# Selected Topics on Regulatory Oversight of Research Reactors

## U.S. Practices

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Prepared for Argonne/IAEA
Research Reactor Workshop
September 2004

# Emergency Preparedness for Research Reactors

- U.S. references
  - NUREG-1537 Parts 1 and 2, Section 12.7 (1996)
  - Regulatory Guide 2.6, Rev. 1 (1983) (Appendix 12.1 of NUREG-1537 Part 1)
  - NUREG-0849 “Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors” (1983) (Appendix 12.2 of NUREG-1537 Part 1)

# Purpose of Planning

- Ensure timely and orderly decision making during emergency
- Ensure availability of necessary equipment, supplies and services
- Ensure coordination with offsite authorities
- Ensure that preparedness realistically reflects potential radiological hazards

# Preparedness Elements Proportional to Potential Hazard (Power Level)

- Less than 100 W
- 100 W to 100 kW
- Greater than 100kW to 2 MW
- Greater than 2 MW

# Organization and Responsibilities

- Onsite organization
  - Identification of response responsibilities by title
- Augmentation from offsite groups
  - Written agreements with support organizations (fire departments, hospitals)

# Emergency Classification System and Action Levels

- Unusual Event
  - Natural phenomena
  - Facility fire
  - Bomb threat
  - High fission product activity in coolant
- Alert
  - Failure of fuel cladding or fueled experiments
  - Releases of radioactive materials

# Emergency Classification System and Action Levels - 2

- Site Area Emergency
  - Failures with potential offsite consequences approaching protective action guidelines
- General Emergency
  - Protective action offsite may be necessary
  - Not credible for most research reactors

# Emergency Planning Zones

- 2 MW or less
- 2 MW to 10 MW
- 10 MW to 20 MW
- 20 MW to 50MW
- Over 50MW

- Operations boundary
- 100 meters
- 400 meters
- 800 meters
- Case-by-case analysis

# Response Measures

- Notifications
- Assessments
- Mitigating measures for each emergency class and problem type
- Protective actions for each emergency class

# Facilities and Equipment

- Emergency Support Center
- Types and locations of monitoring and sampling equipment
- Measures and facilities for injured or exposed persons
- Communications systems

# Recovery

- Criteria for reentry of personnel
- Process for approval of recovery procedures after the emergency

# Maintaining Preparedness

- Initial and periodic training
  - Decision making and communication
  - Accident assessment
  - First aid and medical support
  - Security and offsite police response
  - Fire fighting personnel (onsite and offsite)

# Maintaining Preparedness - 2

- Annual emergency drills with critiques
- Review and update of the emergency plan every two years
- Operational readiness of equipment
  - maintenance
  - calibration
  - inventory

# Operator Training and Requalification for Research Reactors

- U.S. references
  - 10 CFR Part 55.59
  - NUREG -1537 Parts 1 and 2, Section 12.10

# Operator Licenses

- Reactor Operator and Senior Reactor Operator Licenses
  - Issued by NRC
  - 6-year term
- Power reactors: licensee may give examinations
- Research reactors: NRC gives initial examination, licensee gives requalification examinations

# Requalification Program

- Submitted for NRC approval
- Two-year requalification cycle
- Plan contents
  - requalification schedule
  - lectures, reviews, training, examinations
  - on-the-job training
  - emergency procedures
  - inactive operators, retraining
  - documentation records and audits

# Requalification Lecture Topics

- Nuclear theory and principles of operation
- Facility design and operating characteristics
- I&C systems
- Reactor protection system
- Engineered safety features
- Normal and emergency operating procedures
- Radiation control and safety
- Technical specifications and regulations
- Facility-specific training

# Evaluation of Research Reactor Operators and Senior Operators

- Annual walkthrough examination and written test
  - System and procedure understanding
  - Changes to facility and procedures
  - Operational proficiency
- Two-year comprehensive evaluation, including job performance, annual examination results, participation in training

# Research Reactor Operator License Renewal

- Results of requalification activities submitted to NRC every 6 years for license renewal for operators and senior operators