



American Nuclear Society Presentation to the NESCC

November 3, 2014

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Presentation Overview

- Society history
- High-level organizational structure
- Standards Committee structure and charter
- Recent reorganization of the Standards Committee
- Standards Board initiatives, programs, and projects
- Consensus committee scopes, future plans, and active standards projects
- Proposed new standards in development and recently approved
- Summary





History

The American Nuclear Society (ANS) was launched in 1954 as a professional organization of engineers and scientists devoted to peaceful and beneficial applications of nuclear science and technology.

ANS has more than 11,000 members. These individuals represent a broad spectrum of organizations, from utilities and manufacturers to educational institutions, national laboratories, and government agencies - approximately 900 members reside overseas in 60 countries. The Society's main objective is to promote the advancement of engineering and science relating to the atomic nucleus.

In addition to voluntary consensus standards, ANS publishes the following documents:

- *Nuclear News*, a monthly industry magazine
- *Radwaste Solutions*, an industry topical magazine
- Proceedings, Transactions, textbooks, monographs
- ANS News, a Society newsletter
- *Nuclear Standards News*, a bi-monthly newsletter dedicated solely to nuclear standards and nuclear regulatory issues
- Journals: Nuclear Science and Engineering, Fusion Science and Technology, Nuclear Technology
- A variety of electronic media (Notes & Deadlines, Nuclear Café, ANS tweets)



Organizational Chart



The ANS Standards Committee



Standards Committee

The ANS Standards Committee is a collective term for all committees involved in the development, approval, and management of ANS standards. The ANS Standards Board (SB), a Standing Committee of the Society, oversees the ANS Standards Committees. The Standards Committee was formed in 1957 and has earned American National Standards Institute (ANSI) approval of over 300 standards. ANS has 77 current American National Standards and nearly 60 standards projects in development.



Charter

ANS is the only standards development organization (SDO) devoted solely to the development of standards for the nuclear science and technology community.

The ANS Standards Committee is responsible for the development and maintenance of standards that address the following subjects and closely related activities:

- Definitions of terminology used in nuclear science and technology
- Siting requirements for nuclear facilities
- Nuclear facility design and operations, including safety criteria for facilities, operator selection, and training
 - o Power production reactors
 - o Research reactors and critical facilities
 - o Nuclear fuel production, handling, and storage facilities
 - o Facilities for handling radioactive isotopes, including remote handling of radioactive materials
- Remediation and restoration of sites used for nuclear facilities
- Emergency preparedness
- Nuclear criticality safety





Reorganization

The ANS Standards Committee completed a reorganization in 2013. Six new consensus committees were created by reassigning standards products of two excessively large consensus committees into more focused concentrations. Two existing consensus committees remained unchanged – the Nuclear Criticality Safety Consensus Committee and the ANS/ASME Joint Committee on Nuclear Risk Management. The reorganization was deemed necessary to increase efficiency and productivity, afford greater expertise on each consensus committee, and better utilize scarce volunteer resources.



The ANS Standards Committee



Subcommittees (23 subcommittees) (preliminary reviewers/task orientated)

> Working Groups (~120 working groups) (standards writers)

The ANS Standards Board



Standards Board (SB)

Chair: George F. Flanagan, Oak Ridge National Laboratory Vice Chair: Steven L. Stamm, Individual

The SB manages all standards activities and interests for the Society. The SB is responsible for disbanding or creating consensus committees as the need dictates, defining consensus committee scopes, evaluating, approving, and assigning proposed standards projects in the case of a disagreement. The SB provides policy and procedural direction for all elements of the Standards Committee. The SB certifies that the consensus process is fulfilled and ensures that due process procedures have been implemented prior to requesting approval of ANSI for new and revised standards and reaffirmations.





Initiatives: Programs & Projects

The SB has initiated several programs and projects....

- Development of a white paper on defense-in-depth to determine appropriate use and level of detail in ANS standards
- Solicitation of ANS student member participation in ANS standards
- Creation of an ANS web-based workspace for ANS standards development
- Establishment of liaisons with other SDOs, regulatory agencies, and industry groups
- Harmonization of PRA standards through the joint chairmanship of the Nuclear Risk Management Coordinating Committee
- Support of U.S. participation in international standards (ANS holds the secretary position for ISO/TC 85/Subcommittee 6 on reactor technology)
- Creation of 5 task groups to address specific goals





The SB has created five task groups to address current needs

- Policy Task Group improves the link between the SB and the rest of the management structure of ANS
- Priority Task Group sorts ANS standards data to show a priority list of ANS standards
- External Communications Task Group improves the links between ANS and ANS standards users, national regulators, industry organizations (NEI, EPRI, INPO) and other SDOs both national and international
- Internal Communications Task Group establishes closer relationships with ANS governance and Professional Divisions
- Sales Task Group increase the sales of ANS standards



Special Committee Risk-Informed and Performance-Based Principles Policy Committee (RP3C)

Chair: N. Prasad Kadambi, Individual Vice Chair: Ed. G. Wallace, NuScale Power Inc.

The RP3C is responsible for the identification and oversight of the development and implementation of the ANS Risk-Informed and Performance-Based Standards Plan that establishes the approaches, priorities, responsibilities and schedules for implementation of risk-informed and performance-based principles into ANS standards. These principles are applicable to standards that address the design, construction, operation, evaluation and analysis, decontamination and decommissioning, waste management, and environmental restoration for nuclear facilities. The RP3C is not authorized to develop consensus standards or other similar products.



Consensus Committee Scopes & Projects



Large Light Water Consensus Committee (LLWRCC)

Chair: William B. Reuland, Individual Vice Chair: Timothy K. Meneely, Westinghouse Electric Company

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.

Future Plans: Reviewing historical ANS standards and inactive projects assigned to the LLWRCC in the reorganization to determine whether there may be a need to reinvigorate previous standards or projects. Topical areas under consideration include containment hydrogen control and emergency preparedness response. Additional standards are being consideration to support the NRC Near Term Task Force review of insights from the Fukushima Daiichi accident.





Standards in development:

- ANS-3.1 "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" (historical revision)
- ANS-3.5, "Nuclear Power Plant Simulators for Use in Operator Training and Examination" (revision)
- ANS-3.8.7, "Properties of Planning, Development, Conduct, and Evaluation of Drills and Exercises for Emergency Preparedness at Nuclear Facilities" (historical revision)
- ANS-3.13, "Nuclear Facility Reliability Assurance Program (RAP) Development Criteria" (new standard)
- ANS-18.1, "Radioactive Source Term for Normal Operation of Light Water Reactors" (historical revision)
- ANS-51.10, "Auxiliary Feedwater System for Pressurized Water Reactors" (revision)
- ANS-56.8, "Containment System Leakage Testing Requirements" (revision)
- ANS-58.6, "Criteria for Remote Shutdown for Light Water Reactors Facilities" (historical revision)
- ANS-58.8, "Time Response Design Criteria for Safety-Related Operator Actions" (revision)



Research and Advanced Reactor Consensus Committee (RARCC)

Chair: George F. Flanagan, Oak Ridge National Laboratory Vice Cochair: Bruce B. Bevard, Oak Ridge National Laboratory Vice Cochair: D. Sean O'Kelly, National Institute of Standards and Technology

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.

Future Plans: Reviewing historical ANS standards and inactive projects assigned to the RARCC in the reorganization to determine whether there is a need to reinvigorate. Topical areas under consideration include standards for advanced reactors and small modular reactors.



RARCC Projects

Standards in development:

- ANS-15.4, "Selection and Training of Personnel for Research Reactors" (revision)
- ANS-15.11, "Radiation Protection at Research Reactors" (revision)
- ANS-15.15, "Criteria for the Research Safety Systems of Research Reactors" (new standard)
- ANS-15.16, "Emergency Planning for Research Reactors" (revision)
- ANS-20.1, "Nuclear Safety Criteria and Design Process for Fluoride Salt-Cooled High-Temperature Reactor NPPs" (new standard)
- ANS-30.1, "Risk-Informed and Performance-Based Nuclear Power Plant Design Process" (new standard)
- ANS-30.2, "Risk-informed, Performance Based Safety Classification System for Nuclear Facilities" (new standard)
- ANS-54.1 "Nuclear Safety Criteria and Design Process for Liquid-Sodium-Cooled-Reactor NPPs" (historical revision)





Nonreactor Nuclear Facilities Consensus Committee (NRNFCC)

Chair: James B. O'Brien, U.S. Department of Energy Vice Chair: Jeffery R. Brault, Individual

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.

Future Plans: Reviewing historical ANS standards and inactive projects assigned to the NRNFCC in the reorganization to determine whether there may be a need to reinvigorate or create. For example, the NRNFCC is evaluating the need for voluntary consensus standards on hot cells and gloveboxes.





NRNFCC Projects

Standards in development:

- ANS-3.14, "Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities" (new standard)
- ANS-57.11, "Integrated Safety Assessments for Fuel Cycle Facilities" (new standard)





Safety and Radiological Analyses Consensus Committee (SRACC)

Chair: Andrew O. Smetana, Savannah River National Laboratory Vice Chair: Abraham Weitzberg, Individual

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.

Future Plans: Reviewing historical ANS standards and inactive projects assigned to the SRACC in the area of reactor physics and scientific engineering software to determine if any should be reinvigorated. The SRACC is looking at other areas within its scope where a standard would be beneficial.





SRACC Projects

- ANS-5.1, "Decay Heat Power in Light Water Reactors" (revision)
- ANS-6.4.2, "Specification for Radiation Shielding Materials" (revision)
- ANS-6.4.3, "Gamma-Ray Attenuation Coefficients & Buildup Factors for Engineering Materials" (historical revision)
- ANS-6.6.1, "Calculation and Measurement of Direct and Scattered Gamma Radiation from LWR Nuclear Power Plants" (revision)
- ANS-10.8, "Non-Real Time, High Integrity Software for the Nuclear Industry-User Requirements" (new standard)
- ANS-19.1, "Nuclear Data Sets for Reactor Design Calculations" (revision)
- ANS-19.4, "Acquisition and Documentation of Reference Power Reactor Physics Measurements for Nuclear Analysis Verification" (historical revision)
- ANS-19.5, "Requirements for Reference Reactor Physics Measurements" (historical revision)
- ANS-19.11, "Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Water Reactors" (revision)



Environmental and Siting Consensus Committee (ESCC)

Chair: Carl A. Mazzola, CB & I Federal Services Vice Chair: Yan Gao, Westinghouse Electric Company

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 U.S. 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.

Future Plans: Reinvigorating inactive standards projects and initiating new standards projects on environmental impact assessment and analysis, meteorology, hydrogeology, seismic, and ecology to support new reactor licensing. Developing a suite of natural phenomena hazards standards to support DOE needs associated with DOE-STD-1020 and DOE-STD-1189.



ESCC Projects

Standards in development:

- ANS-2.2, "Earthquake Instrumentation Criteria for Nuclear Power Plants" (historical revision)
- ANS-2.8, "Determine External Flood Hazards for Nuclear Facilities Determining Design Basis Flooding at Power Reactor Sites" (historical revision)
- ANS-2.9, "Evaluation of Ground Water Supply for Nuclear Facilities" (historical revision)
- ANS-2.10, "Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation" (revision)
- ANS-2.16, "Criteria for Modeling Design-Basis Accidental Releases from Nuclear Facilities" (new standard)
- ANS-2.18, "Standards for Evaluating Radionuclide Transport in Surface Water for Nuclear Power Sites" (new standard)
- ANS-2.21, "Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink" (new standard)
- ANS-2.23, "Nuclear Plant Response to an Earthquake" (revision)
- ANS-2.30, "Assessing Capability for Surface Faulting at Nuclear Facilities" (new standard)
- ANS-2.31, "Standard for Estimating Extreme Precipitation at Nuclear Facility Sites" (new standard)
- ANS-3.8.10, "Criteria for Modeling Real-Time Accidental Release Consequences at Nuclear Facilities" (new standard)
- ANS-3.11, "Determining Meteorological Information at Nuclear Facilities" (revision)





Fuel, Waste, and Decommissioning Consensus Committee (FWDCC)

Chair: Donald R. Eggett, AMEC PPA Vice Chair: Sheila A. Lott, Los Alamos National Laboratory

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.

Future Plans: Reviewing historical ANS standards and inactive projects assigned to the FWDCC in the area of new and used fuel, waste, and decommissioning to determine if any should be reinvigorated or created. Additionally, the FWDCC is currently evaluating new areas where standards are needed for fuel, waste, and specifically decommissioning due to the latest permanently shutdown commercial plants.





FWDCC Projects

Standards in development:

- ANS-57.2, "Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants" (historical revision)
- ANS-57.3, "Design Requirements for New Fuel Storage Facilities at LWR Plants" (historical revision)





Joint Committee on Nuclear Risk Management (JCNRM)

(A joint ANS and ASME consensus committee)

ANS Cochair: Robert J. Budnitz, Lawrence Berkeley National Laboratory ASME Cochair: C. Rick Grantom, South Texas Project Nuclear Operating Company ANS Vice Cochair: Dennis Henneke, General Electric Company ASME Vice Cochair: Pamela Nelson, National Autonomous University of Mexico

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 & Certification Board. These criteria and methods are applicable to design, development, construction, operation, decontamination, decommissioning, waste management, and environmental restoration for nuclear facilities.

Future Plans: A new standard covering PRA for non-LWR power reactors was issued for trial use in December 2013. In the next year, the JCNRM expects to issue four new PRA standards, all to be issued initially for trial use. These standards cover (1) PRA for LWRs during low power and shutdown conditions; (2) Level 2 PRA for LWRs; (3) Level 3 PRA for LWRs; and (4) a standard for advanced LWR reactors in the design and construction phase. Trial use findings will be incorporated into the standards before seeking ANSI approval.





JCNRM Projects

Standards in development:

- ANS/ASME-58.22, "Low-Power Shutdown PRA Methodology" (new standard)
- ASME/ANS RA-S, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications" (revision)
- ASME/ANS RA-S-1.2, "Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications" (previously ANS/ASME-58.24) (new standard)
- ASME/ANS RA-S-1.3, "Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications" (previously ANS/ASME-58.25) (new standard)
- ASME/ANS RA-S 1.5, "Advanced Light Water Reactor PRA Standard" (new standard)



Nuclear Criticality Safety Consensus Committee (NCSCC -- Formerly N16)

Chair: Robert D. Busch, University of New Mexico Vice Chair: Larry L. Wetzel, Babcock & Wilcox Nuclear Operations Group

The NCSCC (formerly known as N16) is responsible for the preparation and maintenance of voluntary consensus standards for determining the potential for nuclear criticality of fissile material outside reactors, for the prevention of accidental criticality, for mitigating consequences of accidents should they occur, and for the prevention of nuclear chain reactions in activities associated with handling, storing, transporting, processing, and treating fissionable nuclides.

Future Plans: The NCSCC is exploring the possibility of developing a criticality standard specific to spent fuel storage facilities and is working with the NRNFCC on ANS-57.11, "Integrated Safety Assessments for Fuel Cycle Facilities."



NCSCC Projects

Standards in development:

- ANS-8.3, "Criticality Accident Alarm System" (revision)
- ANS-8.5, "Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material" (revision)
- ANS-8.7, "Nuclear Criticality Safety in the Storage of Fissile Materials" (revision)
- ANS-8.10, "Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement" (revision)
- ANS-8.12, "Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors" (revision)
- ANS-8.20, "Nuclear Criticality Safety Training" (revision)
- ANS-8.21, "Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors" (revision)
- ANS-8.22, "Nuclear Criticality Safety Based on Limiting and Controlling Moderators" (revision)
- ANS-8.23, "Nuclear Criticality Accident Emergency Planning and Response" (revision)
- ANS-8.24, "Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations" (revision)
- ANS-8.26, "Criticality Safety Engineer Training and Qualification Program" (revision)
- ANS-8.27, "Nuclear Criticality Safety Based on Limiting and Controlling Moderators" (revision)
- ANS-8.28, "Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety" (new standard)



ANS Standards

New Standards in Development & Recently Approved





- ANS-3.13, "Nuclear Facility Reliability Assurance Program (RAP) Development Criteria" (LLWRCC)
- ANS-3.14, "Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities" (NRNFCC)
- ANS-10.8, "Non-Real Time, High Integrity Software for the Nuclear Industry-User Requirements" (SRACC)
- ANS-15.15, "Criteria for the Research Safety Systems of Research Reactors" (RARCC)
- ANS-20.1, "Nuclear Safety Criteria and Design Process for Fluoride Salt-Cooled High-Temperature Reactor NPPs" (RARCC)
- ANS-30.1, "Risk-Informed and Performance-Based Nuclear Power Plant Design Process" (RARCC)
- ANS-30.2, "Risk-informed, Performance Based Safety Classification System for Nuclear Facilities" (RARCC)
- ANS-2.16, "Criteria for Modeling Design-Basis Accidental Releases from Nuclear Facilities" (ESCC)
- ANS-2.18, "Standards for Evaluating Radionuclide Transport in Surface Water for Nuclear Power Sites" (ESCC)
- ANS-2.21, "Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink" (ESCC)



New Standards in Development (Continued)

- ANS-2.30, "Assessing Capability for Surface Faulting at Nuclear Facilities" (ESCC)
- ANS-2.31, "Standard for Estimating Extreme Precipitation at Nuclear Facility Sites" (ESCC)
- ANS-3.8.10, "Criteria for Modeling Real-Time Accidental Release Consequences at Nuclear Facilities" (ESCC)
- ANS-8.28, "Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety" (new standard)
- ANS/ASME-58.22, "Low-Power Shutdown PRA Methodology" (JCNRM)
- ASME/ANS RA-S-1.2, "Severe Accident Progression and Radiological Release (Level 2) PRA Methodology to Support Nuclear Installation Applications" (JCNRM)
- ASME/ANS RA-S-1.3, "Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications" (JCNRM)
- ASME/ANS RA-S 1.5, "Advanced Light Water Reactor PRA Standard" (JCNRM)



Standards Recently Approved by ANSI (new & revised)

- ANSI/ANS-2.15-2013, "Criteria for Modeling and Calculating Atmospheric Dispersion of Routine Radiological Releases from Nuclear Facilities"
- ANSI/ANS-3.4-2013, "Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants"
- ANSI/ANS-6.1.2-2013, "Neutron and Gamma-Ray Cross Sections for Nuclear Radiation Protection Calculations for Nuclear Power Plants"
- ANSI/ANS-8.1-2014, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors"
- ANSI/ANS-8.15-2014, "Nuclear Criticality Control of Special Actinide"
- ANSI/ANS-8.19-2014, "Administrative Practices for Nuclear Criticality Safety"
- ANSI/ANS-10.7-2013, "Non-Real-Time, High-Integrity Software for the Nuclear Industry—Developer Requirements"
- ANSI/ANS-58.16-2014, "Safety Classification and Design Criteria for Nonreactor Nuclear Facilities"



Challenges

The greatest challenge of the ANS Standards Committee is volunteer resources. Company support for standards work has been on the decline for many years and many volunteers struggle to find time for standards activities with continually increasing workloads. Additionally, a substantial number of volunteers have reached retirement or will be retiring soon. While these individuals now have the time to devote their vast knowledge to standards activities, retirement affords them no company support. Without additional resources, the schedules associated with standards development and maintenance could fall victim to delays caused by inability of key people to actively participate in face-to-face meetings.



ANS is ready to play a greater role in addressing the issues of more effective standardization in nuclear technology, but we will need more resources if we are to do it to an expedited schedule.



Accomplishments

- 10 new standards in development
- 50 revised standards in development
- 50 standards approved in the last 5 years (reaffirmation, revisions, and new standards)





Recap

- The ANS Standards Committee is working hard to develop and maintain standards for the industry.
- ANS strongly supports the coordination efforts of the NESCC as a forum to interact between other SDOs, DOE, NRC, and industry.
- ANS encourages all to consider participating in ANS standards and airing topics of interest at ANS national meetings.
- ANS welcomes comments and questions on ANS standards.