

Respondent: American Nuclear Society (ANS) Standards Board on behalf of the ANS Standards Committee

Point of Contact: Andrew Sowder, ANS Standards Board Chair

Title: American Nuclear Society Standards Board Response to NIST RFI (NIST–2023–0005)

Date: November 5, 2023

The National Institute of Standards and Technology (NIST) issued a “Request for Information on Implementation of the United States Government National Standards Strategy for Critical and Emerging Technology (USG NSSCET)”.

The National Science and Technology Council (NSTC) has defined critical and emerging technologies (CETs) as “a subset of advanced technologies that are potentially significant to U.S. national security.” The latest list of CETs explicitly includes **Advanced Nuclear Energy Technologies**.¹

The American Nuclear Society (ANS) Standards Committee develops voluntary consensus standards to be certified by the American National Standards Institute (ANSI) as American National Standards. The standards developed and maintained by the ANS Standards Committee address the design, analysis, and operation of components, systems, and facilities related to the application of nuclear science and technology. Additional information on the ANS Standards Committee and its processes is provided at the end of this document.

General Questions

1. Are there potential benefits, opportunities, or risks associated with increased U.S. participation in standards development activities for CET?

There are many opportunities and benefits with increased U.S. participation in standards development activities in relation to Advanced Nuclear Energy Technologies. Increased U.S. participation in standards development for Advanced Nuclear Energy Technologies allow the U.S. to utilize its experience to help shape the global standards landscape and remain relevant as new nuclear technologies emerge and are deployed internationally. There do not appear to be any risks or downsides associated with increased U.S. participation. To the contrary, the risks are in decreased U.S. participation.

As stated in an IAEA Bulletin article in 1977:

Safety standards and requirements are basic for the design, construction, and operation of nuclear facilities and are the codification of sound engineering practice and experience. When establishing nuclear safety standards and requirement in an importing country, the choice will essentially consist of using the available standards of the importing country, international standards, or those of the exporting country. Since standards are associated with industrial undertakings, the developing countries usually do not have a base of engineering related standards, and certainly no specific nuclear standards. International standards are being developed, including a large safety standards programme at

¹ Critical and Emerging Technologies List Update. A Report by the Fast Track Action Subcommittee on Critical and Emerging Technologies of the National Science and Technology Council. Washington, D.C. February 2022. <https://www.whitehouse.gov/wp-content/uploads/2022/02/02-2022-Critical-and-Emerging-Technologies-List-Update.pdf>.

*the IAEA, but their general application and use in the nuclear field may still be many years in the future. Although somewhat of an over-simplification, the importing country, especially the developing countries, must almost of necessity adopt the standards and requirements of the exporting country.*²

Accordingly, failure to actively engage in civilian nuclear energy exports and in the development of the requisite codes and standards that frequently accompany those export, the United States risks losing its key role in establishing international norms and standards with respect to nuclear safety. As stated by a State Department official in 2013 during remarks at the Nuclear Energy Institute on civilian nuclear technology, “When we export U.S. technology, we are also exporting our safety and security cultures.”³

2. What are the potential risks or implications of decreased U.S. participation in standards development activities for CET?

Decreased U.S. participation in standards development for Advanced Nuclear Energy Technologies would likely lead to decreased U.S. global relevance and influence in the safety of civilian nuclear plant technology and would result in a marketplace where U.S. nuclear plant designs and components would not align with the international standards and regulatory frameworks adopted by importing countries, especially new-to-nuclear countries. This would put U.S. exports at a disadvantage relative to other exporting countries.

Decreased U.S. participation would also likely result in even lengthier development time for standards and insufficient cohorts of subject matter experts to review draft standards potentially resulting in technical inadequacy. Standards developed without sufficient participation from industry stakeholders, such as designers and vendors of Advanced Nuclear Energy Technologies, will likely result in standards development by personnel lacking practical experience and commercial perspectives and possible undue influence from other countries and non-industry sectors that yield biased or self-serving outcomes.

Decreased U.S. participation in international standard development for Advanced Nuclear Energy Technologies, in the words of the Council on Foreign Relations, “... will also cost U.S. leadership in setting safety and security standards in the global civil nuclear energy industry, in shaping the global nuclear nonproliferation regime, and in the geopolitical and geoeconomic competition against its major rivals.”⁴

3. What are the most important challenges faced by the private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) when participating in standards development activities for CET, and how can these

² Morris Rosen. The Critical Issue of Nuclear Power Plant Safety in Developing Countries. *IAEA Bulletin*. Vol. 19, No. 2. 1977.

³ Remarks delivered by Rose Gottemoeller, Acting Under Secretary for Arms Control and International Security, U.S. Department of State. *Geopolitics and Nuclear Energy: The View from the State Department*. Nuclear Energy Institute. Washington, D.C. May 15, 2013. <https://2009-2017.state.gov/t/us/209768.htm>

⁴ Zongyuan Zoe Liu. Renewing America’s Leadership in the Global Civil Nuclear Energy Market. Renewing America (blog post). Council on Foreign Relations. Washington, D.C. June 22, 2022. <https://www.cfr.org/blog/renewing-americas-leadership-global-civil-nuclear-energy-market>

challenges be addressed?

Because most SDOs, including ANS, rely almost exclusively on volunteers for completing the bulk of work on standards development and maintenance, the ability to produce standards in a timely manner is determined by the availability of subject matter experts to either donate their time after hours or to have their time provided as an in-kind contribution from their employers.

One major challenge faced by the private sector is mustering of adequate resources to support standards development for Advanced Nuclear Energy Technologies, as those resource commitments must be balanced against other pressing demands for key or limited technical staff expertise, commercial product development timelines, and allocation of capital obtained from private investors. Investment of staff time can be particularly difficult for small and medium sized companies, including start-ups with limited staff and monetary resources.

Because SDOs rely heavily on subject matter experts from private industry, there can also be concerns of sharing propriety information, concerns of additional regulatory compliance burdens resulting from the development of new standard – especially if the benefits of or justification for that standard is not clear, and concern that the standard will not be completed in a timely manner.

The most direct avenue for addressing the challenges faced by SDOs in the Advanced Nuclear Energy Technology domain would be direct or indirect government funding support to bolster and expedite the standards development process. Even having a single contractor funded to coordinate and track standards development can greatly accelerate the tempo for standards writing and comment resolution, which otherwise relies upon the unpredictable availability of volunteers. And by having some dedicated funding for development of a specific standard, SMEs and/or their employers would have more confidence in both the timeliness of the standard and the efficiency of the overall process.

Funding for support of nuclear standards development could come in the form of non-competitive grants and competitive awards from the government stakeholder organizations, including the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, and the Department of Defense. Also, code and standard development could also be tied to successful funding awards for funding opportunity announcements (FOAs), request for proposals (RFPs), and other federal funding solicitation vehicles. Because establishment of a code or standards can facilitate and streamline the licensing and adoption of new nuclear energy technologies, including standard development as an expected outcome for government sponsored projects, where applicable or appropriate, could further enhance the public's return on its investment in the development of Advanced Nuclear Energy Technologies.

USG NSSCET Objective 1: Investment

4. How can the U.S. Government establish policies that promote standards development for CET as a critical component of U.S. innovation culture?

Standards in the nuclear industry are developed by volunteers. Many companies do not support employees spending company time and resources on standards work. As many if not most standards development meetings can be held virtually, the primary issue is for companies to allow company time for employees to participate in standards work. If the U.S. government encouraged private companies to allow employees to be involved in standards development, it would increase participation, greatly broaden the knowledge-based spectrum and increase the pace of the development of standards. Currently, development of a new standard typically takes 5 or 6 years. Greater support and participation could cut that time in half.

With respect to Advanced Nuclear Energy Technologies, NIST, U.S. Department of Energy, and the

U.S. Nuclear Regulatory Commission should engage with and support the Advanced Reactor Codes and Standards Collaborate (ARCSC). The ARCSC is an industry-led collaborative to support the codes and standards needs of the advanced reactor community.

The ARCSC is currently performing a gap analysis to identify and prioritize codes and standards that support and facilitate commercial deployment of advanced reactor technologies that include the Advanced Nuclear Energy Technologies included under the USG NSSCET.

More information on ARCSC is provided below.

5. How can the U.S. Government utilize Federal spending on research and development to drive technical contributions for CET standards development activities?

Because standards development relies on volunteer contributions, often exclusively, the development of standards for Advanced Nuclear Energy Technologies can take many years to complete. The development of priority standards could be accelerated if funding were made available to support drafting and coordination activities and to cover expenses (time and travel) through stipends, grants, cost-sharing, or other vehicles for subject matter experts to be involved in standards development. Such support would incentivize participation in and shorten the timeline for the development of Advanced Nuclear Energy Technology standards.

6. How can the U.S. Government facilitate the adoption of standards- based CET by industry stakeholders, including start-ups and small- and medium-sized enterprises (SMEs)?

The U.S. Government already incentivizes application of standards by U.S. Government entities. The National Technology Transfer and Advancement Act of 1995 (NTTAA)⁵ 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-119,⁶ which provides guidance to promote consistent application of the Act across federal agencies and departments.

The U.S. Government could further facilitate the adoption of standards for Advanced Nuclear Energy Technologies by funding or encouraging training on the value and application of standards for Advanced Nuclear Energy Technologies. In addition, application of standards could be incentivized by the U.S. Government beyond its own agencies and departments by incorporating standards development and use into requirements and milestones for federally funded projects and programs, such as those awarded through funding opportunity announcements and requests for proposals.

7. How can the U.S. Government better support publicly funded and private research in standards development activities for CET?

The U.S. Government could incentivize integration of standards development activities as part of existing funding mechanisms and programs that provide support to public and private research. Funding for support of nuclear standards development could come in the form of non-competitive grants and competitive awards from the government stakeholder organizations, including the U.S.

⁵ The NTTAA is available at: <https://www.gpo.gov/fdsys/granule/STATUTE-110/STATUTE-110-Pg775/content-detail.html>

⁶ OMB Circular A-119 is available at: https://www.whitehouse.gov/wp-content/uploads/2020/07/revised_circular_a-119_as_of_1_22.pdf.

Department of Energy, the U.S. Nuclear Regulatory Commission, and the Department of Defense. Code and standard development could also be tied to successful funding awards for funding opportunity announcements (FOAs), request for proposals (RFPs), and other federal funding solicitation vehicles. Because establishment of a code or standards can facilitate and streamline the licensing and adoption of new nuclear energy technologies, including standard development as an expected outcome for government sponsored projects, where applicable or appropriate, could further enhance the public's return on its investment in the development of Advanced Nuclear Energy Technologies.

USG NSSCET Objective 2: Participation

8. How can the U.S. Government increase the amount and consistency of private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) engagement in standards development activities for CET?

Because standards development relies on volunteer contributions, often exclusively, the development of standards for Advanced Nuclear Energy Technologies can take many years to complete. The development of priority standards could be accelerated if funding were made available to support drafting and coordination activities and to cover expenses (time and travel) through stipends, grants, cost-sharing, or other vehicles for subject matter experts to be involved in standards development. Such support would incentivize participation in and shorten the timeline for the development of Advanced Nuclear Energy Technology standards.

U.S. Government support for international harmonization of standards is needed to encourage and facilitate current and future efforts to better align U.S. standards with those of the international community. For example, this could include direct support for U.S. participation on the ANSI Nuclear Technology Advisory Group for ISO Technical Committee TC 85.

U.S. Government incentivization of and support for piloting of and “table-top exercises” for new/draft standards with industry involvement would be an effective means for increasing private sector engagement in standards development and application for Advanced Nuclear Energy Technologies.

9. How can the U.S. Government improve communications among the public and private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) to address potential participation gaps in standards development activities for CET?

The U.S. Government should leverage and support existing mechanisms and relationships to improve communications among public and private sector entities to address participation gaps in standards development for Advanced Nuclear Energy Technologies.

For example, relevant U.S. Government entities such as the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission already have formal liaison roles on SDOs, including the ANS Standards Board. These roles provide U.S. Government employees and their departments with direct insights into the existing and planned work products as well as planned standards development activities for Advanced Nuclear Energy Technologies. The nature of these existing roles and relationships should be communicated broadly within and outside of U.S. Government channels to ensure the coordination opportunities and general awareness are maximized for the benefit of public and private stakeholders in the Advanced Nuclear Energy Technology domain.

Another existing opportunity for U.S. Government support for coordination and communication among public and private stakeholders is the industry-led Advanced Reactor Codes and Standards Collaborative (ARCSC).⁷ The ARCSC was established by SDOs to ensure the development, alignment and timely availability of U.S., Canadian and international codes and standards needed to support large-scale advanced reactor deployment. ARCSC membership comprises representatives from NEI, EPRI, and SDOs having significant roles in nuclear standards development, including ASME, ANS, CSA, and IEEE. ARCSC objectives are to:

1. Facilitate information sharing as to the development of advanced reactor codes and standards underway within SDOs, and between SDOs, industry, regulators, and research organizations.
2. Identify and gather advanced reactor developer standards needs from advanced reactor vendors, and from the national and international industry, regulators, and research organizations.
 - a. Allow SDOs to identify if the needs for standards are currently being addressed and identify where there is a gap that requires additional resources to address the need.
 - b. Facilitate an assessment on needed codes and standards, provide a prioritization of the results, and identify additional actions to be pursued.
3. Inform and complement international and national efforts on advanced reactor codes and standards, such as the IAEA Nuclear Harmonization and Standardization Initiative (NHSI)⁸ and the World Nuclear Associations (WNA) Cooperation in Reactor Design Evaluation and Licensing (CORDEL) working group.⁹
4. Provide information to the North America Advanced Reactor Roadmap Implementation Board to align near and long-term codes and standards development activities with the NEI/EPRI Advanced Reactors Roadmap Codes and Standards building block.

10. How can the U.S. Government foster early collaboration with private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) stakeholders to identify standards for CET that would encourage market and regulatory acceptance as needed? At what stage is early collaboration most effective?

The logical point of contact for the U.S. Government to foster early collaboration with the private sector stakeholders on Advanced Nuclear Energy Technology standards to encourage market and regulatory acceptance would be the industry-led collaborative for Advanced Reactor codes and standards development – ARCSC (see above).

Such collaboration should be initiated early in the development process of Advanced Nuclear Energy Technologies and at the very beginning of standards development to ensure maximum opportunity for Government – industry communications, understanding, and alignment as appropriate.

⁷ The ANS Standards Committee is a founding member organization for ARCSC and can provide points of contact.

⁸ Information on the IAEA NHSI initiative can be found at: <https://nucleus.iaea.org/sites/smr/SitePages/Nuclear-Harmonization-and-Standardization-Initiative.aspx>

⁹ Information on the WNA CORDEL working group can be found at: <https://world-nuclear.org/our-association/what-we-do/working-groups.aspx>

Once new standards are developed, government funding of trial use applications can be particularly effective for encouraging adoption of new standards for Advanced Nuclear Energy Technologies. For example, for probabilistic risk assessment (PRA) standards, trial-use pilot-application of the joint ANS – ASME Non-light-water reactor PRA standard was particularly effective at encouraging widespread awareness and use of the new standard; this activity was funded in part by the U.S. Department of Energy.

11. What roles do the academic community and civil society organizations play in standards development activities for CET, and how can they increase their contributions to a private sector-led system?

The academic community already plays an important role in standards development for Advanced Nuclear Energy Technologies. In many cases, the concepts and the companies themselves originated in R&D programs at universities and national laboratories. However, one area that could lead to increased contributions to standards development would be greater awareness of the role that standards play in the commercialization of Advanced Nuclear Energy Technologies. Greater emphasis placed on nuclear codes and standards in nuclear (and adjacent) engineering programs could encourage increased participation by students as they progress in their career trajectory from undergraduate to graduate programs and then to jobs in the public and private sectors. Government sponsorship of codes and standards awareness, training, and application, for example in engineering design courses, could incentivize greater integration of standards in academic curricula.

12. How can the U.S. Government better support state, local, and tribal governments in participating in standards development activities for CET?

To better support state, local, and tribal government participation in standards development for Advanced Nuclear Energy Technologies, the U.S. Government could sponsor of training programs for increased understanding and awareness and could provide funding to cover staff time and travel to enable participation in standards development activities at the nuclear SDOs.

USG NSSCET Objective 3: Workforce

13. How can the U.S. Government leverage existing or develop new digital tools and resources that facilitate access to standards development processes, and increase engagement by private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) CET stakeholders?

The development and maintenance of standards relies on extensive collaboration among volunteers and access to scientific and engineering information spanning public and private sources. These two functions can be enhanced through online collaboration platforms and databases. Developing, maintaining, and/or licensing such platforms and tools is costly in terms of time and funding. U.S. Government funding support would enable modernization of these practices within SDOs.

14. How can the U.S. Government incentivize the modification of existing curricula and/or the creation of new curricula, to include faculty professional development, by educational institutions for pedagogy to support standards development activities for CET?

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in R&D programs at universities and national laboratories. However, one area that could lead to increased contributions to standards development would be greater awareness of the role that standards play in the commercialization of Advanced Nuclear Energy Technologies. Greater emphasis placed on nuclear codes and standards in nuclear (and adjacent) engineering programs could encourage increased participation by students as they progress in their career trajectory from undergraduate to graduate programs and then to jobs in the public and private sectors. Government sponsorship of codes and standards awareness, training, and application, for example in engineering design courses, could incentivize greater integration of standards in academic curricula.

15. What standards development activities for CET can U.S. government and private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) stakeholders promote or develop to encourage increased participation by students and trainees?

The academic community already plays an important role in standards development for Advanced Nuclear Energy Technologies. In many cases, the concepts and the companies themselves originated in R&D programs at universities and national laboratories.

However, one area that could lead to increased contributions to standards development would be greater awareness of the role that standards play in the commercialization of Advanced Nuclear Energy Technologies. Greater emphasis placed on nuclear codes and standards in nuclear (and adjacent) engineering programs could encourage increased participation by students as they progress in their career trajectory from undergraduate to graduate programs and then to jobs in the public and private sectors. Government sponsorship of codes and standards awareness, training, and application, for example in engineering design courses, could incentivize greater integration of standards in academic curricula.

16. How can the U.S. Government support both private sector and public sector recognition for standards development expertise and how can this recognition be utilized to increase standards development activities for CET?

Participation in standards development activities should be recognized as a value contribution by individuals to public and private sector organizations. Historically, participation in standards development was encouraged if not required by private sector industry in the early days of the nuclear industry as a means of positively influencing the commercial and regulatory path to deployment of nuclear technology. Now that new technologies are being developed for commercialization, that same contribution by private sector stakeholders is needed to facilitate a viable path to design, construction, licensing, and operation of a new generation of Advanced Nuclear Energy Technologies.

USG NSSCET Objective 4: Integrity and Inclusivity

17. How can the U.S. Government work with private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) stakeholders to more effectively coordinate with international partners and reinforce private sector-led standards development activities for CET?

The U.S. Government should leverage existing collaborations and initiatives that are focused on international standards harmonization. For Advanced Nuclear Energy Technologies, this includes the

afore-mentioned ARCSC industry-led collaborative, the IAEA NHSI initiative, and WNA CORDEL.

18. How should the U.S. Government share information on standards development activities for CET with like-minded partners and allies?

The U.S. Government should leverage existing collaborations and initiatives that are focused on international standards harmonization. For Advanced Nuclear Energy Technologies, this includes the aforementioned ARCSC industry-led collaborative, the IAEA NHSI initiative, Nuclear Energy Agency, and WNA CORDEL.

19. What standards information and tools can the U.S. government develop and promote to ensure U.S. exporters can compete in global markets for CET?

As stated above, supporting and facilitating appropriate U.S. nuclear technology exports also typically supports the export of the underlying codes and standards used to develop and license that technology.

20. How can the U.S. Government further advance the design and implementation of technical assistance programs for CET that enable broad and inclusive participation by developing countries in international SDOs?

Participation by developing countries in international SDOs is likely limited by the lack of resources to support travel to SDO meetings. The U.S. Government could establish a travel award program based on submissions from applicants or their organizations. This could be done in coordination with existing international organizations and initiatives that are focused on Advanced Nuclear Energy Technology standards development and harmonization, such as the IAEA.

21. How can the U.S. Government work with international partners to ensure that standards for CET are developed in a way that supports U.S. interests, including a commitment to free and fair market competition in which the best technologies come to market?

The U.S. Government should leverage existing collaborative efforts that include international harmonization objectives, such as the industry-led ARCSC, the IAEA NHSI Initiative, the Nuclear Energy Agency, and the WNA's CORDEL working group (described above).

22. How can the U.S. Government make the United States a more desirable location to hold international standards meetings, events, and activities for CET?

The U.S. Government could sponsor international standards meetings for U.S. locations, including to offset the costs of the meeting venue and associated meeting equipment. Support of a social and networking events, including food and beverage, can be an effective draw for international participants. Additionally, U.S. Government funding support would enable more U.S. subject matter experts to attend and lead the meetings.

Likewise, having the U.S. Government provide funding to sponsor international participants to attend meetings in the U.S., especially for participants from developing countries, would make the United States an attractive host location for international standards meetings.

One specific opportunity for Advanced Nuclear Energy Technology standards would be to have the U.S. Government, for example NIST, work with the U.S. Nuclear Technical Advisory Group (NTAG) to sponsor an International Organization on Standardization (ISO) meeting in the United States.

About the ANS Standards Committee

The mission of the ANS Standards Committee is to develop voluntary consensus standards to be certified by the American National Standards Institute (ANSI) as American National Standards. Over 900 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 2022, there were 88 current standards approved by ANSI as American National Standards.

The ANS 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 ANS Standards Committee includes the development and maintenance of standards on 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
 - Power production reactors
 - Research reactors and critical facilities
 - Nuclear fuel production, handling, and storage facilities
- 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
- Reactor physics and radiation shielding
- Computational analysis programs used in the nuclear field
- Probabilistic risk assessment, risk management, and risk criteria
- Fission product behavior
- 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.

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. The ANS Standards Committee organizational structure is presented in Figure 1.

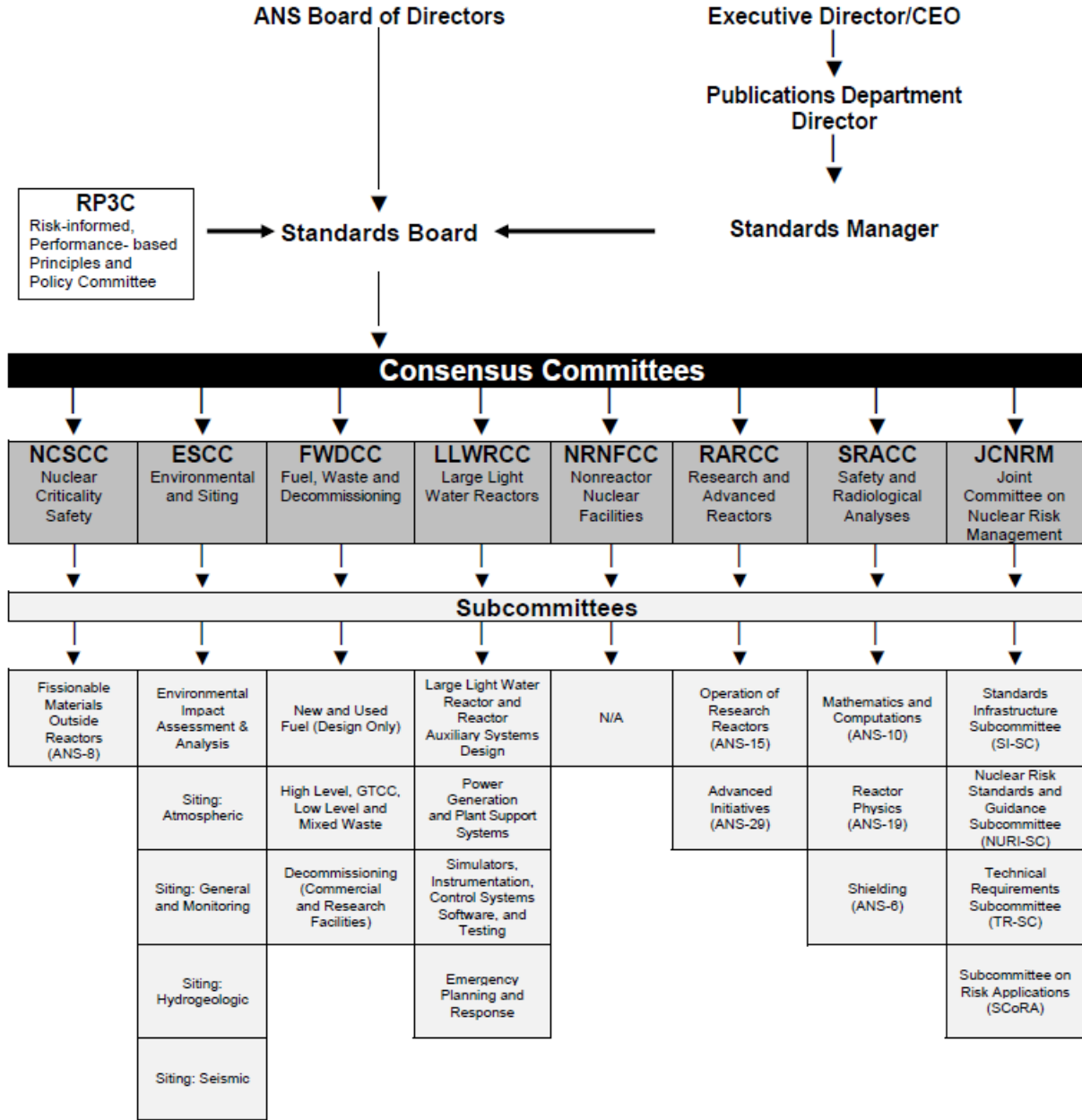


Figure 1. ANS Standards Committee Organizational Chart

About the ANS Standards Development Process

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.