

Research and Test Reactor Licensing

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
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Today's Presentation will Cover...

- Types of non-power reactor licenses
 - Research and test reactors
 - Commercial facilities
- Applicable regulatory requirements
- Applicable regulatory guidance
- Licensing process
- Initiating engagement with the NRC

Types of Non-Power Reactors

- Pursuant to Section 101 of the Atomic Energy Act of 1954, as amended, the NRC licenses production and utilization facilities
- All current reactors, both power and non-power are licensed as utilization facilities
- Two primary types of non-power reactor licenses:
 - Section 103 Commercial Licenses
 - Section 104 Medical Therapy and Research and Development Licenses

Section 104 Medical Therapy and Research and Development Licenses

- Three subsets of production and utilization facility licenses provided for in Section 104 of AEA
 - 104(a) – Medical therapy licenses
 - 104(b) – Early industrial and commercial facility demonstration licenses
 - 104(c) – Research and development licenses
- All NRC-licensed research and test reactors are licensed pursuant to 104(c) of the AEA, one facility also holds a 104(a) license

Section 104(c) Research and Test Reactors

- Commission directed to impose minimum amount of regulation on 104(c) research and test reactor licensees
- NRC licenses research and test reactors pursuant to the regulations provided in Title 10 of the *Code of Federal Regulations*, Part 50, “Domestic Licensing of Production and Utilization Facilities”
- Two types of research and development facilities defined
 - Non-power reactors
 - Test facilities

Non-power Reactors

- *Non-power reactor* means a research or test reactor licensed under 10 CFR 50.21(c) or 50.22 of this part for research and development (*10 CFR 50.2*)
- *Research reactor* means a nuclear reactor licensed by the Commission under the authority of subsection 104c of the Act and pursuant to the provisions of 10 CFR 50.21(c) of this chapter for operation at a thermal power level of 10 megawatts or less, and which is not a testing facility as defined in this section. (*10 CFR 170.3*)

Testing Facilities

Testing facility means a nuclear reactor which is of a type described in 10 CFR 50.21(c) of this part and for which an application has been filed for a license authorizing operation at:

- (1) A thermal power level in excess of 10 megawatts; or
- (2) A thermal power level in excess of 1 megawatt, if the reactor is to contain:
 - (i) A circulating loop through the core in which the applicant proposes to conduct fuel experiments; or
 - (ii) A liquid fuel loading; or
 - (iii) An experimental facility in the core in excess of 16 square inches in cross-section. (10 CFR 50.2)

Research and Development

Research and development means (1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes.

Prototype Plants

- *Prototype plant* means a nuclear reactor that is used to test design features, such as the testing required under 10 CFR 50.43(e). The prototype plant is similar to a first-of-a-kind or standard plant design in all features and size, but may include additional safety features to protect the public and the plant staff from the possible consequences of accidents during the testing period.
- Applies to commercial power facilities licensed under 10 CFR Parts 50 and 52

Applicable Regulatory Requirements

- In addition to meeting 10 CFR Part 50 requirements, Research and Test reactors must also consider:
 - Part 20, “...Protection Against Radiation”
 - Part 30, “...Licensing of Byproduct Material”
 - Part 51, “Environmental Protection Regulations for Domestic Licensing...”
 - Part 55, “Operators’ Licenses”
 - Part 73, “Physical Protection of Plants and Materials”
- Test reactors must also meet 10 CFR Part 100 accident dose acceptance criteria

Regulatory Requirement Comparison

- Test Reactors
 - Occupational dose requirements: 10 CFR 20.1201
 - Public dose requirements: 10 CFR 20.1301
 - Accident dose requirements: 10 CFR 100.11
 - Require Environmental Impact Statement, hearing, and ACRS Review
- Research Reactors
 - Occupational dose requirements: 10 CFR 20.1201
 - Public/accident dose requirements: 10 CFR 20.1301
 - Traditionally receive environmental assessment, and have no requirements for hearing or ACRS review

Applicable Regulatory Guidance

- NUREG-1537, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors”
 - Part 1, Format and Content
 - Part 2, Standard Review Plan
- Interim Staff Guidance Augmenting NUREG-1537
 - Radioisotope production facilities
 - Aqueous homogeneous reactors
 - Digital Instrumentation and Control

Applicable Regulatory Guidance

NUREG-1537 and Interim Staff Guidance Review Areas

1. The Facility
2. Site Characteristics
3. Design of Structures, Systems, and Components
4. Facility Description
5. Coolant Systems
6. Engineered Safety Features
7. Instrumentation and Control
8. Electrical Power Systems
9. Auxiliary Systems
10. Experimental Facilities
11. Radiation Protection and Waste Management
12. Conduct of Operations
13. Accident Analysis
14. Technical Specifications
15. Financial Qualifications
16. Other License Considerations
17. Decommissioning
18. Uranium Conversions
19. Environmental Review

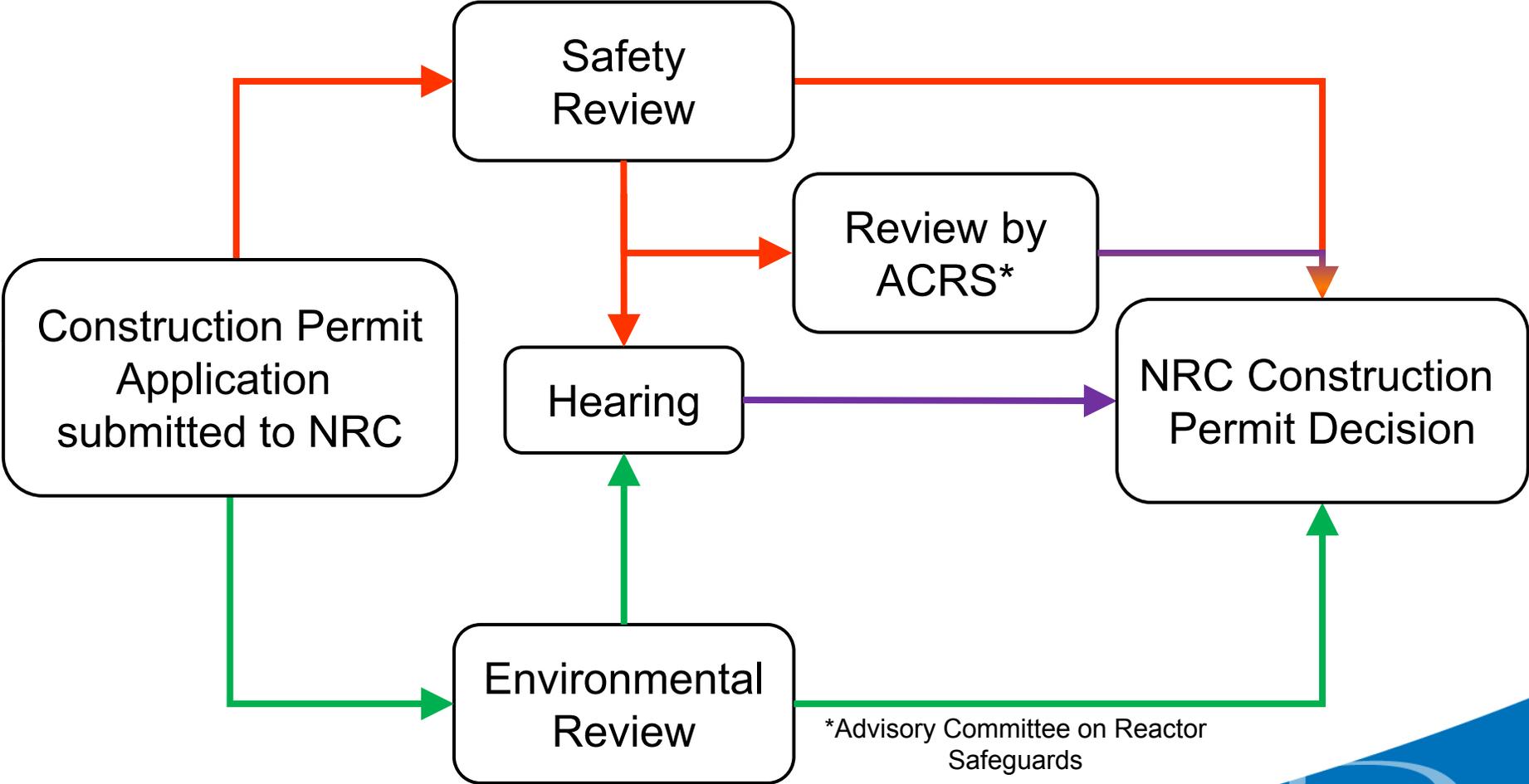
Applicable Regulatory Guidance

- Regulatory Guides
 - Provide specific implementation guidance for NRC regulations, review techniques, and data requirements
 - Division 2 and Division 5 provide guidance for Research and Test Reactors (e.g., technical specification development, quality assurance program requirements, and emergency planning)
- ANS/ANSI Research Reactor Standards ANS 15 Series (15.2, 15.8, 15.11, 15.20) endorsed by guidance

NRC Part 50 Licensing Process

- Construction permit application
 - Environmental report
 - Preliminary safety analysis report
- Operating license application
 - Final Safety Analysis Report, including: plans for operation, emergencies, and technical specifications
 - Update to Environmental Report, as necessary
 - Physical Security Plan
- Research and test reactors may elect to submit applications separately or together

Test Reactor Construction Permit Review



Docketing of Application

- Acceptance/sufficiency review
 - Summary description of the facility
 - Preliminary design of the facility
 - Preliminary analysis and evaluation of design
 - Environmental Report
- Decision to docket

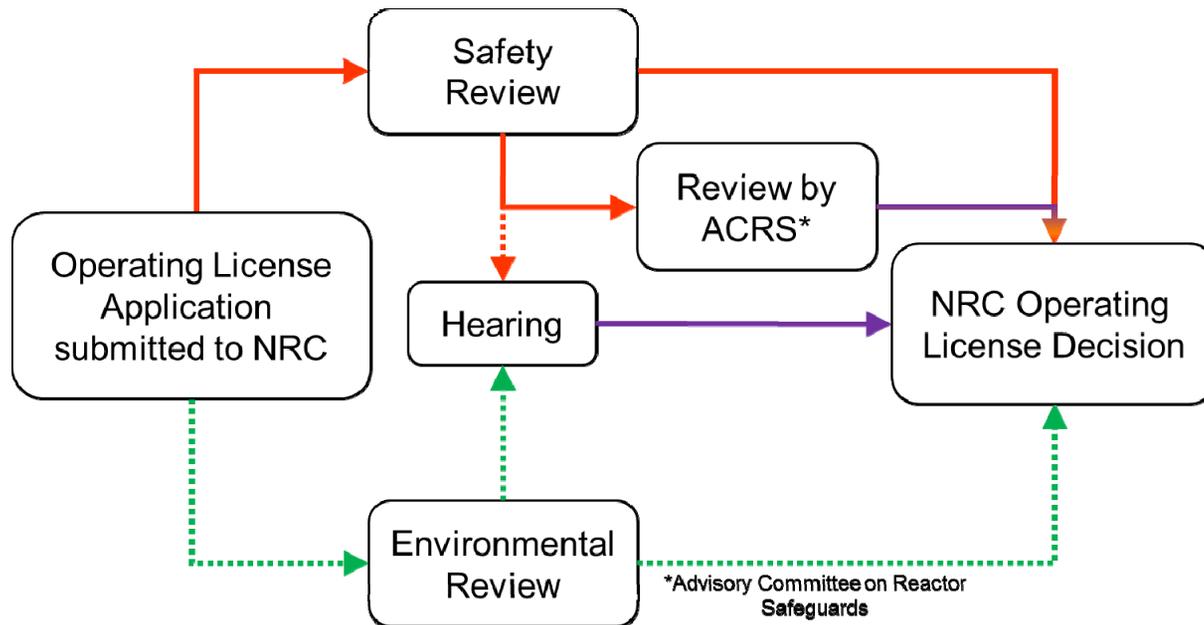
Safety Review

- NRC staff review of the application
- Request(s) for additional information, as needed
- Safety Evaluation Report
- Advisory Committee on Reactor Safeguards (test reactors only)
- Hearing (test reactors only, unless petition to intervene granted)
- Decision to grant or deny construction permit

Environmental Review

- National Environmental Policy Act
 - NRC Environmental regulations (10 CFR Part 51)
- Environmental scoping meeting
- Site audit
- Draft Environmental Impact Statement
(or Environmental Assessment)
- Environmental Impact Statement (or Environmental
Assessment)

Test Reactor Operating License Review



- Review Elements

- Safety Evaluation Report
- Advisory Committee on Reactor Safeguards
- No hearing, unless petition granted
- Decision to grant or deny license

Initiating the Licensing Process

- Public Meetings
 - Promote engagement between NRC and applicants
 - Establish working relationship, supporting the development of high-quality applications
 - Allow for appropriate budgeting and resource allocation
 - Keep public informed of NRC licensing actions
- Ultimate licensing decisions will be based on individual technologies, so early interaction is essential to efficient application processing

Questions?

