



**UNITED STATES**  
**NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001

**OFFICE OF THE  
INSPECTOR GENERAL**

December 21, 2017

MEMORANDUM TO: Victor M. McCree  
Executive Director for Operations

FROM: Dr. Brett M. Baker */RA/*  
Assistant Inspector General for Audits

SUBJECT: AUDIT OF NRC'S SECURITY OVERSIGHT OF  
RESEARCH AND TEST REACTORS (OIG-18-A-07)

The Office of the Inspector General (OIG) conducted this audit to determine whether NRC provides adequate security oversight of research and test reactors. OIG found that NRC's security oversight of research and test reactors takes into account the mission of permitting research while ensuring that licensee activities promote secure operations. Therefore, OIG makes no recommendations.

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## BACKGROUND

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The *Atomic Energy Act of 1954*, as amended (AEA), Section 104.c, authorizes the licensing of utilization and production facilities useful in the conduct of research and development activities. However, the AEA also directs the Commission

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.

In the oversight of research and test reactors, NRC's mission to ensure safety and security thus takes on unique aspects.

### Research and Test Reactors (RTR)

NRC licenses 31<sup>1</sup> currently operating RTRs. Most are at universities and colleges, three are at non-Department of Energy Federal facilities, one licensee is a state, and three licensees are companies in the private sector. RTRs contribute to research in diverse fields such as physics, medicine, archeology, and materials science.

RTRs use a limited amount of radioactive material in their diverse designs. All are designed to be inherently safe and resistant to unintentional or intentional mis-operation. The 31 operating facilities are licensed to operate at a range of power levels from 5 watts thermal energy to 20 megawatts.<sup>2</sup>

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<sup>1</sup> A list of currently licensed RTRs can be found at <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/research-reactors-bg.html>.

<sup>2</sup> By contrast, a commercial nuclear power plant may be licensed to capacity as great as 4000 megawatts thermal, or 200 times the power of the largest RTR.

The type or quantity of special nuclear material (SNM)<sup>3</sup> determines the potential for radiological release or the attractiveness of an RTR to adversaries. Consequently, security requirements take a “graded approach” based on the strategic significance of SNM a facility is licensed to possess. NRC regulations establish possession limits for “moderate strategic significance” or a Category II quantity, and “low strategic significance” or a Category III quantity.

### Responsible Office

In accordance with a Commission decision, all RTR regulatory activities, including security, reside in a center of excellence made up of two branches in the Office of Nuclear Reactor Regulation, Division of Licensing Projects.

The RTR Oversight Branch is responsible for security, safety, and operator licensing programs. The RTR Oversight Branch maintains a total of 10 positions related to oversight: 3 security specialists (also security inspectors), 4 safety inspectors, and 3 operator licensing examiners. Each of these oversight roles has a specific qualification program. Cross-qualification in at least two roles is a priority for branch staff. Also, within NRC, RTR Oversight Branch staff provide subject matter expertise in relevant policy and rulemaking activities. Outside NRC, the staff furthers NRC's international mission by supporting International Atomic Energy Agency programs on RTRs.

The RTR Licensing Branch is responsible for all RTR licensing actions, such as renewals, amendments, and new licenses. The RTR branches collaborate closely, and the RTR Oversight Branch provides expertise as needed for security plan reviews and other support of licensing activities.

### Post-9/11 Security Enhancements

As part of NRC's assessment of threats to licensed facilities following the events of September 11, 2001, the agency evaluated the implementation of additional security measures at RTRs. To incorporate the voluntary security enhancements already taken by RTRs, NRC issued Confirmatory

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<sup>3</sup> SNM is plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235.

Action Letters (CALs)<sup>4</sup> rather than mandatory Security Orders, to conform to the AEA standard of minimum necessary regulation. Twenty-six RTRs were issued CALs regarding site-specific voluntary compensatory measures. The remaining five RTRs did not receive CALs because assessments showed they had the least potential consequence from security threats.

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## OBJECTIVE

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The audit objective was to determine whether NRC provides adequate security oversight of research and test reactors.

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## RESULTS

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### **RTR Security Oversight Is Effective and Dynamic**

NRC's security oversight for RTRs is designed to meet the requirements established in the AEA to provide regulations, guidance, and oversight for RTR licensees as they conduct research activities. Oversight is structured around the risks associated with the strategic significance of the SNM a licensee may possess and is designed to be site-specific. The RTR Oversight Branch has taken steps to increase effectiveness, even as security requirements have changed with the threat environment. However, the oversight program is dynamic and will require continued balancing of resources going forward.

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<sup>4</sup> A CAL reflects an agreement by a licensee to undertake voluntary actions, and NRC's expectation that the licensee will implement the actions.

## *What Is Required*

### **AEA Establishes Oversight Framework**

The AEA establishes the framework for NRC's regulatory and oversight activities. Regulatory activities include publishing regulations and guidance; licensing; and oversight through inspection, assessment, and enforcement; identifying and resolving issues that affect more than one licensee; and obtaining information that supports decisionmaking. In addition, NRC must ensure qualifications of oversight staff to accomplish the mission.

For security, NRC oversight is conducted to ensure licensees' accounting systems for special nuclear and source materials, and security programs, are implemented in accordance with NRC regulations. Security inspections to verify that a licensee's security activities are properly conducted are an important element of NRC's oversight of its licensees.

## *RTR Security Oversight Activities*

The RTR Oversight Branch conducts security oversight activities in three primary areas: review of physical security plans; security inspections; and policy and rulemaking related to RTR security.

### Physical Security Plan Reviews

Security specialists review physical security plans as part of license renewals. Each physical security plan must describe how the licensee will comply with the regulations in 10 CFR Part 73.<sup>5</sup> The security plans are site-specific and tailored to the safeguards categories of materials that the licensee may possess. NRC expects licensees with CALs to incorporate their site-specific compensatory measures when revising the physical security plan.

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<sup>5</sup> Key security regulations applicable to RTRs include fingerprinting for unescorted access; restriction of access to SNM; detection and response requirements for unauthorized access; and other measures for protection of SNM of moderate and low strategic significance.

The security specialists use internal guidance to ensure the physical security plan is complete and meets all necessary requirements. After receiving all necessary information and verifying that the physical security plan complies with the necessary regulations, the security specialist documents for the license renewal that the plan has been reviewed and found acceptable. CALs may be closed if all the site-specific compensatory measures are included in the licensee's updated physical security plan.

The task remains to close CALs for approximately 10 facilities. One security specialist focuses on timely closeout of the CALs while reviewing the physical security plans. To have more security specialists involved in closing the CALs requires them to be pulled from other tasks.

Security Inspections

The safeguards and security portion of the RTR inspection program uses a graded approach. The frequency of security inspections at RTRs is determined by the licensed possession of SNM. Category II facilities should be inspected biennially. Category III facilities should be inspected triennially.<sup>6</sup> Table 1 lists the inspection procedures used to conduct security inspections at RTRs.

Table 1: Inspection Procedures (IPs) Used in Safeguards and Security Inspections

IP 81401	Plans, Procedures, and Reviews
IP 81402	Reports of Safeguards Events
IP 81421	Fixed Site Physical Protection of SNM of Moderate Strategic Significance
IP 81431	Fixed Site Physical Protection of SNM of Low Strategic Significance
IP 81810	Protection of Safeguards Information
IP 85102	Material Control and Accounting - Reactors

Source: NRC Inspection Manual Chapter 2545, *Research and Test Reactor Inspection Program*

<sup>6</sup> According to Inspection Manual Chapter 2545, biennial inspections should be performed at least once every 2 years with the interval not to exceed 2 years and 6 months, or 30 months; and triennial inspections should be performed at least once every 3 years with the interval not to exceed 3 years and 9 months, or 45 months.

The OIG audit team reviewed 8 years of security inspection reports for all 31 RTRs. OIG found that inspections have been completed in a timely manner, within the defined frequency, and with appropriate inspection procedures. Inspection findings have been dispositioned consistent with the NRC Enforcement Manual.

Security specialists have cross-qualified as security inspectors which will improve communication with licensees regarding security requirements and activities. Although cross-qualification addresses staffing changes<sup>7</sup>, the security specialists will have to balance inspections with their other responsibilities to maintain reliability of security oversight.

### Policy and Rulemaking

The security specialists in the RTR Oversight Branch consult with the Office of Nuclear Security and Incident Response (NSIR) on policy and rulemaking related to cybersecurity, digital instrumentation and control, and security at projected medical isotope facilities.<sup>8</sup>

NSIR has the lead for cybersecurity, but the RTR Oversight Branch conducts oversight for RTRs. NRC staff assessed cybersecurity vulnerabilities at RTRs and concluded that licensees implemented an adequate level of cybersecurity at their facilities. There are no current regulations for cybersecurity at RTRs, but the RTR Oversight Branch developed a best practices document for licensees to protect against cyber-based threats. An ongoing responsibility for NRC staff is to monitor potential impacts as the RTR licensees implement plans to teach remotely and to share research information worldwide.

RTR licensees are gradually digitizing their analog instrumentation and controls. The RTR Oversight Branch is currently building a hypothetical all-digital facility to model an RTR with all digital upgrades. If the study shows that consequences<sup>9</sup> change with digital control, then rulemaking may be necessary. NRC licensing

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<sup>7</sup> NRC's efforts to match programs and staff to the current nuclear industry environment have resulted in a compression of staffing levels in various programs, including RTR oversight.

<sup>8</sup> Worldwide shortages of capacity in the production of medical isotopes for diagnosis and treatment has prompted development of new isotope production facilities in the U.S.

<sup>9</sup> "Consequences" is one of the three factors NRC considers in analyzing risk. The other two factors are possible events or conditions and the likelihood of those events. If the range of outcomes or consequences for likely events or conditions changes, then risk for security or safety may change and require new regulatory actions.

staff currently assess digital instrumentation and control to ensure that upgrades are not integrated with security systems. NRC will have to be vigilant in monitoring the incremental digital changes as they occur and ensuring that there is no change to site-specific consequences.

Medical isotope production facilities are in the process of being developed and licensed. The RTR Oversight Branch is consulting with NSIR on security at the these facilities. The medical isotope facilities will be Category II facilities, and the RTR Oversight Branch already has expertise in security for Category II facilities. Also, some of the isotope production processes may involve the use of an RTR. For the processes taking place at existing RTRs, the RTR Oversight Branch will have the lead on oversight. When security regulations and facility designs are concrete, the RTR Oversight Branch will understand its future security oversight role as the facilities are built and begin to operate.

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## **AGENCY COMMENTS**

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After reviewing a discussion draft, agency management provided comments that have been incorporated into this report, as appropriate. As a result, agency management stated their general agreement with the results of this report and opted not to provide formal comments for inclusion in this report.

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## **SCOPE AND METHODOLOGY**

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The audit objective was to determine whether NRC provides adequate security oversight of research and test reactors.

The audit was conducted at NRC Headquarters, Rockville, MD, and Austin, TX, from July 10, 2017, to October 12, 2017. The scope included security oversight of currently operating RTRs licensed by NRC and security activities related to pending new license applications. Internal controls related to the audit objective were reviewed and analyzed. Throughout the audit, auditors considered the possibility of fraud, waste, and abuse in the program.



OIG reviewed relevant NRC requirements, guidance, and policies. Some documents reviewed include

- *Atomic Energy Act of 1954*, as amended.
- NRC regulations at 10 CFR Part 50 and 10 CFR Part 73.
- NRC Inspection Manual Chapters and Inspection Procedures.
- NRC Enforcement Manual.
- NRC Technical Qualification Programs.
- Commission Papers (SECYs) and Staff Requirements Memoranda (SRMs).

To understand the inspection process and its significant role in RTR security oversight, OIG reviewed inspection reports and accompanied an NRC inspection team on a security inspection at an RTR.

OIG conducted interviews of NRC personnel to gain an understanding of the roles, responsibilities, procedures, and controls for security oversight of RTRs.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The audit was conducted by Beth Serepca, Team Leader; Amy Hardin, Audit Manager; and Janelle Wiggs, Auditor.

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## COMMENTS AND SUGGESTIONS

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If you wish to provide comments on this report, please email OIG using this [link](#).

In addition, if you have suggestions for future OIG audits, please provide them using this [link](#).