:**

Larry Wetzel, Chair, Individual ; Robert Busch, University of New Mexico; Scott Finrock, Savannah River Nuclear Solutions; Shawn Henderson (Associate Member), Sandia National Laboratories; Jerry Hicks, Individual; Derek Hounshel, Los Alamos National Laboratory; Timothy Jackson (Associate Member), Consolidated Nuclear Security, LLC; Jeremy Munson, U.S. Nuclear Regulatory Commission; Cecil Parks, Boston Government Services; Christopher Perfetti, University of New Mexico; Andrew Prichard, TradeWind Services, LLC Christopher Tripp, Tripp Nuclear Consulting Services

**Status:** A reaffirmation of the standard was approved by ANSI on 1/3/2023. The working group has begun working on basis statements for the current version of the standard.

**ANSI/ANS-8.26-2007 (R2022), Criticality Safety Engineer Training and Qualification Program (new standard)**

**Scope:** *This standard presents the fundamental content elements of a training and qualification program for Individuals with responsibilities for performing the various technical aspects of criticality safety engineering. The standard presents a flexible array of competencies for use by management to develop tailored training and qualification programs applicable to site-specific job functions, facilities and operations.*

**Membership:**

Kevin Reynolds, Chair, Consolidated Nuclear Security; James Baker, Spectra Tech, LLC; Douglas Bowen, Oak Ridge National Laboratory; Kevin Carroll, Individual; Theresa Cutler, Los Alamos National Security, LLC; David Erickson, Individual; Makenzie Gorham, Idaho State University; David Hayes, Los Alamos National Laboratory; Jerry Hicks, Individual; Ronald Knief, Individual; Gary Ly, U.S. Department of Energy; James Morman, Argonne National Laboratory; Lon Paulson, GE Hitachi Nuclear Energy; Nicholas Peterka, U.S. Nuclear Regulatory Commission; Chad Pope, Idaho State University; Andrew Prichard, TradeWind Services, LLC; Alicia Walls, BWX Technologies, Inc.; Robert Wilson, U.S. Department of Energy

**Status:** The standard was reaffirmed by ANSI on 2/10/2022. A PINS was submitted to ANSI 8/20/2013 and resubmitted after each reaffirmation. The working group is responding to comments submitted with the NCSCC ballot.

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**ANSI/ANS-8.27-2015 (R2020), Burnup Credit for LWR Fuel (revision of ANSI/ANS-8.27-2008)**

**Scope:** *The standard provides criteria for processes and techniques used for criticality safety evaluations of irradiated light water reactor fuel assemblies in storage, transportation and disposal.*

**Membership:**

William Marshall, Oak Ridge National Laboratory; Charles Rombough, Secretary, CTR Technical Services, Inc.; Stefan Anton, Hotlec International; Steve Baker, TransWare Enterprises; Andrew Barto, U.S. Nuclear Regulatory Commission; Kristin Bennett, GE Hitachi; Mark DeHart, Idaho National Laboratory; Sarah Gibboney, Orano Federal Services LLC; John Hannah, Global Nuclear Fuels; Ed Knuckles, Individual; Dale Lancaster, NuclearConsultants.com; Zita Martin, Tennessee Valley Authority; John Massari, Individual; Dennis Mennerdahl, E. Mennerdahl Systems; Prakash Narayanan, Orano TN; Greg O'Connor, Office for Nuclear Regulation; Cecil Parks, Boston Government Services; Holger Pfeifer, NAC International; Meraj Rahimi, U.S. Nuclear Regulatory Commission; Alan Wells, Individual; Kent Wood, U.S. Nuclear Regulatory Commission; John Zino, GE Hitachi

**Status:** ANSI approved a reaffirmation of this standard on 8/27/2020. No significant activity in 2023 beyond change in chair. William Marshall replaced Dale Lancaster as chair. Ramp up expected in 2024 to support revision or reaffirmation in 2025.

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**ANS-8.28, Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety (proposed new standard)**

**Scope:** *This standard provides administrative practices covering the interface between the criticality safety community and the NDA community including in-situ measurements and measurements of containerized materials.*

**Membership:**

Jeffrey Chapman, Co-chair, National Nuclear Safety Administration; Ernest Elliott, Co-chair, BWX Technologies, Inc.; Roger Bartholomay, C.S. Engineering Inc.; Lawrence Berg, U.S. Department of Energy; Douglas Bowen, Oak Ridge National Laboratory; Ashby Bridges, Reveam, Inc.; David Dolin, Savannah River Solutions; Michael Dunn, Spectra Tech, Inc.; A. Nichole Ellis, Ellis Nuclear Engineering, LLC; Patricia Glenn, U.S. Nuclear Regulatory Commission; Katherine Norton, C.S. Engineering, Inc.; Christopher Haught, Consolidated Nuclear Security, LLC; Jerry Hicks, Individual; David Kupferer, Consolidated Nuclear Solutions; Sandra Larson, 21 Consulting Group, Inc.; Megan Pritchard, Nuclear Safety & Technology Services; Thomas Sampson, Sampson Professional Services; Wade Scates, Idaho National Laboratory; Gladys Udentia, U.S. Department of Energy; Robert Wilson, U.S. Department of Energy; John Winkel, CPCC; Dominic Winstanley, Sellafield, Limited

**Status:** The PINS form was submitted to ANSI on 1/28/2011. The draft was submitted for ANS-8 ballot in February 2021. The working group responded to and resolved ANS-8 comments. The draft was subsequently submitted for NCSCC ballot in October 2021. The working group resolved the NCSCC comments. ANSI approval and publication is anticipated in early 2024.

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## Nuclear Criticality Safety Consensus Committee (NCSCC) List of Standards/Projects

Chair: Larry L. Wetzel

Vice Chair: William R. Shackelford

### Fissionable Materials Outside Reactors Subcommittee (ANS-8)

**Subcommittee Chair: Douglas Bowen**

Ⓢ = PINS submitted to ANSI

ANS-8.1-2014 (R2023) Ⓢ (A1)	Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors	RF 6/5/2023 (WGC: N. Brown)
ANS-8.12-1987 (R2021) Ⓢ (A1)	Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors	RF 8/16/2021 (WGC: C. Tripp)
ANS-8.20-1991 (R2020) Ⓢ (A1)	Nuclear Criticality Safety Training	RF 5/8/2020 (WGC: D. Hill)
ANS-8.22-1997 (R2021) Ⓢ (A1)	Nuclear Criticality Safety Based on Limiting and Controlling Moderators	RF 12/7/2021 (WGC: M. Crouse/ L. Paulson)
ANS-8.26-2007 (R2022) Ⓢ (A1)	Criticality Safety Engineer Training and Qualification Program	RF 2/10/2022 (WGC: K. Reynolds)
ANS-8.3-2022 (A2)	Criticality Accident Alarm System	RV 9/8/2022 (WGC: J. Hicks)
ANS-8.6-1983 (R2022) (A2)	Safety in Conducting Subcritical Neutron-Multiplication Measurements In Situ	RF 9/9/2022 (WGC: T. Cutler)
ANS-8.7-2022 (A2)	Nuclear Criticality Safety in the Storage of Fissile Materials	RV 5/6/2022 (WGC: J. Kuropatwinski)
ANS-8.10-2015 (R2020) (A2)	Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement	RF 3/26/2020 (WGC: A. Prichard)
ANS-8.14-2004 (R2021) (A2)	Use of Soluable Neutron Absorbers in Nuclear Facilities Outside Reactors	RF 8/5/2021 (WGC: K. Wessels)
ANS-8.15-2014 (R2019) (A2)	Nuclear Criticality Control of Special Actinide Elements	RF 9/12/2019 (WGC: C. Rombough)
ANS-8.17-2004 (R2019) (A2)	Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors	RF 9/12/2019 (WGC: E. Saylor & A. Lang)
ANS-8.19-2014 (R2019) (A2)	Administrative Practices for Nuclear Criticality Safety	RF 8/22/2019 (WGC: J. Miller)
ANS-8.21-2023 (A1)	Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors	RV 6/20/2023 (WGC: D. Erickson)
ANS-8.23-2019 (A2)	Nuclear Criticality Accident Emergency Planning and Response	RV 9/16/2019 (WGC: B. O'Donnell)
ANS-8.24-2017 (R2023) (A2)	Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations	RV 1/3/2023 (WGC: L. Wetzel)
ANS-8.27-2015 (R2020) (A2)	Burnup Credit for Light Water Reactor Fuel	RF 8/7/2020 (WGC: BJ Marshall)
ANS-8.28 (NEW) Ⓢ (B1)	Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety	Active Project (WGCs: J. Chapman / E. Elliott)
(A1) Current Being Worked On Standards		
(A2) Current Not Being Worked On Standards		
(B1) Proposed Being Worked On Standards		
(B2) Proposed Not Being Worked On Standards		
(C1) Withdrawn Being Worked On Standards		
(C2) Withdrawn Not Being Worked On Standards		

**Table 5 – NCSCC List of Standards/Projects**

## Research and Advanced Reactors Consensus Committee (RARCC)

**Gale Hauck**  
**Oak Ridge National Laboratory**

**Scope:** *The RARCC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting the design, operation, maintenance, operator selection and training, and quality requirements for current and future research and test reactors including pulsed critical facilities, reactors used for the production of isotopes for industrial, educational, and medical purposes and current and advanced non-large LWRs. The scope includes but is not limited to: water-cooled and non-water cooled Small Modular Reactors, Generation III+ and IV reactors, and future non-light water cooled/moderated large commercial reactors.*

*The RARCC standards include but are not limited to the design and operation of the nuclear island, the balance of plant, and other systems within the plant boundary affecting safety and operations. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee. These subcommittees have been organized as follows:*

- *Operation of Research Reactors (ANS-15)*
- *Advanced Initiatives (ANS-29)*

*Each subcommittee has established various working groups to develop specific proposed standards and maintain existing standards within its respective area of responsibility. These working groups create the text of RARCC standards and resolve review and ballot comments.*

### **RARCC Membership:**

**Gale Hauck, Chair**, Oak Ridge National Laboratory  
**Jason Andrus, Vice Chair**, Idaho National Laboratory  
**Thomas Newton, Vice Chair**, National Institute of Standards & Technology  
Amir Afzali, Individual  
James August, Core, Inc.  
Bruce B. Bevard, Oak Ridge National Laboratory  
Edward Blandford, Kairos Power, LLC  
Matthew Bucknor, Argonne National Laboratory  
Casey Cadman, Westinghouse Electric Co. LLC  
Brandon Chisholm, Southern Nuclear Operating Company  
George Flanagan, Individual  
Leslie Foyto, University of Illinois, Urbana-Champaign  
Tony Greci, Salt River Project  
Brian Grimes, Individual  
Edward Helvenston, U.S. Nuclear Regulatory Commission  
Matthew Hertel, X-Energy, LLC  
William Kennedy, U.S. Nuclear Regulatory Commission  
Brendan Kochunas, University of Michigan, Ann Arbor  
Matthew Kravec, Westinghouse Electric Company, LLC  
David Lawson, U.S. Department of Energy  
Ben Lindley, University of Wisconsin, Madison  
Mark A. Linn, Individual  
D. Sean O'Kelly, Idaho National Laboratory  
Mark Peres, Individual  
Steven Reese, Oregon State University  
Donald Spellman, Individual  
Anthony Veca, General Atomics  
Matthew Wargon, TerraPower, LLC

### Observers:

David E. Holcomb, Idaho National Laboratory  
Majeed Kahn, National Institute of Standards & Technology

**Report of RARCC:**

The RARCC met June 14, 2023, at the ANS Annual Meeting in Indianapolis, IN, and on November 15, 2023, at the ANS Winter Meeting in Washington, DC. Gale Hauck was elected Chair and Jason Andrus was elected Vice Chair of the RARCC. Matthew Bucknor, Casey Cadman, Brandon Chisholm, Edward Helvenston, Brendan Kochunas, Matthew Kravec, Ben Lindley, and Matthew Wargon were confirmed as members of the RARCC. Mark Peres from Kairos and Donald Spellman from Cardinal Capital Corporation retired but remained on the RARCC in the Individual balance of interest category.

**Approved in 2023:**

**ANSI/ANS-15.1-2007 (R2023)**, *The Development of Technical Specifications for Research Reactors* (reaffirmation of ANSI/ANS-15.1-2007; R2018)

**ANSI/ANS-15.8-1995 (R2023)**, *Quality Assurance Program Requirements for Research Reactors* (reaffirmation of ANSI/ANS-15.8-1995; R2018)

**ANSI/ANS-15.21-2012 (R2023)**, *Format and Content for Safety Analysis Reports for Research Reactors* (reaffirmation of ANSI/AN-15.21-2012; R2018)

**Active Standards/Projects (Approved PINS):**

**ANS-1**, *Conduct of Critical Experiments* (revision of ANSI/ANS-1-2000; R2019)

**ANS-15.22**, *Classification of Structures, Systems, and Components for Research Reactors* (proposed new standard)

**ANS-20.2**, *Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt Reactor Nuclear Power Plants* (proposed new standard)

**ANS-GS-30.1**, *Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs* (proposed new guidance standard)

**ANS-30.2**, *Structures, Systems, and Component Classification for Nuclear Power Plants* (proposed new standard)

**ANS-53.1**, *Nuclear Safety Criteria for the Design of High Temperature Gas-Cooled Reactor Plants* (revision of ANSI/ANS-53.1-2011; R2021)

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**Advanced Initiatives Subcommittee (ANS-29)**

***Membership:***

**Jason Andrus, Chair**, Idaho National Laboratory  
James August, Individual  
Edward Blandford, Kairos Power LLC  
Matthew Denman, Kairos Power LLC  
Mihai Diaconeasa, North Carolina University  
George Flanagan, Individual  
David Holcomb, Idaho National Laboratory  
Mark Linn, Individual  
Robert Sachs, Individual

The Advanced Initiatives Subcommittee manages the following projects and current standards:

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**ANS-20.1, Nuclear Safety Design Criteria for Fluoride Salt-Cooled High-Temperature Reactor Nuclear Power Plants (proposed new standard)**

**Scope:** *This standard establishes the nuclear safety design criteria and design requirements for a fluoride salt-cooled, high-temperature reactor. The standard reflects performance-based, risk-informed criteria wherever possible. It also describes the design process to establish those criteria and addresses structures, systems, and component classifications.*

**Membership:**

Edward Blandford, Co-Chair, Kairos Power LLC; Matthew Denman, Co-Chair, Kairos Power LLC

**Status:** The PINS was submitted to ANSI on 5/31/2013. Project on indefinite hold.

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**ANS-20.2-202x, Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt Reactor Nuclear Power Plants (proposed new standard)**

**Scope:** *This standard establishes the nuclear safety design criteria and functional performance requirements for liquid-fuel molten salt reactor nuclear power plants. The document uses performance-based, risk-informed criteria wherever possible. It also describes the design process to be followed to establish those criteria and perform structures, systems, and component classifications.*

**Membership:**

David Holcomb, Chair, Idaho National Laboratory; Vincent Lackowski (Secretary), Thorium Energy Alliance; Abdalla Abou-Jaoude, Idaho National Laboratory; Amir Afzali, Individual; Francis Akstulewicz, Terrestrial Energy USA; Edward Blandford, Kairos Power LLC; Daniel Carleton, Terrestrial Energy USA; Bernard Carlucc, Framatome, Inc.; Kun Chen, Atomoverde Canada Inc.; Brandon Chisholm, Southern Nuclear Operating Company; Ondrej Chvala, University of Tennessee; Bernat Ciera (Associate Member), Seaborg Technologies; Stephen Cook, Individual; Ronald English, Individual; George Flanagan, Individual; Charles Forsberg, Massachusetts Institute of Technology; Massimiliano Fratoni, University of California–Berkley; Jess Gehin, Idaho National Laboratory; Kurt Harris, Flibe Energy, Inc.; Chris Johns, TerraPower LLC; Brian Johnson, TerraPower LLC; Lars Jorgensen, Thorcon Power; Takashi Kamei, Research Institute for Applied Science; John Kutsch, Thorium Energy Alliance; Vince Lackowski, Thorium Energy Alliance; Imtiaz Madni; U.S. Nuclear Regulatory Commission; Stewart Magruder, Individual; Zander Mausloff, TerraPower, LLC; Ashkhen Nalbandyan, DTU Physics; Thomas Pederson, Copenhagen Atomics; Per Peterson, University of California–Berkley; Edward Pheil, Exodys Energy; Wendy Reed, U.S. Nuclear Regulatory Commission; Raluca Scarlat, University of California–Berkley; Shayan Shahbazi, Argonne National Laboratory; Vikram Singh (Associate Member), University of Tennessee; Nicholas Smith, Idaho National Laboratory; Andrew Sowder, Electric Power Research Institute; Aslak Stubsgaard, Copenhagen Atomics; Nam-il Tak, Korea Atomic Energy Institute; Christopher Van Wert, U.S. Nuclear Regulatory Commission; Lorenzo Vergari (Associate Member), University of California–Berkley; Edward Wallace, GNBC Associates, Inc.

**Status:** The PINS was approved and submitted to ANSI on 7/7/2016. The draft was issued for subcommittee ballot and non-developing consensus committee reviews in September of 2021. Comments were resolved allowing the draft to be issued to RARCC for approval ballot on 7/11/2022. The ballot closed 10/19/2022 after 4 extensions. A recirculation ballot was issued to approve substantive changes to the draft to resolve comments and to notify of a maintained negative vote carried from the first ballot. The BSR-9 was submitted to ANSI for approval in 12/12/2024, approval should be received in January 2024.

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**ANS-GS-30.1, Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs (proposed new guidance standard)**

**Scope:** *This technology-neutral guidance standard provides information for preparation of technology-specific new reactor design standards and supporting documents. New reactor designs include modular reactors using light water nuclear technologies and advanced reactors using non-light water nuclear technologies as the basis for their respective designs. This guidance standard is focused at a high-level to enable risk-informed and performance-based (RIPB) results to be consistently applied across all stages of plant lifecycle and to be integrated throughout design development. The guidance provided in this document can be applied beyond reactor safety into the areas of project risk, and reliable and economical plant operation.*

**Membership:**

Mark Linn, Chair, Individual; David Johnson, Vice Chair, Individual; Mihai Diaconeasa, North Carolina University; Jordan Hagaman, Kairos Power LLC; Ralph Hill, Individual; Darvin Kapitz, Individual; Patrick O'Regan, Electric Power Research Institute; Russell Williston, Individual

**Status:** The PINS was submitted to ANSI on 8/11/2015. The Standards Board held several long discussions on the path forward for this project in 2021 in light of comments received from the subcommittee ballot and non-developing consensus committee reviews. The Standards Board directed that the project continues to be pursued as a guidance standard. The document has been revised accordingly and was re-balloted in 2023 and approved by the Advanced Initiatives Subcommittee. Resolution to comments from the subcommittee and non-developing consensus committees are ongoing. The consensus committee ballot is expected in the first quarter of 2024.

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**ANS-30.2, Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants (proposed new standard)**

**Scope:** *This standard provides a single technology neutral categorization and classification process for SSCs for new nuclear power plants that is, where possible, risk informed and performance based. This process will then be used to determine special treatment of SSCs to meet the safety basis. This standard applies only to those new design facilities (i.e., greater than Generation III) that must obtain an operating license from the proper regulatory authority. It provides a complete (e.g., necessary and sufficient) repeatable logical process based upon risk-informed, performance-based objectives. Other voluntary consensus standards (VCS) may often be required in order to complete the entire process for all SSCs. Those standards are incorporated by reference.*

**Membership:**

Mihai Diaconeasa, Chair, North Carolina State University; Donald Spellman, Vice Chair, Individual; Amir Afzali, Individual; Jason Andrus, Idaho National Laboratory; James August, Individual; David Blanchard, Applied Reliability Engineering; Robert Burg, EPM, Inc.; Zachary Deziel (Associate Member), Texas A&M University; Matthew Hertel, X-Energy, LLC; Ralph Hill, Hill Engineering Solutions LLC; Brian Johnson, TerraPower LLC; Prasad Kadambi, Kadambi Engineering Consultants; Vicken Khatchadourian, EPM, Inc.; Svetlana Lawrence, Idaho National Laboratory; Gary Locklear, Kinectrics AES, Inc.; Patrick O'Regan, Electric Power Research Institute; James Pappas (Observer), Westinghouse Electric Company, LLC; Hanh Phan, U.S. Nuclear Regulatory Commission; Johannes Pickelmann, Framatome GmbH; Alexandra Renner, Oklo, Inc.; Dagistan Sahin (Observer), National Institute of Standards and Technology; Edward Wallace, GNBC Associates; Kent Welter, NuScale Power, Inc.

**Status:** PINS was submitted to ANSI on 7/7/2016. Kent Welter stepped down as chair in January 2023. Mihai Diaconeasa is now the Chair, and Donald Spellman is the Vice Chair of the working group. The working group held meetings and continued work on the draft. Progress continues to be made.

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**ANSI/ANS-53.1-2011 (R2021), Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants (new standard)**

**Scope:** *This standard applies to the safety design process for MHR nuclear power plants. This standard provides a process for establishing top-level safety criteria (TLSC), safety functions, top-level design criteria (TLDC), licensing basis events (LBEs), design basis accidents (DBAs), safety classification of systems, structures, and components (SSC), safety analyses, defense-in-depth (DID), and adequate assurance of special treatment requirements for safety-related SSC throughout the operating life of the plant. The standard does not provide detailed guidance for design; other existing standards cover those.*

**Membership:**

James August, Chair, Individual; John Bolin, General Atomics; Alok Deshpande, Simpson, Gumpertz & Heger, Inc.; John Fletcher, Ultrasafe Nuclear Corporation; James Glover, Fluxion Technologies; Izabela Gutowska, Oregon State University; Matthew Hertel, X-Energy, LLC; Howard Iskyan, Iskyan LLC; William Kennedy, U.S. Nuclear Regulatory Commission; Brendan Kochunas, University of Michigan-Ann Arbor; Ben Lindley, University of Wisconsin-Madison; Fatih Sarikurt, TerraPower; Liang Shi, Constellation Nuclear; Donald Spellman, Individual

**Status:** The standard was reaffirmed on 10/7/2021. A PINS for a revision was approved and submitted to ANSI on 1/13/23. Interest was expressed at the September 2018 NRC Standards Forum for this standard. A discussion at the RARCC November 2018 meeting recommended that a revision should be initiated. The PINS changes the title for the revision of the standard to *Nuclear Safety Criteria for the Design of High Temperature Gas-Cooled Reactor*

*Plants.* The working group has been meeting every other week. We established that we would redo the entire standard rather than revise the old details. The draft will cover gas-cooled reactors and will define reactor. Most of the content has been exhaustively discussed in the process of developing a new outline. The work areas are primarily in the areas of defense in depth and special treatments.

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**ANSI/ANS-54.1-2020, Nuclear Safety Criteria and Design Process for Sodium Fast Reactor Nuclear Power Plants (new standard, historical revision of ANSI/ANS-54.1-1989)**

**Scope:** *The scope of this standard covers the nuclear safety of these facilities, meaning the elements of the design aimed at preventing or mitigating accidental damage to the facility which could lead to radiological releases that would harm the public or the facility's workers. Any facility design must also be concerned with preventing and mitigating damage caused by a security breach arising from either inside or outside the facility, and a general criterion related to that subject is included in the scope of this standard.*

**Membership:**

George Flanagan, Chair, Individual, Robert Bari, Brookhaven National Laboratory; Robert Budnitz, Consultant; Peter Gaillard, TerraPower; Michael Garrett, Individual; Christopher Grandy, Argonne National Laboratory; Tony Greci Salt River Project; Prasad Kadambi, Individual; Thomas King, Information Systems Laboratory, Inc; Christian Lobscheid, Advent Engineering Services; Imtiaz Madni, U.S. Nuclear Regulatory Commission; Hisato Matsumiya, Toshiba Corporation; Jan Mazza, U.S. Nuclear Regulatory Commission; Yasushi Okano, Japan Atomic Energy Agency; Roald Wigeland, Idaho National Laboratory

**Status:** This standard was approved by ANSI on 3/23/2020. No activity in 2023.

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**Operation of Research Reactors Subcommittee (ANS-15)**

**Membership:**

Thomas Newton, Chair, National Institute of Standards & Technology  
Michael Balazik, U.S. Nuclear Regulatory Commission  
Joshua Borromeo, U.S. Nuclear Regulatory Commission  
Kevan Crawford, Precision Engineering, Inc.  
Byron Curnutt, Idaho National Laboratory  
Michelle Dudley, National Institute of Standards & Technology  
Leslie Foyto, University of Illinois-Champaign-Urbana  
David Hayes, Los Alamos National Laboratory  
Jere Jenkins, Texas A&M University  
Sean O'Kelly, Idaho National Laboratory  
Steven Reese, Oregon State University  
Dagistan Sahin, National Institute of Standards & Technology  
Randolph Strader, National Institute of Standards & Technology  
Darren Talley, Sandia National Laboratories  
Travis Tate, U.S. Nuclear Regulatory Commission

**Activities**

Incorporation of advanced (research) reactor needs into all applicable standards is in progress.

Operation of Research Reactors Subcommittee manages the following projects and current standards:

**ANSI/ANS-1-2000 (R2019), Conduct of Critical Experiments (revision of ANSI/ANS-1-1987; R1992)**

**Scope:** *This standard provides for the safe conduct of critical experiments. Such experiments study neutron behavior in a fission device where the energy produced is insufficient to require auxiliary cooling, and the power history is such that the inventory of long-lived fission products is insignificant.*

**Membership:**

David Hayes, Chair, Los Alamos National Laboratory; Lawrence Berg, U.S. Department of Energy; Robert Busch, University of New Mexico; Theresa Cutler, Los Alamos National Laboratory; John Ford, Sandia National Laboratories; Ronald Knief, Individual; Thomas McLaughlin, Individual; Abraham Weitzberg, Individual

**Status:** ANSI approved a reaffirmation on 8/12/2019. A PINS for a revision was submitted to ANSI on 7/7/2017 and resubmitted after the reaffirmation. The reaffirmation was processed to keep the standard current while the revision is completed. David Hayes was appointed chair to replace Gary Harms who passed away in 2023. New members will be added as appropriate based on the results thereof. The working group plans to update the PINS and complete work on the revision in 2024.

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**ANSI/ANS-14.1-2004 (R2019), *Operation of Fast Pulse Reactors* (revision of ANSI/ANS-14.1-1975; R1982; R1989; R2000)**

**Scope:** *This standard is for those involved in the design, operation, and review of fast pulse reactors. It has been formulated in general terms to be applicable to all current fast pulse reactors. This standard does not apply to periodically pulsed reactors or booster assemblies.*

**Membership:**

Darren Talley, Chair, Sandia National Laboratories; Richard Anderson, Los Alamos National Laboratory; James Bryson, Sandia National Laboratories; Michael Flanders, White Sands Missile Range; John Ford, Sandia National Laboratories; Joetta Goda, Los Alamos National Laboratory; Ronald Knief, Individual; Douglas Minnema, Defense Nuclear Facilities Safety Board

**Status:** ANSI approved a reaffirmation on 8/12/2019. Darren Talley replaced Matthew Burger as chair in February 2023.

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**ANSI/ANS-15.1-2007 (R2018), *The Development of Technical Specifications for Research Reactors* (revision of ANSI/ANS-15.1-1990; R1999)**

**Scope:** *This standard identifies and establishes the content of technical specifications (TS) for research and test reactors. Areas addressed are: Definitions, Safety Limits (SL), Limiting Safety System Settings (LSSS), Limiting Conditions for Operation (LCO), Surveillance Requirements (SR), Design Features, and Administrative Controls. Sufficient detail is incorporated so that applicable specifications can be derived or extracted.*

**Membership:**

Les Foyto, Chair, University of Illinois–Champaign Urbana; Evan Beese, RiskIQ; Leo Bobek, University of Massachusetts–Lowell; Justin Hudson, Jr., U.S. Nuclear Regulatory Commission; William Kennedy, U.S. Nuclear Regulatory Commission; Sean O’Kelly, Idaho National Laboratory; Steve Reese, Oregon State University; Brian Shea, University of Florida

**Status:** This standard received ANSI approval of a reaffirmation on 4/10/2018. The working group will be working with the NRC in the near future to incorporate "lessons learned" during relicensing of facilities. No major activity to report in calendar year 2023, but the intent is to work with the NRC staff in the coming year that are part of the committee to implement any revisions to the standard based on lessons learned during license renewals.

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**ANSI/ANS-15.2-1999 (R2021), *Quality Control for Plate-Type Uranium-Aluminum Fuel Elements* (revision of ANSI/ANS-15.2-1990)**

**Scope:** *This standard sets forth general requirements for the establishment and execution of a program designed to verify that the quality of plate-type uranium-aluminum fuel elements being purchased for research reactors conforms to the requirements of the contract and applicable technical documents, including specifications, standards, and drawings.*

**Membership:**

Bryon Curnutt, Chair, Idaho National Laboratory; Jeffrey Brower, Idaho National Laboratory; Clinton Cooper, Idaho National Laboratory; Cindy Montgomery, U.S. Nuclear Regulatory Commission; Daniel Pinkston, Oak Ridge National Laboratory; Randolph Strader, National Institute of Standards and Technology

**Status:** The reaffirmation of this standard was approved by ANSI on 1/28/2021. The reaffirmation will keep the standard current while progress is made on new high power LEU conversions. A revision to ANSI/ANS-15.2-1999

(R2009) was issued for ballot to N17 (previous consensus committee). Significant comments were received directing that new high power LEU conversion fuel be incorporated into the next revision of the standard. The revision was put on hold until sufficient progress is made on the new fuel type. This progress has yet to be made and is not expected to be available for some time. The subcommittee and working group chairs do not recommend that the PINS, as previously approved, be administratively resubmitted to ANSI and have committed to submitting a new PINS form acknowledging the incorporation of LEU fuel type and possibly other changes when sufficient information is available.

**ANSI/ANS-15.4-2016 (R2021), *Selection and Training of Personnel for Research Reactors* (revision of ANSI/ANS-15.4-2007)**

**Scope:** *This standard sets the qualification, training, and certification criteria for operations personnel at research reactors and establishes the elements of a program for periodic re-qualification and re-certification. The standard is predicated on levels of responsibility rather than on a particular organizational concept.*

**Membership:**

Jere Jenkins, Chair, Idaho National Laboratory; JohnPeter Bekker (Associate Member), University of Texas—Austin; Michelle DeSouza, U.S. Nuclear Regulatory Commission; Luke Gilde, University of Maryland; Cameron Goodwin, Rhode Island Nuclear Science Center; Jordan Hagaman, Kairos Power LLC; Christopher Heysel, McMaster University; Christopher Hines, Nuclear Science Center; Lance Lippert, Sandia National Laboratories; Celia Oney, Oregon State University; Edward Sierra, Brookhaven National Laboratory; Randolph Strader, National Institute of Standards & Technology; Travis Tate, U.S. Nuclear Regulatory Commission; Jonathan Wallick, U.S. Geological Survey

**Status:** ANSI approved a reaffirmation on 7/23/2021. No activity in 2023.

**ANSI/ANS-15.8-1995 (R2023), *Quality Assurance Program Requirements for Research Reactors* (revision of ANSI/ANS-15.8-1976; R1986)**

**Scope:** *The standard provides criteria for quality assurance in the design, construction, operation, and decommissioning of research reactors.*

**Membership:**

Michelle Dudley, Co-Chair, National Institute of Standards & Technology; Randolph Strader, Co-Chair, National Institute of Standards and Technology; Gary Kirk, Oak Ridge National Laboratory; Daniel Menchaca, Texas A&M University; Richard Pratt, Sandia National Laboratory

**Status:** A reaffirmation was approved by ANSI on 11/27/2023. During the reaffirmation review, the working group determined the standard would benefit from a revision to enhance the content to align with improvements in various process and supporting reference sources since the last revision completed in 1995. A solicitation to the ANS and test and research reactor communities for working group volunteers to support the revision effort resulted in increased representation from across the test and research reactors and private sector communities.

**ANSI/ANS-15.11-2016 (R2021), *Radiation Protection at Research Reactor Facilities* (revision of ANSI/ANS-15.11-2009)**

**Scope:** *This standard establishes the elements of a radiation protection program and the criteria necessary to provide an acceptable level of radiation protection for personnel at research reactor facilities and the public consistent with keeping exposures and releases as low as is reasonably achievable (ALARA).*

**Membership:**

Steven Reese, Chair, Oregon State University; Craig Bassett, U.S. Nuclear Regulatory Commission; David Brown, National Institute of Standards & Technology; Ronald Dobey, Individual; Wesley Frey, University of California–Davis

**Status:** ANSI approved a reaffirmation on 7/20/2021. It is anticipated that the standard will be reviewed in 2024.

**ANSI/ANS-15.16-2015 (R2020), *Emergency Planning for Research Reactors* (revision of ANSI/ANS-15.16-2008)**

**Scope:** *This standard identifies the elements of an emergency plan which describes the approach to coping with emergencies and minimizing the consequences of accidents at research reactor facilities. The emphasis given each of these elements shall be commensurate with the potential risk involved. The emergency plan shall be implemented by emergency procedures.*

**Membership:**

Steven Reese, Chair, Oregon State University; Leo Bobek, University of Massachusetts–Lowell; James Bryson, Sandia National Laboratories; Les Foyto, University of Illinois–Champagne Urbana; Michael Norris, U.S. Nuclear Regulatory Commission; Sean O’Kelly, Idaho National Laboratory

**Status:** The revised standard was approved by ANSI on 2/11/2015 with a reaffirmation approved on 1/23/2020.

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**ANSI/ANS-15.21-2012 (R2023), *Format and Content for Safety Analysis Reports for Research Reactors* (revision of ANSI/ANS-15.21-1996; R2006)**

**Scope:** *This standard identifies specific information and analyses for inclusion in the safety analysis report for research reactors and establishes a uniform format for the report. This standard provides the criteria for the format and content for safety analysis reports for research reactors.*

**Membership:**

Michael Balazik, Chair, U.S. Nuclear Regulatory Commission; William Kennedy, U.S. Nuclear Regulatory Commission; Jerry Newhouse, Reed College; Steven Reese, Oregon State University; Clifford Stanley, Los Alamos National Laboratory

**Status:** The standard was reaffirmed by ANSI on 1/19/2023.

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**ANS-15.22, *Classification of Structures, Systems, and Components for Research Reactors* (proposed new standard)**

**Scope:** *This standard provides one technology neutral SSC classification process for research reactors that is, where possible, performance-based and risk-informed. This standard applies to existing and future research and test reactors.*

**Membership:**

Dagistan Sahin, Chair, National Institute of Standards & Technology; Leo Bobek, University of Massachusetts–Lowell; Mihai Diaconeasa, North Carolina State University; Jordan Hagaman, Kairos Power LLC; Brenden Heidrich, Idaho National Laboratory; Jere Jenkins, Texas A&M University; Bryce Kelly, Idaho National Laboratory; Mark Linn, Individual; Steven Lynch, U.S. Nuclear Regulatory Commission; Steven Reese, Oregon State University; Dagistan Sahin, National Institute of Standards & Technology; Andrew Smolinski, Armed Forces Radiobiology Research Institute; Patrick Snouffer, Zeno Power Systems, Inc.; Clifford Stanley, Los Alamos National Laboratory; Randy Strader, National Institute of Standards & Technology; Carroll Trull, EPM, Inc.; Guanyi Wang (Associate Member), Argonne National Laboratory

**Status:** The PINS was submitted to ANSI on 3/27/2017. Dagistan Sahin took over the chair role from Bryce Kelly on 11/30/2023.

## Research Advanced Reactors Consensus Committee (RARCC) Organizational Chart

Chair: George F. Flanagan

Vice Chairs: Bruce B. Bevard, Thomas Newton

ANS-15	ANS-29
Operation of Research Reactors	Advanced Initiatives
Thomas Newton (Chair)	Bruce B. Bevard (Chair)
<b>Ⓢ = PINS submitted to ANSI</b>	
ANS-1-2000 (R2019) Ⓢ (A1) Conduct of Critical Experiments <a href="#">RF 8/12/2019</a> (WGC: D. Hayes)	ANS-53.1-2011 (R2021) Ⓢ (A1) Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants <a href="#">RF 10/7/2021</a> (WGC: J. August)
ANS-14.1-2004 (R2019) (A2) Operation of Fast Pulse Reactors <a href="#">RF 8/12/2019</a> (WGC: D. Talley)	ANS-54.1-2020 (A2) Nuclear Safety Criteria and Design Process for Sodium Fast Reactor Nuclear Power Plants <a href="#">APP'D 3/23/2020</a> (WGC: G. Flanagan)
ANS-15.1-2007 (R2018) (A2) Development of Technical Specifications for Research Reactors <a href="#">RF 4/10/2018</a> (WGC: L. Foyto)	ANS-20.2-2023 (NEW) (B1) Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel, Molten-Salt Reactor Nuclear Power Plants <a href="#">APP'D 1/4/2023</a> (WGC: D. Holcomb)
ANS-15.2-1999 (R2021) (A2) Quality Control for Plate-Type Uranium-Aluminum Fuel Elements <a href="#">RF 1/28/2021</a> (WGC: B. Curnutt)	ANS-GS-30.1 (NEW) Ⓢ (B1) Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs (Guidance Standard) (WGC: M. Linn)
ANS-15.4-2016 (R2021) (A2) Selection and Training of Personnel for Research Reactors <a href="#">RF 7/23/2021</a> (WGC: J. Jenkins)	ANS-30.2 (NEW) Ⓢ (B1) Classification and Categorization of Structures, Systems, and Components for New Nuclear Power Plants (WGC: K. Welter)
ANS-15.8-1995 (R2023) Ⓢ (A2) Quality Assurance Program Requirements for Research Reactors <a href="#">RF 11/27/2023</a> (WGCs: R. Strader & M. Dudley)	ANS-20.1 (NEW) Ⓢ (B2) <b>PROJECT ON INDEFINITE HOLD</b> Nuclear Safety Design Criteria for Fluoride Salt-Cooled High-Temperature Reactor NPPs (WGC: E. Blandford)
ANS-15.11-2016 (R2021) (A2) Radiation Protection at Research Reactors <a href="#">RF 7/20/2021</a> (WGC: S. Reese)	
ANS-15.16-2015 (R2020) (A2) Emergency Planning for Research Reactors <a href="#">RF 1/23/2020</a> (WGC: S. Reese)	
ANS-15.21-2012 (R2023) (A2) Format and Content for Safety Analysis Reports for Research Reactors <a href="#">RF 1/19/2023</a> (WGC: M. Balazik)	
ANS-15.22 (NEW) Ⓢ (B1) Classification of Structures, Systems and Components for Research Reactors (WGC: D. Sahin)	
(A1) Current Being Worked On Standards	
(A2) Current Not Being Worked On Standards	
(B1) Proposed Being Worked On Standards	
(B2) Proposed Not Being Worked On Standards	
(C1) Withdrawn Being Worked On Standards	
(C2) Withdrawn Not Being Worked On Standards	

**Table 6 – RARCC Organizational Chart**

## Safety and Radiological Analyses Consensus Committee (SRACC)

**Andrew O. Smetana, Chair  
Individual**

**Scope:** *The SRACC is responsible for the preparation and maintenance of voluntary consensus standards as well as standards-related guidance documents, guidance standards, and technical reports supporting physics methods and measurements for nuclear facilities, shielding materials and methods for shielding analyses, safety analyses and for the associated computational methods and computer codes. Input data for calculations and codes, such as nuclear cross sections, are included in this scope. The ANS Standards Committee Procedures Manual for Consensus Committees shall be used to guide the activities of this consensus committee.*

*Subcommittees have been established to manage the activities of working groups and to perform detailed reviews of proposed standards for technical need, relevance, and acceptability. Each subcommittee has been assigned a unique and specific area of technical responsibility.*

*These subcommittees have been organized as follows:*

- *Mathematics and Computation (ANS-10)*
- *Reactor Physics (ANS-19)*
- *Shielding (ANS-6)*

*Each subcommittee has established various working groups to develop specific proposed standards and maintain existing standards within its respective area of responsibility. These working groups create the text of SRACC standards and resolve review and ballot comments.*

### **SRACC Membership:**

**Andrew O. Smetana, Chair**, Individual  
**Julie Jarvis, Vice Chair**, Defense Nuclear Facilities Safety Board  
F. Arzu Alpan, Oak Ridge National Laboratory  
Richard S. Amato, Individual  
John Bess, JFoster and Associates, LLC  
Dimitrios M. Cokinos, Individual  
Donald J. Dudziak, Los Alamos National Laboratory  
Eric Giavedoni, Grove Engineering, Inc.  
Mukesh K. Gupta, Amentum Technical Services  
Nolan E. Hertel, Georgia Institute of Technology  
Paul Hulse, Sellafield, Limited  
Moussa Mahgerefteh, Individual  
Peter Norgard, University of Missouri Research Reactor  
Donald E. Palmrose, U.S. Nuclear Regulatory Commission  
Charles T. Rombough, CTR Technical Services, Inc.  
Charlotta E. Sanders, University of Nevada, Las Vegas  
Abraham Weitzberg, Individual

### **Associate Member**

Japan Patel, University of Michigan, Ann Arbor

### **Report of SRACC:**

The SRACC held a virtual meeting on November 9, 2023. Andrew Smetana and Julie Jarvis were re-elected as Chair and Vice Chair, respectively. Eric Giavedoni and Peter Norgard were confirmed as members, and Japan Patel was added as an associate member of the SRACC. Moussa Mahgerefteh retired from Constellation Corporation. Christopher Graham retired from standards activities.



**Approved in 2023:**

**ANSI/ANS-5.1-2014 (R2023)**, *Decay Heat Power in Light Water Reactors* (reaffirmation of ANSI/ANS-5.1-2014; R2018)

**ANSI/ANS-6.1.2-2013 (R2023)**, *Group Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Power Plants* (reaffirmation of ANSI/ANS-6.1.2-2013; R2018)

**ANSI/ANS-10.7-2013 (R2023)**, *Non-Real-Time, High-Integrity Software for the Nuclear Industry—Developer Requirements* (reaffirmation of ANSI/ANS-10.7-2013; R2018)

**Active Standards/Projects (Approved PINS):**

**ANS-6.4.2**, *Specification for Radiation Shielding Materials* (revision of ANSI/ANS-6.4.2-2006)

**ANS-6.4.3**, *Gamma-Ray Attenuation Coefficients and Buildup Factors for Engineering Materials* (historical revision of ANSI/ANS-6.4.3-1991—proposed new standard)

**ANS-10.4**, *Verification and Validation of Non-Safety-Related Scientific and Engineering Computer Programs for the Nuclear Industry* (revision of ANSI/ANS-10.4-2008; R2021)

**ANS-19.10**, *Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals* (revision of ANSI/ANS-19.10-2009; R2021)

**ANS-19.13**, *Initial Fuel Loading and Startup Tests for FOAK Advanced Reactors* (proposed new standard)

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**Mathematics and Computations Subcommittee (ANS-10)**

**Scope:** *The scope of the Mathematics and Computations Subcommittee includes the development of standards which will promote effective utilization and enhance the reliability of computer programs throughout the nuclear community. The intent of such standards is to improve the ease of use, facilitate the exchange, and simplify the conversion of programs.*

***Membership:***

**Paul Hulse, Chair**, Sellafield Ltd.  
Mark Baird, Oak Ridge National Laboratory  
Phillip Ellison, GE-Hitachi Nuclear Energy  
Nima Fathi, University of New Mexico  
Byron Frank, Westinghouse Electric Company, LLC  
Bernadette Kirk, Kirk Nuclear Information Services  
Yuri Orechwa, U.S. Nuclear Regulatory Commission  
Paul Romano (Associate Member), Argonne National Laboratory  
Robert Singleterry, NASA Langley Research Center  
Andrew Smetana, Individual  
Charles Sparrow, Mississippi State University

The Mathematics and Computations Subcommittee manages the following active projects and current standards:

**ANS-10.2, *Portability of Scientific and Engineering Software* (new standard, historical revision to be considered)**

**Scope:** *This standard provides recommended programming practices and requirements to facilitate the portability of computer programs prepared for scientific and engineering computations.*

***Membership:***

Robert Singleterry, Chair, NASA Langley Research Center

**Status:** The standard was administratively withdrawn 8/14/2019. The working group recommended letting the standard be withdrawn administratively on its 10th anniversary. This is because the standard will need a major re-

write to remain current, and this is not currently possible given the changes that are occurring in software development at this time. A revision will be considered at a later date.

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**ANSI/ANS-10.4-2008 (R2021), Verification and Validation of Non-Safety Related Scientific and Engineering Computer Programs for the Nuclear Industry (new standard, historical revision of ANSI/ANS-10.4-1987; R1998)**

**Scope:** *This standard provides requirements for the verification and validation (V&V) of scientific and engineering computer programs developed for use by the nuclear industry.*

**Membership:**

Nima Fathi, Chair, University of New Mexico; Patrick McDaniel, Vice Chair, University of New Mexico; Byron Frank, Westinghouse Electric Company, LLC; Douglas Hardtmayer (Associate Member), MPR Associates, Inc.; Paul Hulse, Sellafield Ltd.; Ana Jambrina (Associate Member), VTT Technical Research Centre of Finland; Brian Krystek, GE-Hitachi; Wai Law, Tennessee Valley Authority; Giulio Malinverno (Associate Member), FIMAc; Charles Martin, Longenecker & Associates, Inc.; Salvador Rodriguez, Sandia National Laboratories; Paul Romano (Associate Member), Argonne National Laboratory; Ralph Schwartzbeck, Highland TEMS, LLC; Andrew Smetana, Individual

**Status:** The standard was reaffirmed on 6/15/21. A PINS to initiate a revision was submitted to ANSI on 7/17/2018. Work on the draft continues.

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**ANSI/ANS-10.5-2006 (R2021), Accommodating User Needs in Scientific and Engineering Computer Software Development (new standard, historical revision of ANSI/ANS-10.5-1994)**

**Scope:** *This standard presents criteria for accommodating user needs in the preparation of computer software for scientific and engineering applications.*

**Membership:**

Andrew Smetana, Chair, Individual

**Status:** The standard was reaffirmed on 8/23/2021. No activity in 2023.

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**ANSI/ANS-10.7-2013 (R2023), Non-Real Time, High Integrity Software for the Nuclear Industry—Developer Requirements (new standard)**

**Scope:** *This standard addresses rigorous, systematic development of high integrity, non-real time safety analysis, design, simulation software which includes calculations or simulations that can have critical consequences if errors are not detected, but that are so complex that typical peer reviews are not likely to identify errors. This may include nuclear design and performance codes, codes used to assign safety classification levels to systems, structures and components at nuclear facilities, computational fluid dynamics or structural mechanics codes, complex Monte Carlo simulations, radiation dosimetry analysis codes, and nuclear medical physics analytical codes.*

**Membership:**

Bernadette Kirk, Chair, Kirk Nuclear Information Services; Amani Cheniour, Oak Ridge National Laboratory; Nikola Draganic, (Associate Member), Lawrence Livermore National Laboratory; Mason Fox (Associate Member), University of Tennessee; Paul Hulse, Sellafield Limited; Ana Jambrina, VTT Technical Research Centre of Finland; Brendan Kochunas, University of Michigan; Giulio Malinverno, FIMAc SpA; Ryan McClarren, University of Notre Dame; Kyle Metzroth, X-Energy LLC; Duy-Thien Nguyen, Oak Ridge National Laboratory; Japan Patel, University of Michigan; Eric Pearson, GE Hitachi Nuclear Energy; Vince Penkrot, Westinghouse Electric Company, LLC; Charles Sparrow (Observer), Mississippi State University; Peter Stefanovic, Pacific Northwest National Laboratory

**Status:** Reaffirmation of this standard was approved by ANSI on 4/19/2023. The working group is reviewing the standard to see if a revision is needed. There is a need to include risk-informed substance to the standard.

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**ANSI/ANS-10.8-2015 (R2020), Non-Real Time, High-Integrity Software for the Nuclear Industry—User Requirements (new standard)**

**Scope:** *This standard provides minimum requirements for assurance that high-integrity design and analysis software developed for use by the nuclear industry meets state of the practice expectations for quality when employed by end users to solve complex physical problems. Final validation of such software for its intended use is ultimately the responsibility of the user. The developer is responsible for validation of the software over the parameter space defined by the developer; however, the end user may extrapolate beyond the intended validation envelope providing additional benchmarks or appropriate non-dimensional scaling analysis. The requirements in this standard may be graded or tailored for less significant applications than high-integrity software. The intent is to set a minimum level of quality assurance and critical technical process requirements to satisfy due diligence.*

**Membership:**

OPEN, Chair; Mark Baird, Oak Ridge National Laboratory; Byron Frank, Westinghouse Electric Company, LLC; Paul Hulse, Sellafield Ltd.; Charles Martin, Longenecker & Associates, Inc.; Ryan McClarren, University of Notre Dame; Vincent S. Penkrot, Westinghouse Electric Company, LLC; Shivajli Seth, U.S. Department of Energy; John Shultz, U.S. Department of Energy; Andrew Smetana, Savannah River Nuclear Solutions; Peter Stefanovic, Oak Ridge National Laboratory

**Status:** ANSI approved the reaffirmation of this standard on 10/29/2020. This standard is a complement to ANSI/ANS-10.7-2013, *Non-Real Time, High-Integrity Software Industry—Developer Requirements*. 3

**Reactor Physics Subcommittee (ANS-19)****Membership:**

**Dimitrios Cokinos, Chair**, Individual  
**Charles Rombough, Secretary**, CTR Technical Services, Inc  
 F. Arzu Alpan, Oak Ridge National Laboratory  
 Samuel Bays, Idaho National Laboratory  
 John Bess, J Foster and Associates, LLC  
 Friederike Bostelmann, Oak Ridge National Laboratory  
 Ren-Tai Chiang, Individual  
 Mark DeHart, Idaho National Laboratory  
 David Diamond (Observer), Brookhaven National Laboratory  
 Mark Eckenrode, Framatome, Inc.  
 Alireza Haghghat, Virginia Tech Research Center  
 Jesse Klingensmith, Westinghouse Electric Company  
 Edward Knuckles, Individual  
 Robert Little, Los Alamos National Laboratory  
 Moussa Mahgerefteh, Individual  
 Nicholas Martin, Idaho National Laboratory  
 Eleodor Nichita, University of Ontario Institute of Technology  
 Georgeta Radulescu, Oak Ridge National Laboratory  
 Benjamin Rouben, Individual  
 Abraham Weitzberg, Individual

**Note:** The following ANS-19 standards have now become international standards and are designated as ISO 18075, ISO 18077, and ISO 19226, respectively with the same titles as in their ANS versions:

- ANS-19.3, *Steady State Neutronics Methods for the Analysis of Power Reactors*
- ANS-19.6.6, *Reload Startup Physics Tests in Pressurized Water Reactors*
- ANS-19.10, *Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals*

The Reactor Physics Subcommittee manages the following projects and current standards:

**ANSI/ANS-5.1-2014 (R2019), Decay Heat Power in Light Water Reactors (revision of ANSI/ANS-5.1-2005)**

**Scope:** *This standard sets forth values for the decay heat power from fission products and  $^{239}\text{U}$  and  $^{239}\text{Np}$  following shutdown of light water reactors containing  $^{235}\text{U}$ ,  $^{238}\text{U}$ , and plutonium. The decay heat power from fission products is presented in tables and equivalent analytical representations. Methods are described that account for the reactor operating history, for the effect of neutron capture in fission products, and for assessing the uncertainty in the resultant decay heat power. Decay heat power from other actinides and activation products in structural materials, and fission power from delayed neutron-induced fission, are not included in this standard.*

**Membership:**

Jesse Klingensmith, Chair, Westinghouse Electric Company, LLC; Ian Gauld, Individual; Ryan Buratti, Framatome Inc.; Anna Jambina (Associate Member), VTT Technical Research Centre of Finland; Edward Knuckles, Individual; John Lehning, U.S. Nuclear Regulatory Commission; Dmitri Zialetsev, AREVA NP

**Status:** Reaffirmation was approved by ANSI on 2/5/2019. Jesse Klingensmith replaced Ian Gauld as working group. A survey of active users of the standard in industry, research, and regulatory agencies was completed in 2022 to help assess user needs and the future direction of the standard's development. Based on industry feedback and discussion with working group members, no new enhancements of ANS-5.1 are planned in the near future. Communication will continue with international committees (i.e., ISO). ANS-5.1 remains in maintenance mode with a reaffirmation discussion planned for 2024.

**ANSI/ANS-19.1-2019, Nuclear Data Sets for Reactor Design Calculations (revision of ANSI/ANS-19.1-2002; R2011)**

**Scope:** *The purpose of this standard is to provide criteria for the use of nuclear data in reactor design calculations. Thus, the standard identifies and describes the specifications for developing, preparing, and documenting nuclear data sets. The nuclear data sets considered are evaluated data sets, processed continuous data sets and processed averaged data sets. These data sets enable the analysts to generate cross section data which are used as input in neutronics codes.*

**Membership:**

Robert Little, Co-Chair, Los Alamos National Laboratory; Friederike Bostelmann, Co-Chair, Oak Ridge National Laboratory; F. Arzu Alpan, Oak Ridge National Laboratory; John Bess, J Foster and Associates, LLC; Dimitrios Cokinos, Individual; Ian Gauld, Individual; Edward Knuckles, Individual; Georgetta Radulescu, Oak Ridge National Laboratory; Benjamin Rouben, Individual

**Status:** The revision of the standard was approved by ANSI on 3/8/2019. No activity in 2023.

**ANSI/ANS-19.3-2022, Steady-State Neutronics Methods for Power Reactor Analysis (revision of ANSI/ANS-19.3-2011; R2017)**

**Scope:** *This standard provides guidance for performing and validating the sequence of steady-state calculations leading to prediction, in all types of commercial nuclear reactors, of (1) reaction-rate spatial distributions; 2) reactivity; 3) change of isotopic compositions with time. The standard provides 1) guidance for the selection of computational methods; 2) criteria for verification and validation of calculational methods used by reactor core analysts; 3) criteria for evaluation of accuracy and range of applicability of data and methods; 4) requirements for documentation of the preceding.*

**Membership:**

Eleodor Nichita, Chair, University of Ontario Institute of Technology; John Bess, JFoster Associates, LLC; Ren-Tai Chiang, Individual; Dimitrios Cokinos, Individual; Ronald Ellis, Individual; Godfree Gert, Lawrence Livermore National Laboratory; Greg Hobson, Framatome, Inc.; Guy Marleau, Ecole Polytechnique de Montreal; Charles Rombough, CTR Technical Services; Benjamin Rouben, 12 & 1 Consulting; Wei Shen, Candu Owners Group; William Walters, Pennsylvania State University; Peter Yarsky, U.S. Nuclear Regulatory Commission; Baocheng Zhang, Westinghouse Electric Company, LLC

**Status:** ANSI approval was received on 10/10/2022 and published on 2/1/2023.

**ANSI/ANS-19.3.4-2022, *The Determination of Thermal Energy Deposition Rates in Nuclear Reactors* (revision of ANSI/ANS-19.3.4-2002; R2017)**

**Scope:** *It is the purpose of this standard to provide criteria for 1) determination of the energy allocation among the principal particles and photons produced in fission, both prompt and delayed; 2) adoption of appropriate treatment of heavy charged particle and electron slowing down in matter; 3) determination of the spatial energy deposition rates resulting from the interactions of neutrons; 4) calculation of the spatial energy deposition rates resulting from the various interactions of photons with matter; and 5) presentation of the results of such computations, including verification of accuracy and specification of uncertainty. This standard addresses the energy generation and deposition rates for all types of nuclear reactors where the neutron reaction rate distribution and photon and beta emitter distributions are known. Its scope is limited to the reactor core, including blanket zones, control elements and core internals, pressure vessel, and the thermal and biological shielding.*

**Membership:**

Georgeta Radulescu, Chair, Oak Ridge National Laboratory; F. Arzu Alpan, Oak Ridge National Laboratory; John Bess, JFoster and Associates; Dimitrios Cokinos, Individual; Adolpho Ferrer, Studsvik Scandpower Inc.; Ana Jambriana, VTT Technical Research Centre of Finland; Yuxuan Liu, University of Michigan; Joel Rhodes, Studsvik Scandpower Inc.; Meng-Jen Wang (Associate Member), University of Utah; Baocheng Zhang, Westinghouse Electric Company, LLC

**Status:** This standard received ANSI approval on 6/12/2022. The current revision contains editorial changes to the standard. An appendix, which contains no requirements of the standard, was added. The appendix contains reference energy deposition calculations. No activity in 2023.

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**ANSI/ANS-19.4-2017 (R2022), *A Guide for Acquisition and Documentation of Reference Power Reactor Physics Measurements for Nuclear Analysis Verification* (new standard, supersedes ANSI/ANS-19.4-1976; R2000)**

**Scope:** *This standard specifies and provides requirements for the reference measurements of reactor geometry, reactivity, and operation parameters in light water power reactors. The measurement data are used in the verification of reactor physics computational methods used for nuclear core designs and analyses. This standard identifies the types of parameters, a brief description of test conditions and experimental data required for such reference measurements, problems and concerns that may affect the accuracy or interpretation of the data, and the criteria to be used in documenting the results of reference measurements.*

**Membership:**

Edward Knuckles, Chair, Individual; John Bess, JFoster and Associates, LLC; Ren-Tai Chiang, Individual, Dimitrios Cokinos, Individual; Dwayne Fitts, Framatome, Inc.; Moussa Mahgerefteh, Individual; Jeremy Roberts, Kansas State University; Charles Rombough, CTR Technical Services, Inc.; Benjamin Rouben, 12 & 1 Consulting; Patrick Sebastiani, Westinghouse Electric Company, LLC

**Status:** The standard received ANSI approval of a reaffirmation 8/24/2022. The working group believes that the standard would benefit from modifications to improve its clarity in some areas and has forwarded recommendations to the chair for further action.

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**ANS-19.5, *Requirements for Reference Reactor Physics Measurements* (proposed new standard, historical revision of ANSI/ANS-19.5-1995)**

**Scope:** *This standard provides criteria for the qualification of reference reactor physics measurements obtained from subcritical (including non-multiplying), critical and experiments performed in any nuclear facility for verification of nuclear design and analysis methods. It also provides criteria for documentation of reference data and review of proposed reference reactor physics data to ensure compliance with this standard. The burden falls upon the user to determine the applicability and relevance of such experimental data to a given reactor design.*

**Membership:**

Mark DeHart, Chair, Idaho National Laboratory; John Bess, JFoster and Associates, LLC; Rowdy Davis, University of New Mexico; Ronald Ellis, Individual; Albert Hsieh, U.S. Nuclear Regulatory Commission; Kyoung Lee, Oak Ridge National Laboratory; Matthew Lund, Idaho National Laboratory; Nicholas Martin, Idaho National Laboratory; Japan Patel, University of Michigan; Patrick Sebastiani, Westinghouse Electric Company, LLC; Andrew Smolinski,

Armed Forces Radiobiology Research Institute; Nazila Tehrani, U.S. Nuclear Regulatory Commission; Alan Wells, Individual

**Status:** A PINS was approved and submitted to ANSI on 11/6/2012 for a resurrection of historic standard ANSI/ANS-19.5-1995 (W2005). Mark DeHart volunteered to chair the working group to reform the group, confirm that the PINS is current, and initiate discussions for a new outline for the standard.

### **ANSI/ANS-19.6.1-2019, Reload Startup Physics Tests for Pressurized Water Reactors (revision of ANSI/ANS-19.6.1-2011 (R2016))**

**Scope:** *This standard applies to the reactor physics tests that are performed following a refueling or other core alteration of a PWR for which nuclear design calculations are required. This standard does not address the physics test program for the initial core of a commercial PWR.*

*This standard specifies the minimum acceptable startup reactor physics test program to determine if the operating characteristics of the core are consistent with the design predictions, which provides assurance that the core can be operated as designed. This standard does not address surveillance of reactor physics parameters during operation or other required tests, such as mechanical tests of system components (for example, the rod drop time test), visual verification requirements for fuel assembly loading, or the calibration of instrumentation or control systems (even though these tests are an integral part of an overall program to ensure that the core behaves as designed).*

*This standard assumes that the same previously accepted analytical methods are used for both the design of the reactor core and the startup test predictions. It also assumes that the expected operation of the core will fall within the historical database established for the plant and/or sister plants.*

#### **Membership:**

Charles Rombough, Chair, CTR Technical Services, Inc.; Paul Adam, Individual; Aaron Austin, Duke Energy–McGuire Nuclear Station; Kaushik Banerjee, Oak Ridge National Laboratory; John Bess, J Foster and Associates, LLC; Robert Borchert, Individual; Ryan Buratti, Framatome, Inc.; Anthony Campos, Framatome, Inc.; Charles Cohen, Naval Nuclear Laboratory; Jason Dever, Framatome, Inc.; Mark Eckenrode, Framatome, Inc.; Moussa Mahgerefteh, Individual; Michael Presnell, Duke Energy Corporation; Michael Prible, Westinghouse Electric Company, LLC; Ken Sahadewan, Constellation Nuclear; Patrick Sebastiani, Westinghouse Electric Company, LLC; John Singleton, Constellation Energy

**Status:** A revision of the standard was approved by ANSI on 12/19/2019. There has been no activity since the standard was revised in 2019. The international version of the standard, ISO 18077:2022, Reload startup physics tests for pressurized water reactors, as issued in 2022.

### **ANS-19.8, Fission Product Yields for 235U, 238U, and 239P (proposed new standard)**

**Proposed Scope:** *This standard provides a reference set of fission yield data for thermal and fast neutron-induced fission of  $^{233}\text{U}$ ,  $^{235}\text{U}$ ,  $^{239}\text{Pu}$ , and  $^{241}\text{Pu}$ ; fast neutron-fission of  $^{232}\text{Th}$ ,  $^{238}\text{U}$ , and  $^{240}\text{Pu}$ ; and spontaneous fission of  $^{252}\text{Cf}$ . The standard includes an extensive compilation of mass chain yields and uncertainties in tabular form. This new standard is particularly important in the characterization of radioactive wastes, predicting radiation source terms production of delayed neutrons, reactor spectra, burnup calculations, and various dosimetry applications including medical applications.*

#### **Membership:**

Robert Little, Chair, Los Alamos National Laboratory; Dimitrios Cokinos, Individual

**Status:** ANS-19.8 was previously designated ANS-5.2. A PINS will be the first task if the decision is made to proceed with this proposed standard. No activity in 2023.

### **ANS-19.9, Delayed Neutron Parameters for Light Water Reactors (proposed new standard)**

**Scope:** *This standard provides energy-dependent delayed neutron yield and decay data for Light Water Reactor design and control. The standard addresses the identification and characterization of fission products leading to delayed neutron emission; the total delayed neutron yield as a function of energy for U-233, U-235, U-238 and Pu-239; and fractions associated with individual emitters, half-lives and spectra for the classical group representation of delayed neutron data.*

**Membership:**

Dimitrios Cokinos, Chair pro temp, Individual; Anthony Attard, U.S. Nuclear Regulatory Commission

**Status:** A PINS was submitted to ANSI on 3/6/2006. A skeleton of the standard has been completed. A working group of active participants is needed to move forward. No activity in 2023.

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**ANSI/ANS-19.10-2009 (R2021), *Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals* (new standard)**

**Scope:** *This standard provides criteria for performing and validating the sequence of calculations required for the prediction of the fast neutron fluence  $t$  in the reactor vessel. Applicable to PWR and BWR plants the standard addresses flux attenuation from the core through the vessel to the cavity and provides criteria for generating cross sections, spectra, transport and comparisons with in- and ex-vessel measurements, validation, uncertainties and flux extrapolation to the inside vessel surface.*

**Membership:**

Alireza Haghghat, Chair, Virginia Tech; Fariz Abdul Rahman, GE Hitachi; F. Arzu Alpan, Oak Ridge National Laboratory; Jianwei Chen, Westinghouse Electric Company; LLC; Dimitrios Cokinos, Individual; Christopher Edgar, GE Hitachi; Ari Foley, Los Alamos National Laboratory; Edward Knuckles, Individual; Robert Little, Los Alamos National Laboratory; Moussa Mahgerefteh, Individual; Benjamin Parks, U.S. Nuclear Regulatory Commission; Amrit Patel, Oklo, Inc.; Joes Risner, Oak Ridge National Laboratory; Brandon Wise, U.S. Nuclear Regulatory Commission

**Status:** A reaffirmation was approved by ANSI on 10/7/2021. A PINS for a revision was approved and submitted to ANSI on 4/15/2022. The working group started to develop the draft before the PINS was approved. The draft was issued for subcommittee ballot and non-developing consensus committee review in February 2023. The working group is responding to comments submitted with the ballot and review.

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**ANSI/ANS-19.11-2017 (R2022), *Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Water Reactors* (revision of ANSI/ANS-19.11-1997; R2011)**

**Scope:** *This standard provides guidance and specifies criteria for determining the MTC in water moderated power reactors. Measurement of the isothermal temperature coefficient of reactivity (ITC) at hot zero power (HWP) conditions is covered in ANSI/ANS-19.6.1-2005, Reload Startup Physics Tests for Pressurized Water Reactors. This standard therefore addresses the calculation of the ITC at HWP and the calculation and measurement of the MTC at power. At present, this standard addresses the calculation and measurement of the MTC only in PWRs, because that is the only type of power reactor currently sited in the United States for which measurement of the MTC is required.*

**Membership:**

Moussa Mahgerefteh, Chair, Individual; Dimitrios Cokinos, Individual; Mark Eckenrode, Framatome, Inc.; Edward Knuckles, Individual; Patrick Sebastiani, Westinghouse Electric Company, LLC; Robert St. Clair, Duke Energy Corporation

**Status:** A reaffirmation was approved by ANSI on 6/2/2022. No activity in 2023.

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**ANS-19.12, *Nuclear Data for the Production of Radioisotope* (proposed new standard)**

**Scope:** *This standard establishes criteria for developing evaluated neutron cross section and branching ratio data for isotope production pathways for fast and thermal reactor systems, providing the data needed to calculate production of the desired medical and other isotopes and associated impurities.*

**Membership:**

Dimitrios Cokinos, Chair pro temp, Individual

**Status:** PINS was approved and submitted to ANSI on 11/1/2007. The project is in need of a permanent chair and members to proceed. No activity in 2023.

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**ANS-19.13, Initial Fuel Loading and Startup Tests for FOAK Advanced Reactors (proposed new standard)**

**Scope:** *This standard will provide best practices for reactor startup of First-of-a-Kind (FOAK) Advanced Reactors (AR) to confirm basic safety, operational, and fundamental property data for technical and safety specifications. The standard will also provide guidance leveraging startup procedures to support software validation methods to retire the operational and regulatory risk associated with the validation performed during reactor design.*

*Best practices for startup of heritage reactors and modern light water reactors (LWR) will be assimilated into generic recommended startup procedures for future FOAK-ARs. This standard will provide traceability between such recommended best practices and the identified key datasets. It will thus allow auditing the methodology of new FOAK ARs.*

**Membership:**

Samuel Bays, Co-Chair, Idaho National Laboratory; Nicolas Martin, Co-Chair, Idaho National Laboratory; Abraham Weitzberg, Co-Chair, Consultant; Hany Abdel-Khalik, Purdue University; Andrea Alfonsi, Ultra Safe Nuclear Corporation; John Bess, Jfoster and Associates, LLC; Benjamin Betzler (Associate Member), Radiant Nuclear; Marie Cuvelier, TerraPower; David Diamond, Brookhaven National Laboratory; Thomas Downar, University of Michigan; Ibrahim Ezelarab, Westinghouse; Massimiliano Fratoni, Individual; Nozomu Fujimoto Kyushu University; Hans Gougar, X-Energy, LLC; Kurt Harris, Flibe Energy; Ayman Hawari, North Carolina State University; David Hayes, Los Alamos National Laboratory; Mustafa Jaradat, Idaho National Laboratory; Timothy Kiefer, Individual; Necdet Kurul, GE Hitachi; Matthew Lund, Idaho National Laboratory; JonMcWhirter, TerraPower; Scott Palmtag, Individual; H. Peter Planchon, Individual; Charles Rombough, CTR Technical Services, Inc.; John Sackett, Individual; Nader Satvat, Kairos Power, LLC; Jeffrey Schmidt, U.S. Nuclear Regulatory Commission; Shane Stimpson, BWX Technologies, Inc.; Matthew Wargon, TerraPower; Michael Zerkle, Naval Nuclear Laboratory; Haihua Zhao, Kairos Power, LLC

**Status:** The PINS was submitted to ANSI 2/2/2023. A preliminary draft of this standard was approved by the working group. Comments from the preliminary draft were incorporated. An appendix was being drafted that provides a technology neutral initial test plan, abbreviated test plans for light water reactors, and a generic test plan for pebble bed reactors. The draft is being prepared for subcommittee ballot in early 2024.

**Shielding Subcommittee (ANS-6)**

**Scope:** *The purpose of this committee is to establish standards in connection with radiation shields, radiation analysis, and radiation protection insofar as it affects design of structures or equipment containing or near radiation sources, to provide shielding information to other standards groups, and to prepare and make available recommended related nuclear data and test problem solutions.*

**Membership:**

**Charlotta Sanders, Chair**, University of Nevada, Las Vegas  
 F. Arzu Alpan, Oak Ridge National Laboratory  
 Richard Amato, Individual  
 Paul Bergstrom, National Institute of Standards and Technology  
 Donald Duziak, Los Alamos National Laboratory  
 Mukesh Gupta, Amentum Technical Services  
 Nolan Hertel, Georgia Institute of Technology  
 Brian Hinderliter, University of Minnesota–Duluth  
 Sharad (Ken) Jha, Bechtel Power Corporation  
 Steven Nathan, Savannah River Nuclear Solutions  
 Jeffrey C. Ryman, Individual  
 Ali Simpkins, HPS Liaison (Employed by Oak Ridge Associated Universities)

**Shielding Subcommittee (ANS-6) Report**

The Shielding Subcommittee (ANS-6) activities fall under the shielding track of the Safety & Radiological Analyses Consensus Committee (SRACC). One of the subcommittee standards, ANSI/ANS-6.1.2-2013 (R2023), *Neutron and Gamma-Ray Cross Sections for Nuclear Radiation Protection Calculations for Nuclear Power Plants*, forms the basis for ISO (International Organization of Standardization) standard 23018:2022, *Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Reactors*. This standard is in the process of maintenance (reaffirmation). Reports on all subcommittee projects are found below.



The Shielding Subcommittee manages the following active and current standards:

**ANSI/ANS-5.4-2011 (R2020), Method for Calculating the Fractional Release of Volatile Fission Products from Oxide Fuel (new standard, historical revision of ANSI/ANS-5.4-1982)**

**Scope:** *This standard provides an analytical method for calculating the release of volatile fission products from oxide fuel pellets during normal reactor operation. When used with nuclide yields, this method will give the so-called "gap activity," which is the inventory of volatile fission products that could be available for release from the fuel rod if the cladding were breached. The standard considers high-temperature (up to the melting point) and low-temperature (where temperature-independent processes dominate) releases and distinguishes between short-halflife (half-life less than one year) and long-halflife (half-life greater than one year) nuclides. This standard requires that releases for nuclides of interest be calculated with both the high-temperature and the low-temperature models, and the larger of the two calculated releases is to be taken as the result.*

**Membership:**

OPEN, Chair; Yun Long, Westinghouse Electric Company, LLC

**Status:** ANSI approved a reaffirmation of this standard on 4/9/2020. No activity in 2023.

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**ANSI/ANS-5.10-1998 (R2019), Airborne Release Fractions at Non-Reactor Nuclear Facilities (new standard)**

**Scope:** *This standard provides criteria for defining Airborne Release Fractions (ARFs) for radioactive materials under accident conditions (excluding nuclear criticalities) at non-reactor nuclear facilities. The criteria in this standard provide requirements for selecting ARFs based on the calculated or assumed forms of radioactive material released. This standard may be applied to determine the ARFs for certain applicable reactor plant events for which alternative methodologies are not mandated by regulatory requirements. Because the predominant physical forms of radioactive materials in non-reactor facilities are solids and liquids, the standard focuses on these forms. Criteria are also provided for gases and materials that can be converted into the form of a vapor.*

**Membership:**

Mukesh Gupta, Chair, Amentum Technical Services; James Dishaw, MeV Technology Consulting

**Status:** Reaffirmation approved by ANSI on 10/3/2019. No activity in 2023.

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**ANSI/ANS-6.1.1-2020, Neutron and Photon Fluence-to-Dose Conversion (new standard, historical revision of ANSI/ANS-6.1.1-1991)**

**Scope:** *This standard presents data recommended for computing the biologically relevant dosimetric quantity in photon and neutron radiation fields. Specifically, this standard is intended for use by radiation shielding designers for the calculation of effective dose. Fit coefficients are given for evaluating whole body effective dose per unit fluence for photons with energy between 10 keV to 10 GeV and for neutrons with energy between 0.001 eV to 10 GeV. Eight different irradiation geometries are considered. Establishing exposure limits is outside the scope of this standard.*

**Membership:**

Paul Bergstrom, Co-chair, National Institute of Standards and Technology; Nolan Hertel, Co-chair, Georgia Institute of Technology; Elijah Dickson, U.S. Nuclear Regulatory Commission; Matthew Mille, National Cancer Institute

**Status:** This standard was approved by ANSI on 9/10/2020. No activity in 2013.

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**ANSI/ANS-6.1.2-2013 (R2023), Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Power Plants (revision of ANSI/ANS-6.1.2-1999; R2009)**

**Scope:** *This standard provides information on acceptable evaluated nuclear data and group-averaged neutron and gamma-ray cross section libraries based on the energy range and materials of importance in nuclear radiation protection and shielding calculations for nuclear power plants.*

**Membership:**

F. Arzu Alpan, Chair, Oak Ridge National Laboratories; Alireza Haghighat, Virginia Tech; Robert Little, Los Alamos National Laboratory; Yuri Orechwa, U.S. Nuclear Regulatory Commission; Jeffrey Ryman, Individual

**Status:** A reaffirmation was approved by ANSI on 6/16/2023.

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**ANSI/ANS-6.3.1-1987 (R2020), Program for Testing Radiation Shields in Light Water Reactors (LWR) (revision of ANSI/ANS-6.3.1-1980)**

**Scope:** *This standard describes a test program to be used in evaluating biological radiation shielding in nuclear reactor facilities under normal operating conditions including anticipated operational occurrences. The program encompasses examining and testing to be performed before startup, during startup, and testing subsequent to the startup phase. Post startup tests are required for the shielded components which do not contain sufficient radioactivity during the startup phase to allow valid testing. Shielding of these components is to be tested when radiation sources develop or are introduced into sufficient strength to allow meaningful measurements. Post startup shield tests are also required whenever radioactive or potentially radioactive equipment which could affect the adequacy of the installed shielding is introduced into the plant or relocated within the plant, or when previously tested shielding has been modified. One special category of post start-up testing is the testing of shielding during refueling operations.*

**Membership:**

OPEN, Chair, Jonathan Rivera, U.S. Nuclear Regulatory Commission.

**Status:** Reaffirmation received ANSI approval on 7/28/2020. A working group chair and members are being sought.

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**ANSI/ANS-6.4-2006 (R2021), Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants (revision of ANSI/ANS-6.4-1997; R2004)**

**Scope:** *This standard contains methods and data needed to calculate the concrete thickness required for radiation shielding in nuclear power plants. Where possible, specific recommendations are made regarding radiation attenuation calculations, shielding design, and standards of documentation. The standard provides guidance to architect engineers, utilities, and reactor vendors who are responsible for the shielding design of stationary nuclear plants. This standard does not consider sources of radiation other than those associated with nuclear power plants. It also excludes considerations of economic aspects of shielding design.*

*Concrete is a mixture of materials, the exact proportions of which will differ from application to application. This standard includes a discussion of the nature of concrete, emphasizing those variable aspects of the material which are important to the shield designer. The document discusses methods of analysis and the shielding input data appropriate to each method. Applications of the analytical methods are given, including bulk transport, radiation heating, streaming, and reflection problems.*

**Membership:**

Ken Jha, Chair, Bechtel Corporation; Moataz Harb, Oak Ridge National Laboratory; Julie Jarvis, Defense Nuclear Facilities Safety Board

**Status:** Reaffirmation of the standard was approved by ANSI on 8/5/2021. No activity in 2023

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**ANSI/ANS-6.4.2-2006 (R2021), Specification for Radiation Shielding Materials (revision of ANSI/ANS-6.4.2-1985; R1997; R2004)**

**Scope:** *This standard sets forth physical and nuclear properties that shall be reported by the supplier as appropriate for a particular application in order to form the basis for the selection of radiation shielding materials.*

**Membership:**

Steven Nathan, Co-Chair, Savannah River Nuclear Solutions; Peter Caracappa, Co-Chair, Columbia University; Amir Bahadori, Kansas State University; Brian Hinderliter, University of Minnesota-Duluth; Ahmad Ibrahim, Oak Ridge National Laboratory; Timothy Lloyd, Westinghouse Electric Company, LLC; Kathryn Robertson-DeMers, Spectrum Technical Services, Inc.

**Status:** The standard was reaffirmed on 12/7/2021. A PINS was submitted to ANSI in 2012 and resubmitted after the 2021 reaffirmation. No activity report provided.

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**ANS-6.4.3, Gamma-Ray Attenuation Coefficients and Buildup Factors for Engineering Materials (proposed new standard, historical revision of ANSI/ANS-6.4-3-1991)**

**Scope:** *This standard provides evaluated gamma-ray elemental attenuation coefficients and single material buildup factors for selected engineering materials for use in shielding calculations.*

**Membership:**

Jeffrey C. Ryman, Co-Chair, Individual; Donald Dudziak, Co-Chair, Laboratory Fellow-Los Alamos National Laboratory; F. Arzu Alpan, Oak Ridge National Laboratory; Adam Davis, Los Alamos National Laboratory; Elijah Dickson, U.S. Nuclear Regulatory Commission; Alex Gil, Perma-Fix; Jack Higginbotham, Oregon State University; Brian Hinderliter, University of Minnesota–Duluth; Dominic Napolitano, Individual; Charlotta Sanders, Sanders Engineering; Sylvia Wang, Westinghouse Electric Company, LLC

**Status:** The PINS for a historical revision of ANSI/ANS-6.4.3-1991 was approved and submitted to ANSI on 3/15/2012. A copy of the Japanese buildup factor standard was purchased and provided to ANS-6 Subcommittee Chair Charlotta Sanders for review. There has been no change in the status of the update to this withdrawn standard. It had earlier been proposed to see if the working group could adopt the Japanese standard on this topic, with the permission of the cognizant Japanese group. ANS standards received a copy of the Japanese standard on this subject some time ago, which was written in Japanese. Although the Japanese working group had originally expected to publish an English language version of their standard, this version has not been forthcoming to the best of our knowledge. Sanders will attempt to contact the Japanese working group to see if there is a path forward to completing the English translation of the Japanese standard.

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**ANSI/ANS-6.6.1-2015 (R2020), Calculation and Measurement of Direct and Scattered Gamma Radiation from LWR Nuclear Power Plants (revision of ANSI/ANS-6.6.1-1987)**

**Scope:** *This standard defines calculational requirements and discusses measurement techniques for estimates of dose rates near light water reactor (LWR) nuclear power plants due to direct and scattered gamma-rays from contained sources onsite. Onsite locations outside plant buildings and locations in the offsite unrestricted area are considered. All sources that contribute significantly to dose rates are identified and methods for calculating the source strength of each are discussed. Particular emphasis is placed on 16N sources as they are significant sources of direct and scattered radiation for boiling water reactors (BWR). The standard specifically excludes radiation from gaseous and liquid effluents. The standard describes the considerations necessary to compute dose rates, including component self-shielding, shielding afforded by walls and structures, and scattered radiation. The requirements for measurements and data interpretation of measurements are given. The standard includes normal operation and shutdown conditions but does not address accident or normal operational transient conditions.*

**Membership:**

Dick Amato, Chair, Individual; Joseph John Bevelacqua, Bevelacqua Resources; Peter Caracappa, Columbia University; Jianwei Chen, Westinghouse Electric Company, LLC; Brian Hinderliter, University of Minnesota–Duluth; Sylvia Wang, Westinghouse Electric Company, LLC

**Status:** ANSI approved a reaffirmation of the standard on 5/23/2020. No activity in 2023.

## Safety and Radiological Analyses Consensus Committee (SRACC) Organizational Chart

Chair: Andrew O. Smetana

Vice Chair: Julie Jarvis

Shielding (ANS-6) Chair: Charlotta Sanders	Mathematics and Computations (ANS-10) Chair: Paul Hulse	Reactor Physics (ANS-19) Chair: Dimitrios Cokinos
<b>Ⓢ = PINS submitted to ANSI</b>		
ANS-6.4.2-2006 (R2021) Ⓢ (A1) Specification for Radiation Shielding Materials <a href="#">RF 12/2/2021</a> (WGC: S. Nathan)	ANS-10.4-2008 (R2021) Ⓢ (A1) Verification and Validation of Non-Safety-Related Scientific and Engineering Computer Programs for the Nuclear Industry <a href="#">RF 6/15/2021</a> (WGC: N. Fathi)	ANS-19.10-2009 Ⓢ (R2021) (A1) Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals <a href="#">RF 10/7/2021</a> (WGC: A. Haghighat)
ANS-5.4-2011 (R2020) (A2) Method for Calculating the Fractional Release of Volatile Fission Products from Oxide Fuel <a href="#">RF 4/9/2020</a> (WGC: OPEN)	ANS-10.5-2006 (R2021) (A2) Accommodating User Needs in Scientific and Engineering Computer Software Development <a href="#">RF 8/23/2021</a> (WGC: A. Smetana)	ANS-5.1-2014 (R2023) (A2) Decay Heat Power in Light Water Reactors <a href="#">RF 12/4/2023</a> (WGC: J. Klingensmith)
ANS-5.10-1998 (R2019) (A2) Airborne Release Fractions at Non-Reactor Nuclear Facilities <a href="#">RF 10/3/2019</a> (WGC: M. Gupta)	ANS-10.7-2013 (R2023) (A2) Non-Real-Time, High-Integrity Software for the Nuclear Industry—Developer Requirements <a href="#">RF 4/19/2023</a> (WGC: B. Kirk)	ANS-19.1-2019 (A2) Nuclear Data Sets for Reactor Design Calculations <a href="#">RF 3/8/2019</a> (WGC: R. Little & F. Bostelmann)
ANS-6.1.1-2020 (A2) Photon and Neutron Fluence-to-Dose Conversion Coefficients <a href="#">App'd 9/10/2020</a> (WGC: N. Hertel/P. Bergstrom)	ANS-10.8-2015 (R2020) (A2) Non-Real Time, High Integrity Software for the Nuclear Industry—User requirements <a href="#">App'd 10/29/2020</a> (WGC: Open)	ANS-19.3-2022 (A2) Steady-State Neutronics Methods for Power Reactor Analysis <a href="#">RV 10/6/2022</a> (WGC: E. Nichita)
ANS-6.1.2-2013 (R2023) (A2) Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for NPPs <a href="#">RF 6/16/2023</a> (WGC: A. Alpan)	ANS-10.2 (W2019) (C2) **Revision to be considered** Portability of Scientific and Engineering Software (WGC: R. Singleterry)	ANS-19.3.4-2022 (A2) The Determination of Thermal Energy Deposition Rates in Nuclear Reactors <a href="#">RV 7/12/2022</a> (WGC: G. Radulescu)
ANS-6.3.1-1987 (R2020) (A2) Program for Testing Radiation Shields in Light Water Reactors (LWR) <a href="#">RF 7/28/2020</a> (WGC: Open)		ANS-19.4-2017 (R2022) (A2) A Guide for Acquisition and Documentation of Reference Power Reactor Physics Measurements for Nuclear Analysis Verification <a href="#">RF 8/24/2022</a> (WGC: E. Knuckles)
ANS-6.4-2006 (R2021) (A2) Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants <a href="#">RF 8/5/2021</a> (WGC: K. Jha)		ANS-19.6.1-2019 (A2) Reload Startup Physics Tests for PWRs <a href="#">App'd 12/19/2019</a> (WGC: C. Rombough)
ANS-6.6.1-2015 (R2020) (A2) Calculation and Measurements of Direct and Scattered Gamma Radiation from LWR NPPs <a href="#">RF 5/23/2020</a> (WGC: R. Amato)		ANS-19.11-2017 (R2022) (A2) Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for PWRs <a href="#">RF 6/2/2022</a> (WGC: M. Mahgerefteh)
ANS-6.4.3 (W2001) Ⓢ (C2) Gamma-Ray Attenuation Coefficients & Buildup Factors for Engineering Materials (WGC: J. Ryman/D. Dudziak)		ANS-19.13 (NEW) Ⓢ Initial Fuel Loading and Startup Tests for FOAK Advanced Reactors (WGCs: S. Bays / A. Weitzberg / N. Martin)
		ANS-19.8 (NEW) (B2) (Project considered) Fission Product Yields for 235U, 238U, and 239P (WGC: R. Little)
		ANS-19.9 (NEW) Ⓢ (B2) Delayed Neutron Parameters for Light Water Reactor (WGC: Open)
		ANS-19.12 (NEW) Ⓢ (B2) Nuclear Data for the Production of Radioisotope (WGC: Open)
		ANS-19.5 (W2005) Ⓢ (C2) Requirements for Reference Reactor Physics Measurements (WGC: M. DeHart)
(A1) Current Being Worked On Standards		
(A2) Current Not Being Worked On Standards		
(B1) Proposed Being Worked On Standards		
(B2) Proposed Not Being Worked On Standards		
(C1) Withdrawn Being Worked On Standards		
(C2) Withdrawn Not Being Worked On Standards		

**Table 7 – SRACC Organizational Chart**

**JCNRM**  
**American Nuclear Society (ANS) /**  
**American Society of Mechanical Engineers (ASME)**  
**Joint Committee on Nuclear Risk Management (JCNRM)**

**Dennis Henneke, ANS Co-chair**  
**GE Hitachi Nuclear Energy**

**K. Raymond Fine, ASME Co-chair**  
**Energy Harbor Nuclear**

**Scope:** *The Joint Committee on Nuclear Risk Management (JCNRM) is responsible for the preparation and maintenance of voluntary consensus standards, standards-related guidance documents, guidance standards, and technical reports that support the application of risk-informed approaches. These efforts address currently operating and future nuclear power plants and other types of reactors, as well as the transport, storage, handling, and processing of new and used nuclear fuel and radioactive waste. The JCNRM may also support other consensus committees of the American Nuclear Society (ANS) and the American Society of Mechanical Engineers (ASME), and other standards-developing organizations (SDOs), by reviewing and commenting on risk-related aspects of standards, guidance documents, and other documents prepared by those organizations, at their request.*

*Activities of the consensus committee shall be guided by the Procedures for ASME Codes and Standards Development Committees but shall also meet the intent of ANS Standards Committee Procedures Manual for Consensus Committees unless specifically authorized by the ANS Standards Board.*

**JCNRM Membership:**

**JCNRM Membership (as of December 2023):**

**Dennis Henneke, ANS Co-chair**, GE Hitachi Nuclear Energy  
**K. Raymond Fine, ASME Co-chair**, Energy Harbor Nuclear  
**Andrea Maioli, ANS Co-vice-chair**, Westinghouse Electric Company  
**Gerry W. Kindred**, Tennessee Valley Authority  
(Alternate: Bradley Dolan, Tennessee Valley Authority)  
Paul J. Amico, Jensen Hughes, Inc.  
Vincent Andersen, Jensen Hughes, Inc.  
Victoria K. Anderson, Nuclear Energy Institute  
George Apostolakis, Nuclear Risk Research Center  
Michelle Bensi, University of Maryland  
Sarah Bristol, NuScale Power  
Robert Budnitz, Consultant  
Gary Demoss, PSEG Nuclear  
Matthew R. Denman, Kairos Power  
Karl N. Fleming, KNF Consulting Services  
David Grabaskas, Argonne National Laboratory  
Rick Grantom, C.R. Grantom P.E. Associates, LLC  
H. Alan Hackerott, Consultant  
Jordan Hagaman, Kairos Power  
Douglas C. Hance, Electric Power Research Institute  
Matthew Humberstone, U.S. Nuclear Regulatory Commission  
(Alternate: Jeffery Wood, U.S. Nuclear Regulatory Commission)  
Jodine Jansen Vehec, Holtec International  
Nathan (Reed) LaBarge, Westinghouse Electric Company  
Stanley H. Levinson, Individual  
Stuart R. Lewis, Individual  
Zhegang Ma, Idaho National Laboratory  
Pamela F. Nelson, National Autonomous University of Mexico  
Robert I. Rishel, Duke Energy

Martin Sattison, Individual  
Raymond E. Schneider, Westinghouse Electric Company  
Jeffrey L. Stone, Constellation  
(Alternate: Suzanne Loyd, Constellation)  
Robert W. Youngblood III, Idaho National Laboratory

**Report of JCNRM:**

In 2023, the JCNRM held two 4-day in-person meetings, which included options for virtual participation. The meeting February 27 – March 2 was held in Albuquerque with a significant in person attendance, with the main committee meeting on March 2. The meeting held September 18 – 21 was held in Baltimore Maryland, with the main committee meeting held on September 21. Participation included multiple attendees from the Japan International Working Group (JIWG) and the International Atomic Energy Agency (IAEA). The JCNRM's Executive Committee has been meeting via Zoom bi-weekly to discuss current activities and to plan the future activities. The next JCNRM meeting is expected to be held physically February 26 – 29th (it is a leap-year), 2024, at the EPRI offices in Charlotte, NC.

The JCNRM Subcommittee on Standards and Guidance (NURI-SC) has been working on the issuance of two light water reactor (LWR) standards, previously issued as Trial-Use Pilot Application (TUPA) including the Level 2 (Severe Accident Progression and Radiological Release) PRA Standard RA-S-1.2 and the Level 3 (Radiological Accident Offsite Consequence Analysis) PRA Standard RA-S-1.3. The Level 2 Standard was balloted several times between 2022 and 2023 and will undergo one additional ballot in February 2024 to address minor and administrative issues. Issuance by ANS should occur later in 2024. The Level 3 draft was balloted in mid-2023 and should be ready for final ballot in April 2024. Additional efforts under NURI-SC include the finalization of the Low Power Shutdown (LPSD) PRA standard, currently issued as TUPA, the Multi-Unit PRA Standard, and the Advanced Light Water Reactor (ALWR) standard. The LPSD standard is scheduled for ballot in mid-2024. Finally, NURI-SC is completed an update to the newly issued ASME/ANS RA-S-1.1-2022, our main (flagship) PRA standard for operating LWRs, which corrected minor inconsistencies in the issued standard.

The Subcommittee on Technical Requirements (TR-SC) includes the working groups for specific technical specialties, such as Fire PRA, Internal Flooding PRA, Seismic PRA, High Winds PRA, External Flooding PRA, and other external hazards PRA. The subcommittee has supported the issuance of the standards discussed, including ensuring the issued standards consistently develop high level and supporting requirements related to specific hazard groups. Members from each of the working groups have been assigned to support each NURI-SC working groups to ensure consistency between the standards.

The Standards Infrastructure Subcommittee (SI-SC) is responsible for the development and revision of standard content between each PRA standard, including the development of Part 1 of each standard. The working groups underneath SI-SC include the Universal Content working group (WG), Data Management WG and Interpretations WG.

The Subcommittee on Risk Applications (SCoRA) continued to fulfill its charter to be the JCNRM interface with ANS and ASME (and other standards development organizations in the future), and to provide assistance to other standards-development projects whenever a new standard (or modification to an existing standard) utilizes risk-informed or performance-based (RIBP) requirements. This JCNRM subcommittee is the JCNRM interface with the ANS Standards Board's Risk-informed and Performance-based Principles Policy Committee (RP3C) and has supported the development of the RP3C Guidance Document for RIBP standards development. In late 2023, SCoRA collected comments on ANS-30.1, and recommended further work be stopped on this standard. As a result, JCNRM balloted and issued a letter to the ANS Standards Board to recommend no further work on ANS-30.1. Finally, in 2023, SCoRA has continued to support development of guidance for application of risk-informed techniques to nuclear power plant physical security and guidance on risk-informed emergency planning, with the later working group under the ANS Large Light Water Reactor Consensus Committee.

For several years, a series of grants to the ANS from the NRC have provided financial support for the work of the JCNRM Standards Committee, mainly to cover travel costs of participants who have no other travel financial support, as well as certain administrative costs and a few other selected expenses. The latest in this series of grants will run until 2025 but has an option of a one-year extension.

The JCNRM was formed from a merger of two committees from ANS and ASME, with a co-chair and co-vice-chair from each organization. It is a pleasure to report that the two co-chairs and the staff of the two societies are working well together and rather little in the way of a legacy of the two societies' former roles remains as an impediment. The business agreement between ASME and ANS has now been in place for several years and is working well.

### **Approved in 2023**

No standards were approved in 2023.

### **Active Standards/Projects (Approved PINS)**

**ASME/ANS RA-S-1.2**, *Standard for Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications* (revision of trial-use standard ASME/ANS RA-S-1.2-2014)

**ASME/ANS RA-S-1.3**, *Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications* (revision of trial-use standard ASME/ANS RA-S-1.3-2017)

**ASME/ANS RA-S-1.5**, *Advanced Light Water Reactor PRA Standard* (proposed new trial-use standard)

**ASME/ANS RA-S-1.6** (formerly ANS/ASME-58.22), *Standard for Low Power and Shutdown Methodology for PRA Applications*. (revision of trial use standard ANS/ASME-58.22-2014; to be redesignated)

**ASME/ANS RA-S-1.7**, *Multi-Unit PRA Standard* (proposed new trial use standard)

The above standards are discussed in more detail in the subcommittee discussions below:

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### **Subcommittee on Nuclear Risk Standards and Guidance (NURI-SC)**

**Charter:** *To assist in the development of standards and guides on probabilistic risk assessment (PRA) methods supporting risk-informed and performance-based applications for nuclear facilities.*

#### **Membership:**

Nathan LaBarge, Chair, Westinghouse Electric Company, LLC  
Zhegang Ma, Vice Chair, Idaho National Laboratory  
Victoria K. Anderson, Nuclear Energy Institute  
Sarah Bristol, Nuscale Power  
Heather L. Detar, Westinghouse Electric Company, LLC  
Karl N. Fleming, KNF Consulting Services, LLC  
David Grabaskas, Argonne National Laboratory  
Dennis W. Henneke, GE Hitachi Nuclear Energy  
Matthew Humberstone, U.S. Nuclear Regulatory Commission  
Andrea Maioli, Westinghouse Electric Company, LLC  
Martin Sattison, Individual  
Raymond E. Schneider, Westinghouse Electric Company, LLC  
Ricky Summitt, Enercon  
Taeyong Sung, Southern Nuclear  
Grant A. Teagarden, Jensen Hughes

**Report:** NURI-SC is responsible for developing and maintaining seven authorized PRA standards in various stages of development, trial use, and maintenance. In addition to development of the new standards by separate writing groups (project teams) that report to NURI-SC, the subcommittee has developed a trial-use procedure adopted by JCNRM for use in consistently interacting with users of trial-use standards during the trial-use periods. The status of the seven standards is provided in the following paragraphs.

**ANSI/ASME/ANS RA-S-1.1-2022, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications (revision of ASME/ANS RA-S- 2008 (R2019)/Addenda A&B)**

**Scope:** PRA of internal and external hazards for all plant operating modes (low power and shutdown modes will be included at a future date). In addition, this Standard establishes requirements for a limited Level 2 PRA sufficient to evaluate large early release frequency (LERF). The only hazards explicitly excluded from the scope are accidents resulting from purposeful human-induced security threats (e.g., sabotage). This Standard applies to PRAs used to support applications of risk-informed decision-making related to design, licensing, procurement, construction, operation, and maintenance. These requirements are written for operating power plants. They may be used for plants under design or construction, for advanced LWRs, or for other reactor designs, but revised or additional requirements may be needed. This version of the PRA Standard provides specific requirements for the following hazard groups:

- a) Internal Events (Part 2)
- b) Internal Floods (Part 3)
- c) Internal Fires (Part 4)
- d) Seismic Events (Part 5)
- e) High Winds (Part 7)
- f) External Floods (Part 8)
- g) Other Hazards (Part 9)

**Membership:**

Andrea Maioli, Chair, Westinghouse Electric Company; Jodine Jansen Vehec, Vice Chair, Holtec; Paul J. Amico, Jensen Hughes, Vincent Andersen, Jensen Hughes; Michelle Bensi, University of Maryland; John M. Biersdorf, Terrapower; Scott A. Brinkman, Duke Energy; Robert J. Budnitz, Consultant; Stephen Eder, Facility Risk Consultants, Inc.; Jonathan E. Evans, U.S. Nuclear Regulatory Commission; Alan Hackerott, Consultant; Jason Hall, Entergy Operations, Inc.; Francisco J. Joglar, Jensen Hughes; Douglas C. Hance, Electric Power Research Institute; Dennis W. Henneke, GE Hitachi Nuclear Energy; Annie M. Kammerer, Annie Kammerer Consulting, LLC; James C. Lin, ABSG Consulting Inc.; Nicholas Lovelace, Jensen Hughes; David N. Miskiewicz, Engineering Planning and Management, Inc.; Alexander A. Rubbico, Duke Energy; Raymond E. Schneider, Westinghouse Electric Co. LLC; Michael Szoke, Individual; Matthew Degonish, Alternate, Ameren; Michelle Gonzalez, Alternate, U.S. Nuclear Regulatory Commission

**Status:** ANSI/ASME/ANS RA-S-2008 was originally published in 2008. Addendum A was released in 2009 and endorsed by the NRC in RG 1.200 Revision 2. Addendum B (of RA-S) was approved and published in 2013.

ANSI/ASME/ANS RA-S-1.1-2022 is a full replacement of Addendum B and represents a significant update of the standard and contains many substantive changes based on feedback from recent users of the standard, along with extensive re-formatting, including elimination of Capability Category III. Extensive efforts have been made to improve consistency in requirements, terminology, and clarity. The seismic PRA Code Case already reflected many of the features in the newly released version RA-S-1.1-2022. In addition, Parts 7 (High Winds), 8 (External Flood), and 9 (Other Hazards), having not been changed since their original publication in the ANS RISC external hazards standard in 1999, were completely replaced to reflect the almost 20 years of experience since then. Finally, Part 10 (Seismic Margins) has been deemed inappropriate for a PRA standard and is being deleted.

The Level 1 Standard was approved by ANSI on May 11, 2022, and published May 31, 2022.

In 2023, the working group completed a further revision of the standard that corrected minimal inconsistencies from the 2022 edition of the standard. The updated edition (expected to be released in 2024) reviewed and dispositioned applicable comments from the NRC to RG 1.247 (on the NLWR PRA Standard) that may have had an impact on the Level 1 Standard. The 2024 edition has been approved for technical content and is undergoing final editing as of end of 2023. The Level 1 Working Group is also processing a proposed code case for redefinition of risk significance on an overall plant level as opposed to an individual hazard basis. In 2023, the Level 1 Working Group identified a future activity to revisit the current applicability of the PRA Standard for modelling of digital I&C in PRA, which has been a focus of significant research and development in the industry in the last few years.



**ASME/ANS RA-S-1.2-2014, Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications (previously ANS/ASME-58.24) (previously ANS/ASME-58.24) (proposed new standard)**

**Scope:** *Criteria and acceptable methods are defined for the evaluation of containment performance and radiological releases to the environment from accidents in a nuclear power plant that result in damage to fuel within the reactor vessel for use in risk-informed applications requiring Level 2 probabilistic risk assessment (PRA). The standard will address sequences initiated by internal or external events during all modes of reactor operation. The initial scope will focus on full power operations.*

**Membership:**

Raymond E. Schneider, Chair, Westinghouse Electric Company, LLC; Nathan LaBarge, Vice Chair, Westinghouse Electric Company, LLC; Aram Hakobyan, Dominion Resources Inc.; John R. Lehner, Individual; Wison Luangdilok, Fauske & Associates, LLC; Ricky Summitt, Enercon; Carroll Trull, Engineering Planning and Management, Inc. Jeffery J. Wood, U.S. Nuclear Regulatory Commission; Michelle L. Hart, Alternate, U.S. Nuclear Regulatory Commission

**Status:** This year marked an important milestone for the Level 2 working group. Over the past several years the Level 2 Working Group has met weekly to resolve initial ballot comments and to prepare a standard ballot. The Level 2 Standard was approved in April (JCNRM ballot 19-3448RC101) and sent to publication. Editorial comments were received in July and responded to by late August. Final proof copies have been reviewed and sent to the publisher. With a revision of the Level 1 Standard expected to be issued in early 2024, a decision was made to hold off on the Level 2 Standard until the Level 1 Standard is approved. This will allow the Level 2 Standard to reference the soon-to-be 2024 version of the Level 1 Standard. ANSI approval and publication of the Level 2 Standard is expected a few months into 2024.

**ASME/ANS RA-S-1.3-2017, Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications (previously ANS/ASME-58.25) (trial-use standard to be revised and seek ANSI approval)**

**Scope:** *This standard provides requirements for application of risk-informed decisions related to the consequences of accidents involving atmospheric release of radioactive materials to the environment. The standard is envisioned to apply to current and future light water reactor designs, other reactor designs, and nonreactor applications such as radiological dispersion device (RDD) incidents. The consequences to be addressed include health effects (early and late) and longer term environmental and economic impacts. The required capabilities allow determination of the efficacy of mitigation strategies on reducing consequences.*

**Membership:**

Grant A. Teagarden, Chair, Individual; Nathan E. Bixler, Individual; Keith Compton, U.S. Nuclear Regulatory Commission; Kyle Hope, Westinghouse; Gerry W. Kindred, Tennessee Valley Authority; Stanley Levinson, Individual; Carl Mazzola, Los Alamos National Laboratory; Vinod Mubayi, Individual; Kevin O'Kula, Individual; Joel Robinson, Office for Nuclear Regulation; Keith Woodward, Individual

**Status:** The Level 3 PRA Standard Working Group spent the first half of the year meeting weekly to resolve comments from the Readiness Review Team (RRT) in preparation for ballot. The RRT had provided a number of helpful comments following its review in 2022, many pertaining to changes to improve consistency with the other evolving PRA standards. The draft Level 3 Standard was balloted in August and the Level 3 Working Group began resolving ballot comments at the September JCNRM meeting in Baltimore. Weekly meetings to resolve comments continued to the end of the year. The L3 PRA Standard is expected to have its recirculation ballot in the 1Q of 2024.

**ASME/ANS RA-S-1.4-2021, Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plants (revision of trial-use standard ASME/ANS RA-S-2013)**

**Scope:** *This standard establishes requirements for a PRA for advanced non-LWR nuclear power plants. The requirements in this standard were developed for a broad range of PRA scopes that may include:*

- a) *Different sources of radioactive material both within and outside the reactor core but within the boundaries of the plant whose risks are to be determined in the PRA scope selected by the user. The technical requirements in this trial use version of the Standard are limited to sources of radioactive material within the reactor coolant system pressure*

boundary. Technical requirements for other sources of radioactive material such as the spent fuel system are deferred to future editions of this Standard.

- b) Different plant operating states including various levels of power operation and shutdown modes.
- c) Initiating events caused by internal hazards, such as internal events, internal fires and internal floods, and external hazards such as seismic events, high winds, and external flooding
- d) Different event sequence end states including core or plant damage states, and release categories that are sufficient to characterize mechanistic source terms, including releases from event sequences involving two or more reactor units or modules for PRAs on multi-reactor or multi-unit plants.
- e) Evaluation of different risk metrics including the frequencies of modeled core and plant damage states, release categories, risks of offsite radiological exposures and health effects, and the integrated risk of the multi-unit plant if that is within the selected PRA scope. The risk metrics supported by this Standard are established metrics used in existing LWR Level 3 PRAs such as frequency of radiological consequences (e.g., dose, health effects) which are inherently technology neutral. Surrogate risk metrics used in LWR PRAs such as core damage frequency and large early release frequency are not used as they may not be applicable to non-LWR PRAs.
- f) Quantification of the event sequence frequencies, mechanistic source terms, offsite radiological consequences, risk metrics, and associated uncertainties, and using this information in a manner consistent with the scope and applications PRA.

#### **Membership:**

David Grabaskas, Chair, Argonne National Laboratory; Karl. N. Fleming, Co-Vice Chair, KNF Consulting Services, LLC; John Biersdorf, Co-Vice Chair, TerraPower; Robert J. Budnitz, Consultant; Matthew Denman, Kairos Power LLC; Jordan Hagaman, Kairos Power; Dennis Henneke, General Electric Co.; Alexander Huning, Oak Ridge National Laboratory; Brian Johnson, TerraPower; Ken Muramatsu, Tokyo City University; Hanh Phan, U.S. Nuclear Regulatory Commission; Martin B. Sattison, Individual; Jiejuan Tong, Tsinghua University; Matthew Warner, Kairos Power; Peiwen Whysall, Kairos Power; Ben Chen, Argonne National Laboratory; Jon Facemire, X-Energy; Harry Liao, X-Energy; Fred Grant, Simpson Gumpertz & Heger; Antonio Godoy, James J Johnson and Associates; Drew Nigh, X-Energy; Annie Kammerer, Annie Kammerer Consulting, LLC; Ben Kosbab, Simpson Gumpertz & Heger; Emma Redfoot, Oklo; Hiroyuki Sato, Japan Atomic Energy Agency; Andrew Whittaker, University of Buffalo; Emre Tatli, Westinghouse Electric Company; Askin Guler Yigitoglu, Oak Ridge National Laboratory; Sai Zhang, Idaho National Laboratory; Heather Detar, Westinghouse Electric Company; Michelle Gonzalez, U.S. Nuclear Regulatory Commission

**Status:** This standard received ANSI approval on 1/28/21 and was published on 2/8/21. The standard was formally endorsed by the U.S. Nuclear Regulatory Commission in Trial Use Regulatory Guide 1.247, released in Spring 2022. The working group is currently focused on collecting user feedback regarding the standard as advanced reactor vendors initiate the licensing process. The next edition of this standard will not occur until revisions of the LPSD, L2, and L3 standards are issued as ANSI standards, currently estimated to be in 2025.

#### **ASME/ANS RA-S-1.5, Advanced Light Water Reactor PRA Standard (proposed new standard)**

**Scope:** This standard sets forth the requirements for PRAs used to support risk-informed decisions for commercial, advanced light water reactor (ALWR) nuclear power plants in the preoperational phase. It is ultimately expected to be a mandatory appendix to the existing PRA standard RA-S, for advanced light water reactors in the design to operational phases.

#### **Membership:**

Sarah Bristol, Chair, NuScale Power, Chair; Heather L. Detar, Westinghouse Electric Company, Vice Chair; Michelle Gonzalez, U.S. Nuclear Regulatory Commission; Dennis W. Henneke, General Electric Co.; Jodine Jansen Vehc, Holtec; Alissa Neuhausen, U.S. Nuclear Regulatory Commission Alternate; Benny J. Ratnagaran, Southern Nuclear; Ram Srinivasan.

**Status:** This draft standard was planned to be balloted starting in September 2013 but has been delayed several times to accommodate changes in scope [i.e., to engage light water small modular reactor (SMR) vendors to ensure that the standard would address their needs, and also to accommodate significant changes requested by the U.S. Nuclear Regulatory Commission to accommodate their intended application of that standard to the new plant licensing process]. There was substantial progress made in 2023, having drafted all parts with the exception of fire still in progress. In 2024, the main focus of the Advanced Light Water Reactor Working Group will be to finalize all parts and complete outside reviews by liaisons. Alignment of this standard with the next edition will be reviewed. The draft is expected to be issued for a readiness review in late 2024 and to be issued to the JCNRM for ballot in 2025.

**RA-S-1.6, Requirements for Low Power and Shutdown Probabilistic Risk Assessment (revision of trial use standard ANS/ASME-58.22-2014; to be redesignated)**

**Scope:** *This standard sets forth criteria and specific methods for plant-specific probabilistic risk assessments (PRAs) to be used to develop risk-informed decisions regarding low power and shutdown (LPSD) operations at light water nuclear power plants. It addresses those attributes of a PRA that will ensure that the scope and level of quality of the assessment are appropriate to the decision being considered. The standard addresses the use of risk information for making plant improvements, the risk, ranking of components, and the development of decisions that can benefit from risk information. The scope of this standard is limited to internal and external events (excluding internal fires) while operating at low power and shutdown conditions. Both requirements for quantitative and qualitative methods are included.*

**Membership:**

Taeyong Sung, Chair, Southern Nuclear; Jeffrey Julius, Vice Chair, Jensen Hughes; Leo Shanley, Vice Chair, Jensen Hughes; Douglas Hance, Electric Power Research Institute; Dennis Henneke, General Electric; Kristin Kaspar, South Texas Project; Kenneth Kiper, Westinghouse; Greg Kvamme, Excel Energy; Jonathan Li, General Electric; Zhegang Ma, Idaho National Laboratory; Mario Martinez, Westinghouse; Jeff Mitman, Individual; Marie Pohida, U.S. Nuclear Regulatory Commission; Keith Tetter, U.S. Nuclear Regulatory Commission; Vaibhav Yadav, Idaho National Laboratory; Jeff Wood, Alternate, U.S. Nuclear Regulatory Commission

**Status:** This standard was issued for a 3-year, trial-use period in March 2015. Seven different outside groups used the standard in a trial-use mode and provided feedback. The Low Power Shutdown Working Group resolved trial-use comments in a couple of technical areas (at-initiator HRA and QLRA). The team has proposed a three-phased approach to address all comments and get ready for the next ballot: phase 1 mainly for the comment resolutions and gathering all inputs, phase 2 for resolving all comments and merge technical pieces and collapse CCs as well as finalize decision on inclusion of hazards, phase 3 for revising Low Power Shutdown PRA sections to be consistent with main PRA standard and to comply with all guidance documents. The draft is expected to be issued for a readiness review in late 2024 and to be issued to the JCNRM for ballot in 2025.

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**ASME/ANS RA-S-1.7, Multi-Unit PRA Standard (proposed new standard)**

**Scope:** *This standard will set forth requirements for a PRA with a scope similar to the scope of ASME/RA-S but concentrating on requirements necessary to capture the risk arising from multi-unit accident sequences.*

**Membership:**

Ricky Summitt, Chair, Enercon; Paul J. Amico, Jensen Hughes; Sarah Bristol, NuScale Power; Karl N. Fleming, KNF Consulting Services; Anne-Marie Grady, U.S. Nuclear Regulatory Commission; Dennis W. Henneke, GE Hitachi Nuclear Energy; Kenneth Kiper, Westinghouse; Andrea Maioli, Westinghouse; Hiromichi Miura, Central Research Institute of Electric Power Industry; Shahen Poghosyan, International Atomic Energy Agency; Marie A. Pohida, U.S. Nuclear Regulatory Commission; Shota Soga, Central Research Institute of Electric Power Industry; Taeyong Sung, Southern Nuclear; Michael Szoke, Individual; Cindy Williams, NuScale Power; Jooneon Yang, Korea Atomic Energy Research Institute; Susan E. Cooper, Alternate, U.S. Nuclear Regulatory Commission; Mark B. Wishart, Alternate, Electric Power Research Institute

**Status:**

- Meeting on average once / week
  - Developed drafts for Part 1 and Part 2
  - Internal review wrapping up
  - Consistency check and align with final L1
  - Vice Chair appointed: Mark Wishart, EPRI
  - Plan to finalize Parts 1 and 2 March 2023 – Writer Guide
  - Parts 3-9 in 2nd Qtr 2023; rely on liaisons
  - Target for final draft of all Parts completed by July 2023
  - Readiness Review: Early 2025
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### Standards Infrastructure Subcommittee (SI-SC)

**Charter:** *To develop standard-inclusive hazard-group or risk application-specific related content, using approved SI-SC framework and guidance, supporting JCNRM Standards Product development. SI-SC is responsible for addressing other identified subcommittee needs, facilitating the development and approval of JCNRM Standards products supporting risk-informed and performance-based applications for nuclear facilities.*

**Membership:**

Douglas C. Rapp, Chair, Energy Harbor; Sai Zhang, Vice Chair, Idaho National Laboratory; Matthew Denman, Kairos Power; Alan Hackerott, Consultant; Raymond Schneider, Westinghouse Electric Company; Jeffrey Stone, Constellation; Jeffery Wood, U.S. Nuclear Regulatory Commission

**Status:** SC-SI is focused exclusively on providing tools and processes to streamline the standards development effort. Formed in the second half of 2022, SC-SI has focused on setting up its own processes, procedures, and membership to effectively interface with JCNRM's standards development efforts.

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### Database Development Working Group

**Charter:** *To ensure consistency in the form, structure, and content of JCNRM Standards products. The DDM WG develops, maintains, and deploys a database of JCNRM Standards products content. This database is the approved content source for all JCNRM Standards products. NURISC and TR-SC WGs interface with the DDM WG to ensure that evolving technical content is adequately communicated and reflected in the database. The USC WG interfaces with the DDM WG to ensure that consistency guidance is appropriately implemented and validated for across JCNRM Standards products. The DDM WG is responsible for producing the ballot-ready and ballot-supporting documents for NURI-SC.*

**Membership:**

Matthew Denman, Chair, Kairos Power; Robert W. Drsek, Energy Harbor; Dave Grabaskas, Argonne National Laboratory; Matthew Humberstone, U.S. Nuclear Regulatory Commission; Michael Szoke, Individual; Jeffery Wood, U.S. Nuclear Regulatory Commission; Sai Zhang, Idaho National Laboratory

**Status:** Once the standards are ingested, the Database Working Group will begin the task of building documents from the structured data.

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### Interpretation Working Group

**Charter:** *To assist with Interpretation as they relate to all active JCNRM Standards.*

**Membership:**

H. Alan Hackerott, Chair, Consultant; Paul J. Amico, Jensen Hughes; Adrienne F. Brown, U.S. Nuclear Regulatory Commission; David N. Miskiewicz, Engineering Planning and Management, Inc.; Matthew Humberstone, Alternate, U.S. Nuclear Regulatory Commission

**Status:** No inquiries were received in 2023.

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### Universal Supporting Content (USC) Working Group

**Charter:** *To maintain common and consistent content for all the JCNRM Standards products being developed or maintained by JCNRM to the extent appropriate and practical. This includes common definitions, action verbs, screening criteria, level of detail, peer review requirements, as well as requirements for configuration control and newly developed methods.*

To assist with the maintenance of the RA-S Standard Part 1.

**Membership:**

Raymond E. Schneider, Chair, Westinghouse Electric Company; Ricky Summitt, Vice Chair, Enercon; Paul J. Amico, Jensen Hughes; Mihaela Biro, U.S. Nuclear Regulatory Commission; Nathan LaBarge, Westinghouse; Andrea Maioli, Westinghouse; Lawrence A. Mangan, FirstEnergy Nuclear Operating Co.; Harold A. Stiles, Enercon; Ian B. Wall, Consultant; Mark B. Wishart, Electric Power Research Institute

**Status:** Over the past year the USC has authored several documents for use by the JCNRM members and other PRA Standard writers to support consistency among the various PRA standards. Documents created and issued in 2023 are:

1. JCNRM Glossary of Action Verbs accepted for use in the JCNRM PRA Standards
2. JCNRM Glossary of Definitions
3. JCNRM List of Acronyms
4. JCNRM Writer's Guide Checklist (Structure and Organization Criteria for PRA Standard)
5. JCNRM PRA Standard Readiness Review Process and Checklist

Documents have been subject to a working group internal ballot and placed on C&S Connect for member use.

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**Technical Requirements Subcommittee (TR-SC)**

**Charter:** *To develop JCNRM Standards products inclusive content associated with specific technical requirements, using approved the SI-SC framework and guidance, supporting the needs of the NURI-SC's Standards products. TR-SC is responsible for developing technical requirements, facilitating the development and approval of JCNRM Standards products supporting risk-informed and performance-based applications for nuclear facilities.*

*TR-SC is responsible for identifying which technical elements are common to multiple standard products and assessing their associated level of consistency. TR-SC is then responsible to recommend changes, as appropriate, to ensure technical requirement consistency across JCNRM Standards products, as applicable. Technical requirements that are only applicable to one Standard product are identified by TR-SC and managed directly by the Product WG responsible for that Product.*

*One dedicated WG is established for each Technical Element.*

*To develop or to maintain the technical requirements (i.e., high level requirements and supporting requirements) associated with a specific PRA Technical Element.*

*Each Technical Requirement WG assigns a liaison for every Product WG, as applicable. The Technical Requirements WG reviews proposed changes to the technical requirements with respect to each individual Standards product(s) and evaluates the Product with the WG to modify the Technical Requirements, as needed. Standards products readiness reviews are not permitted until the Technical Requirements WG has agreed on the acceptability of the technical requirements.*

**Membership:**

Michelle Bensi, Chair, University of Maryland  
Matthew Degonish, Vice Chair, Ameren  
Vicent Andersen, Jensen Hughes  
K. Raymond Fine, Chair, Energy Harbor  
Frederic Grant, Simpson Gumpertz & Heger, Inc.  
H. Alan Hackerott, Consultant  
Matthew Humberstone, U.S. Nuclear Regulatory Commission  
Francisco J. Joglar, Jensen Hughes  
James C. Lin, ABSG Consulting, Inc.  
Nicholas Lovelace, Jensen Hughes

**Status:** We have successfully transitioned to the new organizational structure and working groups have consolidated their rosters. We have engaged the NURI-SC working groups directly by assigning liaisons to each working group from each of the TR-SC working groups to ensure technical consistency across all standards being developed. The liaisons will bring back to the associated TR-SC working group any assigned tasks to complete with consensus of the group and return that feedback to the NURI-SC working group. Current roster levels are sufficient for the assigned tasks and there are currently no challenges.

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## External Flood Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 8.*

### **Membership:**

Michelle Bensi, Chair, University of Maryland; Jemie Dababneh, U.S. Army Corps of Engineers; Joseph Kanney, U.S. Nuclear Regulatory Commission; Svetlana Lawrence, Idaho National Laboratory; Suzanne M. Loyd, Constellation; Zhegang Ma, Idaho National Laboratory; Pierre Macheret, Jensen Hughes; Sean McCloskey, Holtec; Artur Mironenko, Duke Energy; Raymond E. Schneider, Westinghouse Electric Co., LLC; Joy Shuan Shen; John E. Weglian, Electric Power Research Institute; De (Wes) Wu, Alternate, U.S. Nuclear Regulatory Commission

**Status:** During 2023, the external flooding working group met on an approximately weekly basis to discuss and draft technical content related to multiple standards. The working group supported the development of technical requirements and other content for draft standards related to lower power and shutdown PRA and multi-unit PRA. In addition, the working group also supported efforts to perform editorial and make other minor revisions in the standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications.

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## High Winds Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 7.*

### **Membership:**

Nicholas Lovelace, Chair, Jensen Hughes; Stephen M. Hess, Jensen Hughes; Kyle Hope, Westinghouse Electric Company; John Lane, U.S. Nuclear Regulatory Commission; Artur Mironenko, Duke Energy; Raymond E. Schneider, Westinghouse Electric Co. LLC; Alissa Neuhausen, Alternate, U.S. Nuclear Regulatory Commission

**Status:** We have successfully transitioned to the new organizational structure and working groups have consolidated their rosters. We have engaged the NURI-SC working groups directly by assigning liaisons to each working group from each of the TR-SC working groups to ensure technical consistency across all standards being developed. The liaisons will bring back to the associated TR-SC working group any assigned tasks to complete with consensus of the group and return that feedback to the NURI-SC working group. Current roster levels are sufficient for the assigned tasks and there are currently no challenges.

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## Internal Events Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 2.*

### **Membership:**

H. Alan Hackerott, Chair, Consultant; Jodine Jansen Vehec, Vice Chair, Holtec; John M. Biersdorf, Terrapower; Adrienne F. Brown, U.S. Nuclear Regulatory Commission; Matthew Denman, Kairos Power; Douglas C. Hance, Electric Power Research Institute; Todd Hilsmeier, U.S. Nuclear Regulatory Commission; Gerry W. Kindred, Tennessee Valley Authority; Stanley Levinson, Individual; Sean McCloskey, Holtec; Pamela F. Nelson, UNAM; Hideyuki Sunada, Central Research Institute of Electric Power Industry; Kent Sutton, INGRID Consulting Services, LLC.; Susan E. Cooper, Alternate, U.S. Nuclear Regulatory Commission

**Status:** We have successfully transitioned to the new organizational structure and working groups have consolidated their rosters. We have engaged the NURI-SC working groups directly by assigning liaisons to each working group from each of the TR-SC working groups to ensure technical consistency across all standards being developed. The liaisons will bring back to the associated TR-SC working group any assigned tasks to complete with consensus of the group and return that feedback to the NURI-SC working group. Current roster levels are sufficient for the assigned tasks and there are currently no challenges.

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### Internal Fire Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 4.*

**Membership:**

Francisco J. Joglar, Chair, Jensen Hughes; Michele L. Reed, Vice Chair, Westinghouse; John M. Biersdorf, Terrapower; Scott A. Brinkman, Duke Energy; Dennis W. Henneke, GE Hitachi; William Jameson, Exelon; Gregory A. Kvamme, Xcel Energy; Ashley M. Lindeman, Electric Power Research Institute; Nicholas B. Melly, U.S. Nuclear Regulatory Commission; Jeffrey D. Miller, Enercon; David N. Miskiewicz, Engineering Planning and Management, Inc.; Jamal Mohmand, Sandia National Laboratories; Jeffrey L. Stone, Exelon; Richard Stremple, Energy Harbor; Kiang Zee, Individual; Charles E. Moulton, Alternate U.S. Nuclear Regulatory Commission

**Status:** We have successfully transitioned to the new organizational structure and working groups have consolidated their rosters. We have engaged the NURI-SC working groups directly by assigning liaisons to each working group from each of the TR-SC working groups to ensure technical consistency across all standards being developed. The liaisons will bring back to the associated TR-SC working group any assigned tasks to complete with consensus of the group and return that feedback to the NURI-SC working group. Current roster levels are sufficient for the assigned tasks and there are currently no challenges.

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### Internal Flood Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 3.*

James C. Lin, Chair, Individual; Alexander Rubbico, Vice Chair, Duke Energy; Matthew Degonish, Ameren; Jason Hall, Entergy; Joseph Kanney, U.S. Nuclear Regulatory Commission; Douglas C. Rapp, Energy Harbor; Adrienne F. Brown, Alternate, U.S. Nuclear Regulatory Commission

**Status:** We have successfully transitioned to the new organizational structure and working groups have consolidated their rosters. We have engaged the NURI-SC working groups directly by assigning liaisons to each working group from each of the TR-SC working groups to ensure technical consistency across all standards being developed. The liaisons will bring back to the associated TR-SC working group any assigned tasks to complete with consensus of the group and return that feedback to the NURI-SC working group. Current roster levels are sufficient for the assigned tasks and there are currently no challenges. Provided input on our assessment of the impact of RG 1.247 on Part 3 of the Level 1 PRA Standard. Provided comments on Part 4 of the initial draft and a subsequent revised draft of the Low Power and Shutdown PRA Standard. Current roster levels are sufficient for the assigned tasks and there are currently no challenges.

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### Other Hazards Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Parts 6 & 9.*

Vincent Andersen, Chair, Jensen Hughes; Pierre Macheret, Vice Chair, Jensen Hughes; Robert J. Budnitz, Consultant; Matthew Denman, Kairos Power; Kyle Hope, Westinghouse Electric Company; Suzanne M. Loyd, Constellation; Keith Tetter, U.S. Nuclear Regulatory Commission; John Lane, Alternate, U.S. Nuclear Regulatory Commission

**Status:** The Other Hazards TR Working Group supported the following Standard activities in 2023: 1) Review of NRC comments on NLWR PRA Standard for applicability to L1 PRA Standard; 2) revision to Level 1 PRA Standard RA-S-2022; 3) NURI-SC and TR-SC interaction guide development; 4) Multi-Unit PRA (MUPRA) Standard development; and 5) Low-Power Shutdown (LPSD) PRA Standard development. Other Hazards TR Working Group members also participated virtually and in-person to the two annual JCNRM meetings in 2023.

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## Seismic Technical Requirements Working Group

*Charter: To assist with the maintenance of the RA-S Standard Part 5.*

### **Membership:**

Frederic Grant, Chair, Simpson Gumpertz & Heger Inc.; Ram Srinivasan, Vice Chair, Independent Technical Consultant; Paul J. Amico, Jensen Hughes; Vincent Andersen, Jensen Hughes; Robert J. Budnitz, Consultant; Parthasarathy Chandran, GE Hitachi; Robert W. Drsek, Energy Harbor; Stephen Eder, Facility Risk Consultants Inc.; Calin Eftimie, Individual; K. Raymond Fine, Energy Harbor; Eddie M Guerra, RIZZO International; Justin W. Hiller, Ameren Missouri; Annie Kammerer, U.S. Department of Defense; Benjamin Kosbab, Simpson Gumpertz & Heger; Andrea Maioli, Westinghouse Electric Company; Ching Hang Ng, U.S. Nuclear Regulatory Commission; John M. Richards, Electric Power Research Institute; Wen Tong, Simpson Gumpertz & Heger; Gabriel R. Toro, Lettis Consultants International; Andrew S. Whittaker, University at Buffalo; De (Wes) Wu, Alternate, U.S. Nuclear Regulatory Commission

**Status:** The Seismic Hazards TR Working Group supported the following Standard activities in 2023:

- 1) ALWR Standard Development: Numerous and significant interactions with the ALWR WG dealing with “bounding” or “representative” site-specific seismic hazard
- 2) Multi-Unit PRA (MUPRA) Standard Development: Several engagements with the MUPRA Product WG, including workshops to assess suitability of existing SHA supporting requirements for the MUPRA standard, and review and comment on the whitepaper, “20230914 Seismic Input to MUPRA.docx.”
- 3) Low-Power Shutdown (LPSD) PRA Standard development: Reviewed and commented on the draft seismic section, “20230718 Brief on LPSD for Seismic WG.docx”
- 4) NLWR PRA Standard: Provided comments on the seismic section of the NLWR Standard, specifically on the bounding site-specific seismic hazard, consistent with the input provided to the ALWR Standard WG
- 5) Seismic TR Working Group members also participated virtually and in-person in the two annual JCNRM meetings in 2023: in February and September.

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## Subcommittee on Risk Applications (SCoRA)

*Charter: To support the application of risk methods using JCNRM Standards products, as appropriate or requested and the need for new JCNRM Standards products. SCoRA will evaluate new JCNRM Standards products proposals identified by individual JCNRM members or other industry stakeholders. SCoRA will appoint and staff an investigation Project Team to determine product scope, purpose, and need to provide recommendations to JCNRM for further product development. If SCoRA concludes that a new product requires development, then the JCNRM approves further development. SCoRA then performs the necessary process to generate a Project Initiation Notification System (PINS) form. When the PINS form is approved by JCNRM, then a new Product WG, under NURI-SC is formed and tasked with the development of the Product.*

*SCoRA periodically revisits the need for additional JCNRM Standards products and other supporting JCNRM products in development to ensure that they satisfy the original objectives justifying the product’s development. If the Product need changes or is determined to no longer be appropriate, then the Product in development is recommended to be cancelled or paused to the JCNRM.*

*JCNRM with SCoRA support will interface with the ANS Standards Board, the ASME Board on Nuclear Codes and Standards, and their subordinate groups, and other standards developing organizations (SDOs) regarding nuclear-related standards that include or plan to include risk assessment methods, risk management approaches, or risk-informed, performance-based applications. The work of SCoRA is focused on supporting these SDOs in the development and updating of risk-informed standards, as requested by the cognizant SDO. The objective is to strive for value added to the nuclear industry, technical acceptability, and consistency in other nuclear-related standards using risk management principles both within JCNRM and outside of JCNRM.*

*When SCoRA organizes a technical interface with a specific nuclear-related standard (regardless of the originating SDO), it will draw upon the membership of the JCNRM, but need not be limited to JCNRM membership. The interface activity can be informal without a written product, but if a written review product is produced, the report itself is intended to be a product of the SCoRA, as approved by JCNRM, even if developed mainly by an ad hoc subsidiary group. Part of the interface activity includes an education function, for which SCoRA will avail itself of resources that exist among the broader JCNRM membership.*

*SCoRA will also consider mechanisms to disseminate “lessons learned” from reviewing and commenting on nuclear-related standards to other SDOs and writing groups who have similar needs.*

### **Membership:**

Stuart R. Lewis, Chair, Individual  
Gary M. Demoss, Vice Chair, PSEG-Salem & Hope Creek



F Gregory Hudson, Vice Chair, Metcalfe PLLC  
George Apostolakis, NRRC  
Robert J. Budnitz, Consultant  
Bradley Dolan, Tennessee Valley Authority  
Rick Grantom, C.R. Grantom P.E. & Assoc. LLC  
Jordan E. Hagaman, Kairos Power  
Jodine Jansen Vehec, Holtec  
Gerry W. Kindred, Tennessee Valley Authority  
Nathan LaBarge, Westinghouse Electric Company, LLC  
Stanley H. Levinson, Individual  
Roy Linthicum, Constellation  
Andrea Maioli, Westinghouse Electric Company, LLC  
Pamela F. Nelson, UNAM  
James O'Brien, U.S. Department of Energy  
Robert I. Rishel, Duke Energy  
Timothy D. Sande, Enercon  
Jeffrey L. Stone, Exelon  
Ricky Summitt, Enercon  
Kent Sutton, INGRID Consulting Services, LLC  
Dr. Carroll Trull, Engineering Planning and Management, Inc.  
Milton Valentin, U.S. Nuclear Regulatory Commission  
Victoria Warren, Jensen Hughes  
Yasunori Yamanaka, Unclear Damage Compensation and Decommissioning Facilitation  
Anne-Marie Grady (Alternate), U.S. Nuclear Regulatory Commission

**Report:** SCoRA continues to engage actively with other standards developing organizations as a resource for helping them to incorporate risk-informed elements in appropriate and consistent ways into their standards and other documents. Among these, in 2022, the SCoRA continued to provide inputs relating to the evolving efforts to produce Guidance Standard ANS-GS-30.1 and continued engagement with the Institute of Electrical and Electronic Engineers and the Instrument Society of America. SCoRA also continues to oversee the activities of the Risk Informed Emergency Planning (RIEP) Working Group, which is a joint effort of the JCNRM and the ANS Large Light Water Reactor Consensus Committee (LLWRCC). The RIEP Working Group continues to work toward developing guidance related to risk-informing the size of emergency planning zones (primarily aimed at new reactors) and to risk-informing emergency response organizations (primarily focused on operating large light water reactors). These activities are consistent with a PINS approved in 2022. SCoRA is also responsible for the JCNRM Risk-Informed Security Working Group. This working group has two task groups, one focused on introducing further risk-informed elements into physical security for nuclear power plants, and the other devoted to risk-informed approaches to improve cyber security. In 2023, this working group, with new leadership, undertook a concerted effort to establish a framework to guide its activities in both of these areas. SCoRA members also support the ASME Plant System Design Standard and the ANS Standards Board's Risk-Informed, Performance-Based Principles and Policy Committee (RP3C). These activities will continue in 2024 as will efforts to engage with additional standards developing organizations.

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### **Guidance Document for Risk Informing Physical Security and Cyber Security Programs at Nuclear Facilities**

**Charter:** *This guidance document will provide methods/processes to risk-inform nuclear facility physical-security and cyber-security programs, including implementation guidance for these methods/processes. It will also potentially provide part of the technical basis on which a future standard covering these methods/processes could be based.*

#### **Membership:**

F. Gregory Hudson, Co-Chair, Metcalfe PPLC; Stephen J. Reed, Co-Chair, Westinghouse Electric Company; George Apostolakis, NRRC; Robert J. Budnitz, Consultant; Yung Hsien J. Chang, U.S. Nuclear Regulatory Commission; Lon A. Dawson, PMTS; Kevin Deyette, NuScale Power, LLC; Bradley Dolan, Tennessee Valley Authority; Shannon Eggers, Idaho National Laboratory; Ismael Garcia, U.S. Nuclear Regulatory Commission; Rick Grantom, C.R. Grantom P.E. & Assoc. LLC; Pamela F. Nelson, UNAM; James Raines, ARES Security Corporation; Timothy D. Sande, Enercon; Michael R. Sleight, Westinghouse Electrical Company; Ricky Summitt, Enercon; Kent

Sutton, INGRID Consulting Services, LLC; Grant A. Teagarden, Three Strand Living, LLC; Carroll Trull, Engineering Planning and Management, Inc.; Rob White, Xcel Energy; Vaibhav Yadav, Idaho National Laboratory; Robert W. Youngblood, Idaho National Laboratory; Ching Hang Ng, Alternate, U.S. Nuclear Regulatory Commission

**Status:** The Risk-Informed Physical and Cyber Security (RIS) Working Group consists of two task groups, one devoted to physical security and the other cyber security. In general, during 2022 this working group continued to define the focus of its activities and to communicate its efforts to the broader nuclear community. More specifically, the RIPS TASK GROUP developed two draft Risk Applications Tools and Methods documents. The first provided guidance on using release as a target set objective versus the current use of fuel damage. The second was draft guidance on using EMERALD for incorporating FLEX equipment into Vulnerability Assessments and inclusion of Operator Actions. Late in 2022, RIPS was asked to develop a Product Development Plan. Subsequent discussions determined that the best course of action for 2023 is development on a "Security Effectiveness Standard." The primary focus of the RICS TASK GROUP was organizing an industry cyber security workshop. The objectives of this workshop included: (1) industry outreach by task group, (2) understanding industry cyber security activities and initiatives, as well as (3) identifying and understanding cyber security issues that owner/operators and AR developers are facing.

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## ANS/ASME Joint Committee on Nuclear Risk Management

Cochair: Dennis W. Henneke

Vice Cochair: Andrea Maioli

Cochair: C. Rick Grantom

Vice Cochair: Pamela F. Nelson

Standards Infrastructure Subcommittee (SI-SC)	Nuclear Risk Standards and Guidance Subcommittee (NURI-SC)	Technical Requirements Subcommittee (TR-SC)	Subcommittee on Risk Applications (SCoRA)
Douglas Rapp (Chair)	N. Reed LaBarge (Chair)	Michelle Bensi (Chair)	Stuart Lewis (Chair)
Sai Zhang (Vice Chair)	Zhegang Ma (Vice Co-chair)	Matt Degonish (Vice Chair)	Gary Demoss (Vice Chair) Greg Hudson (Vice Chair)
<b>Universal Supporting Content</b> (WGC: R. Schneider)	<b>Product Working Group: Level 1 LWR</b> (WGC: A. Maioli)	<b>Internal Events</b> (WGC: A. Hackerott)	<b>Risk-Informed Security*</b> (WGC: G. Hudson) (WGC: S. Reed)
<b>Database Development and Management</b> (WGC: M. Denman)	<b>Product Working Group: Level 2 LWR</b> (WGC: R. Schneider)	<b>Internal Flood</b> (WGC: J. Lin)	
<b>Interpretation</b> (WGC: A. Hackerott)	<b>Product Working Group: Level 3 LWR</b> (WGC: G. Teagarden)	<b>Internal Fire</b> (WGC: F. Joglar)	
	<b>Product Working Group: Advanced LWR PRA</b> (WGC: S. Bristol)	<b>Seismic</b> (WGC: F. Grant)	
	<b>Product Working Group: Non LWR</b> (WGC: D. Grabaskas)	<b>High Winds</b> (WGC: N. Lovelace)	
	<b>Product Working Group: Multi-Unit PRA</b> (WGC: R. Summitt)	<b>External Floods</b> (WGC: M. Bensi)	
	<b>Product Working Group: Low Power/Shutdown PRA</b> (WGC: T. Sung)	<b>Other Hazards</b> (WGC: V. Andersen)	

*\*Working groups will be moved out of SCoRA when the topic has been deemed sufficiently mature to initiate draft development.*

**Table 8 – JCNRM Organizational Chart**

## Appendix A

### Standards Service Award

Established in 1984, the ANS Standards Service Award recognizes outstanding achievement by individuals in the generation and use of ANS standards in the field of nuclear science and engineering. The purpose of the award is to identify and honor those individuals who have made significant contributions to the development of ANS nuclear Standards accepted by recognized authorities as the most practical and appropriate solution of a recurring problem. Any member of the Society can nominate worthy candidates for the ANS Standards Service Award. The nominees shall be current or past members of the Society in good standing. Past recipients of the award include the following individuals:

Year Awarded	Recipients
2023	Jean-Francois Lucchini
2022	Douglas Bowen
2021	Stanley H. Levinson
2020	George Flanagan N. Prasad Kadambi
2019	James B. Florence Ian B. Wall
2018	Robert D. Busch
2017	Abraham Weitzberg
2016	Andrew O. Smetana
2015	Jerry E. Hicks Donald J. Wakefield
2014	Steven L. Stamm
2013	Carl A. Mazzola
2012	Elizabeth B. Johnson (posthumously) Patricia A. Schroeder
2011	No recipient selected
2010	Allen L. Camp Thomas P. McLaughlin
2009	Calvin M. Hopper
2008	Donald J. Spellman
2007	William L. Whittemore (posthumously)
2006	Robert J. Budnitz
2005	James F. Mallay
2004	Charles H. Moseley
2003	Wade J. Richards
2002	Francis M. Alcorn
2001	Michael J. Wright
2000	William C. Hopkins
1999	Dimitrios Cokinos
1998	Marilyn D. Weber
1997	David R. Smith
1996	Tawfik M. Raby
1995	Hugh K. Clark
1994	George L. Wessman
1993	Joseph T. Thomas
1992	J. Ed Smith (posthumously)
1991	David K. Trubey
1990	James F. Mallay
1989	Walter H. D'Ardenne
1988	A. Dixon Callihan Ralph G. Chalker Miles C. Leverett