



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 11, 2018

MEMORANDUM TO: John Monninger, Director  
Division of Safety Systems, Risk Assessment  
and Advanced Reactors  
Office of New Reactors

THROUGH: Brian Thomas, Director */RA/*  
Division of Engineering  
Office of Nuclear Regulatory Research

FROM: Tom Boyce, Branch Chief  
Regulatory Guidance and Generic Issues Branch  
Division of Engineering  
Office of Nuclear Regulatory Research

SUBJECT: SUMMARY OF ADVANCED NON-LIGHT WATER REACTORS  
WORKSHOP HELD WITH THE AMERICAN NUCLEAR SOCIETY

On May 2, 2018, the American Nuclear Society (ANS) and the U.S. Nuclear Regulatory Commission (NRC) held a workshop for industry stakeholders to develop a strategic vision for advanced reactors standards (see [ML18095A101](#) for Meeting Notice, including Agenda). The workshop provided an opportunity for designers, vendors, owners, regulators, and representatives of standards development organizations (SDOs) to discuss standards needs to support advanced reactors. There were over 85 meeting attendees (see Enclosure 1 for a full list of attendees). A summary of the workshop is provided below.

This memorandum and its enclosures serve as a summary of the meeting, including a list of participants and action items. The presentations and handouts from the meeting can be found at [ML18152B668](#).

### Summary

This workshop was a forum where stakeholders could set goals for standards development related to advanced reactors (see Enclosure 2 for the opening presentation). Technology working groups (TWGs) for the major advanced reactor types, High Temperature Gas Reactors (HTGR), Molten Salt Reactors (MSR), and Fast Reactors (FR) were represented at the workshop. The TWG representatives presented an overview of the technologies and identified potential future standards needs (see Enclosure 3). Generally, the TWGs recognized the benefit of standards, particularly endorsed standards. However, the lack of an existing standard was not expected to delay development of advanced reactors, in that if standards were not available, designers could develop guidance. After the presentations, participants met in smaller (breakout) groups for each of the three technologies to answer five questions posed by

Contact: Shivani Mehta  
301-415-0860

ANS to identify standards needs. The breakout groups for the HTGR TWG and the FR TWG created presentations with their responses to the questions (see Enclosure 4). A summary of the responses are below. A detailed list of the responses can be found in Enclosure 5.

1. *For your technology, what would you say is the current status of standards to support the development, design, and licensing of advanced reactors? Are most of the needed standards available up to date? Do they cover the issues that have the most significant impact on the design? On the schedule?*

The HGTR and MSR groups answered that the currently available codes and standards are sufficient to move forward with development, etc. The FR group stated that the existence of standards is not necessarily a requirement for the technology to be developed, etc., but that standards may accelerate licensing. The groups went on to identify specific areas that needed addressing in standards.

2. *List the five most current important standards (from any SDO) to your area that are in need of updating to support development, design, and licensing. Why are they your top five?*

The three working groups primarily identified ANS and American Society of Mechanical Engineers (ASME) standards.

3. *List the five most important technical areas that need standards development (where they currently don't have standards). Why are they your top five?*

Since the technologies are significantly different from each, the areas were specific to each technology. However, both the MSRs and FRs indicated that additive manufacturing and shipping standards would likely need to be developed. The HTGR group identified that a risk-informed, performance-based (RIPB) suite of standards should be developed.

4. *Provide some prioritization of the two lists, both in overall need (must have to move forward) and in timing (need by a certain date). If possible, provide insights as to why the standard has priority and what aspect of the issues are driving the priority.*

The HTGR group prioritized the RIPB suite as the highest priority, with all the other topics equal. The MSR group believed it to be too early to prioritize the needs. The FR group prioritized source term assessment for non-light water reactors and shipping/dry-storage casks.

- 5A. *What cross-cutting issues do you believe need to be included in the development of new standards for advanced reactors or the updating of current standards? These could include analysis methods (like probabilistic risk assessment, thermal hydraulics, human factors, etc.) or other cross-cutting issues like staffing, emergency management, advanced instrumentation and control, security, etc.*

The groups responded to this question with very different issues. Among the responses, the HGTR group responded that the examples (probabilistic risk assessment, thermal hydraulics, and human factors), should be considered across standards. The MSR group stated that the fact emergency management is less of a concern in the technology should be reflected across standards. The FR group identified safety-significance-based

classification of structures, systems, and components within ASME NQA-1 as a cross cutting issue.

5B. Is there a preference across the advanced reactor industry that future advanced reactor standards be more performance based and use high-level, risk-informed principles compared to current standards? What should drive this decision?

Generally, the groups agreed that performance-based standards are preferred over prescriptive standards, stating that costs should be the key driver.

### **Action Items**

Several standards and codes emerged as priorities between technology groups as candidates for updating and/or harmonization. The relevant SDOs were ASME, ANS, Institute of Electrical and Electronics Engineers (IEEE), American Concrete Institute (ACI), ASTM International (ASTM), American Welding Society (AWS), and International Society of Automation (ISA). The SDOs were asked to follow up on the topics and standards to ensure their usefulness and availability to advanced reactors (a detailed list of the identified standards are in Enclosure 3). Participants agreed that TWG and stakeholder engagement will be necessary to adequately address needs and availability.

The participants identified topics for future workshops to include:

- defense in depth,
- harmonization with LMP approach,
- acceleration of standards development; possible funding support to help,
- unique aspects related to seismic, and
- reducing loads and structures.

The next workshop was not scheduled; participants proposed that the next NRC Standards Forum may be a good opportunity to continue discussions and address action items.

Enclosures:

1. Workshop Attendee List (both in-person and via webinar) (ML18152B677)
2. Presentation by ANS (ML18152B675)
3. Presentations by TWGs (ML18152B674)
4. Breakout session presentations (ML18152B676)
5. Detailed Meeting Summary by ANS (ML18152B678)

**SUBJECT: SUMMARY OF ADVANCED NON-LIGHT WATER REACTORS WORKSHOP  
HELD WITH THE AMERICAN NUCLEAR SOCIETY**

**DISTRIBUTION:**

M. Weber, RES	C. Araguas, RES	M. Evans, NRR	, NRO
E. Hackett, RES	M. Dapas, NMSS	D. Roberts, NSIR	M. Layton, NMSS
C. Regan, RES	S. Moore, NMSS	J. Lubinski, NSIR	T. McGinty, NRO
M. Cheok, RES	V. Ordaz, NRO	R. Caldwell, NRO	K. Brock, NRR
M. Thaggard, RES	F. Brown, NRO	M. Gavrilas, NRR	W. Jones, RII
M. Case, RES	B. Holian, NRR	G. Wilson, NRR	J. Monninger, NRO
J. Giitter, NRR	M. Ross-Lee, NRR	R. Taylor, NRO	C. Erlanger, NMSS
M. Scott, NSIR	J. Tappert, NMSS	B. McDermott, NRR	J. Segala, NRO
A. Cabbage, NRO	W. Reckley, NRO	R. Iyengar, RES	G. Thomas, NRR
R. Reyes-Maldonado	G. Zigh, RES	K. Manoly, NRR	M. Benson, RES
K. Kavanagh, NRO	S. Jones, NRR	R. Wolfgang, NRR	A. Rigato, NMSS
T. Koshy, RES	D. Rahn, NRR		

**ADAMS Accession Package No.: ML18152B668**

<b>OFFICE</b>	RES/DE/RGGIB	RES/DE/RGGIB	RES/DE
<b>NAME</b>	S. Mehta	T. Boyce	B. Thomas
<b>DATE</b>	06/1/2018	06/1/2018	06/11 /18

**OFFICIAL RECORD COPY**