ASME Advanced Reactor Standards Development

NEW & ADVANCED REACTORS: CODES AND STANDARDS

NRC STANDARDS FORUM – SEPTEMBER 25, 2024

THOMAS VOGAN, ASME SENIOR VICE PRESIDENT
STANDARDS & CERTIFICATION

Overview

- ASME Overview
- ASME Standards Development Activities including NRC support and R&D needs

ASME Facts and Figures

Established in 1880 and headquartered in New York City, the American Society of Mechanical Engineers is a not-for-profit international society.

90,000+

Worldwide Membership

135+

Countries with ASME Members

25+

Conferences Conducted Annually

200+

Technical Courses & Master Classes Offered Annually

Offices: New York, NY; Washington, DC; Little Falls, NJ; Houston, TX; Beijing, China; and New Delhi, India

Setting the Standard

Used in 100+ Countries

ASME is an international Standards Development Organization
- Accredited by ANSI
- Development process adheres to the principles and procedures outlined in the World Trade Organization's (WTO) Agreement on Technical Barriers to Trade (TBT) for development of international standards

500+ Standards & Products

Pressure Vessels, Piping, Nuclear Technologies, Elevators/Escalators, Cranes, Performance Testing, etc.

6,500+ Dedicated Volunteers

Engineers, Researchers, Government officials, etc. enhancing public safety, health, and quality of life

Transparency

Impartiality and Consensus

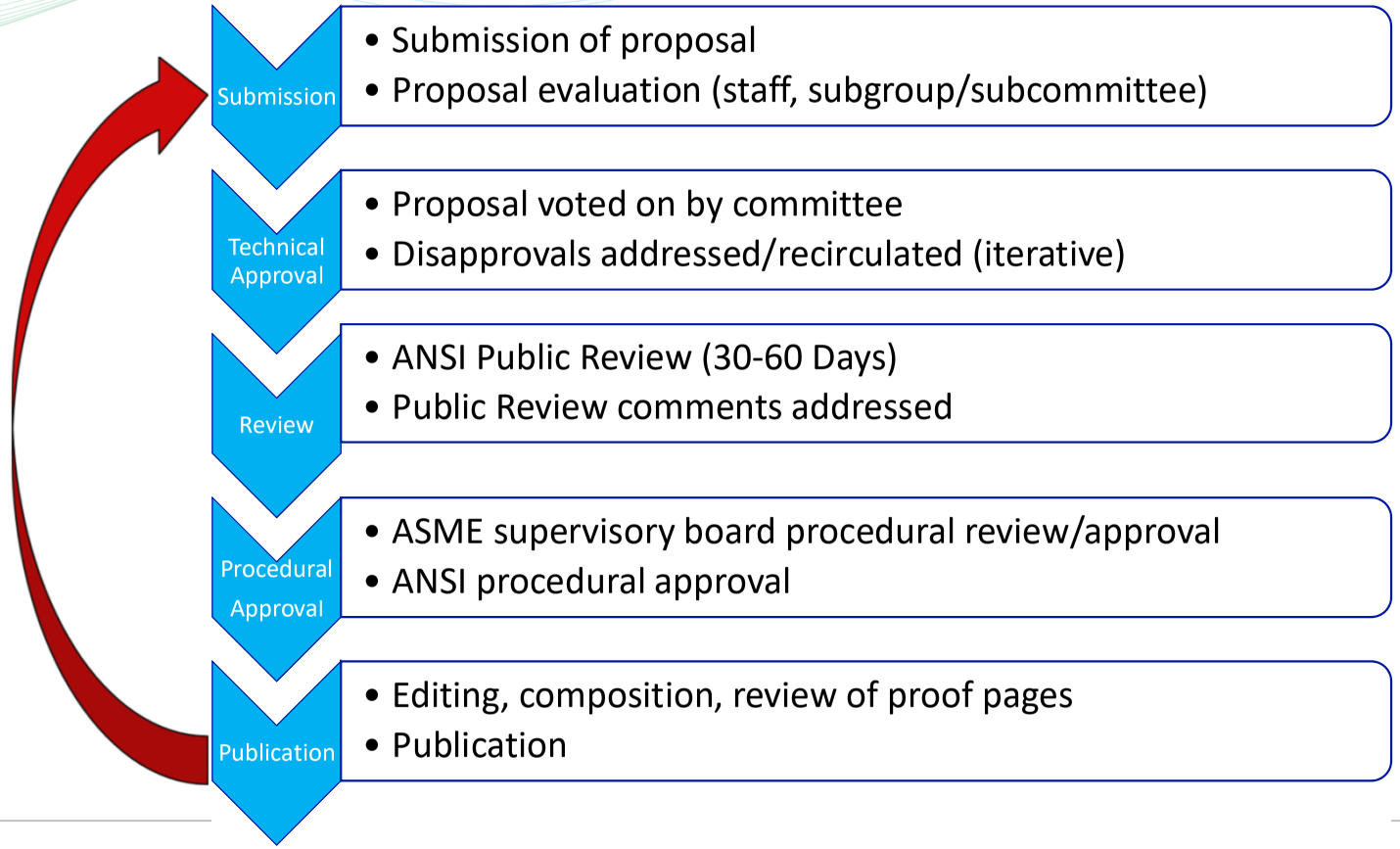
Coherence

Openness

Effectiveness and Relevance

Development Dimension

ASME Consensus Process



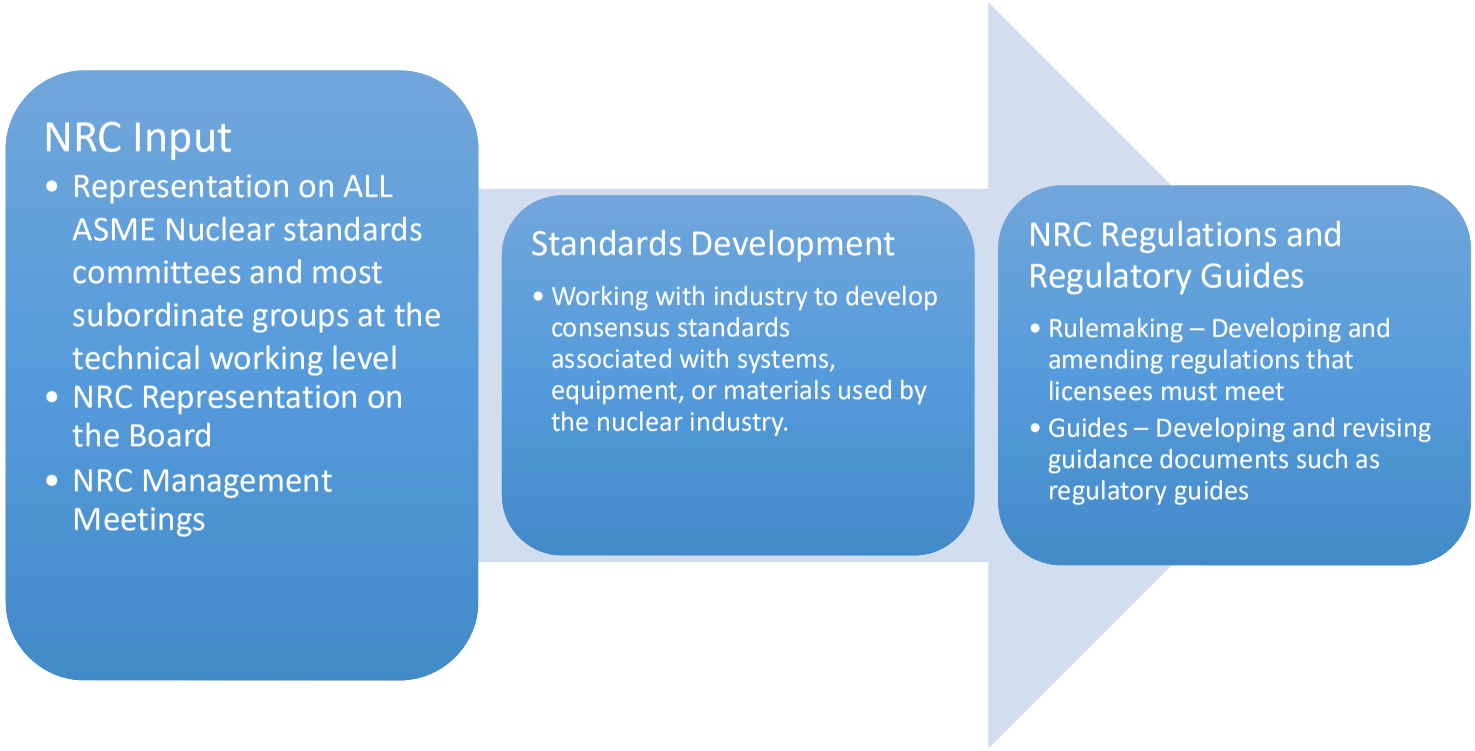
The ASME Advantage

Maturity of our Standards	• Over 100 yrs. of consensus developed content that advances with technology and ensures high quality products and a commitment to overall public safety
Continuous Improvement	• ASME standards development committees continuously work to incorporate engineering lessons learned and advances in technology into the standards to ensure that the standards remain relevant and meet the needs of the industry.
Globally recognized and accepted	• Codes, Standards, and Conformity Assessment requirements aid manufacturers in the development and implementation of Standard through a Quality System in the manufacturing of boilers, pressure vessels, and pressure piping, etc.
Conformity Assessment Program	• ASME Conformity assessment allows the recognition of a company's or individual's capability to fulfill the requirements of an ASME standard in order to advance public safety and facilitate international commerce.

ASME Standards Development Activity

EMERGING TOPICS OF INTEREST FOR NUCLEAR ENERGY APPLICATIONS

Nuclear Regulatory Commission



ASME Nuclear Standards – BPV III

- BPV III - Construction of Nuclear Facility Components
  - Division 1: Metallic vessels, heat exchangers, storage tanks, piping systems, pumps, valves, core support structures, supports, and similar items.
  - Division 2: Concrete containment vessels with metallic liners
  - Division 3: Storage and transportation containments and their internal support structures for spent fuel and high-level radioactive material and waste.
  - Division 4: Fusion Energy Devices
  - Division 5: High temperature reactors providing rules suitable for construction of gas and liquid metal cooled reactors and are under a more active development to meet the evolving needs of our advanced reactor stakeholders
  - BPV II, V, IX & XIII Sections and BPV III Code Cases

ASME Nuclear Standards – BPV III

» Emerging Topics of Interest:

- BPV Section III, Division 1: Seismic Analysis
- BPV Section III, Division 5: High Temperature Materials for SMRs - Need continued support for materials research to support BPV III Division 5 Code Cases (e.g. Alloy 709) and expanded support for assessment of more materials at 500,000 hours (60 years).
- BPV Section III, Division 5: Graphite Materials - Need ongoing support for R&D to expand material property data for nonmetallic materials and to clarify the concepts of crack initiation, damage tolerance, structural failure and lost of functionality.

ASME Nuclear Standards - BPV XI

BPV XI – Nuclear Inservice Inspection

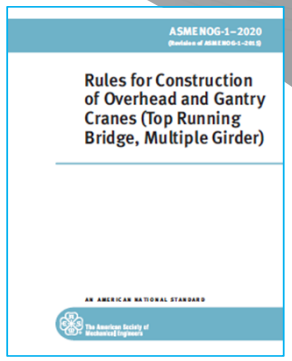
- Division 1: Inspection and Testing of Components of Light-Water-Cooled Plants
- Division 2: Reliability Integrity Management (RIM) A methodology to establish Inservice Inspection criteria independent of the SMR technology (e.g., Molten Salt, HTGR, Liquid Metal, etc.) Alternative approach to current ISI activities, needed to accommodate new technologies.
- BPV XI Code Cases

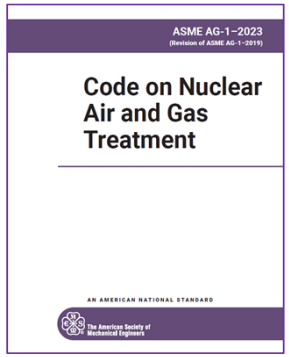
» Emerging Topics of interest

- BPV Section XI, Division 2: Inspection Protocols for Graphite and for Sodium Fast Reactor - R&D is need to establish likely degradation mechanisms of graphite in molten salt and liquid metal coolant systems.

ASME Nuclear Standards – CNF and CONAGT

- CNF Cranes for Nuclear Facilities
  - HRT-1 - Rules for Hoisting, Rigging, and Transporting Equipment for Nuclear Facilities
  - NML-1 Rules for the Movement of Loads using Overhead Handling Equipment in Nuclear Facilities
  - NOG-1 - Rules for Overhead and Gantry Cranes
  - NUM-1 - Rules for Cranes, Monorails, and Hoists (with Bridge or Trolley or Hoist of the Underhung Type)
  - OCS-1 Overhead Crane Safety Engineering: A Guide for Performing a Failure Modes and Effects Analysis (FMEA) and for Implementing a Crane Control Monitoring System (CCMS) for Enhanced Safety Cranes
- Requests currently being discussed: DOE-STD-1090-2020 parallels the recently published NML-1-2019 standard which is titled "Rules for the Movement of Loads using Overhead Handling Equipment in Nuclear Facilities". NML-1 was written so that it can be used at any facility that may have overhead handling lifts, especially those that require some special considerations. It could apply to any DOE facility, not just nuclear ones.
- CONAGT Committee on Nuclear Air and Gas Treatment
  - AG-1 Code on Nuclear Air and Gas Treatment
  - N511 In-service Testing of Nuclear Air Treatment, Heating, Ventilating, and Air Conditioning Systems
- Requests currently being discussed: A project task team of industry experts and DOE representatives are in the process of reviewing all DOE standards, handbooks and orders related to air filtration components and systems. At least 6 tasks have been identified to revise ASME standards and delete or revise DOE documents.

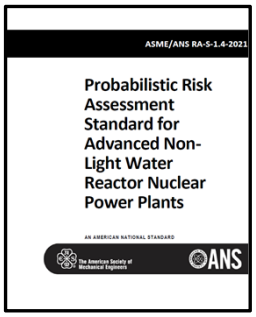




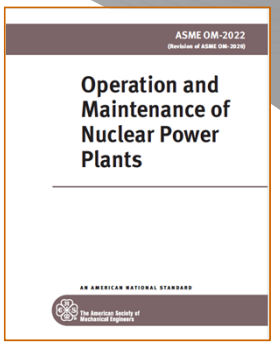
ASME Nuclear Standards JCNRM

Joint Committee on Nuclear Risk Management – Joint Committee with ANS

- RA-S-1.1 - Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment
- RA-S-1.2 - Severe Accident Progression and Radiological Release (Level 2) PRA Standard for Light Water Reactors (LWRs)
- RA-S-1.3 - Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications
- RA-S-1.4 - Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactors
- RA-S-1.6 - Requirements for Low Power and Shutdown Probabilistic Risk Assessment
- RA-S-1.5 - Probabilistic Risk Assessment Standard for Advanced Light Water Reactor Nuclear Power Plants (In course of development)
- RA-S-1.7 - Multi-Unit Probabilistic Risk Assessment (Level1 +LERF) (In course of development)
- RI-Security - Risk Informed Security (In course of development)



ASME Nuclear Standards – OM and QME

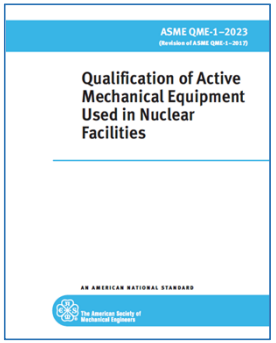


OM Operation and Maintenance

- OM-2 - 2024 Rules for Inservice Testing Requirements for Pumps, Valves, and Dynamic Restraints at Nuclear Facilities was published in Fall 2024 and is applicable to advanced reactors.
- OM-NRC Symposium was held July 2025 In Washington D.C. area. It was extended from 2 days to 2 ½ days due to the number of presentations and addition of an NRC panel session. There was very good interaction between presenters, NRC, and symposium participants.

» **Emerging Topics:**

- NRC Staff is working to complete OM-2 acceptance in a Regulatory Guide. Continued support of this effort is requested.
- OM – 2022 Edition for traditional water-cooled reactors is in process of a major revision to align with the structure of OM-2 to make the code more straightforward and easier to implement. This revision will also simply future maintenance and update of both OM and OM-2.



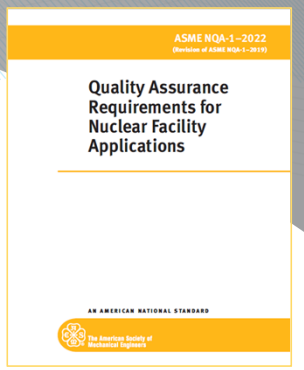
QME Qualification of Mechanical Equipment

- QME-1 - Qualification of Active Mechanical Equipment Used in Nuclear Facilities

» **Advanced Reactor Developers Requests:**

- QME-1 language was specific to LWRs. Revision of QME-1 is in progress to simplify the code, make is more applicable to non-light water reactors and remove the term "active". NRC staff plans to prepare Revision 5 to RG 1.100 to accept the ASME QME-1-2023 Standard and the reformatted QME-1 Standard (expected 2025). Continued support of this effort is requested.
- Future actions to investigate RIM applications and risk informed qualification processes will be undertaken in future revisions.

ASME Nuclear Standards – NQA



- NQA Committee on Nuclear Quality Assurance
  - NQA-1 Quality Assurance Requirements for Nuclear Facility Applications
  - NQA.TR Evolution of Quality Assurance Principles and Requirements in the US Nuclear Industry
- Emerging Topics
  - Graded approach - NQA-1 already addresses the use of a graded quality approach. Potential future actions to better describe how to apply a graded quality approach commensurate with contributions to safety and/or risk and project phase (e.g., R&D, design, procurement, construction, installation, operation) and develop training or guidance for the Designer or Engineering to better describe how to apply risk basis analysis for safety significance assignments to systems, components, and items.

ASME Nuclear Standards – PSD

Plant Systems Design - PSD-1 (In course of development)
Publication expected early 2025.

- A technology neutral standard for design of plant systems for nuclear and fossil power, petrochemical, chemical, and hazardous waste plants and facilities. The standard will provide processes and procedures for design organizations.

Learn More and Participate

- ASME Code & Standards Committees
  - Participation on ASME's standards developing committees is free and open to technically qualified individuals with a willingness and ability to contribute.
  - You do not have to be a member of ASME to join a committee.
  - More information at: https://www.asme.org/codes-standards/asme-code-committee

- Standards Committee Meeting
  - Meetings are free to attend and open to the public,
  - Meeting schedules at: https://www.asme.org/conferences-events/events?eventType=4

- Catalog of Codes & Standards
  - ASME website: asme.org

- Find a Standard on searchable database: https://www.asme.org/codes-standards/find-codes-standards

- Board on Nuclear, Clean Energy, Power & Facilities Codes & Standards; and the Strategic Committee on Nuclear Facilities

Questions?

Tom Vogan

Vogant@asme.org

Contact Information

- Kate Hyam – Director, Nuclear, Clean Energy and Standardization Codes & Standards
  - HyamK@asme.org
- Adam Maslowski– Section III
  - Maslowskia@asme.org
- Daniel Miro-Quesada – Section XI
  - Miroquesadad@asme.org
- Jihoon Oh – CNF
  - ohj@asme.org
- Shaimaa Khalifa – CONAGT
  - khalifas@asme.org
- Oliver Martinez – JCNRM, OM
  - Martinezo@asme.org
- Daniel Wiener – QME
  - Weinerd@asme.org
- Abena Dinizulu – NQA
  - DinizuluA@asme.org
- Gerardo Moino– QPS-1
  - Moinog@asme.org