ANS's Initiative on AI Standards for Nuclear Application

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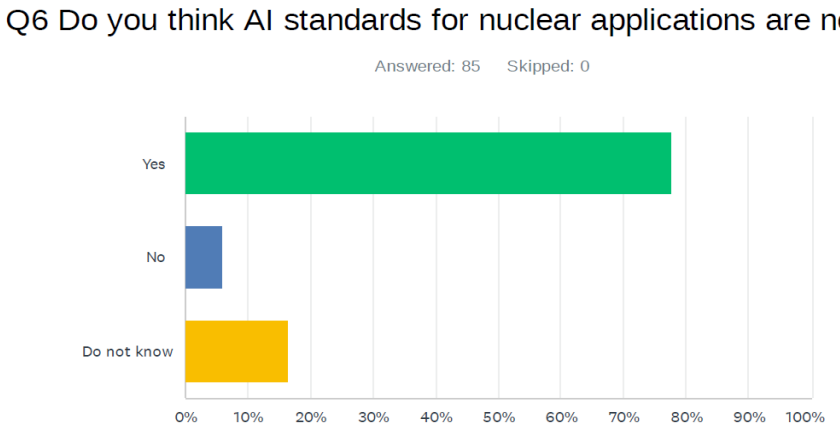
Motivation

- Artificial Intelligence (AI) is increasingly being integrated into the nuclear industry.
- A standards document is beneficial to ensure the safe and reliable implementation of AI in critical nuclear applications.
- Nuclear energy is distinctive due to its regulatory framework.
- Currently, there are no specific national US standards being developed for the application of AI in the nuclear sector.

Our Journey: Initiation and Survey

- The exploration of AI standards was initiated under ANS's Large Light Water Reactor Consensus Committee leading to the formation of an ad hoc committee.
- Information was gathered through surveys to ANS Standards Committee members (85 participated).



Our Journey: Initiation and Survey

Applications of AI in Design	Applications of AI in Operations	Applications of AI in Support
Designing models and reactors	Automating corrective action programs	Securing autonomous systems
Developing and converting code	Running autonomous operations and control	Monitoring nonproliferation
Simulating accidents	Condition monitoring	Managing waste
Developing critical experimental tools	Conducting fire watches	Training using virtual simulators
Applying nuclear data	Diagnosing control systems	Managing logistics
Preparing regulatory submissions	Creating digital twins	Complying with industrial safety
Enhancing nuclear safety	Guiding robots	
Conducting risk analysis	Managing outages	
Optimizing designs	Creating and revising documents	
Designing nuclear cores	Summarizing and ingesting documents	
Testing designs virtually	Providing digital assistance	
Researching fusion energy	Programming sensors	
	Optimizing fuel usage	
Applications of AI in Construction	Planning operations	
Manufacturing and fabricating components	Reading gauges	
Optimizing supply chains and logistics	Detecting changes in images	
Streamlining procurement	Using chatbots for assistance	

Applications of Artificial Intelligence (Survey Results)

Our Journey: Initiation and Survey

- An international effort on AI for nuclear standards has been identified: ISO/IEC SC45A (Instrumentation, Control, and Electric Power Systems of Nuclear Facilities) Working Group 12.
- Several non-nuclear AI standards have been identified.
- Several relevant nuclear standards that are not specific to AI have been identified.
- Nuclear AI guidance documents and technical reports have been identified.

Our Journey: Committee Meetings

- Two ad hoc committee meetings were held to collect feedback and to focus the effort which resulted in a recommendation for ANS to pursue AI standards for nuclear applications.
- A white paper was developed and presented to the ANS Standards Board recommending ANS form a group to develop AI standards.

ANS-X, *Qualification and Commercial Grade Dedication of AI Methods for Operational Decision Making*

ANS-X, *Requalification of AI Methods to Replace Obsolescent Datasets and Tools*

Risk-Informed Methods for Use of AI in Monitoring

Path Forward

- The discussion on the path forward will be continued at the Standards Board meeting on November 10, 2025.
- A decision needs to be made whether a new consensus body should be formed or if an advisory group should be formed to assist existing consensus committees.
- ANS welcomes feedback from
  - industry on the need for specific AI standards, and
  - from other SDOs on their experience


American Nuclear Society