



# ANS Standards Committee

## Standards Priority Survey

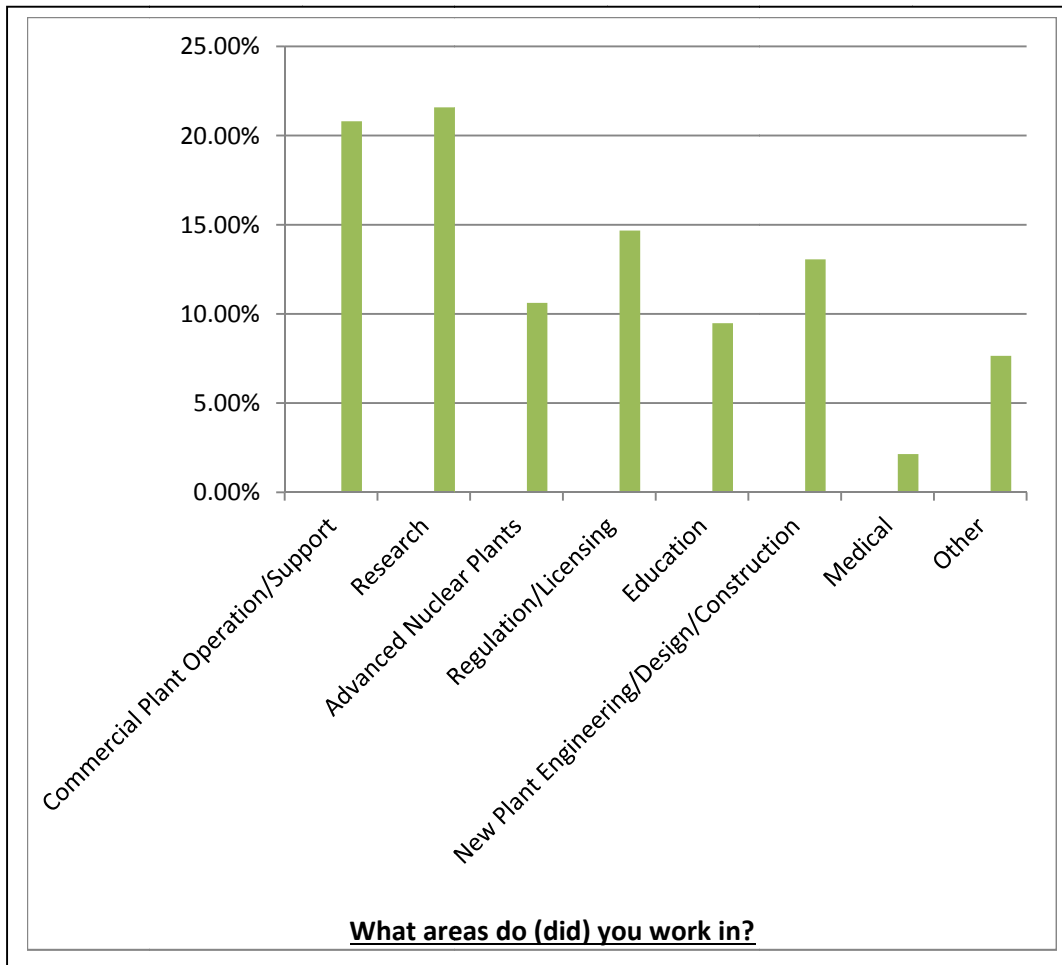
### Executive Summary

#### Overview

A standards priority survey was issued as a means of gaining industry input, the results of which will help establish a priority list to direct the program of work of the American Nuclear Society (ANS) Standards Committee. The survey included 27 topical areas set by the ANS Standards Board representing revisions to current standards,

reinvigorations of historical standards, and potential new topical areas of work.

The survey was sent to ~11,000 ANS members with a nearly identical survey made available to nonmembers through a link on the ANS homepage with notices issued through LinkedIn, Facebook, and Twitter. A total of 935 members and 15 nonmembers finished the survey although participants may not have completed each



question in the survey. Responses from member and nonmember participants were combined. Survey participants represent commercial plants (21%), research (22%), advanced nuclear plants (11%), regulation/licensing (15%), education (9%), new plant engineering (13%), medical (2%), or other areas (8%).

#### Evaluation Method

Participants were asked to rate each of the 27 topical areas on a scale of 1 through 5, with 1 being the highest priority and 5 being lowest priority. Participants could select “not applicable” if the subject area was not relevant to their area of work. This method (as opposed to ranking all topical areas) was chosen to simplify the survey and allow participants to complete within five minutes.

While the survey was not designed to have participants rank the topics, a priority ranking was derived from the data by ordering the topics based on the percentage of participants who indicate each topic is “high priority” (a combined value of 1 and 2). (Note: the percentage of participants who select not applicable (N/A) is included in the chart to reflect the level of need.)

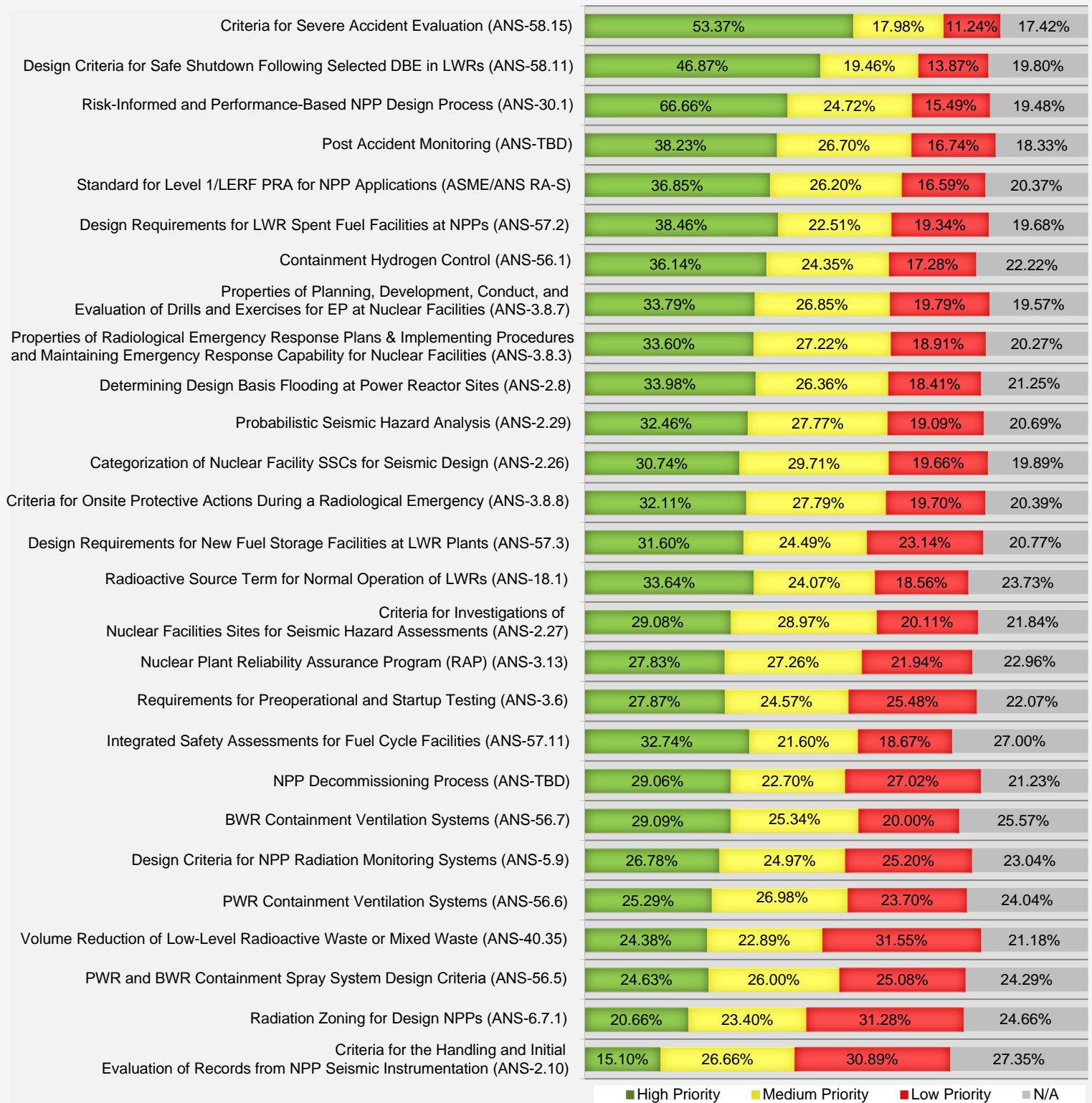
## Findings

The top ten topical areas considered “high priority” by the highest percentage of survey participants are listed in the below table followed by a chart providing ratings for all 27 topical areas included in the survey.

### Top Ten Topical Areas

#1	Criteria for Severe Accident Evaluation (ANS-58.15)
#2	Design Criteria for Safe Shutdown Following Selected Design Basis Events in Light Water Reactors (ANS-58.11)
#3	Risk-Informed and Performance-Based Nuclear Power Plant Design Process (ANS-30.1)
#4	Post-Accident Monitoring (ANS-TBD)
#5	Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications (ASME/ANS RA-S)
#6	Design Requirements for Light Water Reactor Spent Fuel Facilities at Nuclear Power Plants (ANS-57.2)
#7	Containment Hydrogen Control (ANS-56.1)
#8	Properties of Planning, Development, Conduct, and Evaluation of Drills and Exercises for Emergency Preparedness at Nuclear Facilities (ANS-3.8.7)
#9	Properties of Radiological Emergency Response Plans and Implementing Procedures and Maintaining Emergency Response Capability for Nuclear Facilities (ANS-3.8.3)
#10	Determining Design Basis Flooding at Power Reactor Sites (ANS-2.8)

### Priority Ratings Chart Surveyed Topical Areas



## Summary of Comments and Suggestions for Developing Standards

Participants provided nearly 100 general comments of which most were suggestions for developing new standards. Although many subject areas were mentioned, a number of participants suggested that ANS develop standards on cybersecurity, emergency preparedness, advanced reactors, and small modular reactors. Two additional reoccurring themes were voiced in the comments, that is, ANS standards should be available without charge and education on the purpose and benefit of standards is need.

In addition to providing general comments, nearly 90 individuals expressed interest in joining the Standards Committee and/or supporting additional standards projects. Particularly interesting was a response from six individuals expressing interest in supporting one of the lower-placed, topical areas for a proposed standard ANS-3.6, "Requirements for Preoperational and Startup Testing."

Excerpts of participant comments are provide below by category for your reference:

### Standards or topical areas noted of importance (with minimal editing in no particular order)

- I expect new reactors and national labs will have competing priorities. Ensure the existing fleet's needs are met given the increased regulatory requirements.
- Emergency planning standards need to be reviewed in the context of lessons learned, admitted or not, by the federal agencies during Fukushima. The National Response Framework was not followed.
- Safety analysis, such as criticality control, is crucial for nuclear safety as it dominates whether the reactivity of the reactor will continually go up or go down.
- ANSI/ANS-ANS-58.2-1988 (W1998), "Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture," Two-Phase Jet Model has been rejected by members of the Advisory Committee on Reactor Safeguards, so further updating that standard would be beneficial to the industry, especially in attempts to close out General Safety Issue (GSI)-191, "Experimental Studies of Loss-of-Coolant-Accident-Generated Debris Accumulation and Head Loss with Emphasis on the Effects of Calcium Silicate Insulation" (NUREG/CR-6874, LA-UR-04-1227).
- Consider a new ANS standard on applications of general design criteria for advanced nuclear power plants.
- Consider development of an industry standard for a corrective action program to satisfy ANSI/ASME N45.2, "Quality Assurance Program Requirements for Nuclear Facilities," and 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." No standard exists and, thus, the U.S. Nuclear Regulatory Commission (NRC) makes its inspection practices based on opinion. The Institute of Nuclear Power Operations (INPO) has not created a standard and Nuclear Energy Institute (NEI) is intelligent enough not to get involved. This could dove-tail with an Institute of Electrical and Electronics Engineer initiative (since at least 2006) to formulate a standard for root cause analysis.
- The extension of simulation technology from training into engineering design validation and analysis is seriously overdue.
- Standards for licensing new plant designs starting with test facilities and low power test reactors for power ramp up and testing
- Standards for fuel processing and recycling
- Future standards efforts should focus on protecting the three fission product barriers and minimizing the release of radioactive material to the environment. The current regulatory and standards structure address items related to this goal, but fission product barrier production should be emphasized.
- Public communications in the event of fission product barrier failure should also be addressed.
- A solid radwaste characterization standard

- Standards for modular reactors for siting, emergency preparedness, seismic requirements
- Nuclear power plant defense-in-depth adequacy
- A standard for root cause analysis at nuclear facilities
- Standards related to Chapter 18 of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports For Nuclear Power Plants: LWR Edition,” on cybersecurity, integrated procedures, and electronics in control rooms, safe shutdown rooms, design rules for placement of electronic equipment, record keeping for cable routing, and beyond design basis event human actions
- Standards for small modular reactors
- Decommissioning and waste management support activities should be the ANS Standards Committee's highest priority right now. A new standard is needed in support of the changes expected for severe accident guidance.
- A uniform set of guidelines would benefit the fleet. The new standard could be modeled after the recommendations from the International Atomic Energy Agency (IAEA) on a similar topic.
- Any new standards that are created should also look forward to future generations of reactor designs. Concentrating on the current fleets of light water reactors (LWRs) is useful, but the generation of standards for advanced reactor types could aid in the evaluation and approval of advanced reactor types for construction as well as allowing for the decommissioning of older reactor facilities that are unnecessarily prone to failure.
- I do think it is helpful for ANS to duplicate the efforts of NRC, NEI, and INPO in the emergency preparedness and response area.
- There is nothing about accident-tolerant fuels. At this moment, most of the nuclear industry thinks of zirconium alloy only as cladding material for fuel. This concept should be more open and include other material such as ferritic iron-chromium-aluminum (FeCrAl) steels and silicon carbide, among others.
- There should be more emphasis on developing advanced safety systems for LWRs.
- Emergency response during general catastrophe/when infrastructure is degraded
- Cybersecurity, export control (both NRC and U.S. Department of Energy (DOE) regulation), advanced reactor accident criteria
- General design guidance from ANS, especially safety class codes and standards, are helpful.
- I believe the three most important areas in nuclear right now and for the near-term are 1) onsite spent fuel storage facilities (existing), 2) onsite spent fuel storage facilities (new) and 3) nuclear power plant decommissioning process, as these several areas are sure to be used heavily over the next 10-20 years.
- An ANS standard for the evaluation of new fuel designs included in the current DOE Accident Tolerant Fuel (ATF) Program would be very useful. From my perspective as a researcher studying the irradiation performance of ATF concepts, a recommended set of performance data would be a useful tool to design experiments against.
- A consensus standard for disposability of dry storage canisters for spent fuel would be an important step toward disposition of the existing inventory of dual purpose canisters and could give operators a choice for disposability when buying dry storage systems.
- Standards on nonproliferation, safeguards, or safeguards by design

#### Miscellaneous suggestions

- ANS should educate members on how standards ultimately impact regulations and the “business of nuclear.” There is very little understanding in my opinion of how changes to standards impact the economics of operating nuclear plants.
- Clarify (or remind) survey-takers of the purpose of ANS standards and how they're used in industry and regulation.
- Develop a strategic plan for integrating ANS standards initiatives and NEI initiatives.

## Complaints

- We should not charge for standards. Electronic versions should be available for download at no charge.
- There needs to be a way for standards to have a greater weight with the NRC.
- ANS should offer standards at no cost as a public download.
- Some of the ANS standards are outdated so NRC cannot reference them in guidance documents. Effort should be made to help keep these standards up to date as much as possible.
- Spending ANS resources on developing new U.S. reactor design criteria right now is like tossing the money and resources away. It makes no sense whatsoever. Such thinking is outdated and completely oblivious to the current reality that there will be no U.S. reactor orders for decades.

## **Conclusion**

The ANS Standards Committee needs to improve its communication with ANS members and the user community so that they understand 1) the benefits of voluntary consensus standards to the user community, 2) the advantage to companies and individuals that participate in standards development, 3) endorsement or adoption of voluntary consensus standards by government agencies, and 4) the minimal charge of a voluntary consensus standard in comparison to the actual cost of its development.

Improvement is needed in the area of maintaining current standards. Additionally, areas identified which are lacking in standardization need to be addressed. Specifically new or updated standards on emergency preparedness, cybersecurity, spent fuel storage, severe accidents, and standards for small modular reactors require consideration. Standards identified as the top-ten priority need to be expedited or initiated. Other suggested areas warrant further evaluation before expending valuable resources.

It is recognized that the topical areas in the survey as well as comments submitted do not affect all eight ANS consensus committees. The Nuclear Criticality Safety Consensus Committee (NCSCC) and the Joint Committee on Nuclear Risk Management have established close ties with their user communities which have facilitated staffing, use, and maintenance of their standards. In the case of the NCSCC, much of their success is likely attributed to the strong support of the Nuclear Criticality Safety Professional Division which holds a standards forum/technical session at each ANS national meeting to discuss industry issues affecting nuclear criticality safety standards, reviews NCSCC current standards and those in development, as well as encourages participation on NCSCC standards. Further evaluation of these efforts may provide valuable lessons learned for the other consensus committees.

## **Recommendations**

### Recommendation for disposition of highest-rated, topical areas

The Standards Board should direct that the following standards already in development establish a schedule to finalize a draft within 12 months:

- Integrated Safety Assessments for Fuel Cycle Facilities (ANS-57.11)
- Risk-Informed and Performance-Based Nuclear Power Plant Design Process (ANS-30.1)
- Design Requirements for LWR Spent Fuel Facilities at Nuclear Power Plants (ANS-57.2)
- Properties of Planning, Development, Conduct, and Evaluation of Drills and Exercises for Emergency Preparedness at Nuclear Facilities (ANS-3.8.7)
- Determining Design Basis Flooding at Power Reactor Sites (ANS-2.8)

- Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications (ASME/ANS RA-S)

The Standards Board should assign the following topical areas to the appropriate consensus committee to 1) determine whether any industry guidance exists to build on, 2) ensure that efforts would not duplicate those of another standards development organization, 3) solicit subject matter experts to form a working group, and 4) develop a scope for a new standard or broaden the scope of a current standard to be completed within 12 months:

- Criteria for Severe Accident Evaluation (ANS-58.15)
- Design Criteria for Safe Shutdown Following Selected Design Basis Events in Light Water Reactors (ANS-58.11)
- Criteria for Onsite Protective Actions During a Radiological Emergency (ANS-3.8.8)
- Post-Accident Monitoring Containment Hydrogen Control (ANS-56.1)
- Properties of Radiological Emergency Response Plans and Implementing Procedures and Maintaining Emergency Response Capability for Nuclear Facilities (ANS-3.8.3)
- Nuclear Power Plant Decommissioning Process (new - undefined)
- Cybersecurity (new - undefined)
- Advanced and small modular reactors (new - undefined)
- Requirements for Preoperational Startup Testing (ANS-3.6)

#### Recommendation for disposition of lower-placing, topical areas

The Standards Board should direct additional evaluation on the need to initiate new standards (those not current standards or in development) in low-rated topical areas including the following:

- Radiation Zoning for Design of Nuclear Power Plants (ANS-6.7.1)
- Volume Reduction of Low-Level Radioactive Waste or Mixed Waste (ANS-40.35)
- PWR and BWR Containment Spray System Design Criteria (ANS-56.5)
- Pressurized Water Reactor Containment Ventilation Systems (ANS-56.6)
- Design Criteria for Nuclear Power Plant Radiation Monitoring Systems (ANS-5.9)
- Nuclear Power Plant Decommissioning Process (new – undefined)
- Boiling Water Reactor Containment Ventilation Systems (ANS-56.7)

#### Recommendations to general suggestions

The ANS Standards Board should

- contact ANS Professional Divisions with charters closely related to consensus committees and subcommittees with a request for their sponsorship,
- establish a standards educational program for non-standards developers,
- create a strategic plan to address and set a schedule to
  - solicit input from the user community to ensure maintenance and development of relevant standards for the industry,
  - solicit new members to sufficiently staff standards committees to maintain current, standards and develop new standards,
  - encourage participation of young professionals to sustain the standards program,
  - establish a Standards Committee training program to ensure volunteers are familiar with policies and procedures in order to develop higher-quality standards in less time, and
  - create a standards educational program for the user community.