

Codes & Standards Use in NRC Licensing and DOE Authorization Activities

Battelle Energy Alliance manages INL for the
U.S. Department of Energy's Office of Nuclear Energy



Idaho National Laboratory

Purpose of the NRC-INL Collaborative Effort

- Project was born from a discussion between (then) Nuclear Regulatory Commission (NRC) Chair Christopher Hansen and Idaho National Laboratory (INL) Director John Wagner to enhance communications and technical exchanges between NRC and INL
- The purpose of this project between INL and NRC was to review and assess the effectiveness and timeliness of codes and standards activities associated with development and licensing of advanced nuclear reactors
 - Specifically, are there new and/or novel ways to endorse codes and standards more efficiently?
- The scope of this effort includes external communication with stakeholders and an evaluation of publicly available reports to identify the most critical codes and standards needed to successfully deploy advanced reactors

Common Themes

- Need to improve timeliness of the development, updating, and endorsement of codes and standards (C&S) to support new and advanced reactor designs. Challenges include the need for consensus, while relying on volunteers that may not be funded by their employer
- Current standards specific to light-water reactors (LWRs) may be overly prescriptive and are not applicable to many advanced reactor designs, and first-of-a-kind and Nth-of-a-kind applications may require different approaches
 - Need to incorporate risk-informed, performance-based methods
- There are gaps in C&S for certain technologies and material qualification. This is especially true in graphite and high-temperature materials
- Commercial C&S acceptance/endorsement would allow the supply chain to grow more quickly and could reduce cost without sacrificing safety
- International code and standard inclusion is essential to utilizing foreign vendors as current efforts are focused heavily on North America

Codes and Standards Work at INL

- Regulatory Development Codes and Standards Project
 - Main task: Build on the efforts accomplished under the NRC-INL Collaborative Effort on Codes and Standards
 - Expedite the development of codes and standards to support advanced reactor licensing by identifying and prioritizing critical codes and standards for near-term advanced reactor design, licensing, and deployment
 - Also supports NRC in their effort to make the endorsement process more efficient
 - Includes the consideration and review of commercial codes and standards
 - Engagement with advanced reactor developers, NEI, NRC, and standards development organizations have been frequent and will continue to address developer's changing needs
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Codes and Standards Projects

- Microreactor Codes and Standards Project
 - Main task: Identify gaps in codes and standards that specifically impact the development and high-volume deployment of microreactors
 - Focuses on microreactor-specific needs such as
 - Assembly line manufacturing
 - Transportation
 - Quick startup times
 - Remote operations
 - Engagement with microreactor developers and standards development organizations will be critical to this project
 - Next task will provide funding to national laboratory personnel to assist in the development of the identified codes and standards
 - Output from these activities would be a white paper or report (potentially developed in coordination with NEI or EPRI) to support NRC endorsement
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DOE-NE Codes and Standards Activities

- DOE-NE Regulatory Development Program will be continuing work to revise and support NRC endorsement of the sodium fire consensus standard ANS 54.8, which was previously endorsed in 1988 and withdrawn in 2000
 - This standard is critical to sodium fast reactor development and deployment
 - While it is possible to cite a withdrawn standard in an NRC license application, industry will significantly benefit from the re-activation of this standard
 - Phase 1: Re-activate the standard (close to completion)
 - Phase 2: Update language using risk-informed methodologies (working)

NRIC Codes and Standards Activities

- Nuclear Quality Assurance Challenges
 - NQA requirements are critical to reactor safety and reliability but also have major cost and schedule implications
 - NRIC held a workshop in December 2024 in Washington, D.C. on addressing these challenges
 - The event was co-sponsored by EPRI and NEI
 - A key takeaway from the workshop included:
 - Commercial quality programs (such as ISO-9001) and non-nuclear codes and standards could benefit the industry greatly
 - The meeting summary and final report was issued in July 2025
 - INL/RPT-25-83730, “A Feasibility Study on Addressing Nuclear Quality Assurance Challenges”

DOE Authorization vs. NRC Licensing: Codes & Standards

- DOE Reactor Authorization and Oversight (10 CFR Part 830)
 - Allows for alternative methodologies to demonstrate safety and compliance, including:
 - DOE methods (10 CFR Part 830)
 - NRC methods (10 CFR Parts 50 or 52, Licensing Modernization Project)
 - A combination of DOE and NRC methods (only in DOE auth. process)
 - Efforts are underway to utilize and pilot NRC advanced reactor licensing approaches and gain efficiencies with future NRC licensing
- NRC Licensing Processes (10 CFR Part 50 or 52 and future Parts 53 or 57)
 - Codes & standards currently endorsed for use under 10 CFR Part 50.55(a)
 - Regulatory Guides provide guidance for the use of certain codes & standards

Summary of DOE Authorization Process for Nuclear Facilities

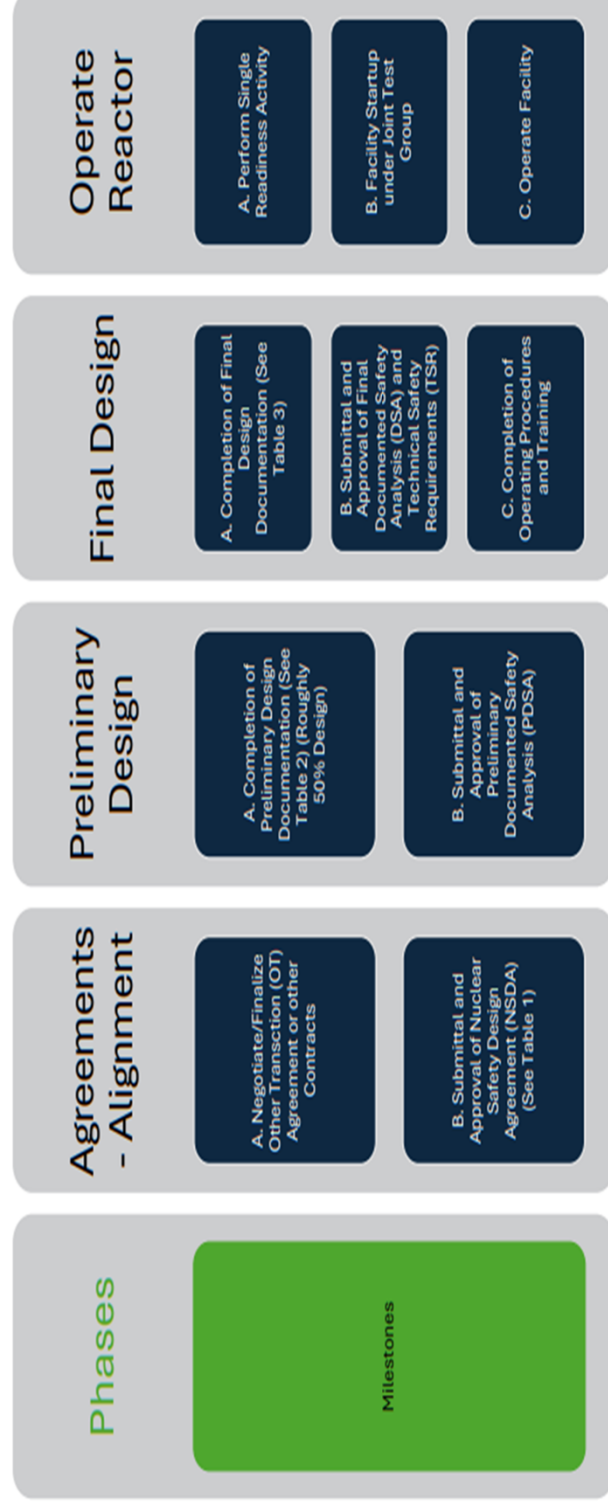
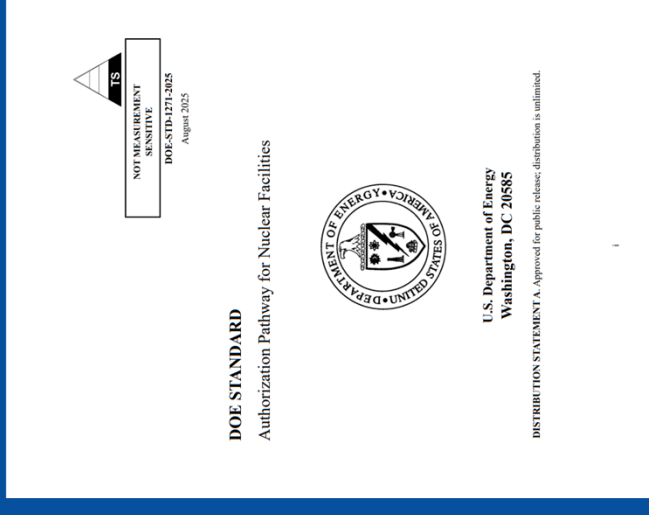


Figure.1: Summary of DOE Authorization Process for Nuclear Facilities

Notes – Agreements - Box B represents a streamlining of past DOE expectations in that it eliminates precursor steps to a PDSA. For nuclear facilities that are funded by private entities, construction may start at the earliest point permitted by law. Nuclear material, over a Hazard Category 3 level, may not be added to the nuclear facility until the Readiness Review is completed and approval of the Startup Approval Authority is obtained. See NE O 425.1

Codes & Standards in the DOE Authorization Process

- Major differences between NRC licensing and DOE authorization in the use of codes and standards include:
 - Use of specific, previously unapproved codes and standards may be allowed by the DOE Safety Basis Approval Authority
 - New DOE-STD-1271-2025 process develops a Nuclear Safety Design Agreement that brings the identification of codes and standards to the beginning of the DOE Authorization process
 - The previous process identified codes and standards later in the authorization process in the Safety Design Strategy



DOE Authorization to NRC Design Certification/License

What is the transition path from a DOE authorized reactor to an NRC licensed reactor?

- Is there an efficient and effective pathway?
- Can artificial intelligence be used to assist in this effort?
- DOE is funding work in FY-26 to develop crosswalk between the new DOE Authorization process and NRC Licensing process of advanced reactors and microreactors

Major question for future exploration as part of the collaboration:

- What codes and standards are acceptable for use in a DOE authorization that could be accepted in an NRC certification/license application?
 - Example: Use of USGS surveys for siting evaluation
- Can efficiencies be made to eliminate the duplication of efforts when transferring from a DOE Authorization to an NRC License?

Path Forward

- INL will continue to assist NRC with the implementation of the NRC Action Plan and will continue to implement the INL Action Plan
 - This path forward will continue collaborative efforts with the NRC and will likely include coordination with industry and other organizations
- Continue work to revise and support NRC endorsement of the sodium fire consensus standard ANS 54.8
- Work on the team performing the DOE-funded work package to development a crosswalk between DOE Authorization and NRC Licensing of advanced reactors and microreactors
 - As part of the effort, put emphasis on the codes and standards regulations
 - Continue to explore which codes and standards would be acceptable for a DOE authorization that would not be accepted for an NRC certification/license
- For input or observations, please contact:
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*Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy.
INL is the nation's center for nuclear energy research and development, and also performs research
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