



Licensing Process and Review and Assessment of Safety Documents

Duane Hardesty, Licensing Project Manager
Research and Test Reactors Licensing Branch
U.S. Nuclear Regulatory Commission

Introduction

- This presentation will focus on information reviewed and assessed by the United States Nuclear Regulatory Commission (NRC) for construction permits and operating license for Research and Test Reactors

Guidance and Authority

- NRC established by an act of U.S. Congress (Atomic Energy Act and Reorganization Act) of 1974
- Regulations stated in Code of Federal Regulations (CFR) Title 10 is for “Energy”
- Guidance documents published by NRC for recommended method to comply with regulations

Applicable Regulations

- Research and Test Reactor license application made under Part 50 of 10 CFR (partial list)
 - 50.21 Medical Therapy and Research
 - 50.22 Commercial and Industrial Facilities
 - 50.30 Filing Instructions
 - 50.33 General Content
 - 50.34 Technical Content
 - 50.35 Construction Permit Issuance
 - 50.36 Technical Specifications
 - 50.57 Operating License Issuance

Applicable Regulations

- Other sections of the regulations may also apply to the facility (examples)
 - Part 20 Radiation Protection
 - Part 30 Byproduct Material
 - Part 51 Environmental Protection
 - Part 70 Special Nuclear Material
 - Part 73 Physical Protection
 - Part 100 Siting Criteria
 - Part 150 Financial Requirements

Guidance Documents

- It is clear from the number of regulations that may apply additional guidance would help the applicant and the reviewer
- For Research and Test Reactor Licensing NRC technical report (designated as NUREG)
NUREG-1537 was created

Guidance Documents

- IAEA Safety Standards Series
 - GS-G-1.2 “Review and Assessment of Nuclear Facilities by the Regulatory Body”
 - Appendix – “Topics to be Covered by Review and Assessment”

Guidance Documents

- 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 and Acceptance Criteria”
 - Parts 1 and 2 are designed to be complementary; titles and numbers match Safety Analysis Review (SAR) sections

Guidance Documents

- 18 Chapters total, chapter 18 specifically created for High Enriched to Low Enriched Uranium conversions
- Chapters designed to provide a complete safety analysis for the facility, including siting requirements, equipment and behaviors for safe operations, and impact from potential accidents

Guidance Documents

- Technical Specifications (TS) “operational limits and conditions”
 - TS are chapter 14 in NUREG-1537
 - Appendix 14.1 in Part 1 of NUREG-1537 provides format and content guidance
 - American National Standards Institute/American Nuclear Society (ANSI/ANS) 15.1 provides guidance for development of TS
 - 10 CFR 50.36 lists required elements for TS

Guidance Documents

- TS relate to chapters in the Safety Analysis Report (SAR) in NUREG-1537
- Licensing review looks at the relationship between what is stated in the SAR and what is required by the TS
- Site inspections review licensee actions for compliance with TS

Overview of Facility Licensing

- Two-step initial licensing process
 - Construction Permit (CP)
 - Operating License (OL)
- License renewal reviews to extend the OL
- Application submitted to the NRC
 - Safety analysis report
 - Technical specifications (operational limits and conditions)
 - Environmental report
 - Security, emergency, and personnel training plans

Overview of Facility Licensing

- Major steps in the licensing process:
 - NRC accepts or rejects the application
 - NRC reviews the application
 - NRC requests additional information, if needed
 - Opportunity for public involvement
 - Review by the Advisory Committee on Reactor Safeguards for a testing facility
 - Hearings by the Atomic Safety and Licensing Board, if needed
 - NRC issues a safety evaluation, environmental assessment or impact statement, technical specifications, and a CP or OL
 - Licensee conducts activities in accordance with the CP or OL

Reactor Licensing

- The objective of the safety review is to consider all aspects of reactor construction, operation, and decommissioning, including potential accidents
- The license defines how the facility is to be built, operated, maintained, and decommissioned

Reactor Licensing

- A license is issued with conditions including:
 - Maximum power level
 - Quantities and types of material allowed
 - Reference to approved security plan
 - Location of facility
 - Technical Specifications [operational limits and conditions] (Typically Appendix A)

Technical Specifications

(operational limits and conditions)

- 10 CFR 50.36 “Each applicant for a license ... shall include in his application proposed technical specifications in accordance with the requirements of this section ... the bases ... shall be included ... but shall not become part of the technical specifications”

Technical Specifications

- **Tech Specs (TS) structure** (defined in 10 CFR 50.36)
 - Safety Limit (SL - defined in safety analysis)
 - Limiting Safety System Setting (LSSS - protects the safety limit)
 - Limiting Conditions of Operation (LCO - ensures LSSS is not challenged)
 - Surveillance Requirements (SR – provides assurance equipment will perform its required function when needed)
 - Design features
 - Administrative controls

Technical Specifications

- Safety Limit (SL)
 - Intended to protect fission product barrier
 - Usually a limit related to fuel design
 - Blister temperature
 - Internal pressure
 - Stability of fuel matrix
 - Typically one or two key parameters

Technical Specifications

- Limiting Safety System Setting (LSSS)
 - Examples include:
 - maximum fuel temperature
 - minimum flow
 - minimum coolant level
 - maximum bulk pool temperature
 - May be a single item (fuel temperature) or a limited collection designed to ensure the SL is not challenged

Technical Specifications

- Limiting Conditions for Operation (LCO)
 - Are numerous and cover multiple areas
 - If an LCO is the same as an LSSS, its value is lower
 - LCOs may include action statements allowing for temporary deviations, provided special conditions are met
 - Radiation monitoring equipment may be included
 - Designed for defense in depth

Technical Specifications

- LCOs and operators
 - Operators are expected to know the applicable LCOs
 - Procedural guidance designed to reinforce LCO limitations
 - Operator is expected to take action before an LCO is challenged
 - Many automatic action (trip) set points are below LCO value to prevent violation of license

Technical Specifications

- Design features
 - Includes systems, structures, and components important to the safety analysis but do not have an LCO
- Administrative controls
 - Includes reporting requirements, organizational structure, and document control

NUREG Chapters

- Chapter 1 – General description of the facility and equipment including comparisons to similar facilities
- Chapter 2 – More detailed site characteristics (flooding, earthquake, population density, local industry/ military/ air traffic)

NUREG Chapters

- Chapters 3 through 11 provide more detailed descriptions
 - Chapter 3 Design bases and facility systems, structures, and components (SSC) including response to environmental factors
 - Chapter 4 Reactor core and components
 - Chapter 5 Reactor coolant system
 - Chapter 6 Engineered safety systems
 - Chapter 7 Instrumentation and control

NUREG Chapters

- Detailed chapters continued
 - Chapter 8 Normal and Emergency Electrical Power
 - Chapter 9 Auxiliary Systems
 - Chapter 10 Experimental Facilities
 - Chapter 11 Radiation Monitoring and Protection Systems and Waste Management

NUREG Chapters

- Chapter 12 Conduct of operations
- Chapter 13 Accident analysis
- Chapter 14 Technical specifications
- Chapter 15 Financial considerations
- Chapter 16 Special considerations
- Chapter 17 Decommissioning

Inspection and Review Activities

- Initial licensing review and construction
 - Quality Assurance (QA):
 - Does the licensee ensure adequate QA from vendors and suppliers?
 - Safety Analysis Review
 - Perform independent confirmation of important parameters (for example: cladding and fuel temperature predictions)
 - Construction Inspection
 - Is construction matching information in construction permit?
 - How are deviations managed?

Inspection and Review Activities

- After the operating license is issued and the facility is complete
 - Periodic routine inspections for compliance with the regulations and license
 - License amendments are required for changes to TS or facility modifications that exceed regulatory constraints (10 CFR 50.59)

Conclusion

- Safety Review of Facility
 - Governed by regulations
 - Guided by Agency generated documents
 - Thorough review takes time and resources on the part of the regulator and the applicant/licensee
 - Highly specialized knowledge may be required in some areas of the review

Thank You for Your Attention

- Additional Discussion:
 - Questions
 - Clarification
 - Suggestions