



# U.S. NRC Research Reactor Regulatory Enhancements Consistent With the IAEA Code of Conduct

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Research and Test Reactors Licensing Branch

# Overview

- NRC regulation of research reactors
- Regulatory enhancements for research reactors
- Summary

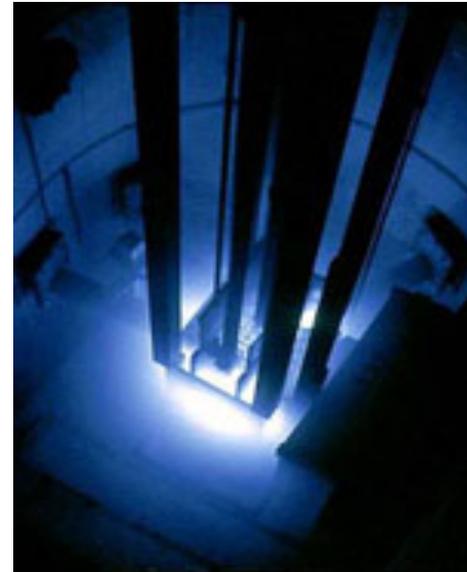
# U.S. Research and Test Reactors

- 31 operating reactors
- Four shutdown
- Power range 5 watts to 20 MW
  - Five are 2 MW or greater
- Reactor types
  - 16 TRIGA
  - 9 plate-type fuel
  - 3 AGNs
  - 3 one-of-a-kind (PULSTAR, Argonaut, critical assembly)



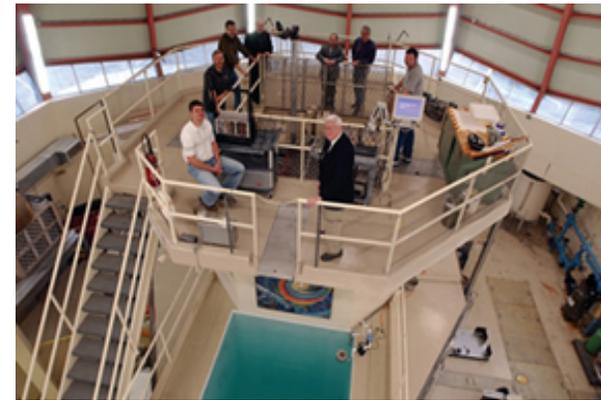
## Research and Test Reactors Licensing Branch

- Conducts licensing reviews
  - Construction permits
  - Operating licenses
  - Amendments
  - High to low enriched uranium conversions
  - Renewals
  - Medical isotope production facilities
- Develops licensing guidance
  - Application format and content
  - Standard review plan
- Interfaces with outside organizations (e.g., IAEA, licensee groups and other government agencies)



## Research and Test Reactors Oversight Branch

- Conducts oversight activities
  - Facility inspections
  - Reactor operator licensing
  - Security
  - Inspection and operator licensing guidance
  - Enforcement
  - Emergency response



# NRC Applies Minimum Regulation

The **Atomic Energy Act** (Section 104c)



*The Commission is directed to impose only such **minimum amount of regulation** of the licensee as the Commission finds will permit the **Commission to fulfill its obligations under this Act to promote the common defense and security and to protect the health and safety of the public and will permit the conduct of widespread and diverse research and development.***

# Regulatory Enhancements for Research Reactors

- Proposed rulemaking to streamline license renewal
- Issued draft guidance which addresses human factors
- Completed evaluation of research reactors in light of the Fukushima-Daiichi accident



# Proposed Streamlined Licensing

## Proposed Rulemaking

- Eliminate license terms for research reactors (not test reactors or commercial non-power facilities)
- Require 5-year update to safety analysis report
- Establish a public accident dose criteria for non-power production or utilization facilities, except test reactors (1 Rem (10 mSv) TEDE)
- Establish definition for non-power production or utilization facilities (NPUF)

# Improved Human Factors Guidance

- Draft guidance issued for the instrumentation and control chapter of NUREG-1537, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors”
- Guidance expanded human factors in the instrumentation and control system sections in the licensee application format and content guidance and NRC staff standard review plan

# Post Fukushima-Daiichi Accident Activities

Prompt informal assessment of natural events, loss of power, loss of decay heat removal, spent fuel storage, combustible gas control and reactor confinement/containment and determined:

- No imminent risk from continued operation and licensing of U.S. research and test reactors (RTRs)
- Normal licensing requirements for U.S. RTRs already considers beyond design basis accident conditions in the maximum hypothetical accident
- Post- 9/11 assessments for RTRs analyzed degraded conditions at RTRs that were significantly beyond the conditions assumed in maximum hypothetical accident analyses

## Post Fukushima-Daiichi Accident Activities

- Assessment guidance was developed and assessment of RTRs were performed
- Assessment method consistent with intent of IAEA Safety Report Series No. 80
- Review focused on external events such as earthquakes, tornadoes, flooding, fire, lightning, snow loads, temperature extremes, loss of power and loss of heat sink

## Post Fukushima-Daiichi Accident Activities

- Screening determined that three highest-powered reactors (6, 10, and 20 MW) needed a detailed review
- Other 28 facilities were screened out of further consideration
- Seismic review performed using latest hazard maps and modern methodology
- Review performed for tornado driven missiles
- Severe rainfall event analyzed for 20 MW facility

# Post Fukushima-Daiichi Accident Activities

For the three analyzed facilities:

- Facility design basis meets the latest seismic hazard
- Tornado missiles will not cause fuel damage
- Local flooding from rain event will not lead to fuel damage

# Summary

The U.S. NRC regulation of research and test reactors meets the Code of Conduct



U.S. NRC enhancements to the regulation of research and test reactors are in harmony with the Code of Conduct

Post Fukushima-Daiichi evaluations concluded public health and safety continues to be protected