

Recap of the ANS/NEI Advanced Reactor Codes and Standards Workshop held June 23, 2020

Written by Pat Schroeder for *Nuclear Standards News* (Vol. 51, #4 • July/August 2020)

The views expressed are intended as a summary of the workshop and do not necessarily reflect those of the American Nuclear Society.

The American Nuclear Society (ANS) and the Nuclear Energy Institute (NEI) hosted a virtual workshop on June 23, 2020, for industry partners to discuss advanced reactor codes and standards needs. As industry efforts to design, develop, and deploy advanced reactors increase, there is a need for codes and standards development to support these technologies. As noted in the recent [ANS Special Report](#), “consensus standards are a vital, albeit sometimes underappreciated, aspect of nuclear energy system design, operation, and regulation. They allow commercial suppliers and regulators to leverage the collective wisdom of the entire scientific and engineering community to ensure the appropriate margin of safety in the design and construction of nuclear systems, and they provide a technically robust basis for decision makers. Bringing new nuclear energy systems to market requires serious commitment on the part of industry, government, and standards development organizations (SDOs).” Shortly after the release of the ANS Special Report, NEI issued its report [Advanced Reactor Codes and Standards Needs Assessment \(NEI 19-03\)](#) with specific recommendations for near-term priorities for codes and standards development.

More than 400 attendees were welcomed by Marc Nichol, NEI Senior Director of New Reactors, followed by a few logistics from ANS Director of Government Relations, John Starkey. As an introduction to the workshop’s topic, an overview of [ANS Special Report: Setting the Right Bar: How Consensus Standards Help Advanced Reactor Development](#) was provided by Steven Arndt, one of the authors of the report and immediate past ANS Standards Board Chair. Michael Tschiltz, NEI consultant and project lead, summarized [NEI 19-03](#).

Dirk Cairns-Gallimore represented the U.S. Department of Energy (DOE), Office of Nuclear Energy. An update on the advanced reactor landscape was provided acknowledging over 60 companies and research institutions working on a wide array of capabilities to meet the energy needs of the future. Standards were recognized as the basis for efficiency, improved trade and commerce, and reduced vulnerability to a wide range of hazards.

The first panel, Matching of Advanced Reactor Developer Needs and SDO Capabilities, included Lauren Latham (Southern, Molten Salt Reactor Technology Working Group Chair); Michael Cohen (TerraPower); Jordan Hagaman (Kairos Power); Alex Harkness (Westinghouse, eVinci); and Jacob DeWitte (Oklo, Fast Reactor Technology Working Group Chair). Advanced reactor developers are involved in standards development considered urgent but recognized that consensus codes and standards take time to develop and gain approval. A few standards currently in development were not considered necessary, and they feel, should not be pursued. Near-term, design-specific demonstrations are expected to lay the foundation for long-term codes and standards. Priorities expressed include pre-application interaction with the U.S. Nuclear Regulatory Commission (NRC) on new codes, standards, and methodologies to help identify issues as soon as possible to prevent later delays; areas related to safety analysis and safety-related equipment; potential need for changes to the supply chain for long lead items; materials not included in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC); and integration of risk-informed information.

Another panel, Other Codes and Standards Organizations Perspectives, allowed for SDOs to share key issues that impede progress and discuss potential solutions. Presenters included Robert Keating (ASME BPVC, Sec. III), Rick Swayne and Thomas Roberts (ASME BPVC, Sec. XI), Rick Grantom (ASME/ANS Joint Committee on Nuclear Risk Management), Javeed Munshi (Joint American Concrete Institute/ASME Committee 359), Daryl Harmon (Institute of Electrical and Electronics Engineers, Nuclear Power Engineering Committee), and Martin White (Additive Manufacturing Programs, American Society for Testing and Materials) with a number of additional SDO representatives that participated in the panel discussion. Challenges conveyed had many similarities. SDOs are working to continuously improve standards to meet stakeholder needs by incorporating new methods, industry data, and advancements in materials and new designs. The significant length of time to develop a standard is related to the voluntary effort of codes and standards. Sufficient experience with advanced reactors is lacking to achieve a consensus for standard practice as are subject matter experts needed for standards development. Additional representatives from advanced reactor design organizations supporting standards development, better collaboration between SDOs and designing organizations, and funding to aid the volunteer effort are considered part of the solution to improve standards development.

George Flanagan (ANS), Garrett Smith (DOE), Chip Lagdon (Bechtel), Kent Welter (NuScale Power), and Michael Arcaro (Prism, GE Hitachi Nuclear Energy) supported the next panel, Addressing the Barriers to Standards Creation. The sentiment that the process to develop codes and standards needs to be expedited was shared by all. The greatest factor voiced in the timeline of developing codes and standards is the lack of supported volunteers. Without company backing, the voluntary effort is not part of expert's everyday activities. Advanced reactor developers need to understand and recognize the importance of standards over the long term and encourage their staff and DOE to develop such standards. Other challenges exist in addressing needs of a number of different advanced reactor technologies, acquiring earlier work by DOE which resides at national laboratories, attracting and retaining next generation of engineers and scientists for standards development, continuity of knowledge amongst standards writers and advanced reactor developers, and lack of funding for basic research and sharing of results.

NRC Standards Executive Louise Lund shared NRC's perspective and roles in advanced reactor codes and standards. NRC is actively participating in the development and use of consensus codes and standards across multiple SDOs. The NRC recognizes that codes and standards improve effectiveness and efficiency of regulatory oversight. Staff participation helps to facilitate the NRC endorsement process; however, SDOs are encouraged to notify NRC of new and revised standards to aid in the regulatory process. In the absence of codes and standards, developers can proceed with adequate basis supporting their designs. Lund announced that the NRC will be holding the next NRC Standards Forum on September 15, 2020. The Forum will build on today's discussions on advanced reactor codes and standards.

Marc Nichol, Steven Arndt, and Michael Tschiltz recapped workshop learnings and takeaways. The following issues and challenges were expressed:

- There is a need to identify and align priorities and fund those deemed of high priority.
- Technology readiness levels could be utilized in prioritization of codes and standards development.
- The best way to influence SDO activities is to be involved.
- Advanced reactor developers emphasized the importance of advanced reactor materials research and standards development as opposed to development of process standards.

- A myriad of advanced reactor designs makes standards development more challenging.
- The lack of “state of practice” experience limits interest and inhibits progress in this area.
- DOE programs (demonstration projects) that accelerate advanced reactor development and deployment need to support and fund codes and standards development activities to promote accelerated timelines.
- Trial use and pilot application standards should be considered when the state of practice has not been fully developed.
- Communication among advanced reactor developers and SDOs needs improvement.
- Consideration should be given to codes and standards development infrastructure to adapt and better support advanced reactor development.
- Voluntary support of codes and standards development will likely not support the accelerated development needed for advanced reactors.
- Key standards for which information is available and ranked high should receive additional resources.
- Standards that require additional research (such as materials standards) should get the resources needed to gather the needed data.

In closing, steps to achieve the goal of developing a path forward and setting priorities for the development of codes and standards were identified for industry partners. They include

- NEI to take the role of bridging the gap between industry and SDOs.
- Advanced reactor technology working groups to develop priorities for codes and standards.
- SDOs to work with industry to understand capabilities.
- DOE and the Gateway for Accelerated Innovation in Nuclear to clarify and establish funding opportunities.
- Advanced reactor developers and SDOs to partner on proposals for funding specific codes and standards development.
- NEI and industry partners to work on processes for accelerating acceptance of codes and standards; process for licensing where no codes and standards exist.
- NRC to participate in codes and standards development and to prepare for acceptance.

View the presentations [here](#).