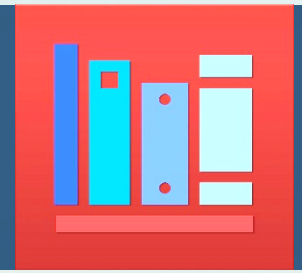
Overview of Recent Codes and Standards Initiatives



- **Moderator:** Ronaldo Jenkins, Senior Project Manager, RES/DE/RGPMB

- **Panelists/Speakers:**
  - Donald Eggett (ANS) and Thomas Vogan (ASME)
  - Mark Richter (NEI)
  - Thomas Basso (NEI)
  - David Rudland (NRC)
  - Sheila Ray (NRC)

ANS/ASME Nuclear Standards Collaborative to Support Advanced Reactor Standards Needs

NRC Standards Forum
September 15, 2021
Donald R. Eggett
Chair, ANS Standards Board
Thomas J. Vogan
Chair, Board on Nuclear Codes & Standards

Background

Over the past few years, multiple reports have been issued and workshops held identifying standards needs for the advanced reactor community. Some of these include:

- NEI 19-03 (Rev. 1), Advanced Reactor Codes and Standards Needs Assessment (March 2020)
- ANS/NEI Advanced Reactor Codes and Standards Workshop (June 2020)
- NRC Standards Forum emphasizing the need for better industry coordination (October 2020)
- ASME High-Temperature Reactor Workshop (November 2020)

- ANS Special Report Setting the Right Bar: How Consensus Standards Help Advanced Reactor Development (November 2019)

- ANS/NRC Workshop to Develop a Strategic Vision for Advanced Reactor Standards (May 2018)

- NRC Standards Forum on advanced reactors (September 2017)
- ORNL/SR-2017/520, Assessment of Applicability of Standards Endorsed by Regulatory Guides to Sodium Fast Reactors (September 2017)

ANS/ASME Joint Nuclear Standards Collaborative Proposal

ANS and ASME approved a proposal to jointly create a Nuclear Standards Collaborative—a "centralized industry led team"—to ensure there is coordination and collaboration among standards development organizations (SDOs) to support the reactor designers, regulators, and other interested stakeholders to develop industry standards and/or guidelines in support of the designers' advanced reactor designs.

This proposal parallels the focus of NRC's Forums:

"… aims to identify standards needs for the nuclear industry that are not currently being addressed by standards development organizations (SDOs) such as ASTM, ASME, ACI, ANS, IEEE, etc."

Focus

The primary focus is on the integration and harmonization among all SDOs to support advanced reactor designers on the needs for developing such standards. Although the focus will be on advanced reactors, nonreactor nuclear facilities and current operating reactors may be given some consideration relative to their prioritized needs for consensus standards or industry guidelines.

Objectives

- Develop appropriate interrogatories, agendas, and other actions necessary to facilitate strategies and action plans that support the development of codes, standards, and other guidance that foster licensing, design, construction, and operation of advanced reactors. Specific actions include:
  - Establish a list of advanced reactor needs using existing industry resources.
  - Solicit additional standards needed from Nuclear Standards Collaborative members based on users' prioritization.
  - Compile a list of all standards currently being developed or revised and planned by SDOs and other stakeholders that will support advanced reactor initiatives.

Objectives (Cont'd)

- Develop a roadmap for advanced reactor standards needs across all participative SDOs based on above gathered information.
- Develop a recommended list of standards development priorities with associated targeted milestones from this roadmap.

- Develop plans that are optimal in meeting the needs of developers/designers and stakeholder organizations. Formats may include virtual, face-to-face, or hybrid meetings and the structuring of semi-annual international forums with the mission of assembling stakeholders to obtain their input, comments, priorities, and challenges.

Organization

- The Nuclear Standards Collaborative will be governed by a steering committee. The ANS Standards Board Chair and the ASME Board on Nuclear Codes and Standards Chair have been assigned to lead the steering committee.

- The membership of the steering committee will be comprised of a “core group” of industry members, working independently but with support of the full Nuclear Standards Collaborative, ANS and ASME leadership, and other stakeholders to drive achievement of timely needed prioritized standards.

- ANS and ASME organization staffs will administratively support the Nuclear Standards Collaborative as needed.

Membership Makeup

- Full membership should include stakeholders from several constituencies, for example: SDOs (ANS, ASME, IEEE, ASTM, ASCE, ACI, etc.), NEI, NRC, DOE (incl. labs), EPRI, reactor developers/vendors (e.g., BWXT, Holtec, GEH, Westinghouse, NuScale, Kairos Power, Terra Power, X-Energy, etc.) architect engineers & constructors (e.g., Bechtel, Fluor, Sargent & Lundy, etc.), equipment and technical service suppliers, and owners/licensees.

- Consideration will be given to including members from international organizations to gain their input and engagement.

Benefits to Participation

- Improve the identification and prioritization of needed standards through engagement, input and collaboration with industry stakeholders.
- Determine which subject matter is best covered by standards vs. other industry documents (“guidelines”).
- Incentivize the “harmonization” of integrated codes & standards and collaborative SDO activities.
- Expedite standards development through an industry process for funding and possible “trial use.”
- Standards that better meet design goals, challenges and development timelines, and provide a path to efficient regulatory approval.

Benefits to Participation (Cont'd)

- SDOs will realize benefits as follows:
  - Utilize recommendations to ensure prioritization of timely needed standards to better plan for and allocate limited supporting resources.
  - Ensure standards are relevant and support industry objectives.
  - Increase participation of advanced reactor developers/vendors standards development.
  - Develop more harmonized and better-quality standards through collaboration.
  - Establish better collaboration with industry.
  - Elevate awareness of OMB Circular A-119 and the National Technology Transfer and Advancement Act which establishes and clarifies U.S. policy to elevate and increase Federal reliance on voluntary consensus standards.

Milestones: Initial Phase (3-12 months)

- ANS and ASME have appointed co-chairs to lead activities.
- ANS and ASME to perform initial outreach and solicit participation from SDOs and key industry stakeholders to support the steering committee.
- Establish the Nuclear Standards Collaborative committee membership; hold working meeting(s) to initiate the committee.
- Establish the process to obtain needed financial support for the development of prioritized, near-term advanced reactor codes and standards.

Milestones: Initial Phase (3-12 months) (Cont'd)

- Determine Nuclear Standards Collaborative meeting structure (i.e., full committee meetings vs. steering committee plus industry workshops and periodicity).

- Develop and issue full committee and steering committee charters, meeting frequencies, committee protocols, required logistics, decision making processes, etc.

Milestones: Near Term (1-2 yrs.)

- Establish a list of the next advanced reactor needs.
- Compile list of the next advanced reactor standards under development/revision or planned.
- Develop roadmap of the next needed advanced reactor standards.
- Prioritize list of the next needed advanced reactor standards.
- Develop proposals for funding and resource development for the next highest priority standards.

Milestones: Long Term (3-5 yrs.)

- Update list of needed advanced reactor standards.
- Update list of standards under development/revision or planned.
- Revise roadmap if needed for advanced reactor standards.
- Update prioritized list of needed advanced reactor standards.
- Develop additional proposals for funding development of advanced reactor priority standards.

Closing Remarks

The Nuclear Standards Collaborative

A multi-organization campaign dedicated to accelerating the development of industry consensus standards for advanced nuclear energy systems.

This approved proposal /initiative parallels the focus of NRC's Forums.

Guiding principle: Greater use of industry consensus standards in the NRC licensing and regulatory processes.

Main objectives:

1. Identify high priority consensus standards in need of development/updates.
2. Seek and obtain funding to accelerate development of high priority standards, using inter-SDO partnerships where applicable.
3. Ensure the timely adoption of new/updated standards into NRC regulations.

Closing Remarks (Cont'd)

The Nuclear Standards Collaborative

Other Considerations:

1. An aggressive initiative requiring everyone's engagement.
2. Harmonization of technical and management decision-making.
3. A "living exercise" i.e., roadmap can change at any time, if needed.


ANS

Recent Codes and Standards Initiatives

NRC Standards Forum

Mark Richter
Nuclear Energy Institute

September 15, 2021

Advanced Reactors

- Energy markets are evolving and carbon-free options drive forward planning
- Large reactor competitive position challenged-plants shutting down
- U.S. utilities evaluating different options for new nuclear
- Growing interest in conversion of coal power sites to nuclear
- Carbon-free energy portfolios not possible without nuclear
- Continued strong support in Congress

Advanced Reactor Momentum

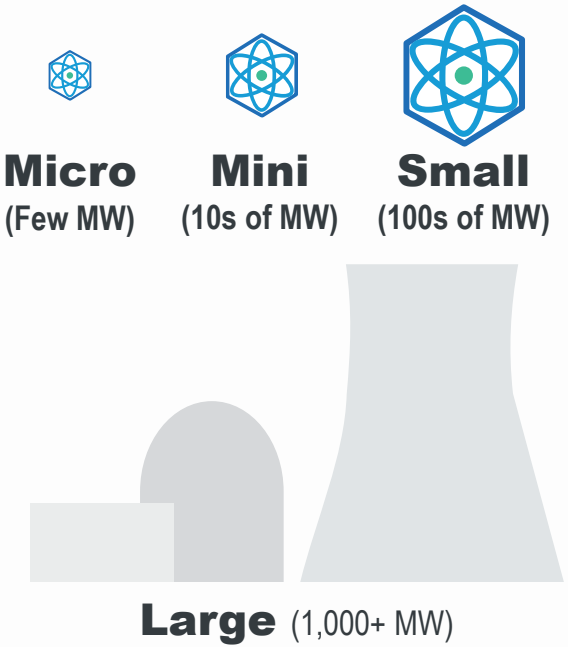
- Over 60 new technologies under development for numerous markets
- Strong bipartisan support in Congress
- Tangible movement to multiple demonstrations in 2020s
  - DOE funding 12 different designs, >$5B over 7 years
- Federal and state policies evolving in right direction
- U.S. utilities evaluating advanced reactor nuclear energy in their resource plans

NRC must enable innovation

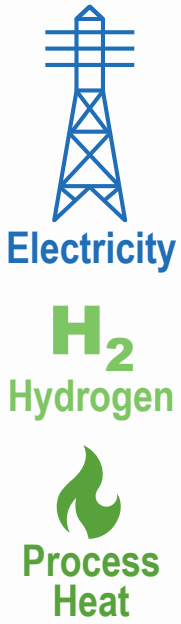
so that nuclear can play a key role in carbon reduction

Advanced Nuclear Versatility

Spectrum of Sizes/Options



Variety of Outputs



Multitude of Uses

Types of Advanced Reactors

Range of sizes and features to meet diverse market needs

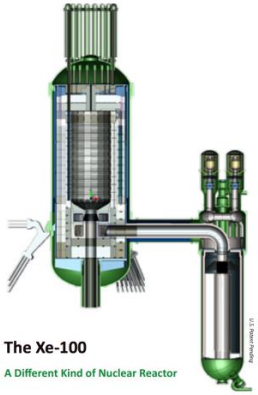
Micro Reactors (< 20MW)

Oklo (shown)
Approximately a dozen in development

LWR SMRs <300MW

NuScale (shown)
GEH X-300
Holtec SMR-160

High Temp Gas Reactors

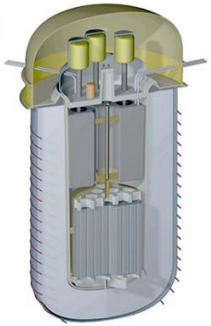


X-energy (shown)
Several in development

Liquid Metal Reactors

TerraPower Natrium (shown)
Several in development

Molten Salt Reactors

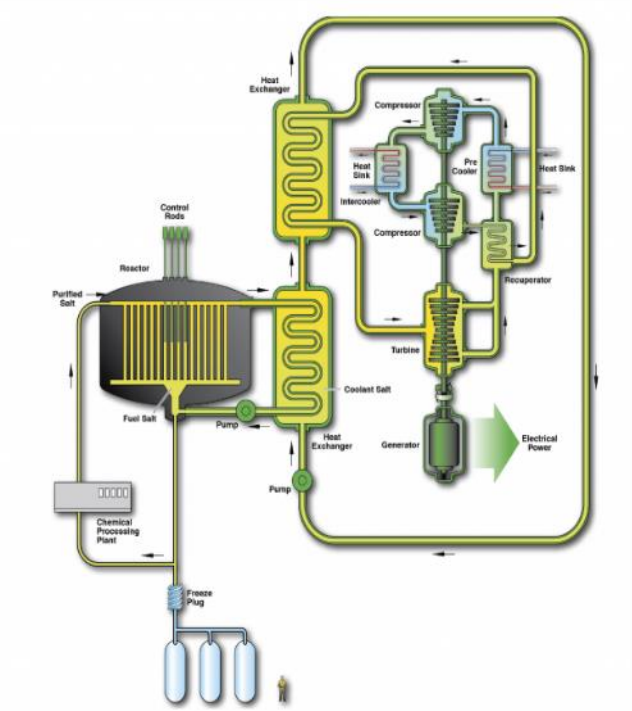


Terrestrial (shown)
Several in development

Non-Water Cooled
Most <300MW, some as large as 1,000 MW

NRC Applications and Pre-Application

- NuScale – Light-water SMR
- Oklo Aurora – micro-reactor
- GEH BWRX-300 – Light-water SMR
- General Atomics EM2 – gas cooled fast reactor
- Holtec SMR-160 – Light-water SMR
- Kairos Power – salt cooled with TRISO fuel
- Terrestrial Energy – molten salt reactor
- TerraPower – Natrium
- TerraPower – molten chloride fast reactor
- Westinghouse – micro-reactor
- X-energy XE-100 – high-temperature gas reactor



Information above from NRC as of Aug 16, 2021

Regulatory Priorities

- Streamlining the regulatory process
  - Timely and efficient NRC safety reviews
  - Environmental reviews
- Resolving key technical and policy issues
  - Emergency planning zones
  - Physical security
  - Population criteria for siting
- Modern and efficient regulatory framework
  - Risk-informed licensing approaches
  - Technology-inclusive rulemaking

NEI Activities

ASME/ANS Joint Proposal to Create a U.S. Nuclear Standards Advisory Committee

- Background
  - Advanced reactor (AR) developers moving forward rapidly with initial licensing and design activities
  - Recognition by SDOs, NEI, AR Developers, NRC and DOE that prioritization and coordination of C&S development is necessary to support timely development and deployment of ARs
- Actions
  - Compile list of AR needs using resources such as NEI 19-03, independent ANS assessment and forums and workshops
  - Develop roadmap for AR standards needs from SDOs

Quality Assurance Guidance for 10 CFR Part 53

- Plants licensed under Part 53 able to purchase components under a commercial quality program without commercial grade dedication
- New approaches to QA that are not anchored by Part 50 and App B
- Prefer use of ISO 9001 versus ISO 19443, the nuclear specific version of ISO 9001 - may limit the number of possible suppliers
- QA requirement related to providing “reasonable assurance of adequate protection.” Adequate protection equivalent to “safety-related” in Part 50
- Allows more flexibility in how ISO-9001 can meet the requirement
- Current action is identifying deltas between Appendix B and ISO 9001, and special requirements needed to buttress 9001
- Potential applicability to operating fleet, as Part 53 continues development

Questions?

NEI Codes and Standards Task Force

Thomas Basso
Sr. Director Eng & Risk

September 15, 2021

NUCLEAR ENERGY INSTITUTE

NEI Codes and Standards Task Force

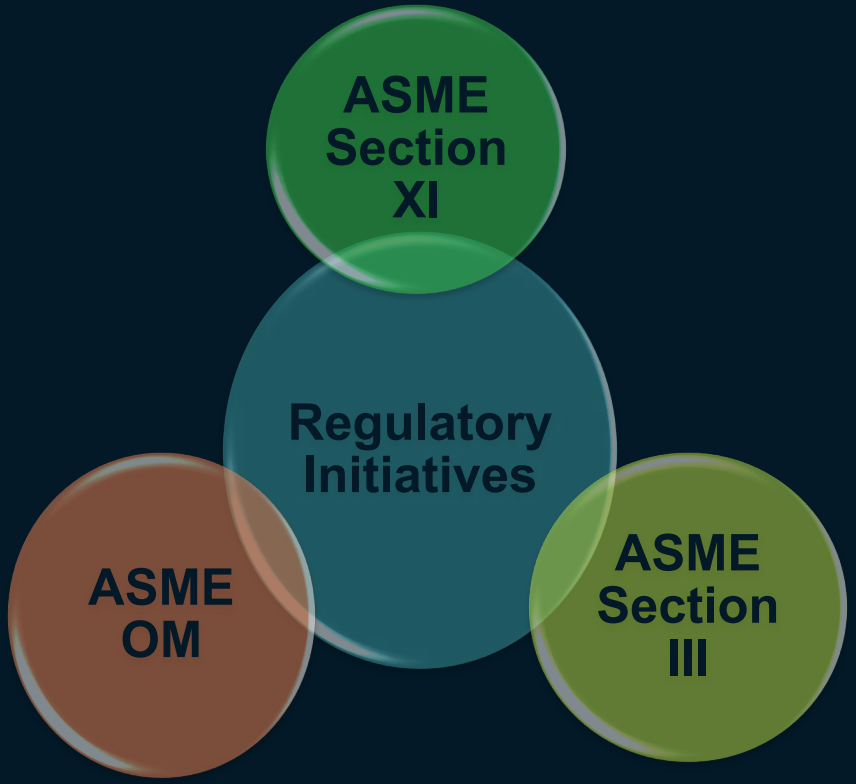
Mission

Ensure licensee and regulatory activities implemented through codes and standards committees are consistent with nuclear industry policies and interests, and consistent with the Principles of Good Regulation.

Codes & Standards Task Force Scope

- Advocate for utilities representation on code and standards committees to improve industry engagement.
- Engage utility representatives on changes to codes and standards by ensuring the best interest of the industry is known and understood.
- Facilitate member collaboration and support on code and standards activities, review of regulatory changes, and application of risk-informed approaches.
- Communicate proposed or approved code and regulation changes that significantly benefit or impact the industry to garner requisite support or challenge.
- Primary task force interface with NRC on code items including emergent issues from inspections to ensure industry alignment.
- Promote retention and understanding C&S knowledge.

NEI Codes and Standards Task Force Update



ASME Section XI Code Activities

- Code Case to Extend In-service Inspection Interval to 12 Years
- TG Repair/Replacement Optimization
  - Clarification on Repair/Replacement Plans Options
  - Code Case on Repairs of Routine Nature
  - Pressure Testing Alternative
- Cast Austinetic Stainless Steel UT Examination Requirements (CC N-824)

ASME Section III Code Activities

- Task Group on Section III/XI Interface
- Code Case on Alternate Requirements
- Regulatory Strategy Support
  - Risk-informed Code Initiative Alignment

ASME OM Code Activities

- Valve Supplemental Position Indication Testing
  - Code Case OMN-28 Relief Request and Implementation
  - Code Case on Alternative to ISTC-3700
- Valve Manual Exercising Frequency Extension
- Exploring Potential Risk-informed Applications
- OM Subcommittee on New Reactors

Regulatory Initiatives

- Reg Guides 1.147, 1.84, and 1.192 Review and Comment
- 10 CFR 50.55a Proposed Rule Review and Comment
- Extension of 10 CFR 50.55a Requirements to Update ISI/IST Programs
  - SECY-21-0029 Commission Review
  - Pilot Exemption Request
- RIS (in process) on Treatment of Operational Leakage

Questions

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UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

NRC Standards Forum

Rulemaking Plan on Revision of Inservice Testing and Inservice Inspection Program Update Frequencies Required in 10 CFR 50.55a

September 15, 2021

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

NRC Staff

- Presenters:
  - David Rudland, NRR: Technical Lead
- Working Group Members:
  - Sheldon Clark, OGC: Attorney
  - Victoria Huckabay, NMSS: Rulemaking PM
  - Thomas Scarbrough, NRR: Technical Staff
  - Ian Tseng, NRR: Technical Staff
  - Mark Yoo, RES: Technical Staff

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UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Agenda

- Purpose of the SECY Paper
- Rulemaking Impact
- Background
- Regulatory Issue
- Proposed Rulemaking
  - Scope
  - Schedule
- Staff's Recommendation
- ACRS Recommendation

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Protecting People and the Environment

Purpose of the SECY Paper

- Request Commission approval to initiate a rulemaking to amend 10 CFR Part 50.55a to extend the interval of inservice testing (IST) and inservice inspection (ISI) program updates.
  - Current 120-month update interval would be extended to 240 months, after updating to the most recent Codes and addenda incorporated by reference in § 50.55a.
  - Requests Commission to delegate signature authority to the EDO.
- Request Commission approval and delegations for a **potential** subsequent rulemaking to extend update interval from 240 months to 288 months.

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Protecting People and the Environment

Rulemaking Impact

What will change?

- The frequency licensees are required to update their IST/ISI programs to use the most recent version of the ASME Code incorporated by reference in 10 CFR 50.55a, after updating to 2019/2020 or later editions of ASME Codes
  - IST/ISI programs include processes and procedures for plants to conform to ASME OM Code and BPV Section XI requirements

What won't change?

- Level of safety afforded by the currently mandated Code Editions
- Required inspections, testing, analysis, and reporting
- NRC ability to impose requirements for emergent safety issues
- Licensee ability to update IST/ISI programs early (i.e., prior to required update)

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Protecting People and the Environment

Background

- Effort began as an NRR EMBARK Venture Studios (EVS) project (ML20153A752)
- Identified 3 recommendations to pursue:
  1. Relax the requirement to update IST and ISI programs every 120 months following the next update to the 2019/2020 ASME Codes.
  2. Institute direct final rules for unconditionally approved code cases.
  3. Decrease frequency of ASME Code editions rulemakings.
- SECY requests rulemaking for Recommendation 1.
  - Would provide improved flexibility and burden reduction to licensees while maintaining safety
  - Recommendation is outside the scope of delegation for routine ASME Code updates and requires Commission approval.
- Staff will implement Recommendations 2 and 3.
  - Recommendations are within the staff's delegated authority for rulemaking.

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Regulatory Issue

- 10 CFR 50.55a requires that every 120 months licensees must update IST and ISI programs to the latest edition and addenda of the ASME OM and BPV Section XI Codes incorporated by reference within 18 months of the start of 120-month interval.
  - Major modifications to ASME Codes typically take more than a decade.
  - Discovery of new degradation mechanisms has slowed greatly in recent years.
- Discovery of new degradation mechanisms or performance issues are typically first addressed by ASME using Code Cases before incorporating into an edition.
  - NRC would continue reviewing new or revised Code Cases for incorporation into the regulations on a biannual basis.
  - Extending the IST and ISI program update interval does not inhibit NRC's ability to specify requirements if required for safety.

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Rulemaking Scope

- The proposed rulemaking would double the time between updates for the licensee's Codes of record for IST and ISI programs from **120 months** to **240 months** for licensees that update to the most recent edition and addenda of the ASME OM Code and BPV Code, Section XI, incorporated by reference
  - Current 120-month ISI program update interval corresponds to the current 10-year ISI interval in ASME BPV Code, Section XI.
- Potential future rulemaking to extend the update requirement from 240 months to 288 months.
  - ASME is considering extending current ISI interval to 12 years.
  - Staff is not currently proposing to conduct this rulemaking and ASME has not yet extended the interval.

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Rulemaking Schedule

- Deliver proposed rule to NRR OD – 12 months after receipt of Commission's SRM.
- Deliver final rule to NRR OD – 12 months after comment period for proposed rule closes.
- This rulemaking may be combined with the next routine ASME Code Edition or Code Case rulemaking.

Staff's Recommendation

- Staff recommends that the Commission:
  - Approve initiation of a rulemaking to extend the interval for the IST and ISI program updates from 120 months to 240 months, after updating to the most recent Codes incorporated by reference in § 50.55a.
  - Approve a future rulemaking to extend the interval from 240 months to 288 months if ASME increases the ISI interval to 12 years.
  - Approve the staff's request not to develop a regulatory basis for these rulemakings.
  - Delegate signature authority for these actions to the EDO.

ACRS Recommendation

- Staff briefed the ACRS on July 7, 2021
- By letter dated July 26, 2021, the ACRS:
  - Concurred with the staff's recommendation to extend the IST/ISI update interval from 120 months to 240 months, with a potential future extension to 288 months.
  - Noted the minimal impact on safety once licensees have implemented recent ASME Code editions (2019/2020 or later).
  - Recommended that the staff move expeditiously to implement the two additional recommendations in the EMBARK Venture Studio report.

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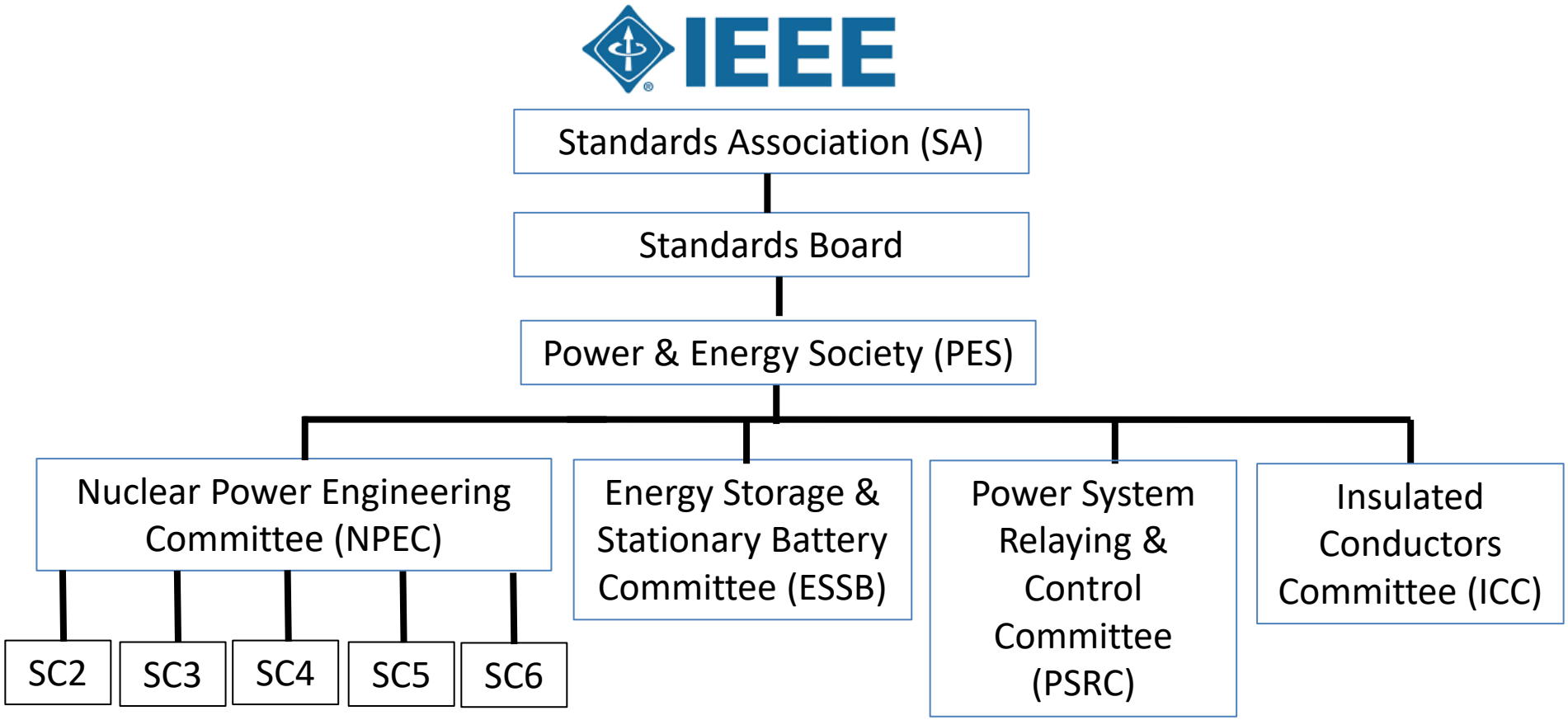
QUESTIONS?

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Regulatory Guidance Framework for IEEE Electrical Standards

Sheila Ray, P.E.
NRR/DEX/EEEB
September 15, 2021


IEEE
Standards Association (SA)
Standards Board
Power & Energy Society (PES)
Nuclear Power Engineering Committee (NPEC)
SC2
SC3
SC4
SC5
SC6
Energy Storage & Stationary Battery Committee (ESSB)
Power System Relaying & Control Committee (PSRC)
Insulated Conductors Committee (ICC)

Status of Significant Regulatory Guides

- Environmental Qualification: RG 1.89
  - To endorse IEC/IEEE Std. 60780-323-2016
  - Received public comments
  - Addressing public comments currently
  - Publication expected first quarter 2022
- Environmental Qualification of Connection Assemblies: RG 1.156
  - To endorse IEEE Std. 572-2019
  - Draft for public comment expected before end of Dec 2021
- Environmental Qualification of Actuators: RG 1.73
  - To endorse IEEE Std. 382-2019
  - Draft in development

Status of Significant Regulatory Guides

- Onsite Emergency AC Power Sources: RG 1.9
  - To endorse IEEE Stds. 387-2017 (EDG) and 2420-2019 (CTG)
  - Adds Design and Testing Considerations for AC Power sources other than EDGs and CTGs
  - Received & addressed public comments
  - ACRS meetings held in July 2021
  - Public meeting conducted in Aug 2021
  - Republish revised draft guide for public comment by end of Dec. 2021
- Protection of Class 1E Power Systems: new RG
  - To endorse IEEE Std. 741-2021/2022 (upcoming revision)
  - Expected to have draft out for public comment mid-2022

Status of Significant Regulatory Guides

- Assessing, Monitoring, and Mitigating Aging Effects: new RG
  - To endorse IEEE Std. 1205-2014
  - Expected to have draft out for public comment by the end of Dec. 2021
- Risk-Informed Categorization of Electrical and Electronic Equipment
  - To endorse IEEE Std. 1819-2016
  - Determining path forward of endorsing in a new RG or an existing RG 1.201 on categorization of SSCs

Status of Significant Regulatory Guides

- Qualification of battery chargers, inverters & UPS: RG 1.210
  - To endorse IEEE Std. 650-2017
  - Draft in development
- Sizing lead-acid batteries: RG 1.212
  - To endorse IEEE Std. 485-2020
  - Draft in development
- Installation Design & Installation of Vented Lead-Acid Batteries: RG 1.128
  - To endorse IEEE Std. 484-2019
  - Draft in development

Acronyms

AC – Alternating Current
ACRS – Advisory Committee on Reactor Safeguards
IEC – International Electrotechnical Commission
IEEE – Institute of Electrical and Electronics Engineers
RG – Regulatory Guide
SSC – system, structure, and component
Std. – Standard
UPS – uninterruptible power supply

Questions?

Vision & Strategy of IEEE Electrical Standards - ROADMAP

- Focus on the agency mission and regulatory requirements when determining a RG is needed or requires updating.
- Represents a technically viable approach for allowing licensees, manufacturers, vendors, and NRC staff to effectively navigate and use regulatory guidance.
- Prevents the ad hoc approach of generating additional regulatory guidance documents.
- Combine related standards on a technical topic into one RG.
  - Reduced staff hours as compared to updating and maintaining several RGs
  - Reduced costs as compared to updating and maintaining several RGs
  - Technical Efficacy - Generates efficiencies such that industry/users have a one-stop shop on NRC positions on a particular topic
  - Process Efficiency – review process is streamlined for one RG on a technical topic (i.e. one public comment period on a technical topic)
  - Updates to a combined RG endorsing several standards would only be considered when there are significant changes that impact the staff's position or provide additional clarifications
  - Examples:
    - RG. 1.100 (seismic qualification) includes both 60980-344 & C37.98
    - One RG on the design of DC systems to include 946 (design), 1189 (selection of batteries), 1375 (protection), & 2405 (battery chargers), all of which are critical to a DC system design.
- For standards in the early stages of development, NRC action will be determined once early drafts are available to ascertain how the standard fulfills the agency's mission and provides methods to meet regulatory requirements.