Global Approaches to Small Modular Reactor and Advanced Reactor Licensing

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US NRC Licensing Options

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"	10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants"	10 CFR Part 53
• Construction Permit • Operating License • Limited Work Authorization • Site Suitability Reviews	• Early Site Permits • Standard Design Certification • Combined License • Manufacturing License • Duplicate Plant License • Standard Design Approval • Site Suitability Reviews	Under Development

Pathway to New Regulatory Framework

"Part 53" Rulemaking by July 2025

- Nuclear Energy Innovation and Modernization Act (NEIMA) requirement
- Technology-inclusive, risk-informed and performance based regulatory framework
- Commission direction SRM-SECY-20-0032
- Builds on current activities, including the Licensing Modernization Project
- Significant stakeholder engagement

PART 53 | TRANSFORMATIVE

Establishes a Transformative Regulatory Framework

Part 53 builds on a **strong foundation** of Commission policies and decisions

Features

- Evolves use of **risk**
- Leverages **performance-based** requirements
- **Modern**izes licensing basis **change process**
- Includes **consequence-oriented** scalable requirements
- Enables operational **flexibility**
- Optimizes balance between flexibility and **predictability**

Preapplication Activities to Support Licensing

- Pre-application engagement
- NRC response to applicant's general correspondence
- NRC review of and feedback on applicant's regulatory engagement plan
- NRC assessment and response to applicant's white papers
- NRC evaluation of applicant's technical and topical reports
- Pre-application audits to support a high-quality application

Small Modular Reactor Designs - Current Licensing Activities

- Preapplication Engagement
  - NuScale Power standard design approval application for the NPM-20 design
  - Carbon Free Power Project combined license application for the NPM-20 design
  - GE Hitachi BWRX-300 design
  - Tennessee Valley Authority license application for the Clinch River Site
  - SMR (Holtec) SMR-160 design
- Design Certification of NuScale standard plant design
- Alignment of requirements in 10 CFR Part 50 and Part 52

Broad Landscape of Advanced Reactor Designs

Liquid Metal Cooled Fast Reactors (LMFR)

- **TerraPower/GEH (Natrium)***
- GEH PRISM (VTR)
- Advanced Reactor Concepts

Sodium-Cooled

- Westinghouse
- Columbia Basin
- Hydromine

Lead-Cooled

High-Temperature Gas-Cooled Reactors (HTGR)

- **X-energy ***
- Framatome
- StarCore
- MIT

TRISO Fuel

- General Atomics (EM2)
- General Atomics

Molten Salt Reactors (MSR)

- Kairos *
- Kairos (Hermes | RTR)

Liquid Salt Cooled

- Terrestrial *
- TerraPower (MCFR)
- Southern (TP MCRE) | RTR
- ACU | RTR *
- Elysium
- ThorCon
- Muons
- Flibe
- Alpha Tech

Liquid Salt Fueled

Micro Reactors

- Westinghouse (eVinci)*
- BWX Technologies
- X-energy
- Radiant | RTR

Transportable

- UIUC / Ultra Safe | RTR*
- Oklo

Stationary

LEGEND

ARDP Awardees

- **Demo Reactors**
- Risk Reduction
- ARC-20

In Licensing Review

* Preapplication

RTR Research/Test Reactor

International Regulatory Cooperation

IAEA

Small Modular Reactors Regulators Forum

IAEA Safety Standards Committees

NEA
NUCLEAR ENERGY AGENCY

Committee on Nuclear Regulatory Activities Working Groups

Multinational Design Evaluation Programme

Framework for Irradiation Experiments

Canadian Nuclear Safety Commission