



Regulation and Codes & Standards for New Reactors

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Outline

- Mission of the U.S.NRC
- New Reactor Licensing
- International Cooperation on Design and Standards
- Materials R&D Objectives
- Conclusions

Mission of the U.S.NRC

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.

New Reactor Licensing — The Regulator's Perspective

- Maintain the safety of licensed plants
- Enhance safety for future plants
- Predictable licensing process
- Meaningful public participation
- Independent and credible regulator

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*

Energy Policy Act of 2005

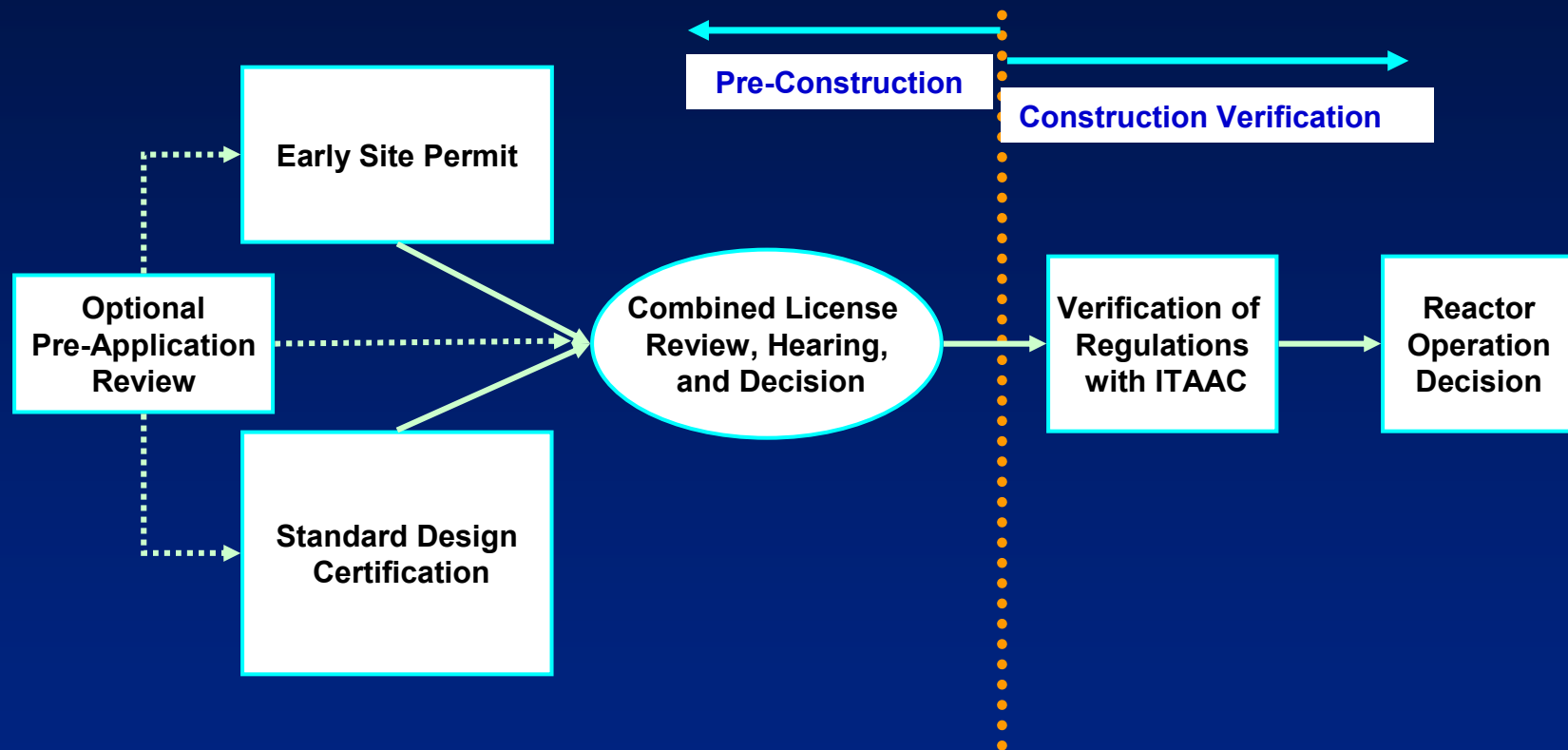
- Authorizes Federal risk insurance for the next 6 nuclear plants built in the USA, for delays associated with reviews by the U.S.NRC
- Contains loan guarantees to assist with financing new construction
- Offers nuclear energy production tax credits for the first 6,000 megawatts of electricity produced by new reactors
- Authorizes \$3 billion in nuclear research and development to support NP2010 and NGNP

10 CFR Part 52* Licensing Processes

- Licensing steps:
 - Early Site Permit (ESP)
 - Design Certification (DC)
 - Combined License (COL) (Construction and Operating License)
- Provide a predictable licensing process
- Resolve safety and environmental issues before authorizing construction
- Provide for timely and meaningful public participation
- Encourage standardization of nuclear plant designs
- Reduce financial risk to nuclear plant licensees

**Title 10, Part 52, of the United States Code of Federal Regulations*

Part 52 - Fitting the Pieces Together



- Licensing decisions finalized before major construction begins
- Inspections with inspections, tests, analyses, and acceptance criteria (ITAAC) to verify construction

Early Site Permit

- Allows early resolution of siting issues and “banking” of a site for 10–20 years
- Plant design does not need to be decided
- Review areas include:
 - Site safety
 - Environmental impact
 - Emergency preparedness

Design Certification

- Allows an applicant to obtain preapproval of a standard nuclear plant design
 - Essentially complete, standard design
 - Inspections, tests, analyses, and acceptance criteria (ITAAC)
- Reduces licensing uncertainty by resolving design issues
- Remains valid for 15 years

Combined License Application

- Combines the construction permit and operating license for a nuclear power plant
- May reference an early site permit, a standard design certification, both, or neither
- Promotes the resolution of all safety and environmental issues before construction is authorized
- Requires verification, prior to fuel load, that the facility has been constructed in accordance with the license
- Remains valid for 40 years

Licensing Conclusions

- The U.S.NRC is preparing for an exceptionally high level of new reactor licensing activity
- The U.S.NRC will accomplish our mission to ensure adequate protection of public health and safety and the environment for new reactors licensed under 10 CFR Part 52
- The U.S.NRC will review applications in a timely manner
- Applicants' standardized applications utilizing the design-centered approach are essential

International Cooperation on Design and Standards

Multinational Design Evaluation Program (MDEP)

- MDEP Stage 1: EPR Design Working Group
 - Members: US, Finland, France
 - Goal: Share information on EPR design
- MDEP Stage 2:
 - Goals:
 - Establish reference regulatory practices and regulations to enhance the safety of new nuclear reactor designs
 - Increase cooperation among regulators to improve the effectiveness and efficiency of the regulatory design

Preliminary MDEP Findings

- Benefits of enhanced cooperation among regulators
- Convergence of regulatory requirements is not feasible in the near-term
 - Some progress on ASME/RCCM/JSME design codes
 - Instead, harmonize regulatory practices
- Cooperation on manufacturing inspections
- Legal framework and information sharing library are ongoing efforts
- Licensing of Gen III+ reactors will provide lessons-learned for Gen IV

U.S.NRC Policy 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 and improve effectiveness and efficiency of regulatory oversight
- Federal law requires Government staff to use consensus standards where possible

Future Directions for Standards

- Performance-based
- Risk-informed
- Proactive
 - Aging management: For reactor and piping integrity, detecting (or even preventing) degradation is preferred over detecting failures
 - Anticipate structures, fabrication methods, and materials needed for new and advanced reactor designs

Standards for New & Advanced Reactors

- 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 HTGRs
 - New materials and fabrication techniques
- ANS, ASTM, other new and revised standards are expected

Materials R&D Objectives

- **Design data for high temperatures**
 - Fatigue, creep, and creep-fatigue interaction
- **Materials degradation mechanisms and data**
 - Effects of impurities in He coolant
 - Aging behavior of alloys during exposure to elevated temperatures
 - Sensitization of austenitic alloys
 - Carburization, decarburization, and oxidation of metals
 - Effects of neutron dose and elevated temperature on graphite
- **Methods and reliability of in-service inspection and online monitoring**

Requirements for Success

- Policy and legislative support of new nuclear plants
- Cooperation among regulators, designers, manufacturers, standards developers, etc.
- Safety and security of existing plants