



U.S. Nuclear Regulatory Commission Regulatory Inspection Framework for Research Reactors

Patrick Boyle, Nuclear Engineer
Research and Test Reactors Licensing Branch
U.S. Nuclear Regulatory Commission

U.S. Inspection Programme

- Graded Approach
- Types of Inspections
- Procedures and Inspector Training
- Inspection Process
- Outcomes and Follow-up Actions

Graded Approach

- Grading based on power level and amount of special nuclear materials allowed by the license
- Grading determines the number of inspections performed per year and the types of inspections

Graded Approach

- U.S. has 31 operating research reactors
 - Power range 5 watts to 20 megawatts (MW)
 - Five are 2 MW or greater
 - Reactor types
 - 16 TRIGA
 - 9 plate-type fuel
 - 3 AGN
 - 3 one-of-a-kind

Graded Approach

The U.S. research reactors are classified according to their maximum thermal power level

- Class I: Thermal power level is 2 MW or more
 - 10 inspection modules results in 2 one-week visits each year
- Class II: Thermal power is less than 2 MW
 - One inspection module with 11 sub-topic results in one site visit per year

Graded Approach

- Class III: Long-term shutdown or possession only license
 - Five inspection modules (available) resulting in one site visit every three years
- Actively Decommissioning
 - Possession only license, Office of Nuclear Materials Safety and Safeguards inspections only

Types of Inspections

- Routine announced inspections
- Reactive scheduled inspections
- Event response inspections

Types of Inspections

- Routine announced inspections
 - Scheduled in advance
 - Areas to be inspected known to licensee and the inspector
 - Used to confirm safe and compliant facility operations
 - Normally conducted by assigned inspector

Types of Inspections

- Reactive scheduled inspections
 - National or international event leading to a need to determine the ability of the facility to safely respond to the event
 - Operating experience event that may involve a specific technology or practice
 - May involve technical experts in addition to normal inspector

Types of Inspections

- Event response inspection
 - Reportable event occurs at the facility
 - Significant potential safety consequence
 - Decision if licensee has properly responded or if additional actions need to be imposed
 - Will normally include a team with specialized knowledge assisting the inspector

Procedures and Inspector Training

- All NRC procedures are available on the public web site (<https://www.nrc.gov/>)
- Inspection Procedures – IPs, contain specific steps and items to be reviewed
- Inspection Manual Chapters – IMCs, support the IPs

Procedures and Inspector Training

- Each IP follows a common format which includes:
 - Objective
 - Inspection requirements
 - Inspection guidance
 - Specific guidance
 - Resource estimate
 - References

Procedures and Inspector Training

- The inspector qualification process is governed by IMC 1245
 - Appendix B is the “General Proficiency-Level Training and Qualification Journal”
 - Appendix C5 is specifically for “Research and Test Reactor Inspector”

Procedures and Inspector Training

- Upon completion of the required training materials (self-study, task activities, and on the job training) a board is convened to test the inspector's ability to integrate and apply inspector competencies to field situations
- The board may forward a favorable finding, some weaknesses, or deficiencies

Procedures and Inspector Training

- A separate certification process is utilized for qualifying an operator examiner
- This is independent of the facility inspector process and is used to qualify licensee personnel to operate the reactor facility

Inspection Process

- Preparatory work
 - Determine which modules will be utilized
 - Review reports since the last inspection
 - Routine
 - Event driven
 - Review previous inspection for any items requiring resolution
 - Speak with facility project manager for any licensing related areas of review

Inspection Process

- The inspector proceeds with implementation at the dates agreed with the operating organization
- An entry meeting is conducted with the different participants involved in the inspection (inspector(s), reactor management and operating personnel) to review the inspection plan details

Inspection Process

- Performance based approach
 - Emphasize observing activities and programme results over a paper review
 - Utilize the material reviewed prior to the inspection to direct the area observed
 - Utilize document (e.g. operator logs) review and discussions with facility personnel to support a better understanding of the observed activities

Inspection Process

- Exit Meeting is intended to:
 - Summarize the conduct of the inspection, its findings, and its main conclusions
 - Obtain agreement on the minutes of the inspection, which should present the major findings and reflect any disagreement with the licensee
 - Identify comments from the licensee

Outcomes and Follow-up Actions

- An inspection report will be generated following the inspection
 - Safety significant program weaknesses will be characterized as:
 - Inspector follow-up items
 - Unresolved items
 - Violations

Outcomes and Follow-Up Actions

- Inspection reports (timeliness goals)
 - Routine reports issued within 30 days
 - Special inspection reports issued within 45 days
- An inspection report with no negative findings is acceptable
 - The licensee is encouraged to identify and correct any programme weaknesses

Outcomes and Follow-up Actions

- The inspection report should state how the observations clearly and convincingly support the conclusions

Outcomes and Follow-Up Actions

- Violations may result in Enforcement Actions
 - Severity level (I-IV) is assigned based on safety significance including:
 - Actual safety consequence
 - Potential safety consequence
 - Impact to the regulatory process
 - Willfulness (deliberate behavior)

Outcomes and Follow-Up Actions

- Violations
 - The severity of the violation determines the monetary fines and the extent of corrective actions taken by licensee management
 - A non-cited violation (NCV) is the term used to describe one method for dispositioning a severity level IV (lowest safety significance) violation

Outcomes and Follow-Up Actions

- Violations may be issued against
 - The facility (license holder)
 - An individual (employee of the licensee)

Conclusions

- The U.S. NRC research reactor inspection framework is flexible enough to account for various facility sizes and technologies and can utilize expertise from other areas of the agency when making a safety determination.
- Failure to comply with NRC regulations can result in the shutdown of the facility and monetary fines.



Thank you

for your attention