American Nuclear Society

Standards Committee Report of Activities

2019
STANDARDS COMMITTEE

Report of Activities

2019

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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 2019. The Report provides information on ANS standards projects.

Nearly 800 volunteer members participate in the development of ANS-sponsored nuclear standards, of which there are over 120 in various phases of maintenance and development. As of the end of 2019, there were 82 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
- FWDCC: 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.
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/sites/whitehouse.gov/files/omb/circular/A119/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.
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.
Appeals Filed on Two Standards
Appeals were filed this year on two draft standards – ANS-3.5, “Nuclear Power Plant Simulators for Use in Operator Training and Examination,” and ANS-54.1, “Nuclear Safety Criteria and Design Process for Sodium Fast Reactor Nuclear Power Plants.” The last standards appeal was filed in 2003. The appeal on ANS-3.5 was both technical and procedural. Additional procedural steps were taken to ensure that the objector felt that his comments were afforded due process. Technical issues were given serious consideration. The appeal was closed with a formal letter issued to the objector on August 29, 2019, stating that there would be no technical changes made to the standard. ANSI/ANS-3.5-2018 was approved by the American National Standards Institute (ANSI) on October 10, 2019. The year in the designation of the standard reflects the year the draft was completed.

The technical appeal on ANS-54.1, “Nuclear Safety Criteria and Design Process for Sodium Fast Reactor Nuclear Power Plants,” remains in process at the end of 2019. The technical appeals committee has held two calls and is finalizing their recommendations. Should any changes to the draft be recommended as a result of the appeal, the changes will need to follow the procedures for consensus approval before seeking ANSI approval.

ANS Standards Used in University of Pittsburg Class
Three ANS standards were used as course materials for a graduate class at the University of Pittsburg. The course, titled “Case Studies in Nuclear Codes and Standards,” is part of the school’s Nuclear Engineering Program. Seventeen standards are a part of the curriculum. In addition to ANS, standards from the American Society of Mechanical Engineers, ASTM International, and the Institute of Electrical and Electronics Engineers were applied.

NRC Grant Proposal Submitted to Support Development of Probabilistic Risk Assessment Standards
A grant proposal was submitted October 2019 in response to a Funding Opportunity Announcement (FOA) from the U.S. Nuclear Regulatory Commission (NRC). The FOA is specific to development of voluntary consensus standards that establish safety and risk criteria and methods for probabilistic analysis, risk analysis, risk assessment, and risk management. The grant will continue coverage of an existing grant that ends February 2020. It is expected that the NRC will award the grant in early 2020 to continue coverage. Grant funds support travel reimbursement of eligible members without company support, meeting related expenses, and administrative support.

Comparison of Standards Committee Goals and Objectives with New ANS Strategic Plan
The Standards Board approved Revision 2 of the Standards Committee Strategic Plan in December 2017, just before the new ANS Strategic Plan was approved. A task group under the Standards Board performed an evaluation and comparison of the goals and objectives of both strategic plans. The task group concluded that the Standards Committee Strategic Plan fully addresses each applicable item of the new ANS Strategic Plan.

SMART Matrix Used to Track Standards Committee Strategic Plan Goals and Objectives
The Standards Board developed a SMART Matrix as a companion to the Standards Committee Strategic Plan to track progress on goals and objectives. The SMART Matrix was reviewed at the Standards Board’s June and November 2019 meetings and updated accordingly to reflect progress.

Progress Update on the Risk-informed, Performance-based Principles and Policy Committee Activities
The Standards Board formed the Risk-informed, Performance-based Principles and Policy Committee (RP3C) in 2013 to establish the approaches, priorities, responsibilities and schedules for implementation of risk-informed and performance-based (RIPB) principles in ANS standards. A RIPB Guidance Document was prepared to identify roles and responsibilities and the process for using RIPB approaches. The guidance document titled "Incorporating Risk-Informed and Performance-Based Approaches/Attributes in ANS Standards" was released for trial use and comment after the 2019 ANS Annual Meeting. A training program is in development and expected to be launched in early 2020 to provide guidance to working groups in incorporating RIPB methods in ANS standards. The RP3C is also working on establishing a RIPB Community of Practice (CoP). The intent is to hold monthly CoP discussions open to all to support knowledge sharing of the development and application of RIPB principles and practices within the nuclear industry.
Professional Division Liaison Program
The Standards Board initiated a liaison program with the support of the ANS Professional Divisions Committee in 2016. Standards Board Chair Steven Arndt addressed the Professional Divisions Committee at the 2019 ANS Annual Meeting to review the program benefits and liaison roles to insure that new liaisons are familiar with the program. Since division leadership changes annually, division chairs were contacted after the annual meeting to confirm their appointed liaisons. The process of confirming and educating new liaisons is on-going.

Standards Committee Engagement of Young Professionals via Associate Membership
The Associate Member Program was created in 2007 by the Standards Board at the suggestion of the ANS Young Member Group to allow young professionals the opportunity to participate in standards development without any experience. While standards development requires support of industry experts with years of experience, emerging professionals bring a fresh perspective and revitalization to insure industry standards needs continue to be met. The Associate Member Program helps to sustain the standards program while providing young professionals and their organizations valuable experience. Currently the program has over 40 associate members and recognizes 12 associate members that have been upgraded to full membership.

In an effort to encourage greater participation of young professionals, creating video testimonials was explored but limited support was found. Work is currently underway to create a young member/associate member webpage with photos of standards participants with their experience in our standards program.

Change to Policy on Guidance Standards to Permit Development of Guidance Documents
A revision of the Standards Committee Policy on the Development of Guidance Standards was proposed to accommodate development of a risk-informed-security guidance document by the ANS/ASME Joint Committee on Nuclear Risk Management (JCNRM). A few technical meetings have been held by a JCNRM subgroup to explore the need and possible avenues to provide risk-analysis methods to physical and cyber security for nuclear power plants. The sentiments of this group are that the subject matter is not sufficiently mature enough to develop a standard and that the appropriate vehicle is a guidance document, opposed to a guidance standard. Concern over this policy change was expressed by a few Standards Board members at the Standards Board meeting during the 2019 ANS Annual Meeting. The subject was revisited at the 2019 ANS Winter Meeting. While not unanimous, the Standards Board approved a revision of the policy on developing guidance standards to incorporate development of guidance documents.

ANS Standards Workspace Migration with ANS Collaborate and Potential Use as Volunteer Database
The migration of the ANS Standards Workspace into ANS Collaborate was initiated in February 2019. Initial issues due to syncing difficulties between ANS’s association management system and ANS Collaborate have been corrected. Identified roster errors have also been corrected. Files and records from all 150+ sites from the ANS Standards Workspace were successfully added to ANS Collaborate, retaining each group’s stored documents and ballot records. The merger provides ANS members that participate in ANS standards a single sign-on for all of their ANS activities. Collaborate’s networking features offer a database of potential volunteers that may be interested in supporting ANS standards activities. The Standards Board has asked the ANS Information Technology Department to enhance these features for utilization as a standards volunteer database but understands that work on the redesign of the ANS website takes precedence.

Revised Standards Committee Glossary of Definitions & Terminology Issued
A task group under the ANS Standards Board completed another update of the Standards Committee Glossary of Definitions and Terminology. First issued in draft form in 1976, the glossary is an edited compilation of the definitions provided in standards issued by the ANS Standards Committee. The glossary provides a consistent set of definitions, to minimize the time-consuming task of developing unique definitions for each standard and to avoid unnecessary duplication. It is intended to be a living document subject to continual revision every few years. The updated Standards Committee Glossary of Definitions and Terminology is available on the ANS website as one of the guidance documents for working groups in the Toolkit for ANS Standards Development and Maintenance.

ANS Standards Style Manual Issued for Trial Use
The first ANSI Standards Style Manual was completed and issued for trial use by standards working group members in January 2019. The style manual incorporates guidance from the 1991 “Style Manual for Preparation of Proposed American National Standards” issued by the American National Standards Institute that remains valid and format and style criteria specific for ANSI standards. The purpose of this style manual is to provide the necessary information to prepare American National Standards that are to be published by ANSI. It provides
detailed specifications regarding content, format, and style as well as detailed descriptions of ANS policies relating to ANS standards and their publication. The style manual includes an appendix which provides sample standard elements that illustrate the written specifications. The ANS Standards Style Manual is publicly available in the Toolkit for ANS Standards Development and Maintenance on the ANS website.

Maintenance of Standards
Efforts continued to ensure that all current standards receive a timely review to minimize delinquent standards (those > than 5 years old) to comply with ANSI requirements. A chart showing the continued improvement in maintaining standards is provided below:

<table>
<thead>
<tr>
<th>Year</th>
<th># of Current Standards at Close of Year</th>
<th># of Standards Reaffirmed</th>
<th># of Delinquent Standards</th>
<th>% of Delinquent Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>78</td>
<td>2</td>
<td>33</td>
<td>42.3%</td>
</tr>
<tr>
<td>2015</td>
<td>80</td>
<td>6</td>
<td>25</td>
<td>31.3%</td>
</tr>
<tr>
<td>2016</td>
<td>81</td>
<td>20</td>
<td>19</td>
<td>23.4%</td>
</tr>
<tr>
<td>2017</td>
<td>80</td>
<td>14</td>
<td>10</td>
<td>12.5%</td>
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<tr>
<td>2018</td>
<td>82</td>
<td>10</td>
<td>8</td>
<td>9.8%</td>
</tr>
<tr>
<td>2019</td>
<td>82</td>
<td>8</td>
<td>3</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Certification of Consensus Committee Balance of Interests
The Standards Board reviewed balance of interest reports for eight consensus committees at their June 2019 meeting and certified that all consensus committees are in compliance with requirements as specified in the ANS Standards Committee Rules and Procedures. The Standards Board approved by motion subsequent approvals of balance of interest reports to be achieved via electronic ballot.

2019 Standards Action Activities
Project Initiation Notification System (PINS) forms were approved and submitted to ANSI for the following projects:

- ANS-3.5.1-202x, “Nuclear Power Plant Simulators for Use in Simulation-Assisted Engineering and Non-Operator Training” (new standard)
- ANS-57.8-202x, “Fuel Assembly Identification” (revision of ANSI/ANS-57.8-1995; R2017)
- ANS-59.3-202x, “Nuclear Safety Criteria for Control Air Systems” (new standard)

The following standards and/or draft standards were issued for ballot and public review:
• ANS-2.8-201x, “Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities” (new standard, supersedes ANS-2.8-1992)
• A ANS-2.29-202x, "Probabilistic Seismic Hazard Analysis" (revision of ANSI/ANS-2.29-2008; R2016)
• ANS-8.15-2014 (R201x), “Nuclear Criticality Control of Selected Actinide Nuclides” (reaffirmation of ANSI/ANS-8.15-2014)
• ANS-8.23-201x, “Nuclear Criticality Accident Emergency Planning and Response” (revision of ANSI/ANS-8.23-2007; R2012)
• ANS-57.11-202x, “Integrated Safety Assessments for Nonreactor Nuclear Facilities” (new standard)

The following standards were approved:
 • ANSI/ANS-3.5-2018, "Nuclear Power Plant Simulators for Use in Operator Training and Examination” (new standard, supersedes ANSI/ANS-3.5-2009)
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The following standards were published:

A response to an inquiry on the following standard was issued:
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

Steven A. Arndt, Chair, U.S. Nuclear Regulatory Commission
Donald R. Eggett, Vice Chair, Individual
Amir Afzali, Member at Large, Southern Nuclear Operating Company
Robert A. Bari, Member at Large, Brookhaven National Laboratory
Robert J. Budnitz, Ex Officio Member (JCNRM), Lawrence Berkeley National Laboratory
C.E. (Gene) Carpenter, Ex Officio Member (LLWRCC), U.S. Department of Energy
George F. Flanagan, Chair, Ex Officio Member (RARCC), Oak Ridge National Laboratory
David Hillyer, Ex Officio Member (FWDCC), Energy Solutions
Mark A. Linn, Member at Large, Oak Ridge National Laboratory
Carl A. Mazzola, Ex Officio Member (ESCC), Project Enhancement Corporation
John A. Nakoski, Member at Large, U.S. Nuclear Regulatory Commission
James O’Brien, Ex Officio Member (NRNFCC), U.S. Department of Energy
Andrew O. Smetana, Ex Officio Member (SRACC), Savannah River National Laboratory
Andrew G. Sowder, Member at Large, Electric Power Research Institute
Steven L. Stamm, Member at Large, Individual
William M. Turkowski, Member at Large, Westinghouse Electric Company, LLC
Larry L. Wetzel, Ex Officio Member (NCSCC), BWX Technologies, Inc.

Dennis Henneke, Observer, General Electric
Calvin M. Hopper, Observer, Individual
N. Prasad Kadambi, ANSI Liaison, Individual
Stanley H. Levinson, JCNRM/SCoRA Liaison, Individual
Shivani Mehta, Observer, U.S. Nuclear Regulatory Commission
Robert Roche-Rivera, Observer, U.S. Nuclear Regulatory Commission
Donald Spellman, IEEE-NPEC Liaison/Observer, Xcel Engineering
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)                          Bruce Bevard
Decommissioning (Commercial and Research Facilities) (FWDCC) OPEN
Emergency Planning and Response (LLWRCC)                     Ronald Markovich
Environmental and Impact Assessment                          Kevin Bryson
Fissionable Material Outside Reactors/ANS-8 (NCSCC)          Douglas Bowen
High Level, GTCC, Low Level, and Mixed Waste (FWDCC) OPEN
Light Water Reactor and Reactor Auxiliary Systems Design (LLWRCC) Michelle French
Mathematics and Computations/ANS-10 (SRACC)                  Paul Hulse
New and Used Fuel (Design Only) (FWDCC)                      Mitchell Sanders
Operation of Research Reactors/ANS-15 (RARCC)                Thomas Newton
Reactor Physics/ANS-19 (SRACC)                               Dimitrios Cokinos
Shielding/ANS-6 (SRACC)                                      Charlotta Sanders
Simulators, Instrumentation, Control Systems, Software and Testing (LLWRCC) Pranab Guha
Siting: Atmospheric                                          Jennifer Call
Siting: General and Monitoring (ESCC)                        Leah Parks
Siting: Hydrogeologic (ESCC)                                 Yan Gao
Siting: Seismic (ESCC)                                       Jim Xu
Subcommittee on Risk Applications (JCNRM)                    Gerry Kindred
Subcommittee on Standards Development (JCNRM)                Barry Sloane
Subcommittee on Standards Maintenance (JCNRM)                Paul Amico
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APPROVED AMERICAN NATIONAL STANDARDS
Developed by the ANS Standards Committee
(through December 2019)

ANS-1-2000; R2007; R2012; R2019
Conduct of Critical Experiments (reaffirmed 8/12/2019)

ANS-2.2-2016
Earthquake Instrumentation Criteria for Nuclear Power Plants (approved 7/14/2016)

ANS-2.3-2011; R2016

ANS-2.6-2018

ANS-2.8-2019
Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities (approved 12/17/2019)

ANS-2.10-2017
Criteria for Retrieval, Processing, Handling, and Storage of Records from Nuclear Facility Seismic Instrumentation (approved 12/19/2017)

ANS-2.15-2013; R2017
Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities (reaffirmed 12/2/2017)

ANS-2.17-2010; R2016
Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants (reaffirmed 3/10/2016)

ANS-2.21-2012; R2016

ANS-2.23-2016
Nuclear Plant Response to an Earthquake (approved 4/7/2016)

ANS-2.26-2004; R2010; R2017
Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design (reaffirmed 9/12/2017)

ANS-2.27-2008; R2016
Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments (reaffirmed 6/15/2016)

ANS-2.29-2008; R2016
Probabilistic Seismic Hazard Analysis (reaffirmed 10/11/2016)

ANS-2.30-2015
Criteria for Assessing Tectonic Surface Fault Rupture and Deformation at Nuclear Facilities (approved 5/28/2015)

ANS-3.1-2014
Selection, Qualification and Training of Personnel for Nuclear Power Plants (approved 11/20/2014)

ANS-3.2-2012; R2017
Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants (reaffirmed 4/4/2017)

ANS-3.4-2013; R2018
Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants (reaffirmed 7/2/2018)

ANS-3.5-2018
Nuclear Power Plant Simulators for Use in Operator Training and Examination (approved 10/10/2019)
ANS-3.11-2015  Determining Meteorological Information at Nuclear Facilities (approved 8/20/2015)


ANS-5.4-2011  Method for Calculating the Fractional Release of Volatile Fission Products from Oxide Fuel (approved 5/19/2011)


ANS-6.1.2-2013; R2018  Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Power Plants (reaffirmed 10/19/2018)


ANS-6.4-2006; R2016  Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants (reaffirmed 8/4/2016)

ANS-6.4.2-2006; R2016  Specification for Radiation Shielding Materials (reaffirmed 9/27/2016)


ANS-8.3-1997; R2003; R2012; R2017  Criticality Accident Alarm System (reaffirmed 10/25/2017)

ANS-8.5-1996; R2002; R2007; R2012; R2017  Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material (reaffirmed 11/14/2017)

ANS-8.6-1983; R1988; R1995; R2001; R2010; R2017  Safety in Conducting Subcritical Neutron-Multiplication Measurements In Situ (reaffirmed 8/24/2017)

ANS-8.7-1998; R2007; R2012; R2017  Nuclear Criticality Safety in the Storage of Fissile Materials (reaffirmed 12/14/2017)


ANS-8.15-2014; R2019  Nuclear Criticality Control of Special Actinide Elements (reaffirmed 9/12/2019)


<table>
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<tr>
<th>Standard Number</th>
<th>Description</th>
<th>Reaffirmed Date</th>
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<tbody>
<tr>
<td>ANS-8.22-1997; R2006 R2011; R2016</td>
<td>Nuclear Criticality Safety Based on Limiting and Controlling Moderators (reaffirmed 10/17/2016)</td>
<td></td>
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<tr>
<td>ANS-8.26-2007; R2012; R2016</td>
<td>Criticality Safety Engineer Training and Qualification Program (reaffirmed 12/15/2016)</td>
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<tr>
<td>ANS-8.27-2015</td>
<td>Burnup Credit for LWR Fuel (approved 11/10/2015)</td>
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<tr>
<td>ANS-10.4-2008; R2016</td>
<td>Verification and Validation of Non-Safety Related Scientific and Engineering Computer Programs for the Nuclear Industry (reaffirmed 9/26/2016)</td>
<td></td>
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<tr>
<td>ANS-10.7-2013; R2018</td>
<td>Non-Real Time, High-Integrity Software for the Nuclear Industry—Developer Requirements (reaffirmed 8/13/2018)</td>
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<tr>
<td>ANS-10.8-2015</td>
<td>Non-Real Time, High-Integrity Software for the Nuclear Industry—User Requirements (approved 11/19/2015)</td>
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<tr>
<td>ANS-15.2-1999; R2009; R2016</td>
<td>Quality Control for Plate-Type Uranium-Aluminum Fuel Elements (reaffirmed 8/18/2016)</td>
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<tr>
<td>ANS-15.4-2016</td>
<td>Selection and Training of Personnel for Research Reactors (approved 4/19/2016)</td>
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<tr>
<td>ANS-15.8-1995; R2005; R2013; R2018</td>
<td>Quality Assurance Program Requirements for Research Reactors (reaffirmed 7/18/2018)</td>
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<tr>
<td>ANS-15.11-2016</td>
<td>Radiation Protection at Research Reactor Facilities (approved 5/13/2016)</td>
<td></td>
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</tbody>
</table>


ANS-19.3-2011; R2017  Steady-State Neutronics Methods for Power Reactor Analysis (reaffirmed 1/24/2017)

ANS-19.3.4-2002; R2008; R2017  The Determination of Thermal Energy Deposition Rates in Nuclear Reactors (reaffirmed 5/18/2017)


ANS-41.5-2012; R2018  Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation (reaffirmed 10/19/2018)

ANS-51.10-2002; R2008; R2018  Auxiliary Feedwater System for Pressurized Water Reactors (reaffirmed 8/13/2018)


ANS-56.8-2002; R2011; R2016  Containment System Leakage Testing Requirements (reaffirmed 6/26/2016)


ANS-57.8-1995; R2005; R2011; R2017  Fuel Assembly Identification (reaffirmed 2/23/2017)

ANS-57.10-1996; R2006; R2016  Design Criteria for Consolidation of LWR Spent Fuel (reaffirmed 7/7/2016)

<table>
<thead>
<tr>
<th>Standard Number</th>
<th>Approved/Reaffirmed</th>
<th>Description</th>
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<tbody>
<tr>
<td>ANS-58.14-2011; R2017</td>
<td></td>
<td>Safety and Pressure Integrity Classification Criteria for Light Water Reactors (reaffirmed 1/12/2017)</td>
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**Approved ASME/ANS Joint American National Standard**

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<thead>
<tr>
<th>Standard Number</th>
<th>Approved/Reaffirmed</th>
<th>Description</th>
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**Approved ASME/ANS Joint Trial Use Standards (not approved by ANSI)**

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<th>Standard Number</th>
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<tr>
<td>ANS/ASME-58.22-2014</td>
<td></td>
<td>Requirements for Low Power and Shutdown Probabilistic Risk Assessment (approved for trial use by the JCNRM; not approved by ANSI)</td>
</tr>
<tr>
<td>ASME/ANS RA-S-1.2-2014</td>
<td></td>
<td>Severe Accident Progression and Radiological Release (Level 2) PRA Standard for Nuclear Power Plant Applications for Light Water Reactors (LWRs) (approved for trial use by the JCNRM; not approved by ANSI)</td>
</tr>
<tr>
<td>ASME/ANS RA-S-1.3-2017</td>
<td></td>
<td>Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications (approved for trial use by the JCNRM; not approved by ANSI)</td>
</tr>
<tr>
<td>ASME/ANS RA-S-1.4-2013</td>
<td></td>
<td>Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plants (approved for trial use by the JCNRM; not approved by ANSI)</td>
</tr>
</tbody>
</table>
Environmental and Siting Consensus Committee (ESCC)

Carl A. Mazzola, Chair
Project Enhancement Corporation

Scope: The ESCC is responsible for the preparation and maintenance of voluntary consensus standards for all aspects of nuclear power plant and nonreactor 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, Project Enhancement Corporation
Jennifer Call, Vice Chair, Oasys, Inc.
Thomas Bellinger, Consolidated Nuclear Security, LLC
David Bruggeman, Los Alamos National Laboratory
Kevin Bryson, Individual
William Ebert, Argonne National Laboratory
Yan Gao, Dominion Energy
Brent Gutierrez, U.S. Department of Energy
R. Joseph Hunt, Consolidated Nuclear Security, LLC
Marsha Kinley, Duke Energy Corporation
Yong Li, Defense Nuclear Facility Safety Board
Kit Ng, Bechtel Power Corporation
James O’Brien, U.S. Department of Energy
Leah Parks, U.S. Nuclear Regulatory Commission
Samuel Rosenbloom, U.S. Department of Energy
Jean Savy, Individual
Ali Simpkins, Oak Ridge Associated Universities
Jim Xu, U.S. Nuclear Regulatory Commission

ESCC Observer:
Brad Harvey, U.S. Nuclear Regulatory Commission

Report of the ESCC:
Two teleconferences were held in 2019 (March and July), and a physical meeting was held during the ANS Winter Meeting in Washington, DC, on Wednesday, November 18. William Ebert was confirmed as a new member of the ESCC. Paul Snead retired from standards activities and was replaced by Marsha Kinley also from Duke Energy Corporation.
Approved in 2019:

Active standards/projects (Approved PINS):
ANS-2.16, "Criteria for Modeling Design-Basis Accidental Releases from Nuclear Facilities" (proposed new standard)
ANS-2.21, "Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink" (revision of ANSI/ANS-2.21-2012; R2016)
ANS-2.22, "Environmental Radiological Monitoring at Nuclear Facilities" (proposed new standard)
ANS-2.27, "Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments" (revision of ANSI/ANS-2.27-2008; R2016)
ANS-2.29, "Probabilistic Seismic Hazard Analysis" (revision of ANSI/ANS-2.29; R2016)
ANS-2.34, "Characterization and Probabilistic Analysis of Volcanic Hazards" (proposed new standard)

Environmental and Impact Assessment and Analysis Subcommittee

Membership:
Kevin Bryson, Chair, Individual
Daniel Mussatti, U.S. Nuclear Regulatory Commission

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


Scope: There is a need for guidance on suitable survey techniques to evaluate potential effects of a nuclear facility on surrounding ecology. This standard discusses the need developers of nuclear facilities have for information on the terrestrial and aquatic environment. Facilities include uranium enrichment facilities, fuel fabrication facilities, reactors, interim storage facilities, reprocessing facilities, low/high level waste disposal facilities, DOE GNEP facilities and other DOE owned/ operated facilities. The previous standard was withdrawn for administrative reasons and will be reinvigorated to include present conditions and to coincide with current regulations.

Membership:
NA

Status: The project was formally terminated with notice submitted to ANSI on 8/30/19 subsequent to ballots to both the ESCC and the Standards Board. The white paper prepared to justify the project’s termination stated that applicants were able to provide Ecological Baseline Studies in their ERs that were complete, well defined,
defensible and acceptable to the NRC by utilizing mostly their own initiatives approaches and experience. The
NRC has provided more focused guidance regarding aquatic and terrestrial environmental studies, particularly as
provided in RG 4.2, Rev 3, RG 4.11, Rev 2 and RG 4.24. Rev 0. As a result of both the applicant's approaches and
these RGs, applicants now have a comprehensive standard for providing both aquatic and terrestrial baseline
studies. Accordingly, this voluntary consensus standard is not merited at this time. This justification is the same for
proposed standard ANS-2.33 also terminated.

ANS-2.33, “Aquatic Ecological Surveys Required for Siting, Design, and Operation of Nuclear Power
Plants” (proposed new standard)

Membership:
NA

Status: The project was formally terminated by ballot to the ESCC. The white paper prepared to justify the
project's termination stated that applicants were able to provide Ecological Baseline Studies in their ERs that were
complete, well defined, defensible and acceptable to the NRC by utilizing mostly their own initiatives approaches
and experience. The NRC has provided more focused guidance regarding aquatic and terrestrial environmental
studies, particularly as provided in RG 4.2, Rev 3, RG 4.11, Rev 2 and RG 4.24. Rev 0. As a result of both the
applicant's approaches and these RGs, applicants now have a comprehensive standard for providing both aquatic
and terrestrial baseline studies. Accordingly, this voluntary consensus standard is not merited at this time. Since
the project (PINS) never was approved by the Standards Board nor submitted to ANSI, no further action to
terminate this project was needed. This justification is the same for proposed standard ANS-2.25 also terminated.

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; Daniel Mussatti, Vice Chair, U.S. Nuclear
Regulatory Commission; Linda Andrews, Framatome Inc.; Bandana Kar, Oak Ridge National Laboratory; Archie
(Archana) Manoharan, Tennessee Valley Authority; Leah Parks, U.S. Nuclear Regulatory Commission; Amy Rose,
Oak Ridge National Laboratory; Rachel Turney-Work, Enercon Services, Inc.; Kevin Weinisch, KLD Engineering,
P.C.

Status: We are in the formative stages of developing ANS-2.35. PINS submitted to ANSI on 5/20/2019.

Siting: Atmospheric Subcommittee

Membership:
Jennifer Call, Chair, Oasys, Inc.
OPEN, Vice Chair
Jeffrey Baum, ABSG Consulting, Inc.
Thomas Bellinger, Consolidated Nuclear Security, LLC
David Bruggeman, Los Alamos National Laboratory
John Ciolek, AlphaTRAC, Incorporated
Marsha Kinley, Duke Energy Corporation
Rodman Linn, Los Alamos National Laboratory
Carl Mazzola, Project Enhancement Corporation
Kevin Quinlan, U.S. Nuclear Regulatory Commission

The Siting: Atmospheric Subcommittee oversees the following projects:

**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:**

**Status:**
This standard was reaffirmed 6/29/16. The previous chair, Brad Harvey, resigned from the chair position during 2018 upon his retirement from NRC. Jennifer Call presented an update on this standard to the NUMUG community at the Las Vegas meeting in October 2018 and recruited Jeffrey Baum as the new chair. Baum is revitalizing the working group to initiate a revision. 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.


**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, Chair, AlphaTRAC, Inc.; 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, Savannah River National Laboratory; Marsha Kinley, Duke Energy; Mike Mazaika, U.S. Nuclear Regulatory Commission; Carl Mazzola, Project Enhancement Corporation; Edward McCarthy, E.F. McCarthy & Associates; Matthew Parker, Savannah River National Laboratory; Doyle E Pittman, Individual; Jeremy Rishel, Pacific Northwest National Laboratory; Ali Simpkins, Oak Ridge Associated Universities; Ping Wan, Individual; Ken Wastrack, Tennessee Valley Authority

**Status:** This standard was reaffirmed on 12/21/17. No activity in 2019.

ANS-2.16, “Criteria for Modeling Design-Basis Accidental Releases from Nuclear Facilities” (proposed new standard)

**Scope:** This standard establishes criteria for using meteorological data collected at nuclear facilities to evaluate the atmospheric effects on accidental radioactive and chemical releases, including dilution, dispersion, plume rise, plume meander, aerodynamic effects of buildings, dry deposition, and wet deposition (e.g., precipitation scavenging). These criteria may also be useful in Department of Homeland Security (DHS) consequence assessments.

**Membership**
ANS Standards Committee Report of Activities 2019

Matt Parker, Savannah River National Laboratory; Doyle E. Pittman, Individual; Ali Simpkins, Oak Ridge Associated Universities; Harold Thistle, Individual; Ping Wan, Individual; Ken Wastrack, Tennessee Valley Authority

**Status:** The PINS was approved and submitted to ANSI in 2005. The previous chair, Dr. Harold Thistle, resigned from the chair position during 2018. Jennifer Call presented an update on this standard to the NUMUG community at the Las Vegas meeting in October 2018 and recruited Kevin Quinlan as the new chair. Quinlan hopes to revitalize this working group.


**Scope:** This standard establishes criteria for use of meteorological data collected at nuclear facilities to evaluate the atmospheric effects from meteorological parameters (e.g., dry-bulb temperature/wet-bulb temperature differential, precipitation, wind speed, short wave radiation, incoming solar (short wave) radiation, surface water temperature, and atmospheric pressure) on ultimate heat sinks.

**Membership:**
Marsha Kinley, Chair, Duke Energy; Jeffrey Baum, ABSG Consulting; Edward Buchak, Environmental Resources Management; Jennifer Call, Oasys, Inc.; Mark Carroll, ChemStaff; Richard Codell, Individual; Andrew Dewhurst, Individual; Ludwig Haber, Alden Research Laboratory; Chang-Yang Li, U.S. Nuclear Regulatory Commission; Michael Mazaika, U.S. Nuclear Regulatory Commission; Gerard Purciarello, Individual; Kevin Quinlan, U.S. Nuclear Regulatory Commission; Larry Wheeler, U.S. Nuclear Regulatory Commission

**Status:** This standard was reaffirmed on 4/18/2016. The PINS for the revision of ANS-2.21 was approved and submitted to ANSI on 5/31/2019. The working group had six calls during the year, and writers commenced work on the first draft in 2019, including consideration of potential climate change impacts on the UHS and data representativeness. Writers for revision of ANS-2.21 are Edward Buchak, Richard Codell, Andrew Dewhurst, and Ludwig Haber.

ANS-3.8.10, “Criteria for Modeling Real-time Accidental Release Consequences at Nuclear Facilities” (proposed new standard)

**Scope:** This standard establishes criteria for use of meteorological data collected at nuclear facilities or nearby stations to evaluate in real time the atmospheric effects of all anticipated accidental radioactive and hazardous chemical releases during emergencies, including atmospheric transport and dispersion. These criteria may also be useful in Department of Homeland Security (DHS) emergency response consequence assessments.

**Membership:**
OPEN, Chair; Rishel, Vice Chair, Pacific Northwest National Laboratory; Mark Abrams, ABS Consulting, Inc.; George Atthey, Atthey Consulting; Tom Bellinger, Consolidated Nuclear Security, LLC; Jay Boris, Naval Research Laboratory; Jennifer Call, Oasys, Inc.; Mark Carroll, ChemStaff; Joseph Chang, Department of Homeland Security; John Ciolek, AlphaTRAC, Inc.; Toree Cook, Tennessee Valley Authority; Mark Drucker, Structural Integrity Associates, Inc.; Michael Dunleavy, Defense Nuclear Facilities Safety Board; Bruce Egan, Egan Environmental; Cliff Glantz, Pacific Northwest National Laboratory; Chuck Hunter, Savannah River National Laboratory; Marsha Kinley, Duke Energy; Michael Mazaika, U.S. Nuclear Regulatory Commission; Edward McCarthy, EF McCarthy & Associates; Matt Parker, Savannah River National Laboratory; Doyle E Pittman, Individual; Kevin Quinlan, U.S. Nuclear Regulatory Commission; Ali Simpkins, Oak Ridge Associated Universities; Ping Wan, Individual; Ken Wastrack, Tennessee Valley Authority

**Status:** The chair position for this standard is once again open after Harold Thistle resigned from the position in 2018. We have had five chairmen come and go without being able to see this standard through to publication. Call has recruited colleagues directly, as well as tried an all-call approach to the CCM community with no luck. Consideration was given to combining this standard with either ANS-2.15 or ANS-2.16, as the content and the working groups overlap greatly, in order to reduce overall effort, and possibly increase the functionality and value of ANSI/ANS-2.15-2013. However, ANS-3.8.10 is an operational standard associated with emergency response dispersion modeling, while ANS-2.16 is a licensing standard associated with accidental release dispersion.
modeling, hence the different number sequence. Also, it was recognized that this action would possibly delay ANSI-2.15 while material was being incorporated, and that standard has an action date of 2022. As the main community of users, NUMUG’s feedback is valued greatly in this area, and the path forward was discussed at the NUMUG meeting in October 2018. It was determined that the most desirable path forward was to retain separate standards and a chair was successfully recruited for ANSI-2.16. A chair is obviously still needed; however, for ANSI-3.8.10.

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**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, Oasys, Inc.; Mark Carroll, ChemStaff; John Ciolek, AlphaTrac; Thomas Coulter, Coulter Air Quality Services; Paul Fransioli, Clark County Nevada; Thomas Galletta, U.S. Nuclear Regulatory Commission; Cliff Glantz, Pacific Northwest National Laboratory; Frank Hickey, Susquehanna Nuclear, LLC; James Holian, Horian Environmental, LLC; Charles Hunter, Savannah River National Laboratory; Rachael Ishaya, BRYZA Wind Laboratory; David Katz, Climatronics Corporation; Stanton Lanham, Duke Energy; Stanley Marsh, Southern California Edison; Michael Mazaika, U.S. Nuclear Regulatory Commission; Carl Mazzola, Project Enhancement Corporation; Edward McCarthy, E.F. McCarthy & Associates; Doyle Pittman, Individual; Kevin Quinlan, U.S. Nuclear Regulatory Commission; Walter Schalk, U.S. Department of Energy; Adam Smith, Tennessee Valley Authority; Ping Wan, Individual; Ken Wastrack, Tennessee Valley Authority

**Status:** The standard was approved by ANSI on 8/20/2015. This standard was also moved from the subcommittee Siting: General & Monitoring to the subcommittee Siting: Atmospheric in 2018. No conference calls were conducted during this year. The working group is preparing upcoming action to reaffirm or revise.

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**ANSI-3.16, “Meteorology and Wildland Fires” (proposed new standard)**

**Scope:** The broad scope of this standard is to provide guidance to the user and point the user to the applicable references where more detailed information can be found related to the meteorological / atmospheric impacts and forecasting considerations on wildland fires. (This will be further refined as the PINS is developed.)

**Membership:**
Rodman Linn, Chair, Los Alamos National Laboratory; Jeffrey Baum, ABSG Consulting Inc.; David Bruggeman, Los Alamos National Laboratory; Christopher Fiebrich, University of Oklahoma; Todd Lindley, National Oceanic and Atmospheric Administration; Scott McDonald, Washington State Department of Health; Rhett Milne, Individual; Bill Shields, Individual; John Snow, Snow & Associates, LLC; Ron Stouffer, Individual; Brian Viner, Savannah River National Laboratory

**Status:** The working group is the process of drafting the PINS for this proposed standard. A talented working group of professionals from many organizations has been established over the past two years. However, before work could start in earnest, there was a need to confirm whether there was an end use for this standard within the nuclear community. Private and public sector survey analysis assist in this determination, and the ESCC elected to move forward with this standard development. Rodman Linn recently assumed the chair position of this working group.

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**Siting: General and Monitoring Subcommittee**

**Membership:**
Leah Parks, Chair, U.S. Nuclear Regulatory Commission
Andrew Garrabrants, Vanderbilt University
The Siting: General and Monitoring Subcommittee manages the following projects and current standards:


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:
Daniel Mussatti, Chair, U.S. Nuclear Regulatory Commission; 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, DOE National Laboratories; Bo Saulsbury, Oak Ridge National Laboratory; Harold Stiles, EPM, Inc.; Seshagiri Tammara, U.S. Nuclear Regulatory Commission; Rachel Turney, Enercon Services, Inc.; Kevin Weinisch, KLD Engineering, P.C.

Status: The standard was approved by ANSI on 3/16/2018.

ANSI/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:
Timothy Jannik, Chair, Savannah River National Laboratory; Janet Aremu-Cole, Duke Energy; Amir Bahadori, Associate Member, Kansas State University; James Bland, Chesapeake Nuclear Services, Inc.; Teresa Eddy, Savannah River Nuclear Solutions; Derek Favret, U.S. Department of Energy; Zachary Harvey, Lawrence Berkeley National Laboratory; Jerry Hiatt, Nuclear Energy Institute; Frank Hickey, Susquehanna Nuclear, LLC; Gary Huff, Excel Energy; James Key, Key Solutions, Inc.; Robert Litman, Radiochemistry Laboratory Basics; Erik Merchant, American Electric Power; Tanya Oxenberg, TPO Technical Services, LLC; Zach Ryal, Southern Nuclear Operating Company; Kevin Witt, U.S. Nuclear Regulatory Commission

Status: Timothy Jannik accepted the working group chair position. The working group has been formed and a kick off meeting was held December 14, 2017. The PINS was submitted to ANSI on 4/24/2018.


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
ANS Standards Committee Report of Activities 2019

National Laboratory; Mark Fuhrmann, U.S. Nuclear Regulatory Commission; Albert Kruger, U.S. Department of Energy; Hans van der Sloot, Hans van der Sloot Consultancy

**Status:** This standard was approved by ANSI on February 22, 2019.

ANSI/ANS-41.5-2012 (R2018), “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, Chair; Leah Parks, Observer, U.S. Nuclear Regulatory Commission

**Status:** This standard was reaffirmed by ANSI on 10/19/2018. This standard was formerly under the SRACC, Math & Computations Subcommittee.

Siting: Hydrogeologic Subcommittee

**Membership:**
Yan Gao, Chair, Individual
Kit Ng, Bechtel Power Corporation
Todd Rasmussen, University of Georgia
Lisa Schleicher, Defense Nuclear Facilities Safety Board
Raymond Schnieder, Westinghouse Electric Company, LLC
Michael Truex, Pacific Northwest National Laboratory

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


**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, Individual; Raymond Schnieder, Co-Chair, Westinghouse Electric Company, LLC, Victoria Anderson, Nuclear Energy Institute; James August, Southern Nuclear Operating Company; Kevin Bryson, 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; R. Joe Hunt, Consolidated Nuclear Security, LLC; Kevin Hyde, Individual; Sharon Jasim-Hanif, Department of Energy; Joseph Kanney, Individual; Gregory Lowe, Consultant; Carl Mazzola, Project Enhancement Corporation; Marty McCann, Jack Benjamin & Associates, Inc.; Gerald Meyers, Individual; Kit Ng, Bechtel Power Corporation; Robert Rishel, Duke Energy Corporation; Jery Stedinger, Cornell University

**Status:** The standard gained consensus and was approved by ANSI on 12/17/2019. Publication is expected in early 2020.

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; Larry Armstrong, S&ME, Inc.; Matt Barvenik, GZA GeoEnvironmental, Inc.; Kevin Bryson, Individual; Dib Goswami, Washington State Department of Ecology; Dua Guvanasen, HydroGeoLogic, Inc.; Tim Hunsucker, Duke Energy; Philip Meyer, Pacific Northwest National Laboratory; Fred Molz, III, Clemson University; Thomas J. Nicholson, U.S. Nuclear Regulatory Commission; Todd Rasmussen, University of Georgia; David Scott, Radiation Safety and Control Services; Stewart Taylor, Bechtel Corporation; Mike Young, University of Texas

Status: No activity in 2019. James Bollinger stepped down as working group chair and resigned as a member. Todd Rasmussen also stepped down as working group chair, but remains a member. Membership will need to be confirmed once a new chair is found.


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

Status: Revision of historical standard being considered.


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; Matt Barvenik, GZA GeoEnvironmental, Inc.; Rick Beauheim, Sandia National Laboratories; James S. Bollinger, Savannah River National Laboratory; Mike Godfrey, Southern Nuclear Operating Company; Dib Goswami, Washington State Department of Ecology; Dua Guvanasen, HydroGeoLogic, Inc.; Cynthia Martinec, Duke Energy; Philip D. Meyer, Pacific Northwest National Laboratory; Fred J. Molz, III, Clemson University; Thomas J. Nicholson, U.S. Nuclear Regulatory Commission; David Scott, Radiation Safety and Control Services; Edwin Weeks, U.S. Geological Survey; Dan Wells, Washington Savannah River Co.; Mike Young, Desert Research Institute

Status: This standard was reaffirmed on 3/10/16. No activity in 2019.

ANS-2.18, “Standards for Evaluating Radionuclide Transport in Surface Water for Nuclear Power Sites” (proposed new standard)

Unapproved Scope: This standard presents guidelines for the determination of the transport of radionuclides in surface water resulting from both postulate accidental and routine releases from nuclear power plants and other nuclear facilities.
Membership:
Kit Ng, Chair, Bechtel Power Corporation; Charles Cohen (Associate Member), Individual; Angelos Findikakis, Bechtel National, Inc.;

Status: Kit Ng took over as working group chair 2/1/2016 and has begun the process of reforming the working group. A PINS will be prepared.


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, groundwater, 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: Resurrection of historical standard is being considered. No activity in 2019.


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:

Status: Comments on a PINS issued to the Nuclear Facilities Standards Committee (predecessor consensus committee) remain unresolved. Michael Truex was appointed as working group chair. Additional members were added to the working group to reinvigorate the project.

Siting: Seismic Subcommittee

Membership:
Jim Xu, Chair, U.S. Nuclear Regulatory Commission
Brent Gutierrez, Vice Chair, U.S. Department of Energy
Douglas Clark, Consolidated Nuclear Security, LLC
Emily Gibson, Schnabel Engineering
Kathryn Hanson, KLHanson Consulting LLC
Robert Kassawara, Individual
Stephen McDuffie, U.S. Department of Energy
Farhang Ostadan, Bechtel Corporation
Ivan Wong, Lettis Consultants International
The Siting: Seismic Subcommittee manages the following projects and current standards:


*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:**
Farhang Ostadan, Chair, Bechtel Corp.; Vladimir Graizer, U.S. Nuclear Regulatory Commission; Roy Joe Hunt, Consolidated Nuclear Security, LLC; Roger Kenneally, Individual; Richard Lee, Los Alamos National Laboratory; Robert Nigbor, University of California-Los Angeles; Subir Sen, U.S. Department of Energy

**Status:** The standard was approved by ANSI on 7/14/2016. No activity in 2019.


*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:**

**Status:** Standard was approved by ANSI on 12/19/2017. No activity in 2019.


*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 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:**
Robert Kassawara, Chair, Individual; Divakar Bhargava, Dominion Energy; Greg Hardy, Simpson, Gumpertz and Heger, Inc.; Eric Hendrixson, Dominion Energy; James Johnson, James J. Johnson and Associates; Robert Kenneally, Individual; Robert Kennedy, RPK Structural Mechanics Consulting; William Schmidt, W. Schmidt Consulting

**Status:** The revised standard was approved by ANSI on 4/7/2016. No activity in 2019.

**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:**

**Status:** The standard was reaffirmed on 9/12/2017. A PINS was submitted to ANSI 10/1/2019. A revision of this standard is underway.


**Scope:** This standard provides criteria and guidelines for conducting geological, seismological, geophysical, and geotechnical investigations needed to provide information to support (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 PSHA; (4) non-tectonic, earthquake-induced ground failure hazard; and (5) foundation stability.

**Membership:**
Kathryn Hanson, Chair, KLM Hanson Consulting LLC; William Savage, Vice Chair, Individual; Jon Ake, U.S. Nuclear Regulatory Commission; M. Logan Cline, RIZZO International, Inc.; Carl J. Costantino, Carl J. Constantino & Associates; C.B. Crouse, AECOM; Emily Gibson, Schnabel Engineering; Brent Gutierrez, U.S. Department of Energy; 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; William (Woody) Savage, Individual; Lisa Schleicher, Defense Nuclear Facilities Safety Board; Kenneth Stokoe, University of Texas; Stephen Thompson, Lettis Consultants International; Jim Xu, U.S. Nuclear Regulatory Commission

**Status:** Reaffirmation was approved by ANSI on 6/7/2016. A PINS was submitted to ANSI on 9/28/2017. A Project Implementation Plan was submitted on 9/28/2017. A revision to this standard was submitted to the Siting: Seismic Subcommittee for review in May 2019. Responses to subcommittee review comments were submitted and approved and the revised draft was submitted to the ESCC in November 2019. The revision, which will be coordinated with the revision of ANSI/ANS-2.29 (R2016), is expected to be completed by early 2020.

ANSI/ANS-2.29-2008 (R2016), “Probabilistic Seismic Hazard Analysis” (new standard)

**Scope:** This standard provides guidance for performing a probabilistic seismic hazard analysis (PSHA) for developing design and safety evaluation criteria for nuclear facilities. Criteria provided in this standard address various aspects of conducting PSHAs, including (1) purpose, objective and process; (2) detailed requirements; (3) PSHA framework; (4) source model; (5) motion model; (6) effects; (7) of PSHA for seismic design and seismic probabilistic risk assessments (SPRA); (8) documentation; (9) assurance.

**Membership:**
Emily Gibson, Chair, Schnabel Engineering, LLC; Lisa Schleicher, Vice Chair, Defense Nuclear Facilities Safety Board; 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; Jefffrey Kimball, Rizzo International, Inc.; Yong Li, Defense Nuclear Facilities Safety Board; James Marrone,
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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, Lettis Consultants International; Ivan Wong, Lettis Consultants International; Robert Youngs, Wood Environmental & Infrastructure Solutions

Status: A reaffirmation of this standard was approved 10/11/2016. A PINS was submitted to ANSI on 7/19/2017 for a revision. A revision to this standard was submitted to the Siting: Seismic Subcommittee for review in June 2019. Response to subcommittee review comments were submitted and approved and the revised draft was submitted to the ESCC in November 2019. The revision, which will be coordinated with the revision of ANSI/ANS-2.27 (R2016), will be completed in early 2020.


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, Institute of Nuclear Energy Safety; Keith Kelson, Army Core of Engineers; Jeffrey Kimball, Rizzo Associates; Susan Olig, Olig Seismic Geology Inc.; David Schwartz, U.S. Geological Survey; Donald Wells, AMEC Environment & Infrastructure


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.


Status: The PINS was approved ANSI on 9/28/17. The project plan to develop the standard, and an initial outline, were finalized in May 2019. After a team discussion in September 2019, the outline was slightly revised. As of December 2019, several sections of the standard have been drafted and are under review by the team. Other sections are still in development. A complete standard for consensus committee review is expected in 2020.
Environmental and Siting Consensus Committee (ESCC) Organizational Chart

**Chair:** Carl A. Mazzola  
**Vice Chair:** Jennifer Call

|--------------------|-----------------------|----------------|-------------------------------|---------------------------------------------|
| Jennifer Call
(Chair)            | Yan Gao
(Chair)             | Jim Xu
(Chair)            | Leah Parks
(Chair)            | Kevin Bryson
(Chair)            |
| OPEN (Vice Chair)  | OPEN (Vice Chair)     | Brent Gutierrez
(Chair)      | OPEN (Vice Chair) | OPEN (Chair) |

**Current Standards**
- 4 Proposed/Active Projects
- 2 Current Standards
- 7 Proposed/Active Projects
- 3 Current Standards
- 6 Proposed/Active Projects

**Proposed/Active Projects**
- 1 Proposed/Active Projects

**Projects Considered**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Proposed/Active Projects</th>
<th>Current Standards</th>
<th>Current Standards</th>
<th>Proposed/Active Projects</th>
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<td>2.3-2011 (R2016) Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites</td>
<td>4 Proposed/Active Projects</td>
<td>2 Current Standards</td>
<td>7 Proposed/Active Projects</td>
<td>3 Proposed/Active Projects</td>
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<td>2.15-2013 (R2017) Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities</td>
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<td>2.21-2012 (R2016) Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink</td>
<td>OPEN (Vice Chair)</td>
<td>2 Proposed/Active Projects</td>
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<td>3.11-2015 Determining Meteorological Information at Nuclear Facility Sites</td>
<td>OPEN (Vice Chair)</td>
<td>2 Proposed/Active Projects</td>
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<td>1.16 (NEW) Meteorological Aspects of Wildland Fire Response</td>
<td>OPEN (Vice Chair)</td>
<td>2 Proposed/Active Projects</td>
<td>1 Proposed/Active Projects</td>
<td>1 Proposed/Active Projects</td>
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</table>

Table 1 – ESCC Organizational Chart
Fuel, Waste, and Decommissioning Consensus Committee (FWDCC)

David Hillyer, Chair
Energy Solution

Scope: The FWDCC is responsible for the preparation and maintenance of voluntary consensus standards for the design, operation, maintenance, operator selection and training, quality requirements of new and used fuel transport, storage and related handling facilities; including high level/TRU, 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 FWDCC 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 FWDCC standards and resolve review and ballot comments.

FWDCC Membership:
David Hillyer, Chair, Energy Solutions
Jean Francois Lucchini, Vice Chair, Los Alamos National Laboratory
Sven O. Bader, Orano Federal Services, LLC
Jeffery R. Brault, Individual
Harry D. Felsher, U.S. Nuclear Regulatory Commission
Wayne Lewis, WECTEC
Coleman C. Miller, Pacific Gas & Electric Company
Mitchell Sanders, Individual
Steven W. Schithelm, BWXT, Inc.
Thomas Smedra, Westinghouse Electric Company, LLC
Maryanne Stasko, Duke Energy Corporation

Observer:
Anoop Kota, Individual

Report of FWDCC:
The FWDCC held physical meetings at the 2019 ANS Annual Meeting in Minneapolis, MN, and at the ANS Winter Meeting in Washington, DC. Jodine Jansen Vehec stepped down from the FWDCC. Thomas Smedra was approved at the Westinghouse representative in 2019.

Approved in 2019:

Active Standards/Projects (Approved PINS):

ANS-57.8, “Fuel Assembly Identification” (revision of ANSI/ANS-57.8-1995; R2017)
New and Used Fuel (Design Only) Subcommittee

**Membership:**
Mitchell Sanders, Chair, Individual
Richard Browder, Duke Energy
Rosemary Montgomery, Oak Ridge National Laboratory
John Scaglione, Oak Ridge National Laboratory

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


**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; Douglas Eisterhold, Westinghouse Electric Company, LLC; Wayne Lewis, WECTEC, Thomas Smedra, Westinghouse Electric Company, LLC; Steven Stamm, Individual

**Status:** Reaffirmation was approved by ANSI on 12/6/2019. A PINS has been approved by the FWDCC and is currently in the approval process with the Standards Board and expected to be submitted to ANSI in early 2020. Working group formation is in progress.


**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:**
Richard Browder, Chair, Duke Energy; Wayne Lewis, Vice Chair, WECTEC; Michael Akins, Worley Parsons (semi-retired); Gordon Bjorkman, Nuclear Regulatory Commission; Matthew Eyre, NETCO; Brian Gutherman, Gutherman Technical Services; Nathan Hottle, Framatome, Inc.; Christian Lobscheid, NuScale Power; Mark Peres, Fluor Nuclear Power; Mitchell Sanders, Individual; Justin Schulte, Energy Solutions; Manit Shah (Associate Member), Texas A&M University; Maryanne Stasko, Duke Energy; Gregory Suehr, University of Pittsburgh; Robert Tucker, Bechtel

**Status:** Progress has been slow due to the chair’s heavy workload.


**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.
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Membership:
Richard Browder, Chair, Duke Energy; Brian Gutherman, Vice Chair, Gutherman Technical Services; Timothy Ake, Framatome, Inc.; Michael Akins, Worley Parsons (semi-retired); Wayne Lewis, WECTEC; Christian Lobscheid, Advent Engineering Services, Inc.; John Massey, California Maritime Academy (retired); Mark Peres Fluor Enterprises, Inc.; Mitchell Sanders, Individual; Maryanne Stasko, Duke Energy; Robert Tucker, Bechtel

Status: This standard was approved by ANSI on 2/27/2018.


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 2/27/16 for lack of maintenance. Recruitment of working group members is ongoing. No activity in 2019.


Membership: OPEN

Status: Revision of historical standard being considered.


Scope: This standard describes requirements for the unique identification of fuel assemblies utilized in nuclear power plants. It defines the characters and proposed sequence to be used in assigning identification to fuel assemblies. This standard was developed primarily for commercial light-water reactor fuel, but may be used for any reactor fuel contained in discrete fuel assemblies that can be identified with a serial number as specified by this standard. Additionally, this standard describes requirements for a matrix system for identification in mapping the location of fuel rods within a fuel assembly. The matrix system establishes unique x-y coordinates for each possible rod location.

Membership:
John Scaglione, Chair, Oak Ridge National Laboratory; Caroline Duncan, Westinghouse Electric Company, LLC; Josh Jarrell, Idaho National Laboratory; Steven Maheras, Pacific Northwest National Laboratory; Robert Sachs, DOE National Laboratories; Umer Shahid (Associate Member), University of Ontario Institute of Technology

Status: Reaffirmation was approved by ANSI on 2/23/17. The working group was formed, and a PINS was approved and submitted to ANSI on 1/10/2019. The draft was completed and issued for subcommittee review in November 2019 as well as to the RP3C. Minimal comments are being addressed. The draft is expected to be issued to the FWDCC is early 2020 once copyright permission is acquired for a number of images used in the draft.

ANS-57.9, “Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)” (proposed new standard, supersedes ANSI/ANS-57.9-1992 (W2010))

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

Membership:
Mitchel Sanders, Chair, Individual; Kaushik Banerjee, Oak Ridge National Laboratory; Justin Clarity, Oak Ridge National Laboratory; Brian Gutherman, Gutherman Technical Services, LLC; William Murphy, Duke Energy

Status: A PINS was approved by the FWDCC and issued to the Standards Board. The working group expects to resolve Standards Board comments and submit the PINS to ANSI in early 2020. Work will then begin on the draft.


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:
OPEN

Status: Reaffirmation was approved by ANSI on 7/7/2016. No activity in 2019.

High Level, GTCC, Low Level and Mixed Waste Subcommittee

Membership:
OPEN, Chair
D. Mark Gerboth, AEM Consulting, LLC
Coleman Miller, Pacific Gas & Electric Company
Scott Poole, Atkins, Division of SNC Lavalin

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

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ANS-40.21, “Siting, Construction, and Operation of Commercial Low Level Radioactive Waste Burial Grounds” (inactive project being considered for resurrection)

**Scope unapproved draft PINS**: This standard provides a matrix of minimum criteria to be met in determining the siting, construction and operation of a commercial low level radioactive waste burial ground. The standard will balance siting (i.e., natural criteria), construction (i.e., engineered safeguards) and operation (i.e., acceptance criteria) to provide a safety matrix that provides for the containment of the facility.

**Membership**:  
OPEN

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

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**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**:  
D. Mark Gerboth, Chair, AEM Consulting, LLC; Mike Akins, Individual

**Status**: No activity reported in 2019.

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**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

**Status**: Reaffirmation was approved by ANSI on 6/30/2016. No activity in 2019.

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**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:
Scott Poole, Chair, Atkins, Division of SNC Lavalin; Craig Schmiesing, Framatome, Inc.

Status: Reaffirmation was approved by ANSI on 8/24/2017. Scott Poole was appointed chair of ANS-55.1, ANS-55.4, and ANS-55.6 in late 2018.


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:
Scott Poole, Chair, Atkins, Division of SNC Lavalin; Craig Schmiesing, Framatome, Inc.

Status: This standard was administratively withdrawn on 5/14/2017 for lack of maintenance. Scott Poole was appointed chair of ANS-55.1, ANS-55.4, and ANS-55.6 in late 2018.


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:
Scott Poole, Chair, Atkins, Division of SNC Lavalin; Craig Schmiesing, Framatome, Inc.

Status: This standard was administratively withdrawn on 5/13/2017 for lack of maintenance. Scott Poole was appointed chair of ANS-55.1, ANS-55.4, and ANS-55.6 in late 2018.

Decommissioning (Commercial and Research Facilities) Subcommittee

Membership:
OPEN, Chair

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

ANS-15.10, “Decommissioning of Research Reactors” (proposed reinvigoration 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: Reinvigoration of historical standard being considered.
# Fuel, Waste, and Decommissioning Consensus Committee (FWDCC) Organizational Chart

**Chair:** David Hillyer  
**Vice Chair:** Jean Francois Lucchini

<table>
<thead>
<tr>
<th>New and Used Fuel (Design Only)</th>
<th>High Level, GTCC, Low Level, and Mixed Waste</th>
<th>Decommissioning (Commercial and Research Facilities)</th>
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<tr>
<td>Mitchell Sanders, Chair</td>
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<td>Chair (TBD)</td>
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® = PINS submitted to ANSI

**Current Standards**

- **ANS-57.1-1992 (R2019)**  
  Design Requirements for Light Water Reactor Fuel Handling Systems  
  RF 12/6/2019  
  (WGC: M. Sanders)

- **ANS-57.2 (W1993) ®**  
  Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants  
  (WGC: R. Browder)

- **ANS-57.3-2018**  
  Design Requirements for New Fuel Storage Facilities at LWR Plants  
  App’d 2/27/2018  
  (WGC: R. Browder)

- **ANS-57.5 (W2016)**  
  Light Water Reactors Fuel Assembly Mechanical Design and Evaluation  
  (WGC: R. Montgomery)

- **ANS-57.7 (W2007)**  
  Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)  
  (reinvigoration being considered)  
  (WGC: Open)

- **ANS-57.8-1995 (R2017) ®**  
  Fuel Assembly Identification  
  RF 2/23/2017  
  (WGC: J. Scaglione)

- **ANS-57.9 (W2010) ®**  
  Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)  
  (WGC: M. Sanders)

- **ANS-57.10-1996 (R2016)**  
  Design Criteria for Consolidation of LWR Spent Fuel  
  RF 7/7/2016  
  (WGC: Open)

**Proposed/Active Projects**

- **ANS-15.19 (W2001)**  
  Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactor  
  (reinvigoration being considered)  
  (WGC: Open)

- **ANS-40.21**  
  Siting, Construction, and Operation of Commercial Low Level Radioactive Waste Burial Grounds  
  (reinvigoration being considered)  
  (WGC: Open)

- **ANS-40.35 (W2001)**  
  Volume Reduction of Low-Level Radioactive Waste or Mixed Waste  
  (WGC: M. Gerboth)

- **ANS-40.37-2009 (R2016)**  
  Mobile Low-Level Radioactive Waste Processing Systems  
  RF 6/30/2016  
  (WGC: C. Miller)

- **ANS-55.1-1992 (R2017)**  
  Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants  
  RF 8/24/2017  
  (WGC: S. Poole)

- **ANS-55.4 (W2017)**  
  Gaseous Radioactive Waste Processing Systems for Light Water Reactor Plants  
  (WGC: S. Poole)

- **ANS-55.6 (W2017)**  
  Liquid Radioactive Waste Processing System for Light Water Reactor Plants  
  (WGC: S. Poole)

**Table 2 – FWDCC Organizational Chart**

40
Large Light Water Reactor Consensus Committee (LLWRCC)

C.E. (Gene) Carpenter, Chair
U.S. Department of Energy

Scope: The LLWRCC is responsible for the preparation and maintenance of voluntary consensus standards for 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:

- Large Light Water Reactor and Reactor Auxiliary Systems Design
- Power Generation and Plant Support
- 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:

C.E. (Gene) Carpenter, Chair, U.S. Department of Energy
William Reuland, Vice Chair, Individual
Robert Becse, Westinghouse Electric Company, LLC
Robert Burg, Engineering Planning & Management, Inc.
Lowell T. Christensen, Bechtel Nuclear
Mark Colby, Global Nuclear Fuel - Americas
James B. Florence, Nebraska Public Power District
Michelle French, WECTEC
Darrell Gardner, Kairos Power LLC
Steven W. Gebers, Quantum Nuclear Services
James P. Glover, Graftel, Inc.
Pranab K. Guha, U.S. Department of Energy
Earnestine Johnson-Turnipseed, Entergy Corporation
Mark A. Linn, Oak Ridge National Laboratory
Evan M. Lloyd, Exitech Corporation
Ronald Markovich, Contingency Management Consultant
Timothy K. Meneely, Westinghouse Electric Company, LLC
Charles H. Moseley, Jr., ASME NQA Liaison (Individual)
Steve Routh, Bechtel Power Corporation
Steven L. Stamm, Individual

Observers:
J. Mike Bonfiglio, Framatome, Inc.
R. Michael Ruby, Individual
James C. Saldarini, Advanced Reactor Concepts, LLC

Report of LLWRCC:
The LLWRCC held three teleconferences (March, May, and September) and a physical meeting was held during the 2019 ANS Winter Meeting in Washington, DC, on November 18.
Approved in 2019:


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 title)” (proposed new standard)


ANS-56.8, “Containment System Leakage Testing Requirements” (revision of ANSI/ANS-56.8-2002; R2011; R2016)


Light Water Reactor and Reactor Auxiliary Systems Design Subcommittee

Membership:

OPEN, Chair
Michelle French, Chair, WECTEC
Kenneth Geelhood, Pacific Northwest National Laboratory
Earnestine Johnson-Turnipseed, Entergy Corporation
Mark Linn, Oak Ridge National Laboratory
Kent B. Welter, Nuscale Power, Inc.

The Light Water Reactor and Reactor Auxiliary Systems Design Subcommittee manages the following projects and current standards:


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.

**Scope:** This standard has technology-neutral elements but is intended for use in designing and licensing new commercial light-water reactor designs under 10 CFR Part 50 or Part 52. It provides requirements for using risk-informed, performance-based (RIPB) methods to support (1) definition of top-level design requirements, (2) licensing basis event selection, (3) design basis safety analysis, (4) probabilistic risk assessments, (5) severe accident analysis, (6) classification and categorization of structures, systems, and components, (6) programmatic defense-in-depth, (7) cost reduction measures that can be achieved by RIPB design methods, and (8) risk-informed decision analysis. This standard may be applied in whole or in part to operating reactors at the discretion of the designer and operator.

**Membership:**
Kent B. Welter, Chair, NuScale Power, LLC; David Blanchard, Applied Reliability Engineering, Inc.; Donald Dube, Individual; Ernest Elliott, N3B – Los Alamos; Paul Sicard, Entergy; Donald Spellman, Xcel Engineering; Douglas Van Bossuyt, Naval Postgraduate School; Patrick White, Massachusetts Institute of Technology; Cindy Williams, NuScale Power

**Status:** The PINS was submitted to ANSI on 1/10/2018. The draft was issued for subcommittee review as well as to the RARCC, JCNRM SCoRA, and RP3C. The working group is addressing received comments.


**Scope:** This standard is applicable to pressurized light water reactor nuclear power plants using auxiliary feedwater for emergency applications. Small modular plants are not considered in the scope of this document.

This standard sets forth the nuclear safety-related functional requirements, performance requirements, design criteria, design requirements for testing and maintenance, and interfaces for the nuclear safety-related portion of the auxiliary feedwater system (AFS) of pressurized water reactor (PWR) plants.

**Membership:**
Earnestine Johnson-Turnipseed, Chair, Entergy Corporation; Ralph Hill, Individual

**Status:** Reaffirmation was approved by ANSI on 8/13/2018. The draft was issued to LLWRCC for ballot in early 2016. Comment resolution is nearing completion.


**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.

**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.


**Membership:**
OPEN, Chair; Robert Burg, Engineering Planning and Management, Inc.; Tim Dodson, Engineering Planning & Management, Inc.; Matthew Hertel (Associate Member), ASML; Ethan Hunt, Nuclear Energy Consultants, Inc.; Earnestine Johnson-Turnipseed, Entergy; Prasad Kadambi, Individual; Cherie Paugh, Westinghouse Electric Company, LLC

**Status:** Reaffirmation was approved by ANSI on 2/12/15. 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. Robert Andre resigned as working group chair. The standard will be considered by the working group for revision with risk-informed insights once a new chair is found.


**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

**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.


**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, Oak Ridge National Laboratory; David Blanchard, Applied Reliability Engineering; Paul Sicard, Entergy; Russell Williston, Individual

**Status:** The standard was reaffirmed by ANSI on 1/12/2017. No activity in 2019.

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**Power Generation and Plant Support Systems Subcommittee**

**Membership:**
OPEN, Chair  
Robert Burg, Vice Chair, Engineering Planning & Management, Inc.  
Mark Dooley, Individual  
James Glover, Graftel, Inc.  
Margaret Harding, 4 Factor Consulting, LLC  
Earnestine Johnson-Turnipseed, Entergy  
Donald Spellman, Excel Engineering  
Dong Zheng, Bechtel Power Corporation

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

**ANS-56.1, “Containment Hydrogen Control” (Title TBD) (proposed new standard)**

**Scope:** In development.

**Membership:**
Earnestine Johnson-Turnipseed, Chair, Entergy; James Bradford, Southern Nuclear Operating Company; Joseph Halackna, Westinghouse Electric Company, LLC; Robert McGowan, True North Consulting, LLC; Glenda Patzch-Velasquez, DTE Energy

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

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**Scope from historic standard:** This standard specifies minimum design, actuation, testing, and maintenance requirements for the containment isolation of fluid systems after a 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 isolation requirements for events other than LOCAs.

**Membership:**
Earnestine Johnson-Turnipseed, Chair, Entergy; James Bradford, Southern Nuclear Operating Company; Joseph Halackna, Westinghouse Electric Company, LLC; Robert McGowan, True North Consulting, LLC; Glenda Patzch-Velasquez, DTE Energy

**Status:** A PINS was submitted to ANSI on 6/27/2019. The draft is currently in development.

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.


Status: Dong Zheng accepted the working group chair position in 2017. A PINS is needed to initiate a historical revision.


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: Donald Spellman, Chair, Excel Engineering; Robert Burg, Engineering, Planning & Management, Inc.; Anthony Trupiano, Westinghouse Electric Company, LLC

Status: The standard was administratively withdrawn on 2/21/2019. Consideration is being given to initiate a historical revision.


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: Robert Burg, Chair, Engineering Planning & Management, Inc.; Todd Anselmi, Enercon Services, Inc.; James August, Southern Nuclear Operating Company; Chad Boyer, WECTEC; Raul Hernandez, U.S. Nuclear Regulatory Commission; Matthew Hertel (Associate Member), Individual; Edward Knuckles, Individual; William Reuland, Individual

Status: The PINS was approved by the consensus committee and the Standards Board and submitted to ANSI 1/10/2019.


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:**
Mark Dooley, Chair, Individual

**Status:** Reaffirmation received ANSI approval 6/19/15. New chair assigned in 2017. No activity reported in 2019.

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**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:**
Mark Dooley, Chair, Individual

**Status:** Reaffirmation received ANSI approval 6/16/15. New chair assigned in 2017. No activity reported in 2019.

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ANS-60.1, “Export Control Standard” (Title TBD) (proposed new standard)

**Scope:** In development.

**Membership:**
Margaret Harding, Chair, 4 Factor Consulting, LLC; Chelsea Gunter, Gibson, Dunn & Crutcher LLP; Erik Slobe (Associate Member), The Webb Law Firm

**Status:** Margaret Harding accepted the working group chair position in 2016 and is forming the working group. A draft PINS was prepared and is under review by the working group. No activity reported in 2019.

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Simulators, Instrumentation, Control Systems, and Software Testing Subcommittee

**Membership:**
Pranab Guha, Chair, U.S. Department of Energy
Lowell Christensen, Vice Chair, Bechtel Corporation
James August, Southern Nuclear Operating Company
James Florence, Nebraska Public Power District
James Glover, Graftel, Inc.
Huafei (Harry) Liao, Sandia National Laboratories
Evan Lloyd, Exitech Corporation
Michael Muhlheim, Oak Ridge National Laboratory
Julie Sickle, Exelon Corporation
Kashmir Singh, EDF Energy
Marion Smith, Nuclear Innovation North America
Barbara Stevens, Exelon Corporation

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

**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:**
Julie Sickle, Chair, Exelon Corporation; Ted Amundson, Southern Nuclear Operating Company; Scott Bauer, Nuclear Energy Institute; Hamer Carter, Progress Energy; Theodore Green, Arizona Public Service; Jerry Hiatt, Nuclear Energy Institute; Richard Hons, Southern Nuclear Operating Company; Lauren Kent, U.S. Nuclear Regulatory Commission; Timothy Kolb, U.S. Nuclear Regulatory Commission; Michael Llewelyn, Individual; Gregg Ludlam, Exelon Corporation; Elizabeth McAndrews-Benavides, Nuclear Energy Institute; Joseph Murray, Public Service Electric and Gas Company; Chuck Sizemore, Florida Power & Light; Greg Sparks, Entergy; Geoffrey Steele, South Carolina Electric and Gas; John Suptela, Duke Energy; Sam Wender, First Energy Nuclear Operating Company

**Status:** The standard was approved by ANSI on 11/20/2014. 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. A reaffirmation is in progress and expected to be approved by ANSI in early 2020.


**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:**
Marion Smith, Chair, Nuclear Innovation North America; Clint Eldridge, Vice Chair, Diablo Canyon; Mark Harvey, Unistar/Constellation; Michael Hayse, Exelon Nuclear; Michael Janus, Progress Energy; Charles H. Moseley, Individual; Thomas Niessen, Tennessee Valley Authority; Paul Prescott, U.S. Nuclear Regulatory Commission; George Reed, PSEG Nuclear LLC; Kerry Rhoads, Dominion; Richard Rogalski, Individual; Stanley Stasek, Detroit Edison Company; Richard Sweigart, Duke Energy; Donato Visco, Arizona Public Service Co.; Thomas White, Entergy Nuclear; Dennis Winchester, Exelon

**Status:** The standard was reaffirmed on 4/4/2017. The working group is being reformed to address the next maintenance cycle.


**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:**
Barbara Stevens, Chair, Exelon Corp.; George Rombold, Vice Chair, Scientech Inc.; Michael Ardaiz, U.S. Department of Energy, Sam Hansell, Exelon Corporation; Thomas Jetzer, Occupational Medicine Consultants; Laurie Kubec, NextEra Energy Corp.; Hironori Peterson, U.S. Nuclear Regulatory Commission; Julianne Peterson,

**Status:** This standard was approved by ANSI on 4/29/2013 and was reaffirmed on 7/2/2018. 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.


**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, Nebraska Public Power District-Cooper; Keith Welchel, Secretary, Individual; F. J. (Butch) Colby, Editor, Individual; Theresa Buchanan, U.S. Nuclear Regulatory Commission; Shih-Kao Chang, Individual; William Fraser, Individual; Robert Goldman, Individual; David Goodman, Luminant; Dennis Koutouzis, Institute of Nuclear Power Operations; Jody Lawter, South Carolina Electric & Gas; George McCullough, GSE Systems, Inc.; Mac McDade, Progress Energy–Harris Nuclear Plant; Michael Petersen, Excel Energy; Pablo Rey, Tecnatom, S.A.; James Sale, Individual; Frank A. Tarselli, Individual; Lawrence Vick, Individual; Dong (Allen) Wang, Shandong Nuclear Power Company Ltd.

**Status:** ANSI-3.5-2009 was withdrawn on 9/19/2019. 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).

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.

**Members:**

**Status:** The PINS was submitted to ANSI on 12/14/2018. The working group is holding regular teleconference to work on the draft.
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, Southern Nuclear Operating Company; Odunayo Ayegbusi, U.S. Nuclear Regulatory Commission; James Halderman, Bechtel Power Corporation; N. Prasad Kadambi, Individual; Herbert Massie, Massie Consulting, LLC; Dong Thai Nguyen, Southern Nuclear Operating Company; Mark Paul, Individual; Andrei Smirnov, Ariadne LLC; Shilp Vasavada, 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 2016-2018 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 was too regulatory oriented to be useful to industry. We have reconstituted the approach to “RAP” and are in the process of reforming the working group. The entire process has been reviewed and evaluated for continued need and utility.

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; F. Mitch McCrory, Vice Chair, Sandia National Laboratories; Sacit Cetiner, Oak Ridge National Laboratory; Ralph Branscomb, Florida Power & Light; Ronald Cole, Enercon Federal Services; Shannon Eggers, Idaho National Laboratory; Nathan Faith Exelon Generation Corporation, LLC; Marvin Heart, Kinectrics; Gregory Hudson, Metcalfe PLC; Eric Lee, U.S. Nuclear Regulatory Commission; Frederich McCrory, Sandia National Laboratories; Ted Quinn, Technology Resources; Michael Rowland, Sandia National Laboratories; Steven Stamm, Individual; Barry Westreich, Westreich Group, LLC; Michael Woodridge, Curtiss-Wright Corporation; Robert Youngblood, Idaho National Laboratory; Fan Zhang (Associate Member), University of Tennessee

**Status:** Limited progress has been made since the committee made a presentation to the Standards Board in 2016. The working group is collaborating with JCNRM to produce a guidance document for nuclear power plants. In 2019, Michael Muhlheim replaced Sacit Cetiner as chair of the working group. A PINS is in development for consensus committee approval.


**Scope:** This standard specifies acceptable primary containment leakage rate test requirements to assure valid testing. The scope includes (1) Leakage test requirements; (2) Test instrumentation; (3) Test procedures; (4) Test methods; (5) Acceptance criteria; (6) Data analysis; (7) Inspection and recording of test results.

**Membership:**
James Glover, Chair, Graftel Inc.; Jerome Bettle, U.S. Nuclear Regulatory Commission; Kenneth Clark, Individual; Alexis Courtois, Electricite de France; Mark Gowan, 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; Murray Jennex, University of Arizona; Steven Leighty, Westinghouse Electric Company, LLC; Daniel Oakley, Exelon Corporation; Babul Patel, Consultant
Status: Reaffirmation was approved by ANSI on 5/26/2016. An erratum was issued in April 2018 to correct typographical errors in a formula in Appendix F of the standard. The contents of the proposed revision are complete. The working group chair is going through the draft to check formatting and final details before sending the draft to the working group for final comments and a vote. The draft should be ready for ballot in early 2020.


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:

Status: This standard was approved by ANSI on 8/8/2019.

Emergency Planning and Response Subcommittee

Membership:
Ronald Markovich, Chair, Contingency Management Consulting
Steven Gebers, Vice Chair, Quantum Nuclear Services
Evan Lloyd, Exitech Corporation
Manit Shah, Texas A&M University

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


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 incorporated ANS-3.8.5), and ANS-3.8.7. A decision was made to initiate ANS-3.8.7 as a risk-informed, performance-based (RIPB) standard as a pilot. No industry interest. No activity in 2019.

The chair questions whether there is a need to keep open the 3.8 series standards as both the commercial nuclear and DOE haven't expressed interest in participating. Should this subject matter area (EP) be shelved for the present time until such time as interest is renewed?


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; William Froh, U.S. Department of Energy; Kevin Keyes, Department of Homeland Security; 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 incorporated ANS-3.8.5), and ANS-3.8.7. A decision was made to initiate ANS-3.8.7 as a risk-informed, performance-based (RIPB) standard as a pilot. No industry interest. No activity in 2019.

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**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; David Freshwater, U.S. Department of Energy; Richard J. Stuhler, U.S. Department of Energy; Kevin Keyes, Department of Homeland Security; 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 incorporated ANS-3.8.5), and ANS-3.8.7. No industry interest. No activity in 2019.

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**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; Lori Thomas, U.S. Department of Energy; Mohammad Pourgol-Mohammad, FM Global

**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 incorporated ANS-3.8.5), and ANS-3.8.7. No industry interest. No activity in 2019.

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**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; Stephen Luckett, U.S. Department of Energy; Steve Hook, Individual; William Renz, Entergy Nuclear; Kevin Keyes, Department of Homeland Security; Steven Erickson, Contingency Management Consulting Group, LLC; Martin Hug, Nuclear Energy Institute; Scott McCain, EP Tec, Inc.; Randy Sullivan, U.S. Nuclear Regulatory Commission; Donald Tailleart, U.S. Nuclear Regulatory Commission

Status: ANS-3.8.7 is the standard to be developed as a pilot for the proposed emergency preparedness standards; it is a document to be used by both the commercial nuclear industry and DOE. The concept continues to be for the ANS commercial nuclear membership to develop the standard (since the NRC new rulemaking addressed this area) and then present to the ANS Department of Energy membership for incorporation of their requirements. Unfortunately, continued push back has been received by the commercial nuclear industry, thru NEI, stating that they will not participate in development of the standard. NEI issued a letter on October 23, 2012, to ANS indicating their disapproval of development of this standard and requesting that ANS not develop one. Additionally, the industry, through INPO, are in the process of development of an industry drill and exercise manual. After internal discussions, ANS determined it would continue with the development of the emergency preparedness standards citing that ANS has multiple customers, not only the commercial nuclear industry, and issued its response in a letter dated December 17, 2012. As such, the ANS-3.8.7 membership re-engaged in the finalization of the standard. A draft has been completed which includes the NRC new rulemaking requirements and has been through internal review as well as NRC review and incorporation of its comments. Team members have been in the process of engaging DOE to provide input to the draft standard, however no success. Hence the standard is on hold pending DOE involvement. Issuance of this standard without DOE involvement would not serve a purpose as the commercial nuclear industry is not supportive of its development/issuance. No activity in 2019.
### Table 3 – LLWRCC Organizational Chart

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<thead>
<tr>
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<tbody>
<tr>
<td><strong>Chair:</strong> Michelle French</td>
<td><strong>Chair:</strong> OPEN</td>
<td><strong>Chair:</strong> Pranab Guha</td>
<td><strong>Chair:</strong> Ronald Markovich</td>
</tr>
<tr>
<td><strong>Vice Chair:</strong> OPEN</td>
<td><strong>Vice Chair:</strong> Robert Burg</td>
<td><strong>Vice Chair:</strong> Lowell Christensen</td>
<td><strong>Vice Chair:</strong> Steven Gebers</td>
</tr>
<tr>
<td>3 = Projects</td>
<td>5 = Projects</td>
<td>3 = Projects</td>
<td>5 = Projects</td>
</tr>
<tr>
<td>4 = Current Standards</td>
<td>3 = Current Standards</td>
<td>6 = Current Standards</td>
<td>0 = Current Standards</td>
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- ANS-56.1 (NEW) Containment Hydrogen Control (WGC: J. Glover)

- ANS-3.2-2012 (R2017) Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of NPPs RF 4/4/2017 (WGC: M. Smith)

- ANS-3.4-2013 (R2018) Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants RF 7/2/2018 (WGC: B. Stevens)

- ANS-3.5-2018 Nuclear Power Plant Simulators for Use in Operator Training and Examination Approved 10/10/2019 (WGC: J. Florence)


- ANS-60.1 (NEW) Export Control Standard (Title TBD) (WGC: M. Harding)

Nonreactor Nuclear Facilities Consensus Committee (NRNFCC)

James O’Brien, Chair
U.S. Department of Energy

Scope: The NRNFCC is responsible for the preparation and maintenance of voluntary consensus standards for 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:

James O’Brien, Chair, U.S. Department of Energy
Jeffery R. Brault, Vice Chair, Individual
Todd M. Anselmi, Enercon Services, Inc.
Robert A. Bari, Brookhaven National Laboratory
Lawrence Berg, U.S. Department of Energy
Robert G. Eble, Jr., Individual
Mukesh K. Gupta, Amentum Technical Services
H. M. Hashemian, AMS Corporation
(Alt: Adam Deatherage, AMS Corporation)
Jerry E. Hicks, Individual
Roman Kazban, Defense Nuclear Facilities Safety Board
Margaret Kotzalas, U.S. Nuclear Regulatory Commission
Charles Martin, Longenecker and Associates, Inc.
Herbert W. Massie, Jr., Individual
Carl A. Mazzola, Project Enhancement Corporation
Mohammad Modarres, University of Maryland
Paul Rogerson, Bechtel Power Corporation

Report of NRNFCC:
The NRNFCC held two conference calls (May, August) a meeting on November 16, 2019, at the ANS Winter Meeting in Washington, DC. Lawrence Berg, H.M. Hashemian and Paul Rogerson joined the NRNFCC in 2019.

Approved in 2019:
No projects were approved in 2019.

Active Standards/Projects (Approved PINS):

ANS-3.14, “Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities” (proposed new standard)

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

The NRNFCC supervises the work of the following projects:

ANS-3.14, “Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities” (proposed 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, Enercon Services, Inc.; Craig McMullin, Co-Chair, Savannah River National Laboratory; Mark Blackburn, U.S. Department of Energy; Joseph Crociata, Consolidated Nuclear Security, LLC; Frederic Grant, Simpson Gumpertz & Heger Inc.; William Gunther, Brookhaven National Laboratory; James Heffner, U.S. Department of Energy; Margie Kotzalas, U.S. Nuclear Regulatory Commission; Cailyn Ludwig (Associate Member), Purdue University; Herbert Massie, Massie Consulting, LLC; Michael Mudlock, Simpson Gumpertz & Heger, Inc.; James O'Brien, U.S. Department of Energy; Brian Smith, U.S. Nuclear Regulatory Commission; James Wittkop, Nuclear Fuel Services, Inc.

**Status:** A PINS for the proposed new standard was submitted to ANSI on 1/29/2014. The draft was issued to the NRNFCC for ballot on 7/9/2019 with a close date of 9/7/2019. A number of comments along with a few negative votes were received. The working group is addressing comments.

**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:**
Robert Eble, Chair, Individual; Sven Bader, Orano Federal Services LLC; Robert Faris, Westinghouse Electric Company, LLC; Chelsea Gunter (Associate Member) Gibson, Dunn & Crutcher LLP; Thomas Hiltz, U.S. Department of Energy; Gary Kaplan, RSL Safety; Margie Kotzalas, U.S. Nuclear Regulatory Commission; Alexander Lang, Global Nuclear Fuel; Calvin Manning, Framatome, Inc.; Arielle Miller, Defense Nuclear Facilities Safety Board; Wyatt Padgett, Urenco; Robert Pierson, Tanager Technology, LLC; April Smith, U.S. Nuclear Regulatory Commission

**Status:** A PINS was submitted to ANSI on 2/27/2013 with a revision resubmitted to ANSI on 2/25/2021. 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 is struggling to address all comments.


**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:**
Paul Rogerson, Chair, Bechtel Power Corporation; Randy Bunt, Southern Nuclear Operating Company; Doug Clark, Consolidated Nuclear Security; David Cook, Individual; Gerald Couture, Westinghouse Electric Company, LLC; Pranab Guha, U.S. Department of Energy

**Status:** The standard was approved 9/4/2014. Paul Rogerson accepted the chair position in May 2018. A reaffirmation is expected to be initiated in early 2020.
<table>
<thead>
<tr>
<th>#</th>
<th>Standard Number</th>
<th>Standard Title</th>
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<td>Integrated Safety Assessments for Fuel Cycle Facilities</td>
<td>Active Project</td>
<td>(WGC: R. Eble)</td>
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**Table 4 – NRNFCC List of Standards/Projects**

@ = PINS submitted to ANSI
Nuclear Criticality Safety Consensus Committee (NCSCC)

Larry L. Wetzel, Chair
BWX Technologies, Inc.

Scope: To develop standards for determining the potential for nuclear criticality of fissile fissionable material outside reactors, for the prevention of accidental criticality, and for coping with accidents should they occur.

NCSCC Membership:
Larry L. Wetzel, Chair, BWX Technologies, Inc.
William R. Shackelford, Vice Chair, Nuclear Fuel Services, 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, N3B – Los Alamos
Calvin M. Hopper, Individual
Kevin Kimball, Individual
Ronald A. Knief, INMM Representative (employed by Sandia National Laboratories)
John A. Miller, Sandia National Laboratories
Scott P. Murray, HPS Representative (employed by General Electric Co.)
Richard G. Taylor, C.S. Engineering, Inc.
Robert E. Wilson, U.S. Department of Energy

Observer:
R. Michael Westfall, Individual

Report of NCSCC:
The NCSCC had a teleconference on April 2, 2019, and held a meeting at the ANS Winter Meeting in Washington, DC, on November 16, 2019. Robert Eby resigned from the NCSCC effective 2/6/2019. Thomas Marenchin stepped down from the NCSCC effective 10/16/2019 when he changed employment from the U.S. Nuclear Regulatory Commission to the U.S. Department of Energy.

Approved in 2019


Active Standards/Projects (Approved PINS):
ANS-8.3, "Criticality Accident Alarm System" (revision of ANSI/ANS-8.3-1997; R2003; R2012; R2017)

ANS-8.7, "Nuclear Criticality Safety in the Storage of Fissile Materials" (revision of ANSI/ANS-8.7-1998; R2007; R2012)


ANS-8.22, Nuclear Criticality Safety Based on Limiting and Controlling Moderators

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

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

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 consensus committee N16, Nuclear Criticality Safety.

Membership:
Douglas Bowen, Chair, Oak Ridge National Laboratory
Kevin Reynolds, Vice Chair, Consolidated Nuclear Security, LLC
Michael Crouse, Secretary, Consolidated Nuclear Security, LLC
James Baker, Spectra Tech, LLC
Marvin Barnett, Savannah River Nuclear Solutions
Nicholas Brown, Nuclear Fuel Services, Inc.
Ernest Elliott, N3B – Los Alamos
David Erickson, Savannah River Nuclear Solutions
Christopher Haught, Consolidated Nuclear Security
Thomas McLaughlin, Individual
James Morman, Argonne National Laboratory
Lon Paulson, GE Hitachi/Global Nuclear Fuel Americas
Catherine Percher, Lawrence Livermore National Laboratory
Andrew Prichard, Pacific Northwest National Laboratory
Christopher Tripp, Tripp Nuclear Consulting Services
Dominic Winstanley, Sellafield Ltd. (UK)

Observers:
Peter Angelo, Consolidated Nuclear Security, LLC
Jeffrey Chapman, Oak Ridge National Laboratory
Jerry Hicks, Individual
Deborah Hill, National Nuclear Laboratory, U.K.
Kevin Kimball, Individual
Ronald Knief, Sandia National Laboratories
Dale Lancaster, NuclearConsultants.com
John Miller, Sandia National Laboratories
Jeremy Munson, U.S. Nuclear Regulatory Commission
William Myers, Los Alamos National Laboratory
Charles Rombough, CTR Technical Services, Inc.
Fissionable Material Outside Reactors Subcommittee (ANS-8) Report:

The ANS-8 Subcommittee held a standards forum at the ANS Annual Meeting in Minneapolis, MN, in June, and the ANS Winter Meeting in Washington, DC, in November 2019. An ANS-8 Subcommittee meeting was conducted at the ANS Winter Meeting to discuss internal ANS-8 business and special projects such as to provide basis statements for each standards requirement and recommendation as a reference for the next generation of working group members to assist with inquiries and standards revisions. ANSI/ANS-8.15-2014 (R2019), ANSI/ANS-8.17-2004 (R2019), and ANSI/ANS-8.19-2014 (R2019) were reaffirmed to prepare for revisions. A request for clarification for ANSI/ANS-8.3-1997 (R2017) was approved in August 2019. The draft of new standard ANSI/ANS-8.28-202x, “Administrative Practices for the Use of Nondestructive Assay Measurements for Nuclear Criticality Safety,” was completed in March and was submitted to ANS-8 for review and comment. The ballot did not pass; however, the ANS-8 comments were valuable and are currently being resolved for another ballot in early 2020. The PINS for ANSI/ANS-8.22-202x, “Nuclear Criticality Safety Based on Limiting and Controlling Moderators,” was submitted to ANSI on November 6, 2019. As standards are being prepared for revision, the ANS-8 Subcommittee Chair has asked all working group chairs to document the basis for each recommendation and requirement in a working document to be located on the standards workspace on Collaborate for use by current and new working group members.

Current Standards and Active Projects:


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 233U, 235U, or 239Pu, 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, Nuclear Fuel Services; Douglas Bowen, Oak Ridge National Laboratory; Andrew Arend (Associate Member), U.S. Department of Energy; Katherine Golouglu, C.S. Engineering, Inc.; Chris Haught, Consolidated Nuclear Solutions, LLC; Jerry Hicks, Individual Tom Marenchin, National Nuclear Security Administration; Joshua Marshall, Nuclear Fuel Services, Inc.; Arielle Miller (Associate Member); John Miller, Sandia National Laboratories; James Morman, Argonne National Laboratory; Dallas Moser (Associate Member), Y-12 National Security Complex; Quentin Newell (Associate Member), Urenco USA; David Pilgrim, Canadian Nuclear Laboratories; Andrew Pritchard, Pacific Northwest National Laboratory; Kevin Reynolds, Consolidated Nuclear Security, LLC; Ellen Saylor, Oak Ridge National Laboratory; Matthew Wilson, Paschal Solutions, Inc., Fred Winstanley, Sellafield Ltd.; Ning Zhang (Associate Member), Los Alamos National Laboratory

Status: Reaffirmation of this standard was approved on 11/28/2018. The PINS was resubmitted to ANSI on 11/29/2018 after the 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. Additional volunteers have been identified and are being included in the effort. A suggested change to some of the wording is being considered to address comments from the CSSG regarding catastrophic events and how response to them fits into criticality safety.


Scope: This standard is applicable to all operations involving fissionable materials in which inadvertent criticality can occur and cause personnel to receive unacceptable exposure to radiation. This standard is not applicable to detection of criticality events where no excessive exposure to personnel is credible, nor to nuclear reactors or critical experiments. This standard does not include details of administrative actions or of emergency response actions that occur after alarm activation.
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Membership:
Jerry Hicks, Chair, Individual; Peter Angelo, Consolidated Nuclear Security, LLC; James Baker, Spectra Tech, Inc.; Lawrence Berg, U.S. Department of Energy; Douglas Bowen, Oak Ridge National Laboratory; Kermit Bunde, U.S. Department of Energy; Konner Casanova, Idaho National Laboratory; Jeffrey Chapman, Oak Ridge National Laboratory; Joseph Christianson, U.S. Department of Energy; Theresa Cutler, Los Alamos National Laboratory; Matthieu Duluc, Institute for Radiological Protection & Nuclear Safety; Ed Kendall, Individual; John Kirkpatrick, Mirion Technologies Inc.; Thomas McLaughlin, Individual; James Miller-Marquez, Naval Nuclear Laboratory; Andrew Prichard, Pacific Northwest National Laboratory; Wade Scates, Idaho National Laboratory; Timothy Sippel, U.S. Nuclear Regulatory Commission; Jingjie Wang, Canadian Nuclear Laboratories; William Zywiec (Associate Member), Lawrence Livermore National Laboratory

Status: Reaffirmation received ANSI approval 10/25/17. The reaffirmation was processed to keep the standard current while the revision is completed. The revised draft will be ready for ANS-8 for a second review in 2020. A response to an inquiry was prepared and approved in 2019.


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 $^{235}$U, $^{239}$Pu, or $^{233}$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: Reaffirmation received ANSI approval on 11/14/2017. If a revision of the standard is necessary, the working group will have to be reconstituted. No activity in 2019.


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:
William Myers, Chair, Los Alamos National Laboratory; Ernie Elliott, N3B – Los Alamos; Jerry Hicks, Individual; Chris Haught, Consolidated Nuclear Security, LLC; Jesson Hutchinson, Los Alamos National Laboratory; John Miller, Los Alamos National Laboratory; Norman Schwers, Sandia National Laboratories


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

Membership:
Kevin Kimball, Chair, Individual; James Baker, Spectra Tech, Inc.; Kermit Bunde, U.S. Department of Energy; Theresa Cutler, Los Alamos National Laboratory; Denise Edwards, U.S. Nuclear Regulatory Commission; William Gerding, Veolia Nuclear Solutions; Christy Gibson, Consolidated Nuclear Security, LLC; Ed Kendall, Individual; James
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Kuropatwinski, Los Alamos National Laboratory; Ellen Saylor, Oak Ridge National Laboratory; Brittany Williamson, Savannah River Nuclear Solutions; Travis Wilson (Associate Member), Consolidated Nuclear Security, LLC

Status: Reaffirmation was approved by ANSI on 12/14/2017. The PINS for a revision was submitted to ANSI on 10/1/2016 and resubmitted 12/15/2017 after the reaffirmation. The standard is under revision to incorporate reaffirmation comments and ensure consistency with other ANS-8 standards. The working group communicated through the year via teleconference. The draft was originally planned for 2019, but this has been extended to 2020.


Scope: This standard provides criteria that may be used for operations outside of nuclear reactors with $^{235}U$, $^{233}U$, $^{239}Pu$, 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, Pacific Northwest National Laboratory; Linda Andrews, Framatome, Inc.; James Baker, Spectra Tech, Inc.; Douglas Bowen, Oak Ridge National Laboratory; Jason Crye (Associate Member), Consolidated Nuclear Security, LLC; Theresa Cutler, Los Alamos National Security, LLC; Jerry Hicks, Individual; Darby Kimball, Lawrence Livermore National Laboratory; Thomas McLaughlin, Individual; Lon Paulson, GE Hitachi, Nuclear Energy

Status: The revision of ANSI/ANS-8.10-1983 (R2012) was approved by ANSI on 2/12/15. A reaffirmation of the standard will be initiated in January 2020 with a revision to follow to address evacuation in the standard. A PINS will need to be prepared for the revision.


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% $^{235}U$. 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, Chair, Tripp Nuclear Consulting Services; Tracy E. Stover, Vice Chair, Savannah River Nuclear Solutions, LLC; Debdas Biswas, Lawrence Livermore National Laboratory; Kermit Bunde, Department of Energy, Robert Eble, Individual; Katherine McCurry, U.S. Nuclear Regulatory Commission; Dennis Mennerdahl, E. Mennerdahl Systems; Arielle Miller (Associate Member), Defense Nuclear Facilities Safety Board; Quentin Newell (Associate Member), URENCO USA; Scott Revolinski, Nuclear Safety Associates; Dominic Winstanley, Sellafield-UK

Status: Reaffirmation received ANSI approval 5/16/2016. A PINS for the revision was submitted to ANSI on 9/27/2007 and resubmitted after subsequent reaffirmations with the last submittal being 5/16/2016. The ANS-8.12 standard was first approved in July 1978 and was revised in 1987. It was reaffirmed in 2002, 2011, and most recently in 2016. 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.

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

Status: The standard received ANSI approval of a reaffirmation on 6/29/16. Kristan Wessels took over as working group chair effective 7/1/2019 replacing Lawrence Berg.


Scope: This standard is applicable to operations with the following nuclides: ²³²U, ²³⁴U, ²³⁷Np, ²³⁸Pu, ²⁴⁰Pu, ²⁴¹Pu, ²⁴³Am, ²⁴⁴Am, ²⁴⁷Am, ²⁴⁶Cm, ²⁴⁷Cm, ²⁴⁸Cm, ²⁴⁹Cm, ²⁵⁰Cm, ²⁴⁹Cf, and ²⁵¹Cf. Subcritical mass limits are presented for isolated units. The limits are not applicable to interacting units.

Membership: Charles Rombough, Chair, CTR Technical Services, Inc.; Hiroshi Okuno, Japan Atomic Energy Research Institute; Timothy Sippel, U.S. Nuclear Regulatory Commission; R. Michael Westfall, Oak Ridge National Laboratory; 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.


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: Ellen Saylor, Chair, Oak Ridge National Laboratory; Dale Lancaster, NuclearConsultants.com; Calvin Manning, Framatome, Inc.; William Marshall, Oak Ridge National Laboratory; Austin McGee (Associate Member), Consolidated Nuclear Facilities, LLC; Kristina Spencer (Associate Member), Los Alamos National Laboratory

Status: Reaffirmation received ANSI approval on 7/28/14 and a reaffirmation on 9/12/2019. Ellen Saylor accepted the working group chair position for this project in February 2018.


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; Kelsey Amundson (Associate Member), Defense Nuclear Safety Board; James Baker, Spectra Tech, LLC; Matthew Chapa (Associate Member), Consolidated Nuclear Security, LLC; Jerry Hicks, Individual; Ronald Knief, Sandia National Laboratories; Sandi Larson,21 Consulting Group Inc.; Jennifer
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Lyons, Pacific Northwest National Laboratory; Jeremy Munson, U.S. Nuclear Regulatory Commission; David Pilgrim (Secretary), Canadian National Laboratories; Ellen Saylor, Oak Ridge National Laboratory

**Status:** ANSI/ANS-8.19-2014 was approved by ANSI on July 28, 2014 and received approval of a reaffirmation on 8/22/2019. Since 2015, the focus has been on establishing the working group membership with several additions and three associate members. A meeting was held at the June 2017 ANS Annual Meeting primarily to educate the newer members about historical view points and future plans. There were no official activities in 2018, although there was some discussion about the standard through the EFCOG NCS group about the independence term from Section 4.4, the history of what drove creating the original standard, and the current need/benefit of this standard today.

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**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:**
Ronald Knief, Co-Chair, Sandia National Laboratories; Deborah Hill, Co-Chair, National Nuclear Laboratory (UK); Nichole Ellis, Vice Chair, Ellis Nuclear Engineering, Inc.; Kelsey Amundson (Associate Member), Defense Nuclear Safety Board; Wayne Andrews, Individual; Paul Burdick, C.S. Engineering, Inc.; Theresa Cutler, Los Alamos National Laboratory; Nichole Ellis, Individual; Christopher Haught, Consolidated Nuclear Security, LLC; Jesse McBurney-Rebol, Naval Nuclear Laboratory; Catherine Percher, Lawrence Livermore National Laboratory; Christine McNally, Canadian Nuclear Laboratories; Randy Shackelford, Nuclear Fuel Services, Inc.; Robert P. Taylor, Atkins Nuclear Solutions; Brittany Williamson, Savannah River Nuclear Solutions

**Status:** The last reaffirmation was approved 11/10/2015. The draft was issued to ANS-8 for ballot in 2019. A reaffirmation will be initiated to keep the standard current while comments on the revision are addressed.

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**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 (Associate Member), Los Alamos National Laboratory; Kevin Carroll, Lawrence Livermore National Laboratory; Katherine Goluoglu, C.S. Engineering, Inc.; Jerry Hicks, Individual; Dennis Mennerdahl, E. Mennerdahl Systems-Sweden; Robert Wilson, U.S. Department of Energy

**Status:** Reaffirmation received ANSI approval 4/9/2019. The PINS, supporting a revision, was submitted to ANSI 2/12/2008 and resubmitted after each reaffirmation with the last submittal on 4/23/2019. A revision to ANS-8.21, incorporating comments from the reaffirmation, and also including the salient requirements from ANS-8.5, was sent to NCSCC for ballot in August 2017. The final comment resolutions are almost complete. The revised standard should be ready for NCSCC in early 2020.

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**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, Chair, Consolidated Nuclear Security, LLC; Brannen Adkins, U.S. Nuclear Regulatory Commission; Marvin Barnett, Savannah River Nuclear Solutions; Donna D’Aquila, Fluor BWXT Portsmouth; Derrick
ANS Standards Committee Report of Activities 2019

Faunce, Nuclear Safety & Technology Services; Michael Fendler, Four Rivers Nuclear Partnership, LLC; Sean Gough, Westinghouse Electric Company, LLC; Chris Haught, Consolidated Nuclear Security, LLC; Deborah Hill, National Nuclear Laboratories, UK; Robert Maurer, Nuclear Fuel Services, Inc.; Rahn Ross, Savannah River Solutions; Richard Stachowiak, Interim Tech Solutions Inc.; Alan Wilkinson, Consolidated Nuclear Security, LLC; Travis Wilson, Consolidated Nuclear Security, LLC

Status: This standard was reaffirmed on 10/17/2016. A PINS was submitted to ANSI on 11/22/2019. The working group successfully completed a PINS form to formally begin a revision to the standard. A working group meeting is planned for the 2020 ANS Annual meeting in Phoenix.

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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;R2003, 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:
James Baker, Chair, Spectra Tech, LLC; Peter Angelo, Consolidated Nuclear Security, LLC; Konner Cassanova (Associate Member), Idaho National Laboratory; Theresa Cutler, Los Alamos National Laboratory; Matthieu Duluc, L'Institut de Radioprotection et de Sûreté Nucléaire; Eric Fillastre, Commissariat à L'Énergie Atomique; Patricia Glenn, U.S. Nuclear Regulatory Commission; Neil Harris, UK National Nuclear Laboratory; Jerry Hicks, Individual; Patrick Moss, U.S. Department of Energy; Brandon O’Donnell, BWXT Technologies, Inc.; Blaine Rice (Associate Member), 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. This revision includes several changes, including an updated reference for the most recent version of Standard N13.3 on criticality accident dosimetry, and removing the connection to a criticality accident alarm system. Additional guidance for immediate evacuation zones has been added. The working group does not need new members at this time.

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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, BWX Technologies, Inc.; Robert Busch, University of New Mexico; Scott Finfrock, Savannah River Nuclear Solution; Clint Gross, Paschal Solutions Incorporated, Associates; Jerry Hicks, Individual; Kevin Kimball, Consolidated Nuclear Security, LLC; Cecil Parks, Oak Ridge National Laboratory; Andrew Prichard, Pacific Northwest National Laboratory; Christopher Tripp, Tripp Nuclear Consulting Services; Fitz Trumble, AECOM N&E Technical Services, LLC

Status: The standard was approved by ANSI on 12/12/2017. No activity in 2019.

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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; Kelsey Amundson, Defense Nuclear Facilities Safety Board; James Baker, Spectra Tech, LLC; Douglas Bowen, Oak Ridge National Laboratory; Joye Brotherton, Savannah River Site; Kevin Carroll, Lawrence Livermore National Laboratory; Theresa Cutler, Los Alamos National Security, LLC; Ruxandra Dranga, Canadian Nuclear Laboratories; David Erickson, Savannah River Nuclear Solutions; James Felty, Los Alamos National Laboratory; Makenzie Gorham, U.S. Department of Energy; Jerry Hicks, Individual; Calvin Hopper, Individual; Steve Kessler, Savannah River Nuclear Solutions; Ronald Knief, Sandia National Laboratories; Robert Maurer, Nuclear Fuel Services; Jerry McPherson, Sigma Science, Inc.; James Morman, Argonne National Laboratory; Lon Paulson, GE Hitachi Nuclear Energy; Catherine Percher, Lawrence Livermore National Laboratory; Nicholas Peterka, U.S. Nuclear Regulatory Commission; Chad Pope, Idaho State University; Andrew Prichard, Pacific Northwest National Laboratory; Gerald Sauve, U.S. Department of Energy; Timothy Sippel, U.S. Nuclear Regulatory Commission; Norm Schwiers, Sandia National Laboratories; Fitz Trumble, AECOM N&E Technical Services, LLC; Robert Wilson, U.S. Department of Energy

Status: The standard was reaffirmed by ANSI on December 15, 2016. A PINS was submitted to ANSI 8/20/2013 and resubmitted 1/17/2017 after the reaffirmation. Work on the revision continues.


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:

Status: This standard received ANSI approval on 11/10/2015. No activity reported in 2019.


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:

**Status:** The PINS form was submitted to ANSI on 1/28/2011. The draft was issued for subcommittee review. The working group is addressing comments submitted with the review.
### 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

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<th>18 Current Standards</th>
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<td>RF 10/25/2017</td>
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**Table 5 – NCSCC List of Standards/Projects**
Research and Advanced Reactors Consensus Committee (RARCC)

George Flanagan, Chair
Oak Ridge National Laboratory

**Scope:** The RARCC is responsible for the preparation and maintenance of voluntary consensus standards for 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.

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:
- **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:**

George Flanagan, Chair, Oak Ridge National Laboratory
Bruce B. Bevard, Vice Chair, Oak Ridge National Laboratory
Thomas Newton, Vice Chair, National Institute of Standards & Technology
Alexander Adams, Jr., U.S. Nuclear Regulatory Commission
Amir Afzali, Southern Nuclear Operating Company
Jason Andrus, Idaho National Laboratory
James K. August, Southern Nuclear Operating Company
Edward D. Blandford, Kairos Power
Robert E. Carter, Individual
Leslie P. Foyto, University of Missouri
Tony Grenci, Salt River Project
Brian Grimes, Individual
David R. Lawson, U.S. Department of Energy
Mark A. Linn, Oak Ridge National Laboratory
Jan Mazza, U.S. Nuclear Regulatory Commission
Matthew J. Memmott, Brigham Young University
D. Sean O'Kelly, Idaho National Laboratory
Mark W. Peres, Kairos Power LLC
Steven R. Reese, Oregon State University
Donald Spellman, Xcel Engineering
Richard S. Turk, Individual
Anthony R. Veca, General Atomics

**Observer:**

David E. Holcomb, Oak Ridge National Laboratory
Report of RARCC:
The RARCC met during the 2019 ANS Winter Meeting in Washington, DC. Donald Spellman, Xcel Engineering, and Jason Andrus, Idaho National Laboratory, were confirmed as new members of the RARCC. Andrus will be responsible for submitting INL’s vote related to advanced reactor standards. Sean O’Kelly will continue to submit INL’s vote on research reactor standards.

Approved in 2018:

Active Standards/Projects (Approved PINS):
ANS-15.22, "Classification of Structures, Systems, and Components for Research Reactors" (proposed new standard)
ANS-30.1, “Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs” (proposed new standard)
ANS-30.2, “Structures, Systems, and Component Classification for Nuclear Power Plants” (proposed new standard)

Advanced Initiatives Subcommittee (ANS-29)
Membership:
Bruce Bevard, Chair, Oak Ridge National Laboratory
Amir Afzali, Southern Nuclear Operating Company
James August, Southern Nuclear Operating Company
Edward Blandford, Kairos Power
Matthew R. Denman, Sandia National Laboratories
George Flanagan, Oak Ridge National Laboratory
David Holcomb, Oak Ridge National Laboratory
Mark Linn, Oak Ridge National Laboratory
David Moses, Individual
Robert Sachs, DOE National Laboratories

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


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; Matthew Denman, Co-Chair, Sandia National Laboratory; Zhaolin Chen, Chinese National Nuclear Safety Administration; Ronald Cochereill, Southern Nuclear Operating Company; George Flanagan, Oak Ridge National Laboratory; Charles Forsberg, Massachusetts Institute of Technology; David Holcomb, Oak Ridge National Laboratory; Jan Mazza, U.S. Nuclear Regulatory Commission; Matthew Memmott, Westinghouse Electric Company, LLC; Per Peterson, University of California-Berkeley; Bojan Petrovich, Westinghouse Electric Company, LLC; Benjamin Prewitt (Associate Member), Missouri University of Science & Technology; Carl Stoots, Idaho National Laboratory

Status: The project has been put on hold. When the ANS-20.1 Working Group was originally formed there was a diverse set of stakeholders that participated in the development of the proposed standard. However as Kairos was formed, a number of these stakeholders joined the company which resulted in a less diverse working group. In addition, NRC has been hesitant to provide support to a standard with only one “credible” vendor participating. Due to a combination of these factors and credible progress being made with the LMP and DOE/NRC work on the ARDCs, the participation in ANS-20.1 has really dwindled. The PINS was not withdrawn so that the project can be reinvigorated should additional vendors emerge.


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, Oak Ridge National Laboratory; Amir Afzali, Southern Nuclear Operating Company; Bernard Carlucc, Framatome, Inc.; Sacit Cetiner, Oak Ridge National Laboratory; Kun Chen, Shanghai Institute of Applied Physics; Ondrej Chvala, University of Tennessee; Stephen Cook, Canadian Nuclear Safety Commission; George Flanagan, Oak Ridge National Laboratory; Charles Forsberg, Massachusetts Institute of Technology; Jess Gehin, Oak Ridge National Laboratory; Chris Johns, TerraPower; Brian Johnson, TerraPower; Lars Jorgensen, Thorcon; Kevin Kramer, TerraPower; John Kutsch, Terrestrial Energy; Imitiaz Madni; U.S. Nuclear Regulatory Commission; Christian Marciulescu, Electric Power Research Institute; Jan Mazza, U.S. Nuclear Regulatory Commission; Laurence Miller, University of Tennessee; Per Peterson, University of California – Berkley; Nicholas Smith, Southern Nuclear Operating Company; Andrew Sowder, Electric Power Research Institute; Edward Wallace, GNBC Associates, Inc.

Status: The PINS was approved and submitted to ANSI on 7/7/16. Work on the draft continues.

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

Scope: This standard is technology-neutral and applicable to new reactor designs. It specifies objectives for augmenting deterministic nuclear safety design practices using risk-informed, performance-based (RIPB) methods. The application of RIPB methods to high level safety criteria selection, nuclear safety functions and margin, licensing-basis-event selection, equipment classification, and defense-in-depth adequacy is described to ensure RIPB-augmentation of nuclear safety design practices is consistently applied for all new reactor technologies. The application of this standard to existing reactors is beyond the scope of this standard.

Membership: Mark Linn, Chair, Oak Ridge National Laboratory; David Johnson, Vice Chair, Individual; Mihai Diaconeasa, North Carolina University; Jordan Hagman, Kairos Power LLC; Ralph Hill, Individual; Darvin Kapitz, Individual; Andrea Maioli, Westinghouse Electric Company, LLC; William McTigue, Individual; Per Peterson, University of California—Berkley; Russell Williston, Individual

Status: PINS approved in 2015. The draft is in development. The RP3C reviewed and commented on the draft. The draft will be submitted for preliminary review in early 2020.
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:**
Amir Afzali, Chair, Southern Nuclear Operating Company; David Blanchard, Applied Reliability Engineering; William Culp, Fluor Enterprises; Bryan Erler Individual (alternate), ASME Board of Governors; C. Rick Grantom, ASME BNCS; Raymond Herb, Southern Nuclear Operating Company; Ralph Hill, Hill Engineering Solutions LLC, ASME BNCS; Brian Johnson, TerraPower; Prasad Kadambi, Individual; Russ Lake, BWX Technologies, Inc.; Herbert Massie, Individual; John McLean, Sargent & Lundy, LLC; Enerel Munkhzul, Associate Member, Holtec International; James Pappas, Westinghouse Electric Company, LLC; Hanh Phan, U.S. Nuclear Regulatory Commission; Johannes Pickelmann, Framatome, Inc.; Kristiina Soderholm, Fortum Corporation; Ralph Surman, Westinghouse Electric Company, LLC; Richard Turk, Individual; Kent Welter, NuScale Power; Inc.

**Status:** PINS was submitted to ANSI on 7/7/2016. Work on the draft was put on hold until completion of the Licensing Modernization Project.

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**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, Southern Nuclear Operating Company; Izabela Gutowska, Associate Member, Oregon State University; Howard Iskyan, Iskyan LLC; Liang Shi, Exelon Corporation

**Status:** The standard was reaffirmed on 10/31/2016. 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. To that end, working group members are being reviewed, new members solicited, and other interested parties identified. The working group will collect suggested updates from other ANS parties working on related materials, primary in the RARRC & LLWRCC. Based on these suggestions, the working group will identify top areas for review and update development, and once approved, set about developing revisions for those. The working group expects that the basic content of ANS-53.1 will remain the same but that the overall length and complexity of the existing standard will fall. The working group believes that the revision will be an improved version of ANS-53.1 that will be more useful to all MHR designers.

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**Scope:** This standard establishes the nuclear safety criteria, functional performance and design requirements for liquid-sodium-cooled nuclear power plants. The document uses performance-based, risk-informed PRA criteria wherever possible. It also describes the design process to be followed to establish those criteria and perform structures, systems, and component classifications.
**Membership:**
George Flanagan, Chair, Oak Ridge National Laboratory; Robert Budnitz, Vice Chair, Lawrence Berkeley National Laboratory; Robert Bari, Brookhaven National Laboratory; Peter Gaillard, TerraPower; Michael Garrett, TerraPower (retired); Christopher Grandy, Argonne National Laboratory; Tony Grenci Salt River Project; Prasad Kadambi, Individual; Thomas King, Information Systems Laboratory, Inc.; Christian Lobscheid, Advent Engineering Services; Imitiaz 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:** The draft standard was balloted by the subcommittee in 2017 and by the RARCC in 2018 with a recirculation ballot in 2019 to recognize a maintained objection from a committee member. The member requested a technical appeal which remains in process at the end of 2019.

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

**Membership:**
Thomas Newton, Chair, National Institute of Standards & Technology
Alexander Adams, Jr., U.S. Nuclear Regulatory Commission
(Alternate: Anthony Mendiola, U.S. Nuclear Regulatory Commission)
Leo M. Bobek, University of Massachusetts, Lowell
Matthew Burger, Sandia National Laboratories
Daniel Cronin, University of Florida at Gainesville
Leslie Foyto, University of Missouri
Gary Harms, Sandia National Laboratories
Stephen Miller, Armed Forces Radiobiology Research Institute
Sean O'Kelly, Idaho National Laboratory
Daniel Pinkston, Oak Ridge National Laboratory
Steven Reese, Oregon State University
Randolph Strader, National Institute of Standards & Technology

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


**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:**
Gary A. Harms, Chair, Sandia National Laboratories; Robert Busch, University of New Mexico; David Hayes, Los Alamos National Laboratory; Ronald Knief, Sandia National Laboratories; Thomas McLaughlin, Individual; Richard Paternoster, Los Alamos National Laboratory; Steven Payne, U.S. Department of Energy; Jeffrey Philbin, Sandia National Laboratories; 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 8/15/2019 after the reaffirmation. The reaffirmation was processed to keep the standard current while the revision is completed. With the passing of working group chair, Theodore Schmidt, Gary Harms assumed the chair position. David Hayes was added to the working group.

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**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:
Matt Burger, Chair, Sandia National Laboratories; Rick Anderson, Los Alamos National Laboratory; James Bryson, Sandia National Laboratories; Armando De La Paz, Vista Technologies; James Felty, Science Applications International Corporation; Michael Flanders, White Sands Missile Range; Joetta Goda, Los Alamos National Laboratory; Abdul Kazi, Aberdeen Pulse Radiation Facility; Ronald Knief, Sandia National Laboratories; Marvin Mendonca, U.S. Nuclear Regulatory Commission; Douglas Minnema, National Nuclear Security Administration; Gerald Schlapper, National Nuclear Security Administration

Status: ANSI approved a reaffirmation on 8/12/2019. A revision will likely be initiated soon.


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 Missouri; Alexander Adams, U.S. Nuclear Regulatory Commission, Leo Bobek, University of Massachusetts-Lowell; Daniel Cronin, University of Florida; William Kennedy, U.S. Nuclear Regulatory Commission; Stephen Miller, Armed Forces Radiobiology Research Institute; 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.


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:
Daniel Pinkston, Co-Chair, Oak Ridge National Laboratory; Jeffrey Brower, Co-Chair, Idaho National Laboratory; Clinton Cooper, Idaho National Laboratory; Randolph Strader, National Institute of Standards and Technology; John Sease, Individual

Status: The reaffirmation of this standard was approved by ANSI on 8/18/2016. 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. No activity reported in 2019.


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:
Leo Bobek, Co-chair, University of Massachusetts–Lowell; Christopher Heysel, McMaster University; Daniel Hughes, National Institute of Standards and Technology; Michael Krause, University of Texas at Austin; Stephen Miller, Armed Forces Radiobiology Research Institute; Phillip Young, U.S. Nuclear Regulatory Commission.

Status: Received ANSI approval on 4/19/2016. No activity reported in 2019.

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

Membership:
Randolph Strader, Chair, National Institute of Standards and Technology; Gary Kirk, Oak Ridge National Laboratory; Daniel Menchaca, Texas A&M University; Richard Pratt, Sandia National Laboratory; Jared Wright, Babcock & Wilcox Nuclear Operations Group

Status: A reaffirmation was approved by ANSI on 7/18/2018. No activity reported in 2019.

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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 Standard and Technology; Ronald Dobey, University of Missouri; Wesley Frey, University of California—Davis

Status: The revised standard was approved by ANSI on 5/13/16. No work on this standard occurred in 2019. The working group will assemble in 2019 to determine whether the standard should be renewed or revised.

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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 Missouri; Steven Miller, Armed Forces Radiobiology Research Institute; 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. A reaffirmation was initiated in 2019. ANSI approval is expected in early 2020.

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: Alexander Adams, Chair, U.S. Nuclear Regulatory Commission; Steven Miller, Armed Forces Radiobiology Research Institute, National Naval Medical Center; Steven Reese, Oregon State University; Clifford Stanley, Idaho National Laboratory

Status: The standard was reaffirmed by ANSI on 2/27/2018. Alexander Adams is retiring from the NRC effective 12/31/19 and will step down as the group chair. A new chair will need to be sought.

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: Daniel Cronin, Chair, University of Florida-Gainesville; Alexander Adams, U.S. Nuclear Regulatory Commission; Leo Bobek, University of Massachusetts-Lowell; Joshua Halsted (Associate Member), Oregon State University; Brenden Heidrich, Idaho National Laboratory; Jere Jenkins, Thermo Risher Scientific; Steven Lynch, U.S. Nuclear Regulatory Commission; Bruce Meffert, University of Missouri; Steven Reese, Oregon State University; Patrick Snouffer, Bechtel Power Corporation; Clifford Stanley, Los Alamos National Laboratory; Randy Strader, National Institute of Standards & Technology; Carroll Trull, Westinghouse Electric Company, LLC

Status: The PINS was submitted to ANSI on 3/27/2017. Several new members were added to the working group. Member opinions sought on appropriate SSC classifications and threshold dose levels for the new standard.
### Research Advanced Reactors Consensus Committee (RARCC)

**Organizational Chart**

**Chair:** George F. Flanagan  
**Vice Chairs:** Bruce B. Bevard, Thomas Newton

### Table 6 – RARCC Organizational Chart

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© = PINS submitted to ANSI

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Safety and Radiological Analyses Consensus Committee (SRACC)

Andrew O. Smetana, Chair
Savannah River National Laboratory

Scope: The SRACC is responsible for the preparation and maintenance of voluntary consensus standards for 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, Savannah River National Laboratory
Julie Jarvis, Vice Chair, Bechtel Nuclear, Security & Environmental
F. Arzu Alpan, Oak Ridge National Laboratory
Richard S. Amato, Individual
Dimitrios M. Cokinos, Brookhaven National Laboratory
Donald J. Dudziak, Los Alamos National Laboratory
Christopher Graham, Health Physics Society Representative (Employed by Calloway Nuclear Plant)
Mukesh K. Gupta, Amentum Technical Services
Nolan E. Hertel, Georgia Institute of Technology
Paul Hulse, Sellafield, Limited
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

Report of SRACC:
The SRACC held a physical meeting during the 2019 ANS Winter Meeting in Washington, DC on November 15, 2019. No membership changes were made in 2019.

Approved in 2019:
**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; R2016)


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


**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
- Byron Frank, Westinghouse Electric Company, LLC
- Robin Jones, Southern Nuclear Operating Company
- Yuri Orechwa, U.S. Nuclear Regulatory Commission
- Paul Romano (Associate Member), Argonne National Laboratory
- Robert Singleterry, NASA Langley Research Center
- Andrew Smetana, Savannah River National Laboratory
- Charlie Sparrow, Individual

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

**ANS-10.2, “Portability of Scientific and Engineering Software” (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.


**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:**
Robin Jones, Chair, Southern Nuclear Operating Company; Nima Fathi (Associate Member), University of New Mexico; Byron Frank, Westinghouse Electric Company, LLC; Paul Hulse, Sellafield Ltd. Wai Law, Tennessee Valley Authority; Giulio Malinverno (Associate Member), Advanced Technology Valve S.P.A.; Charles Martin, Longenecker & Associates, Inc.; Paul Romano (Associate Member), Argonne National Laboratory; Ralph Schwartzbeck, Highland TEMS, LLC; Andrew Smetana, Savannah River National Laboratory

**Status:** The standard was reaffirmed on 9/26/16. A PINS to initiate a revision was submitted to ANSI on 7/17/2018. The chair has formed a working group for the update this standard. Particular focus is being placed on updating the definitions and nomenclature to ensure they are consistent with both modern usage and similar ANS standards.


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

**Membership:**
Andrew Smetana, Chair, Savannah River National Laboratory; Jennifer Manneschmidt, Oak Ridge National Laboratory

**Status:** The standard was reaffirmed on 12/8/16. No activity in 2019.

ANSI/ANS-10.7-2013 (R2018), “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:**
OPEN, Chair; Mark Baird, Oak Ridge National Laboratory; Forrest Brown, Los Alamos National Laboratory; Phillip Ellison, GE-Hitachi; Paul Hulse, Sellafield Ltd.; Vincent Penkrot, Westinghouse Electric Company, LLC; Bradley Rearden, Oak Ridge National Laboratory; William Rider, Sandia National Laboratories; J. R. Shultz, U.S. Department of Energy; Shivaji Seth, U.S. Department of Energy; Andrew Smetana, Savannah River National Laboratory; Jin Yan, Westinghouse Electric Company, LLC

In addition, substantial contributions towards the development of earlier drafts of this proposed standard were received from the following: Toni Austin, U.S. Department of Energy; Brett Doories, GE-Hitachi; Jim Fawks, GE-Hitachi; Ahmad Haidari, ANSYS; Sherry Hardgrave, Consolidated Nuclear Security, LLC, National Nuclear Security Administration; Edwin Harvego, Idaho National Laboratory; Harvey S. Hopkins, Lawrence Livermore National
ANSI/ANS-10.8-2015, “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:


Reactor Physics Subcommittee (ANS-19)

Membership:
Dimitrios Cokinos, Chair, Brookhaven National Laboratory
Charles Rombough, Secretary, CTR Technical Services, Inc

John Bess, Idaho National Laboratory
Ren-Tai Chiang, Individual
Mark DeHart, Idaho National Laboratory
David Diamond, Brookhaven National Laboratory
Mark Eckenrode, Framatome, Inc.
Ian Gauld, Individual
Alireza Haghighat, Virginia Tech Research Center
Edward Knuckles, Individual
Robert Little, Los Alamos National Laboratory
Moussa Mahgerefteh, Exelon Corporation
Eleodor Nichita, University of Ontario Institute of Technology
Georgeta Radulescu, Oak Ridge National Laboratory
Benjamin Rouben, Individual
Abraham Weitzberg, Individual

Status: 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-19.6.6, “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:


**Scope:** This standard sets forth values for the decay heat power from fission products and $^{239}$U and $^{239}$Np following shutdown of light water reactors containing $^{235}$U, $^{238}$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 reactor 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:**
Ian Gauld, Chair, Individual; Mourad Aissa, U.S. Nuclear Regulatory Commission; Ren-Tai Chiang, Individual; Jesse Klingensmith, Westinghouse Electric Company, LLC; Edward Knuckles, Individual; Dmitri Ziabletsev, Framatome, Inc.

**Status:** Reaffirmation was approved by ANSI on 2/5/2019. An inquiry was received and responded to in 2018. There were no technical activities in 2019. The working group membership will be reformed in preparation for further development of the standard.


**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, Chair, Los Alamos National Laboratory; Arzu Alpan, Oak Ridge National Laboratory; Steve Baker, Transware Enterprises; John Bess, Idaho National Laboratory; Dimitrios Cokinos, Brookhaven National Laboratory; Dermott Cullen, Individual; Michael Dunn, Spectra Tech, Inc.; Mike Garland, U.S. Department of Energy; Michal Herman, Brookhaven National Laboratory; Albert Kahler, Los Alamos National Laboratory; Russell Mosteller, Individual; Georgetta Radulescu, Oak Ridge National Laboratory; Benjamin Rouben, Individual; Mike Zerkle, Naval Nuclear Laboratory

**Status:** The revision of the standard was approved by ANSI on 3/8/2019.


**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, Idaho National Laboratory; Ren-Tai Chiang, Individual; Dimitrios Cokinos, Brookhaven National Laboratory; Ronald Ellis, Individual; Godfrey Gert, Lawrence Livermore National Laboratory; Donald Harris, Rensselaer Polytechnic Institute-retired; Greg Hobson, Framatome, Inc.; Ken Kozier, Atomic Energy of Canada Limited; Guy Marleau, Ecole Polytechnique de Montreal; Russell Mosteller, Individual; Charles Rombough, CTR Technical Services; Benjamin Rouben, 12 & 1 Consulting; Wei Shen, Canadian Nuclear Safety Commission; Robert St. Clair, Duke Energy Corporation; Scott
ANSI Standards Committee Report of Activities 2019

Thomas, Duke Energy Corporation; William Walters, Penn State University; Peter Yarsky, U.S. Nuclear Regulatory Commission; Baocheng Zhang, Westinghouse Electric Company, LLC

**Status:** The standard was reaffirmed on 1/24/2017. A PINS for the revision was submitted to ANSI on 10/17/2019. The working group met at the ANS 2019 Annual Meeting in Minneapolis, MN and at the ANS 2019 Winter Meeting in Washington, DC. The working group is currently working on small revisions and updates to the standard (e.g. code-to-code comparisons, Monte Carlo, PWR vs. BWR calculations, updated references).

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**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, Idaho National Laboratory; Dimitrios Cokinos, Brookhaven National Laboratory; Adolpho Ferrer, Studsvik Scandpower Inc.; Joel Rhodes, Studsvik Scandpower Inc.; Baocheng Zhang, Westinghouse Electric Company, LLC

**Status:** Standard was reaffirmed on 5/18/2017. The PINS form was submitted to ANSI for a revision on 8/17/2017. The working group met at the 2019 ANS Winter Meeting in Washington, DC. Discussions were focused on the new draft appendix that provides reference energy deposition calculations obtained with representative reactor physics computer codes. The new appendix is expected to be finalized in 2020.

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**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, Idaho National Laboratory; Ren-Tai Chiang, Individual, Dimitrios Cokinos, Brookhaven National Laboratory; Mark Eckenrode, Framatome, Inc.; Moussa Mahgeretfet, Exelon Corporation; Jeremy Roberts, Kansas State University; Charles Rombough, CTR Technical Services, Inc.; Benjamin Rouben, Individual; Rick Sancton, Individual

**Status:** Standard received ANSI approval on 8/24/2017. Reaffirmation will be sought in 2022.

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**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.
ANS Standards Committee Report of Activities 2019

Membership:
OPEN, Chair; Anthony Attard, U.S. Nuclear Regulatory Commission; John Bess, Idaho National Laboratory; Blair Briggs, Idaho National Laboratory; Jeffrey Brown, Westinghouse Electric Company, LLC; Mark DeHart, Idaho National Laboratory; Chris Ellis, General Atomics; Sedat Goluoglu, Oak Ridge National Laboratory; Louis Grobmyer, Westinghouse Electric Company, LLC; Albert Hanson, Brookhaven National Laboratory; Germina Ilas, Oak Ridge National Laboratory; Zain Karriem, Idaho National Laboratory; Trent Primm, Primm Consulting; Abul Shakil, Florida Power & Light; Wei Shen, Canadian Nuclear Safety Commission; Alan Wells, Interserve; Won Sik Yang, Purdue University

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). Work will restart when a new chair is found.


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:

Status: A revision of the standard was approved by ANSI on 12/19/2019.

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

Unapproved Scope: This standard provides a reference set of fission yield data for thermal and fast neutron-induced fission of $^{233}$U, $^{235}$U, $^{238}$Pu, and $^{241}$Pu; fast neutron-fission of $^{232}$Th, $^{238}$U, and $^{241}$Pu; and spontaneous fission of $^{252}$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, Brookhaven National Laboratory

Status: ANS-19.8 was previously designated ANS-5.2. A PINS will be the first task is the decision is made to proceed with this proposed standard.

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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 tem, Brookhaven National Laboratory; 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.

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**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:**
Ali Reza Haghighat, Chair, Virginia Tech; F. Arzu Alpan, Oak Ridge National Laboratory; Dimitrios Cokinos, Brookhaven National Laboratory; Edward Knuckles, Individual; Robert Little, Los Alamos National Laboratory; Moussa Mahgerefteh, Exelon Corporation; Benjamin Parks, U.S. Nuclear Regulatory Commission; Amrit Patel, Individual; Joes Risner, Oak Ridge National Laboratory; Steven Thompson (Associate Member), Dominion

**Status:** A reaffirmation was approved by ANSI on 10/11/2016.

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**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 (HZP) 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 HZP 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, Exelon Corporation; Steven Baker, Transware Enterprises; Robert Borland, First Energy Nuclear Operating Company; David Brown, Tennessee Valley Authority; Dimitrios Cokinos, Brookhaven National Laboratory; Mark Eckenrode, Framatome, Inc.; Edward Knuckles, Individual

**Status:** The revision of ANSI/ANS-19.11-1997 was completed and approved by ANSI on 4/11/2017.

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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 tem, Brookhaven National Laboratory
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.

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:
Charlotte 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
Carl Beyer, Individual
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 Corporation
Steven Nathan, Savannah River Nuclear Solutions
Jeffrey C. Ryman, Individual
Ali A. 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). The International Organization of Standardization (ISO), Subcommittee 6 (Reactor Technology), Working Group 1, is exploring a new work item to issue a standard titled “Group-Averaged Neutron and Gamma-Ray Cross Sections for Radiation Protection and Shielding Calculations for Nuclear Reactors,” which is based on ANSI/ANS-6.1.2-2013 (R2018), “Neutron and Gamma-Ray Cross Sections for Nuclear Radiation Protection Calculations for Nuclear Power Plants.” Reports on all subcommittee projects are found below.

The Shielding Subcommittee manages the following active and current standards:


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-half-life (half-life less than one year) and long-half-life (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:
Carl Beyer, Chair, Individual; A. J. Turnbul, Vice Chair, Consultant; Daniel Baron, EDF - France; Michelle Billaux, Framatome, Inc.; Paul Clifford, U.S. Nuclear Regulatory Commission; Nayem Jahingir, Global Nuclear Fuel; Erik Kolstad, Institutt for Energiteknikk; Brent Lewis, Royal Military College of Canada; Yun Long, Westinghouse Electric Company, LLC; Robert Montgomery, Anatech; Chuck Patterson, Global Nuclear Fuel; C.S. Rim, Consultant; John Voglewede, U.S. Nuclear Regulatory Commission; Bob Weiner, K W Consulting; S.L. Wu, U.S. Nuclear Regulatory Commission

Status: Received ANSI approval on 5/19/2011. Reaffirmation of the standard is expected to be initiated in 2020.

**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.

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**Scope from 1991 standard:** This standard presents data recommended for computing the biologically relevant dosimetric quantity in neutron and gamma-ray radiation fields. Specifically, this standard is intended for use by shield designers to calculate effective dose equivalent. Values are given for effective dose equivalent per unit fluence for neutron energies from 1eV to 14 MeV and for gamma-ray energies from 0.01 to 12 MeV. Establishing maximum permissible 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; Elijah Dickson, U.S. Nuclear Regulatory Commission; Matthew Mille, National Cancer Institute

**Status:** This standard was administratively withdrawn in 2001. A PINS form for the initiation of a historical revision was submitted to ANSI on 10/24/18 with a new title -- Neutron and Photon Fluence-to-Dose Conversion Coefficients. The draft has been submitted for the subcommittee ballot expected to be issued in January of 2020.

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**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:**  
Arzu Alpan, Chair, Oak Ridge National Laboratories; James Adams, Corvus Integration, Inc.; Stanwood Anderson, Westinghouse Electric Company, LLC; John Carew, Brookhaven National Laboratory; Juan-Luis Francois, UNAM-Mexico; Patrick Griffin, Sandia National Laboratories; Alireza Haghighat, Virginia Tech; Robert Little, Los Alamos National Laboratory; Yuri Orechwa, U.S. Nuclear Regulatory Commission; Jeffrey Ryman, URS Professional Solutions; Mark Williams, Oak Ridge National Laboratory

**Status:** A reaffirmation was approved by ANSI on 10/19/18.

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**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

Status: Reaffirmation received ANSI approval 12/11/2015. No current activity. A working group chair is being sought.


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:
Sharad (Ken) Jha, Chair, Bechtel Corporation; Hiruta Hikaru, Idaho National Laboratory; Julie Jarvis, Bechtel Corporation

Status: Reaffirmation of the standard was approved by ANSI on 8/4/2016. In reviewing the standard for reaffirmation, the working group suggested that the next revision include a discussion of hybrid methods as well as additional codes such as MicroShield and SCALE. It is expected that the next revision will be initiated after the reissue of ANS-6.4.3, which is currently being revised. No activity in 2019.


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, Chair, Savannah River Nuclear Solutions; Peter Caracappa, Rensselaer Polytechnic Institute; Stanley Haynes, Sandia National Laboratories; Brian Hinderliter, University of Minnesota-Duluth; Ahmad Ibrahim, Oak Ridge National Laboratory; Timothy Lloyd, Westinghouse Electric Company, LLC; Bill McTigue, URS Professional Solutions; Kathryn Robertson-DeMers, Spectrum Technical Services, Inc.; Kenneth Shultis, Kansas State University; Stanley Tackett (Associate Member), Franklin University; Nancy Willoughby, New York City Department of Design & Construction

Status: The standard was reaffirmed on 9/27/2016. The PINS was submitted to ANSI in 2012 and resubmitted 1/27/2017 after the reaffirmation. The reaffirmation will keep the standard current while the revision is completed.

**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, Individual; F. Arzu Alpan, Oak Ridge National Laboratory; Adam Davis, Los Alamos National Laboratory; Keith Eckerman, Oak Ridge National Laboratory; Richard Faw, Kansas State University, Emeritus; Jack Higginbotham, Oregon State University; Brian Hinderliter, University of Minnesota – Duluth; Essam A. Hussein, University of New Brunswick; Darby Kimball, Lawrence Livermore National Laboratory; Irina Popova, Oak Ridge National Laboratory; Thomas Rosener, TASC, Inc.; Yukio Sakamoto, Japan Atomic Energy Agency; Charlotta E. Sanders, University of Nevada, Las Vegas; Sylvia Wang, Westinghouse Electric Company, LLC

**Status:** The PINS form for a historical revision of ANSI/ANS-6.4.3-1991 was approved and submitted to ANSI on 3/15/2012. No activity reported for 2019.

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**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/ANS-6.6.1-2015 was approved by ANSI on 8/21/2015. A reaffirmation will be process in early 2020 to keep the standard current.
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<tr>
<td><strong>ANS-6.6.1-2015</strong> Calculation and Measurements of Direct and Scattered Gamma Radiation from LWR NPPs App’d 8/21/2015 (WGC: R. Amato)</td>
<td></td>
<td><strong>ANS-19.9 (NEW) ©</strong> Delayed Neutron Parameters for Light Water Reactors (WGC: Open)</td>
</tr>
<tr>
<td></td>
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<td><strong>ANS-19.12 (NEW) ©</strong> Nuclear Data for the Production of Radioisotope (WGC: Open)</td>
</tr>
</tbody>
</table>

Table 7 – SRACC Organizational Chart
JCNRM
American Nuclear Society (ANS) / American Society of Mechanical Engineers (ASME)
Joint Committee on Nuclear Risk Management (JCNRM)

Robert J. Budnitz, ANS Co-chair
Lawrence Berkeley National Laboratory

C. Rick Grantom, ASME Co-chair
C.R. Grantom P.E. & Associates, LLC

Scope: The JCNRM Consensus Committee is responsible for the preparation and maintenance of voluntary consensus standards that establish safety and risk criteria and methods for completion of probabilistic risk analysis (PRA) and risk assessments. Additional related standards activities may be performed as upon concurrence of the ANS Standards Board and the ASME Standards and Certification Board. These criteria and methods are applicable to design, development, construction, operation, decontamination, decommissioning, waste management, and environmental restoration for nuclear facilities. 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.

The JCNRM may be tasked with reviewing / commenting on risk technology related proposed provisions of standards developed by other ASME / ANS Standards Committees at the request of those standards committees.

JCNRM Membership:
Robert J. Budnitz, ANS Co-chair, Lawrence Berkeley National Laboratory (retired)
Dennis W. Henneke, ANS Co-vice-chair, General Electric
   (Alternate: Yunlong Jonathan Li, General Electric)
Pamela F. Nelson, ASME Co-vice-chair, National Autonomous University of Mexico
Paul J. Amico, Jensen Hughes, Inc.
Victoria K. Anderson, Nuclear Energy Institute
George Apostolakis, Individual
Michelle Bensi, University of Maryland
Sarah Bristol, NuScale Power
Gary Demoss, PSEG Nuclear
Matthew R. Denman, Kairos Power
Fernando Ferrante, Electric Power Research Institute
   (Alternate: Douglas C. Hance, Electric Power Research Institute)
K. Raymond Fine, First Energy Nuclear Operating Company
Karl N. Fleming, Individual (KNF Consulting Services)
Anders Gilbertson, U.S. Nuclear Regulatory Commission
David Grabaskas, Argonne National Laboratory
H. Alan Hackerott, Individual
Thomas G Hook, Arizona Public Service
Diane M. Jones, Maracor
Gerry W. Kindred, Tennessee Valley Authority
   (Alternate: Michael J. Walker, TVA)
Stanley H. Levinson, Individual
   (Alternate: Paul W. Whiteman, AREVA)
Roy Linthicum, Exelon, PWR Owners Group
Andrea Maioli, Westinghouse Electric Company
James O’Brien, U.S. Department of Energy
Mayasandra K. Ravindra, Individual, (MKRavindra Consulting)
Robert I. Rishel, Duke Energy, BWR Owners Group
Martin Sattison, Individual
Report of JCNRM:
In 2019, the JCNRM held two 4-day meetings; in February 2019 in St. Petersburg, Florida and in September 2019 in Bethesda, Maryland. It is a pleasure to report that there seems to be almost no “friction” between the two societies in terms of how this merger has worked so far or will work in the future. 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 is now in place.

The JCNRM’s Executive Committee has been meeting more-or-less bi-weekly by conference call to plan the next two years’ activities. The main effort is to develop the next version of the main PRA Combined Standard, which is planned now for issuance in late 2020. This next version, which we will call the “new edition” instead of an “addendum,” is expected to have substantial changes to the format as well as to the content, based largely on feedback received in the past 4 - 5 years as this standard has been used by the commercial nuclear power operating fleet and by the U.S. Nuclear Regulatory Commission (NRC). During this period of use, many areas have been identified where inconsistencies exist between different parts of the large PRA standard, mostly due to variable interpretations, and a few other problems have also been discovered during use. A number of what the JCNRM has called “cross cutting issues” have also been identified, each of which is being worked on by one of several ad hoc project teams within the larger JCNRM. Some of these issues have policy implications for how the standard is to be used, but mostly these are issues with technical substance.

The other major JCNRM task in the next year is to ballot and issue the several new standards under development that are discussed later in this report. This is a major effort, involving several dozen volunteers.

In mid-2013, the JCNRM established a separate new subcommittee, the Subcommittee on Risk Applications, with the charter to be the JCNRM interface with ANS and ASME (and other SDOs in the future) so as to provide assistance to other standards-development projects whenever such a project desires to develop a new standard (or modify an existing standard) to provide risk-informed or performance-based requirements. This JCNRM subcommittee is the JCNRM interface with the ANS Standards Board’s Risk-informed and Performance-based Principles Policy Committee (RP3C.)

For several years, a series of grants to the ANS from the NRC have provided financial support for the work of the standards committee, mainly to cover travel costs of participants who have no other financial support, but also to cover a few other selected expenses. The latest in this series of grants will run out in early 2020. At year’s end, a renewal of this grant is in the procurement process at the NRC.

Active standards/projects:


ASME/ANS RA-S-1.2-2014, “Standard for Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications” (previously ANSI/ASME-58.24) (trial use standard to be revised and seek ANSI approval). The next version of the standard was issued for JCNRM ballot in December 2019 and the standard should be issued by mid-2020.


ASME/ANS RA-S-1.4-2013, “Advanced Non LWR PRA Standard” (trial use standard to be revised and seek ANSI approval). The next version of the standard should be available for public review and use by the end of 2020 and issued in early 2021.

ANS/ASME-58.22-2014, “Standard for Low Power and Shutdown Methodology for PRA Applications” (standard issued for trial use in March 2015). The next version of the standard will be ready for ballot 6 months after approval of the next edition of RA-S.

ASME/ANS RA-S 1.7, “Multi-Unit PRA Standard.” The working group that is developing this standard was formed in mid-2019.

The following three subcommittees report directly to the JCNRM:

Subcommittee on Standards Development (SC-SD)

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.

SC-SD Membership (as of December 2019):
Matthew Denman, Chair, Kairos Power
Victoria K. Anderson, Nuclear Energy Institute
Sidney Bernsen, Individual
Sarah Bristol, NuScale Power
Karl N. Fleming, KNF Consulting Services LLC
Anders Gilbertson, U.S. Nuclear Regulatory Commission
David Grabaskas, Argonne National Laboratory
Dennis W. Henneke, General Electric Company
Nathan LaBarge, Westinghouse Electric Company
Stuart R. Lewis, Jensen Hughes Inc.
Yunlong Jonathan Li, General Electric Company
Zhegang Ma, Idaho National Laboratory
James O’Brien, U.S. Department of Energy
Benny Jebuna Ratnagar, Southern Company
Martin B. Sattison, Individual
Raymond Schneider, Westinghouse Electric Company
Vincent Sorel, EDF
Ricky Summitt, Engineering Planning and Management
Grant Teagarden, Jensen Hughes Inc.
Stephen D. Unwin, Pacific Northwest National Laboratory
Paul Whiteman, AREVA

SC-SD REPORT:
The SC-SD is currently responsible for six authorized PRA standards in various stages of development and trial use. In addition to development of the new standards by separate writing groups (project teams) that report to SC-SD, 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 6 standards is provided in the following paragraphs.

ANS/ASME-58.22-2014, “Requirements for Low Power and Shutdown Probabilistic Risk Assessment” (trial-use standard)

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.

**LPSD PRA Writing Group Membership (as of December 2019):**
Yunlong Jonathan Li, Chair, General Electric Co.; Jeffrey Julius, Vice Chair, Curtiss Wright; Leo Shanley, Vice Chair, Jensen Hughes; Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired); Doug Hance, Electric Power Research Institute; Dennis W. Henneke, GE Hitachi Nuclear Energy; Kenneth L. Kiper, Westinghouse Electric Co.; Zhegang Ma, Idaho National Laboratory; Jeffrey Mitman, U.S. Nuclear Regulatory Commission; Taeyong Sung, Southern Company; Vaibhav Yadav, Idaho National Laboratory; Marie Pohida (alternate for Jeffrey Mitman (NRC))

**Status:** This standard was issued for a 3-year trial use period in March 2015. A summary of trial uses completed or underway is provided in the table below. Feedback from these parallel trial use applications has been reported to SC-SD, and the feedbacks are being considered by the LPD project team in revising the standard. The working group requested an extension of the trial-use period to address comments and align with the next edition of the PRA standard (RA-S) that the LPD standard references, and at the February 2018 meeting the JCNRM approved an extension to 6 months following approval of the next edition of RA-S for development of a final version to be balloted as an ANSI standard. Currently, at-initiator human actions are being revised and 75% of the comments regarding the qualitative sections have been resolved. In 2020, the main focus of the LPD Working Group will be to align this standard with the next edition of RA-S.

<table>
<thead>
<tr>
<th>Issued for Trial Use</th>
<th>Trial Use Application</th>
<th>Trial User</th>
<th>Trial Use Timeframe</th>
</tr>
</thead>
</table>
| Mar 2015 through 6 months after approval of the next edition of RA-S | - Application to Palo Verde NPS  
- Self-assessment of APS pilot application  
- Exelon/BWROG test of Qualitative Risk portion  
- BWROG pilot of Quant portion  
- UK ABWR pilot  
- LPD portion of NRC Level 3 PRA Pilot  
- AP1000 Trial of Qualitative portion  
- Korean Trial Use | • APS  
• EPRI  
• Exelon/BWROG  
• BWROG  
• GEH  
• NRC  
• Westinghouse  
• KHNP | Feb 2015  
Mar 2015  
2016-2017  
2016-2017  
2016  
Feedback 2017  
Feedback 2017  
Undefined |

ASME/ANS RA-S-1.2-2014, “Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications” (previously ANSI/ASME-58.24) (previously ANSI/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:**

**Status:** The L2 PRA standard completed readiness review and was put out for a two-month review and approval ballot in November of 2019.
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.

Level 3 PRA Writing Group Membership (as of December 2019):
Grant Teagarden, Chair, Jensen Hughes; Nathan Bixler, Sandia National Laboratories; Keith Compton, U.S. Nuclear Regulatory Commission; Gerry W. Kindred, Tennessee Valley Authority; Stanley Levinson, AREVA Inc.; Carl Mazzola, Project Enhancement Corporation; Vinod Mubayi, Brookhaven National Laboratory; Kevin O’Kula, AECOM N&E Technical Services LLC; Joel Robinson, Atkins; Keith Woodard, ABS Consulting (retired); Brian T. Wagner, U.S. Nuclear Regulatory Commission (alternate to K. Compton)

Status: This trial use standard was issued in July of 2017 for a 2-year trial-use period. A trial-use application, based on the ballot version, was performed in December 2015 by the PWR Owners Group in support of the Level 3 portion of the NRC Level 3 PRA Pilot. GE Hitachi has also provided trial use feedback from their UK ABWR PRA, and additional feedback has been received as part of the trial use feedback on the Non-LWR PRA trial-use standard. In 2020, the main focus of the Level 3 Working Group will be to align this standard with the next edition of RA-S.

ASME/ANS RA-S-1.4-2013, “Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plants (trial use standard to be revised and seek ANSI approval)

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.

NLWR PRA Writing Group Membership (as of December 2019):
Karl. N. Fleming, Chair, KNF Consulting Services, LLC; David Grabaskas, Vice Chair, Argonne National Laboratory; Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired); Matthew Denman, Kairos Power; Jordan Hagaman, Kairos Power; Dennis Henneke, General Electric Co.; Alexander Huning, X-Energy; Zachary Jankovsky, Sandia National Laboratories; Brian Johnson, TerraPower; Ken Muramatsu, Tokyo City University; Hanh Phan, U.S. Nuclear Regulatory Commission; Martin B. Sattison, Individual; Jiejuan Tong, Tsinghua University; Stephen D. Unwin, Battelle Pacific Northwest National Laboratory; Michelle Gonzalez, U.. Nuclear Regulatory Commission (alternate for H. Phan)
**Status:** This standard was approved for trial use and issued December 9, 2013, for a 36-month trial-use period. Several potential pilot applications have been identified internationally. The NLWR project team has been actively engaged with trial users representing several advanced reactor design concepts in various stages of design in the US, China, Great Britain, and Korea. The trial-use period for this standard was extended through 2018 to allow the project team to develop a final version for ballot as an ANSI standard that would also be consistent with the requirements in the next edition of RA-S. At the February 2018 JCNRM meeting, the JCNRM approved an extension to 6 months following approval of the next edition of RA-S. In September of 2020, the JCNRM decided to decouple the NLWR PRA standard’s publication schedule from the next edition of RA-S to ensure that it was available to support regulatory applications. The NLWR PRA standard is currently preparing for a ballot readiness review.

<table>
<thead>
<tr>
<th>Issued for Trial Use</th>
<th>Trial Use Application</th>
<th>Trial User</th>
<th>Trial Use Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2013 through 6 months after approval of the next edition of RA-S</td>
<td>HTR-PM Pebble Bed Reactor</td>
<td>China</td>
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<td>KAERI/ANL Sodium Cooled Fast Rx</td>
<td>ANL</td>
<td>Ended</td>
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<tr>
<td></td>
<td>TWR Sodium Cooled Fast Reactor</td>
<td>TerraPower</td>
<td>On Hold</td>
</tr>
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<td>Molten Chloride Fast Reactor</td>
<td>TerraPower</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>GE PRISM Sodium Cooled Fast Rx</td>
<td>GEH</td>
<td>LMP Trial</td>
</tr>
<tr>
<td></td>
<td>Xe-100 Pebble Bed Advanced Rx</td>
<td>X-Energy/SNC</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Japan HTGR PRA</td>
<td>JAEA</td>
<td>Pilot Done</td>
</tr>
<tr>
<td></td>
<td>Japan LMFBR PRA</td>
<td>JAEA</td>
<td>2016-2020</td>
</tr>
<tr>
<td></td>
<td>Fluoride Salt Cooled High Temp Rx</td>
<td>Kairos Power</td>
<td>LMP</td>
</tr>
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<td>eVinci Micro Reactor</td>
<td>Westinghouse</td>
<td>LMP</td>
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<tr>
<td></td>
<td>Lead Fast Reactor</td>
<td>Westinghouse</td>
<td>Just starting</td>
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<tr>
<td></td>
<td>Versatile Test Reactor</td>
<td>ANL</td>
<td>2019-2020</td>
</tr>
<tr>
<td></td>
<td>China Sodium Cooled Fast Reactor</td>
<td>ANL</td>
<td></td>
</tr>
</tbody>
</table>

**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.

**ALWR PRA Writing Group Membership (as of December 2019):**

**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 vendors to ensure that the standard would address their needs, and also to accommodate significant changes requested by NRC to accommodate their intended application of that standard to the new plant licensing process. A ballot on this standard for trial use was held in the 4th quarter of 2017, but a number of comments were received regarding the need for a clear definition of large release that will be compatible across the JCNRM standards. A ballot on the large release definition was initiated in late 2018, a reconsideration ballot on the ALWR standard was issued in the first quarter of 2019 and then again in September. In 2020, the main focus of the ALWR Working Group will be to align this standard with the next edition of RA-S. The ALWR appendix will be issued initially for a 3-year trial use once approved.

**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.
Multi-Unit PRA Writing Group Membership (as of December 2019):
Ricky Summitt, Chair, Engineering Planning and Management; Karl Fleming, Vice Chair, KNF Consulting Services LLC; Sarah Bristol, NuScale Power; Robert Budnitz, Lawrence Berkeley National Laboratory (retired); Ovidiu Coman, International Atomic Energy Agency; Fernando Ferrante, Electric Power Research Institute; Dennis Henneke, General Electric Co.; Kenneth Kiper, Westinghouse Electric Company; Suzanne Loyd, Jensen Hughes; Shahen Poghosyan, International Atomic Energy Agency; Michael Szoke, EDF Energy; Cindy Williams, NuScale Power; Maria Pohida, US Nuclear Regulatory Commission

Status: The writing group that will develop this standard was organized in mid-2019, and its work is in its early stages, although it is building upon significant work performed by an earlier JCNRM writing group that worked on a multi-unit-PRA appendix to ASME/ANS standard RA-S. The material in that draft appendix, when expanded and completed and when coordinated with the main single-unit RA-S standard, will comprise this stand-alone standard. No schedule is available at this time.

Subcommittee on Standards Maintenance (SC-SM)

SC-SM Membership:
Paul J. Amico, Chair, Jensen Hughes Inc.
Andrea Maioli, Vice Chair, Westinghouse Electric Company, LLC
(Alternate: Matthew Degonish, Westinghouse Electric Co.)
Vincent Andersen, Jensen Hughes
John M. Biersdorf, Xcel Energy
Michelle Bensi, University of Maryland
Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired)
Michelle Carr, Palo Verde Generating Station
Stephen Eder, Facility Risk Consultants
K. Raymond Fine, FENOC
H. Alan Hackerott, Omaha Public Power District
Jason Hall, Entergy
Douglas C Hance, Electric Power Research Institute
Dennis Henneke, General Electric Co.
Thomas G. Hook, Arizona Public Service
Francisco Joglar, Jensen Hughes
Diane Jones, ENERCON
Annie M. Kammerer, Individual
Lauren King, U.S. Nuclear Regulatory Commission
(Alternate: Jeffrey Mitman, U.S. Nuclear Regulatory Commission)
James Lin, ABS Consulting
Nicholas Lovelace, Hughes Associates
David N. Miskiewicz, Engineering Planning and Management, Inc.
Steve P. Nowlen, Sandia National Laboratories
Mayasandra K. Ravindra, MKRavindra Consulting
Alexander Rubbicco, Westinghouse Electric Company
Raymond E. Schneider, Westinghouse Electric Company
Michael L. Szoke, EDF-Energy
Jodine Jansen Vehec, JTV Nuclear Consultants
Ian B. Wall, Individual

Charter: To discuss, schedule, and approach technical issues related to updates to the current PRA standards. The SC-SD is responsible for the maintenance of the following standards:


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)
h) Seismic Margin Assessment (Part 10)

Status: ANSI/ASME/ANS RA-S-2008 was initially approved in 2008. A reaffirmation was approved by ANSI on 11/5/2019. Addendum B (of RA-S), which although labeled as an “addendum” is actually a new version of the standard, was approved and published in 2013. Addendum B contains changes that are mostly of a clarifying or consistency-within-the-standard nature, plus bringing many citations and other things up to date. A Case for Part 5 (seismic PRA) was approved in August and published in November 2017. Work on the next revision, which the JCNRM will call a “new edition,” is well underway. This new version (to be designated RA-S-1.1) will contain many substantive changes based on feedback from recent users of the standard, along with extensive re-formatting and the like and including elimination of Capability Category III. Extensive efforts have been made to improve consistency in requirements, terminology, and clarity. The Part 5 Case already reflects many of the features of the new edition. 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, are being 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.

A review and comment ballot was held in the summer of 2018, and resulted in over 2000 comments that the working groups had to address. As of the first quarter of 2019, all of the Parts had addressed their comments. However, there were still concerns about consistency issues and additional reviews specifically for those situations. While the working groups together addressed the most straightforward of these consistency issues, there were a few issues that were creating significant friction between different interest groups.

A series of industry/NRC workshops, which extended well into 2019, were held to develop input to the working groups on how they would like to see these issues resolved. Their comments were addressed (mostly accepted, but not all) and the revised version was re-issued for a ballot opening on 16 December 2019. The standard is expected to enter the editing/publication process by the 3rd quarter of 2020.

An additional historical note is that because of the delays, a reaffirmation ballot was held for the 2013 version as five years had elapsed since it was issued. The reaffirmation was formally approved by ANSI on 11/5/2019.

Each working group membership is listed below:

Part 1 Working Group, General Requirements for a Level 1 PRA, Including Large Early Release Frequency, Membership (as of December 2019):
Thomas G. Hook, Chair, Arizona Public Power; Raymond E. Schneider, Vice Chair, Westinghouse Electric Co.; Mihaela Biro, U.S. Nuclear Regulatory Commission; Fernando Ferrante, Electric Power Research Institute; Shigeo Kojima, Individual; Lawrence Mangan, FENOC; Harold Stiles, Duke Energy; Ian B. Wall, Individual; Jonathan Evans (Alternate for M. Biro), U.S. Nuclear Regulatory Commission

Part 2 Working Group, Requirements for Internal Events at-Power PRA, Membership (as of December 2019):
H. Alan Hackerott, Chair, Omaha Public Power District; Jodine Jansen Vehec, Vice Chair, JTV Nuclear Consultants; Diane Jones, Vice Chair, Enercor; John M. Biersdorf, Xcel Energy; Adrienne Driver, U.S. Nuclear Regulatory Commission; Lou Hance, Electric Power Research Institute; Gerry W. Kindred, Tennessee Valley Authority; Stanley H. Levinson, AREVA Inc.; Pamela F. Nelson, National Autonomous University of Mexico; Kent Sutton, INGRID Consulting Services LLC; Paul Whiteman, AREVA
Part 3 Working Group, Requirements for Internal Flood at-Power PRA, Membership (as of December 2019):

Part 4 Working Group, Requirements for Fires at-Power PRA, Membership (as of December 2019):

Part 5 Working Group, Requirements for Seismic at-Power PRA, Membership (as of December 2019)
K. Raymond Fine, Chair, FENOC; Stephen Eder, Vice Chair, Facility Risk Consultants Inc.; Vincent Andersen, Jensen Hughes Inc.; Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired); Parthasarathy Chandran, Individual; Nilesh C. Chokshi, Individual; Ovidiu L. Coman, International Atomic Energy Agency; Calin Eftimie, Individual; Fred Grant, Simpson Gumpertz & Heger; Eddie M. Guerra, Arup; Annie M. Kammerer, Individual; Jeffrey Kimball, Rizzo Associates; Benjamin Kosbab, SC Solutions; Andrea Maioli, Westinghouse Electric Company; Mayasandra K. Ravindra, MKRavindra Consulting; John M. Richards, Electric Power Research Institute; Ram Srinivasan, Individual; Wen H. Tong, Simpson Gumpertz & Heger; Shilp Vasavada, U.S. Nuclear Regulatory Commission

Part 6-9 Working Group: Part 6 (Requirements for Screening and Conservative Analysis) & Part 9 (Requirements for Other Hazards), at-Power PRA, Membership (as of December 2019)
Vincent Andersen, Chair, Jensen Hughes; Paul J. Amico, Jensen Hughes; Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired); Matthew R. Denman, Kairos Power; Anders Gilbertson, U.S. Nuclear Regulatory Commission; Kyle Hope, Westinghouse Electric Co.; Suzanne M. Loyd, Jensen Hughes; Pierre Macheret, Jensen Hughes Inc.; Mayasandra K. Ravindra, MKRavindra Consulting

Part 7 Working Group, Requirements for High Winds at-Power PRA, Membership (as of December 2019)
Nicholas Lovelace, Chair, Jensen Hughes Inc.; Hasan Charkas, Electric Power Research Institute; Stephen Hess, Jensen Hughes Inc.; John Lane, U.S. Nuclear Regulatory Commission; Artur Mironenko, Duke Energy; Mayasandra K. Ravindra, MKRavindra Consulting; Raymond Schneider, Westinghouse Electric Company

Part 8 Working Group, Requirements for External Flooding at-Power PRA, Membership (as of December 2019)
Michelle Bensi, Chair, University of Maryland; Mehdi Reisi Ford, U.S. Nuclear Regulatory Commission; Suzanne Loyd, Jensen Hughes Inc.; Zhegang Ma, Idaho National Laboratory; Pierre Macheret, Jensen Hughes Inc.; Artur Mironenko, Duke Energy; Raymond Schneider, Westinghouse Electric Company

Subcommittee on Risk Applications (SCoRA)

SCoRA Membership (as of December 2019)
Gerry W. Kindred, Chair, Tennessee Valley Authority
Gary DeMoss, Vice Chair, PSEG Nuclear, LLC
Diane M. Jones, Vice Chair, Enercon
Robert J. Budnitz, Lawrence Berkeley National Laboratory (retired)
C. Rick Grantom, C.R. Grantom P.E. Associates, LLC
F. Gregory Hudson, Metcalfe PLLC
Stanley H. Levinson, Individual
Allen Moldenhauer, Dominion
Roy Linthicum, Exelon/PWR Owners Group
Pamela F. Nelson, National Autonomous University of Mexico
James O’Brien, Department of Energy
Vish Patel, Southern Company
Robert Rishel, Duke Energy/BWR Owners Group
Stacey Rosenberg, Nuclear Regulatory Commission
Candace DeMessieres, US NRC (alternate for S. Rosenberg)
Jeffrey Stone, Exelon
Kent Sutton, INGRID Consulting Services, LLC
Carroll Trull, Westinghouse Electric Company
Jodine M. Jansen Vehec, JTV Nuclear Consultants
Vicki Warren, Jensen-Hughes Inc.

Charter: To interface with the ANS Standards Board, the ASME Board on Nuclear Codes and Standards, and their subordinate groups, and other standards development organizations (SDOs) regarding nuclear related standards that include or plan to include risk assessment, risk management, and risk-informed applications. The work of the 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 consistency in other nuclear-related standards with risk management principles, in general, and to work toward consistency with the JCNRM’s PRA standards.

When the SCoRA organizes a technical interface with a specific nuclear-related standard, it will draw upon the membership of the JCNRM, but the interface activity need not be limited to that 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, even if developed mainly by an ad hoc subsidiary group.

Part of the interface activity includes an education function, for which the SCoRA will avail itself of resources that exist among the broader JCNRM membership. The 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.

Status: The influence of SCoRA continues to grow as the subcommittee’s membership expands, and its role in affecting risk application standards matures. SCoRA has been instrumental in the genesis of a JCNRM Physical/Cyber Risk-Informed Security Working Group having a goal of developing a guidance document on how to risk-inform nuclear security. SCoRA has provided meaningful commentary and suggestions on various standards seeking to become more "risk-informed." New initiatives include how to risk-inform nuclear emergency response plans. Finally, several SCoRA members continue to serve on the ANS Standards Board’s Risk-informed, Performance-based Principles and Policy Committee (RP3C); the relationship between SCoRA and RP3C continues to strengthen as each committee addresses specific requests.

JCNRM Physical/Cyber Risk-Informed Security Working Group

Scope: This working group was established with the initial scope to develop a “Guidance Document for Risk Informing Physical Security and Cyber Security Programs at Nuclear Facilities.”

Physical/Cyber Risk-Informed Security Working Group Membership (as of December 2019):
Rob White, Chair, Xcel Energy; George Apostolakis, Individual; Robert Budnitz, Lawrence Berkeley National Laboratory (retired); Yung Hsien J. Chang, US Nuclear Regulatory Commission; Lon Dawson, Sandia National Laboratories; Bradley W. Dolan, Tennessee Valley Authority; Fernando Ferrante, Electric Power Research Institute; Rick Grantom, C.R. Grantom & Assoc. LLC; Jerud Hanson, US Nuclear; Wesley Held, US Nuclear Regulatory Commission; F. Gregory Hudson, Metcalfe PLLC; Sean Peters, US Nuclear Regulatory Commission; Joseph Rivers, Institute for Nuclear Materials Management; Kent Sutton, INGRID Consulting Services LLC; Grant Teagarden, Jensen Hughes; Carroll Trull, Westinghouse Electric Company

Status: This working group was formed by the JCNRM in early 2019 and held 5 meetings and numerous conference calls during calendar 2019. An outline for the proposed “guidance document” was developed early-on, and work began on writing the substantive content of each section of that proposed outline. Much discussion was necessary among the writing group membership to assure that the scope and level of detail of these early contributions are appropriate. In late summer 2019, the working group suspended that activity to concentrate at first on writing a position paper on quantifying the likelihood of an adversary attack, which when complete will be one major part of the larger guidance document. Based on the numerous activities and interactions in 2019, work began in November 2019 to develop a PINS form to formalize the scope of the planned work. After JCNRM approval of that PINS form, it is anticipated that it will be forwarded to the ANS and ASME supervising boards in early 2020. The working group’s effort is still in its early stages, and there is no schedule as yet for the completion of the guidance document.
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<tr>
<th>Subcommittees</th>
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<tr>
<td><strong>Subcommittee on Risk Applications (SCoRA)</strong></td>
<td>JCNRM Physical/Cyber Risk-Informed Security Working Group</td>
</tr>
<tr>
<td>Gerry Kindred (Chair)</td>
<td>(SCoRA does not develop standards.)</td>
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<td>Gary DeMoss (Vice Chair)</td>
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<td>Diane Jones (Vice Chair)</td>
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<tr>
<td><strong>Subcommittee on Standards Development (SC-SD)</strong></td>
<td>ASME/ANS RA-S-58.22, Low Power and Shutdown PRA Writing Group</td>
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<tr>
<td>Barry Sloane (Chair)</td>
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<tr>
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<td>ASME/ANS RA-S Level 1 PRA Working Group Including LERF (Part 1)</td>
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<tr>
<td>Paul Amico (Chair)</td>
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<tr>
<td>Andrea Maioli (Vice Chair)</td>
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<tr>
<td><strong>JCNRM Physical/Cyber Risk-Informed Security Working Group</strong></td>
<td>ASME/ANS RA-S-1.2 Level 2 PRA Writing Group (previously ANS-58.24)</td>
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<td><strong>JCNRM Physical/Cyber Risk-Informed Security Working Group</strong></td>
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<td>ASME/ANS RA-S-1.3 Level 3 PRA Writing Group (previously ANS-58.25)</td>
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<td>ASME/ANS RA-S-1.5 Advanced LWR PRA Writing Group</td>
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<td>ASME/ANS RA-S Screening and Other Hazards Working Group At-Power PRA (Parts 6 &amp; 9)</td>
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Table 8 – JCNRM Organizational Chart
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:

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<tr>
<th>Year Awarded</th>
<th>Recipients</th>
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| 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  
<pre><code>          | Miles C. Leverett                                 |
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<td>Earthquake Instrumentation Criteria for Nuclear Power Plants</td>
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<td>Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites</td>
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<tr>
<td>ANS-2.6-2018</td>
<td>Guidelines for Estimating Present &amp; Projecting Future Population Distributions Surrounding Nuclear Facility Sites</td>
<td>$147</td>
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<td>ANS-2.8-2019</td>
<td>Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities</td>
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<td>ANS-2.10-2017</td>
<td>Criteria for Retrieval, Processing, Handling, and Storage of Records from Nuclear Facility Seismic Instrumentation</td>
<td>$121</td>
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<td>ANS-2.17-2010 (R2016)</td>
<td>Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants</td>
<td>$152</td>
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<td>ANS-2.29-2008 (R2016)</td>
<td>Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments</td>
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<td>Probabilistic Seismic Hazard Analysis</td>
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<td>ANS-2.30-2015</td>
<td>Criteria for Assessing Tectonic Surface Fault Rupture and Deformation at Nuclear Facilities</td>
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<td>ANS-3.1-2014</td>
<td>Selection, Qualification and Training of Personnel for Nuclear Power Plants</td>
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<td>ANS-3.2-2012 (R2017)</td>
<td>Managerial, Administrative, and Quality Assurance Controls for the Operational Phase of Nuclear Power Plants</td>
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<td>Operation of Fast Pulse Reactors (Revision of ANSI-14.1-1975; R2009)</td>
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<td>ANSI-15.2-1996 (R2016)</td>
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<td>Quality Control for Plate-Type Uranium-Aluminum Fuel Elements (Revision of ANSI-15.2-1990)</td>
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<td>ANSI-15.4-2016</td>
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<tr>
<td>Selection and Training of Personnel for Research Reactors (Revision of ANSI-15.4-2007)</td>
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<td>Quality Assurance Program Requirements for Research Reactors (Revision of ANSI-15.8-1976; R1986)</td>
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<td>Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure (Revision of ANSI-16.1-1986)</td>
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<td>Nuclear Data Sets for Reactor Design Calculations (Revision of ANSI-19.1-2002; R2011)</td>
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<td>Steady-State Neutronics Methods for Power Reactor Analysis (Revision of ANSI-19.3-2005)</td>
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<td>The Determination of Thermal Energy Deposition Rates in Nuclear Reactors (Revision of ANSI-19.3.4-1976; R1983; R1989)</td>
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<tr>
<td>Methods for Determining Neutron Fluence in BWR and PWR Pressure Vessel and Reactor Internals (Revision of ANSI-19.11-1997; R2011)</td>
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<td>ANSI-19.11-2017</td>
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<tr>
<td>Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Water Reactors (Revision of ANSI-19.11-1997; R2011)</td>
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<td>Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation</td>
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<td>Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants</td>
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<td>Design Requirements for New Fuel Storage Facilities at Light Water Reactor Plants (Revision of ANSI-57.3-1983)</td>
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<td>Safety and Pressure Integrity Classification Criteria for Light Water Reactors (Supersedes ANSI-58.14-1993)</td>
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<td>Lubricating Oil Systems for Safety-Related Emergency Diesel Generators</td>
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<td>Safety Guide for the Performance of Critical Experiments</td>
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<td>ANSI-2.7-1982</td>
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<td>Criteria and Guidelines for Assessing Capability for Surface Faulting at Nuclear Power Plant Sites</td>
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<td>ANSI-2.8-1992</td>
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<td>Determining Design Basis Flooding at Power Reactor Sites</td>
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<td>ANSI-2.9-1980 (R1989)</td>
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<td>Evaluation of Ground Water Supply for Nuclear Power Sites</td>
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<td>Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation</td>
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<td>Guidelines for Combining Natural and External Man-Made Hazards at Power Reactor Sites</td>
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<td>Requirements for Reference Reactor Physics Measurements</td>
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<td>Auxiliary Feedwater System for Pressurized Water Reactors</td>
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<td>ANS-54.1-1989</td>
<td>General Safety Design Criteria for a Liquid Metal Reactor Nuclear Power Plant</td>
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<td>ANS-54.2-1985</td>
<td>Design Bases for Facilities for LMFBR Spent Fuel Storage in Liquid Metal Outside the Primary Coolant Boundary</td>
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<tr>
<td>ANS-54.8-1988</td>
<td>Liquid Metal Fire Protection in LMR Plants</td>
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<td>Subcompartment Pressure and Temperature Transient Analysis in LWRs</td>
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