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NRC Use of Codes and Standards

Carol E. Moyer, NRC/RES

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Who We Are

- The Energy Reorganization Act of 1974 established the independent U.S. NRC to regulate commercial uses of nuclear material; other duties of the former Atomic Energy Commission were assigned to the Department of Energy.

- The NRC is headed by four Commissioners and a Chairman, all appointed by the President and confirmed by the Senate for staggered five-year terms. No more than three can be from the same political party.

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Who We Are

- The NRC employs about 3,000 people in its suburban Maryland headquarters and four regional offices in Pennsylvania, Georgia, Illinois and Texas.
- NRC inspectors are assigned to 65 nuclear power plant sites and three fuel facilities.
- NRC staff are federal employees qualified to hold positions of public trust. They are bound by stringent ethics rules and restrictions.

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Our Mission

To license and regulate the nation's civilian use of byproduct, source and special nuclear materials to ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment.

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Regulation for Safety

"The Commission believes that a strong and fully independent regulator, who communicates and exchanges best practices with strong and independent regulators from other countries, is the best guarantee of an orderly and safe deployment of nuclear plants to meet the world's growing energy demands."

-Dr. Dale E. Klein, Chairman, U.S.NRC

American Nuclear Society meeting, Nov. 2006

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Some Nuclear Facts

- More than 100 nuclear power plants supply about 20 percent of the electricity in the U.S.
- Nuclear materials are used in medicine for cancer treatment and diagnosis.
- Nuclear materials are widely used in industry, such as in density gauges, flow measurement devices, radiography devices and irradiators.

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The NRC Regulates:

- Nuclear reactors - commercial power reactors, research and test reactors, new reactor designs;
- Nuclear materials - nuclear reactor fuel, radioactive materials for medical, industrial and academic use;
- Nuclear waste – transportation, storage and disposal of nuclear material and waste, decommissioning of nuclear facilities; and
- Nuclear security – physical security of nuclear facilities and materials from sabotage or attacks.

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Our Primary Functions

- Establish rules and regulations
- Issue licenses
- Provide oversight through inspection, enforcement and evaluation of operational experience
- Conduct research to provide support for regulatory decisions
- Respond to emergencies

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Establish Rules and Regulations

- NRC establishes rules that users of radioactive material must follow. These rules protect workers and the public from the potential hazards of radioactivity.

- Before writing or changing the regulations, NRC solicits and considers the views of the public, industry representatives, researchers, state officials, scientists and technical experts.

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NRC's Policy Structure on Consensus Standards

- Consensus codes and standards have been integral to the regulatory process for 3 decades
- Codes and standards promote safe operation of nuclear power plants, improve effectiveness and efficiency of regulatory oversight
- Federal law requires Government staff to use consensus standards where possible

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NTTAA and OMB Circular A-119

- National Technology Transfer and Advancement Act (1995)
  - Established policy for Government to participate in development and adoption of consensus standards
  - Government must consider consensus standards in lieu of Government-specific requirements
- OMB Circular A-119 provides guidance for implementing NTTAA
  - Authorized National Institute of Standards Technology (NIST) for conformity assessment
  - Agencies report annually to NIST, to Congress

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The Consensus Standards Process

- Administered by American National Standards Institute (ANSI)
- Implemented by Standards Developing Organizations (SDOs), such as ASME, IEEE
- Consensus: Due process + “substantial agreement”
- Due process (for ANSI accreditation)
  - Balance of interests
  - Openness, public comment
  - Fair consideration of views
  - Written record
  - Right of appeal

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NRC Staff Participation

- NRC staff participate on codes and standards development committees along with other stakeholders, including licensees, manufacturers, engineering contractors, inspection vendors, consultants, staff of national laboratories
- Codes and standards are developed based on a rigorous consensus process

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How does NRC use Codes and Standards?

- NRC establishes rules and regulations that have to be satisfied to receive and maintain a license
- NRC regulations are contained in Title 10 of the Code of Federal Regulations (CFR). Other federal agencies use the CFR for promulgating regulations.

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How does NRC use Codes and Standards?

- Methods of satisfying NRC regulations are explained in NRC Regulatory Guides (RGs)
- Standard Review Plans maintained by NRC explain how NRC reviews applications for licenses and license amendments
- Both widely reference Codes and Standards

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How does NRC use Codes and Standards?

- 10 CFR incorporates specific sections of the ASME Code and an IEEE Standard by reference in 10 CFR § 50.55a – those ASME sections and the IEEE standard have the force of NRC requirements

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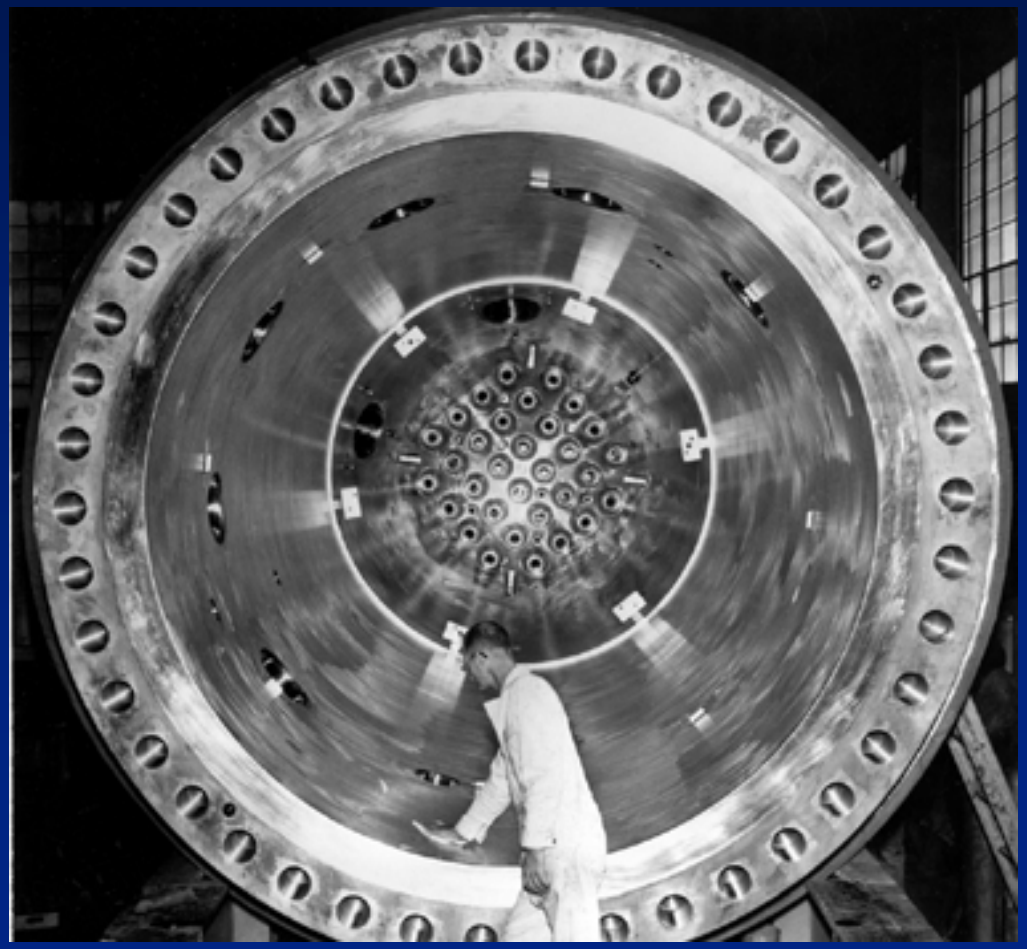
Scope of 10 CFR § 50.55a

- **Incorporates by reference** and mandates use of ASME B&PV Code, Sections III (design) and XI (inspection of operating components)
- Imposes certain NRC limitations and modifications
- Endorses use of selected ASME code cases via three referenced regulatory guides
- **Incorporates by reference** IEEE Standard 279 - Criteria for Protection Systems for Nuclear Power Generating Stations & 603-1991 – Criteria for Safety Systems

Reactor Vessel Before Installation – ASME Section III



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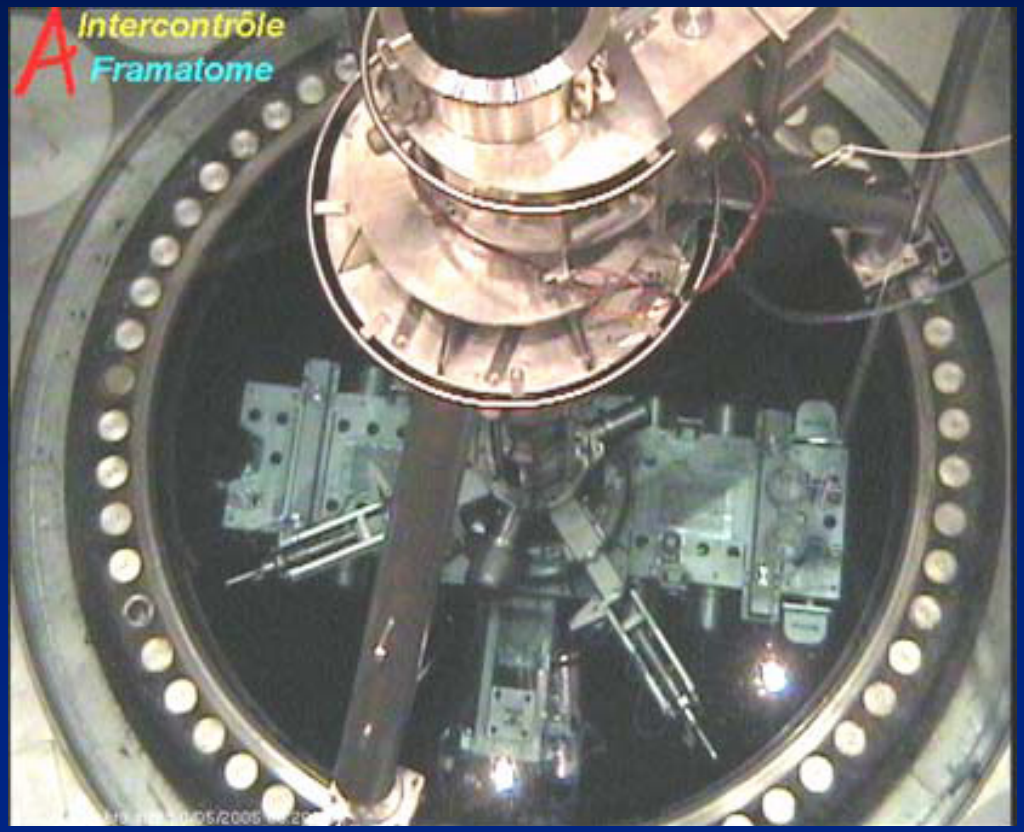
In-service Inspection of Reactor Vessel Welds – ASME Section XI



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Endorsement by Regulation and Regulatory Guide

- As noted above a regulation may involve incorporation of a code or standard
- RG may specify a standard as a method to meet an existing regulation
- Processes for both involve public comment and resolution prior to issuance

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Some recent or current activities related to endorsement of C & S

- ASME
- ANS/ASME PRA
- ASCE
- IEEE
- ASME Standards for New Reactor Construction

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Some NRC Endorsed ASME Standards

- ASME NQA-1, "Quality Assurance (QA) Program Requirements for Nuclear Facilities"
  - Referenced in RG 1. 28, "QA Program Requirements"
- ASME QME-1, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants"
  - Referenced in DG-1175, currently in comment resolution stage

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ANS/ASME Standards

- ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications"
  - Referenced in NRC RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities"
- ANS/ASME joint program on risk
  - Developing updated and more comprehensive Probabilistic Risk Analysis (PRA) standards for referencing in NRC RG 1.200

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ASCE Standard

- American Society of Civil Engineers (ASCE) 43-05, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities"
  - Referenced in NRC Regulatory Guide 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion"

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National Fire Protection Association (NFPA)

- NFPA 805 – "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Ed.
- 10 CFR 50.48(c) was added to allow use of performance-based approach
  - as a substitute for 10 CFR 50.48(b), Appendix R
  - 50.48(c) has additional limitations on NFPA 805
  - 50.48(a) requirements remain in place

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IEEE Standards Endorsed in U.S. NRC Regulatory Guides

- 387-1995, "Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," Rev 4 (03/2007), endorsed in NRC RG 1.9, "Application and Testing of Safety-Related Diesel Generators in nuclear Power Plants."
- 484-2002, "Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications," Rev 2 (02/2007), endorsed in NRC RG 1.128, "Installation Design and Installation of Vented Lead-Acid Storage Batteries for Nuclear Power Plants."
- 450-2002, "Recommended Practice for Maintenance, Testing and Replacement of vented Lead-Acid Batteries for Stationary Applications," Rev.2 (02/2007), endorsed in NRC RG 1.129, "Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants."
- 323-2003, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," Rev 0 (03/2007), endorsed in NRC RG 1.209, "Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants."

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NRC Priorities for Electrical and I&C Safety Standards (IEEE)

- Revisions of IEEE Standards published prior to 2000 to reflect current state of technology and lessons learned from operating experience
- General update of standards for new reactors
- Guidance to industry for digital instrumentation and control (I&C) systems
- New standards or revisions to existing standards to reflect the use of probabilistic risk assessment, and new technologies such as fiber optics, VRLA batteries, etc.

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High-Priority IEEE Standards Revisions

- Revision of IEEE Std. 7-4.3.2-2003: Digital Computers
- Revision of IEEE Std 603-1998: Safety Systems
- Revision of IEEE Std 352-1987: Reliability Analysis

NRC staff will review IEEE standards upon publication to incorporate them into our regulations or to endorse in RGs, as appropriate.

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ASME Standards for New Reactor Construction

- ASME Boiler & Pressure Vessel Code
  - Changes expected in Section III – Construction
  - Re-start activity on Sec III, Subsection NH – Elevated Temperature Design
  - Section D – Subgroup on Elevated Temperature Design
  - New Working Group on High Temperature Gas Reactors
  - New materials and fabrication techniques

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International Standards Developers

- International Atomic Energy Agency (IAEA) Safety Standards, Codes of Conduct
- International Standards Organization (ISO) Standards
- International Committee on Radiation Protection (ICRP) recommendations
- NRC participates in the work of these & other organizations, but does not directly endorse their standards

Conclusions

- NRC makes extensive and effective use C&S as part of its regulatory process
- Regulatory vehicles include regulations, regulatory guides, standard review plans
  - C&S endorsed or referenced in all types of regulatory vehicles
- C&S written by numerous standards bodies, e.g., ANS, ASME, ASCE, IEEE
- NRC staff participate in writing C&S and have influence in setting the priorities of C&S bodies