

March 18, 2016

Dr. Cameron Goodwin, Director
Rhode Island Nuclear Science Center
Rhode Island Atomic Energy Commission
16 Reactor Road
Narragansett, RI 02882-1165

SUBJECT: RHODE ISLAND ATOMIC ENERGY COMMISSION – NUCLEAR REGULATORY
COMMISSION ROUTINE INSPECTION REPORT NO. 50-193/2016-201

Dear Dr. Goodwin:

From February 22–25, 2016, the U.S. Nuclear Regulatory Commission (NRC or the Commission) conducted an inspection at the Rhode Island Nuclear Science Center Reactor facility. The enclosed report documents the inspection results which were discussed on February 25, 2016, with you, members of your staff, and Dr. Clinton Chichester, Chairman of the Rhode Island Atomic Energy Commission.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with conditions of your license. The inspector reviewed selected procedures and records, observed various activities, and interviewed personnel. Based on the results of this review, no findings of significance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

C. Goodwin

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If you have any questions concerning this inspection, please contact Craig Bassett at (301) 466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-193
License No. R-95

Enclosure:
As stated

cc: See next page

cc:

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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

C. Goodwin

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No. 50-193

License No. R-95

Report No. 50-193/2016-201

Licensee: Rhode Island Atomic Energy Commission

Facility: Rhode Island Nuclear Science Center Research Reactor

Location: Narragansett, Rhode Island

Dates: February 22–25, 2016

Inspector: Craig Bassett

Approved by: Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

Rhode Island Atomic Energy Commission
Rhode Island Nuclear Science Center Reactor Facility
NRC Inspection Report No. 50-193/2016-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Rhode Island Atomic Energy Commission's (the licensee's) 2 Megawatt Class I research reactor safety program, including: (1) organization and staffing, (2) review and audit functions and design change control, (3) radiation safety, (4) environmental monitoring, (5) procedures, and (6) transportation of radioactive material since the last U.S. Nuclear Regulatory Commission (NRC) inspection in these areas. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements.

Organization and Staffing

- Organization and staffing remain in compliance with the requirements specified in the facility's Technical Specifications (TSs).

Review and Audit Functions and Design Change Control

- The review and audit program was being conducted acceptably and completed by the Nuclear and Radiation Safety Committee, as stipulated in TSs Section 6.2.
- Changes made at the facility were being reviewed using guidance in the licensee's Facility Modification Procedure, AP-03, and Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59.

Radiation Safety

- Periodic surveys were completed and documented as required by procedure.
- Postings and signs met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.
- Radiation survey and monitoring equipment was being maintained and calibrated as required.
- The radiation safety training program was acceptable and training was being completed as required.
- The radiation safety and the as low as reasonably achievable (ALARA) programs satisfied regulatory requirements.

Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TSs limits.
- The environmental protection program satisfied NRC requirements.

Procedures

- Written procedures were being reviewed, approved, and maintained in accordance with TSs Section 6.5 requirements.
- Procedural compliance was acceptable.

Transportation of Radioactive Material

- The shipments of radioactive material made under the reactor license were in compliance with NRC and Department of Transportation regulations.

REPORT DETAILS

Summary of Facility Status

The Rhode Island Atomic Energy Commission's (the licensee's) Rhode Island Nuclear Science Center (RINSC) 2 Megawatt research reactor continued to be operated in support of education, research, and training. During the inspection, the reactor was operated at various power levels to irradiate samples as part of its research mission.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure (IP) 69006)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Sections 6.1 and 6.2 of the RINSC Technical Specifications (TSs), Amendment No. 30, dated December 19, 2013, to Facility License No. R-95, were being met:

- RINSC organizational structure and staffing
- RINSC Annual Report for the period from July 1, 2013, through June 30, 2014, submitted to the U.S. Nuclear Regulatory Commission (NRC) on August 28, 2014
- RINSC Annual Report for the period from July 1, 2014, through June 30, 2015, submitted to the NRC on August 28, 2015

b. Observations and Findings

The inspector reviewed the facility organization and staffing. It was noted that the organizational structure had not changed since the previous inspection. It was noted that the licensee had hired two individuals to fill the vacant positions of Principle Reactor Operator and Facility Engineer. It was also noted that the Nuclear and Radiation Safety Committee (NRSC) consisted of the appropriate individuals required by the TSs. The organizational structure at the facility appeared to be in compliance with the TSs.

The Director continued to have responsibility for all activities in the facility as stipulated in the TSs. A licensed Senior Reactor Operator was assigned each shift with the responsibility for all activities during that shift. The inspector verified that shift staffing met TSs requirements. Also, the Radiation Safety Officer (RSO) continued to be responsible for assuring that adequate radiation monitoring and control were in effect to prevent undue exposure of individuals to radiation as required by TSs Section 6.4.

In addition, it was noted that most staff members had collateral duties to perform at the facility. Despite this fact, the inspector concluded that staffing appeared to be adequate given the current level of operation at the facility. An increase in the workload would necessitate a corresponding increase in the number of staff.

c. Conclusion

The organization structure and staff functions were in accordance with TSs requirements.

2. Review and Audit Functions and Design Change Control

a. Inspection Scope (IP 69007)

The inspector reviewed the following to ensure that the requirements of TSs Section 6.0 and Title 10 of the *Code of Federal Regulations* (10 CFR) Sections 20.1101 and 50.59 were being implemented effectively:

- NRSC Charter, Revision (Rev.) 4, approval dated November 19, 2015
- NRSC meeting minutes for 2014 through the date of this inspection
- Various 10 CFR 50.59 screen/review forms concerning modifications or changes at the facility
- RINSC Operating Procedures, AP-03, "Facility Modifications," Rev. 1
- RINSC Annual Reports for the last two reporting periods
- RINSC Radiation Safety Annual Audits performed by the RSO for Calendar Year (CY) 2014, completed during January 30 – February 6, 2015 and for CY 2015, completed during January 27 – 29, 2016

b. Observations and Findings

(1) Review and Audit Functions

The inspector reviewed the NRSC meeting minutes and associated records for 2014 through the present. The records showed that meetings were generally held more frequently than required in the TSs. Safety reviews and audits were conducted by various members of the NRSC or other designated persons as required. Topics of these reviews and audits were consistent with TSs requirements to provide guidance, direction, and oversight for the facility, and acceptable use of the reactor. It was also noted that the Radiation Safety Program was being audited annually as required by 10 CFR 20.1101.

No significant problems or deficiencies were found during the NRSC's reviews and audits, but some areas for improvement were noted. Corrective actions were taken as needed.

(2) Design Change Functions

Through interviews with licensee personnel, the inspector determined that various changes had been initiated and/or completed at the facility since

the last NRC inspection. The inspector reviewed the 10 CFR 50.59 review process used at the facility. It was noted that the licensee used 10 CFR 50.59 screenings, reviews, and evaluations. The inspector noted that various screenings had been completed by the licensee. The results indicated that no further reviews/evaluations were required.

c. Conclusion

The NRSC was meeting as required and reviewing the topics outlined in the TSs. Audits were being completed as required. Procedure and facility changes were being completed using the licensee's change review process outlined in Facility Modification Procedure, AP-03.

3. Radiation Safety

a. Inspection Scope (IP 69012)

The following documents were reviewed to determine compliance with 10 CFR Parts 19 and 20 and with TSs Section 3.7.1 requirements regarding radiation safety:

- Radiation Safety training modules and records
- RINSC Radiation Safety Manual dated February 2016
- RINSC Annual Reports for past two reporting periods
- RINSC Radiation safety Annual Audit for the past 2 years
- Copies of NRC Form 3, "Notice to Employees," posted at the facility
- Quarterly dosimetry reports for facility personnel from January 2014 through December 2015
- Selected survey program summary data and the associated survey reports for 2015
- Selected calibration records of area radiation monitors for the past 2 years
- Survey meter calibration files documenting the calibration of various portable survey instruments for the past 2 years
- RINSC Radiation Safety Standard Operating Procedures (SOPs) including Nos. RS-01, RS-02, RS-03, and RS-04

b. Observations and Findings

(1) Surveys

The inspector reviewed selected weekly, monthly, and quarterly radiation and contamination surveys. The surveys, which had been completed by health physics staff members, were generally completed in a timely manner. No contamination had been detected in concentrations above established action levels in the surveys reviewed. Some areas/items were noted with slightly elevated radiation levels, but no problems were found. When areas were found to be contaminated, they were

decontaminated promptly and resurveyed to confirm that the areas were radiologically clean. Results of the surveys were acceptably documented.

During the inspection, the inspector accompanied the facility health physicist (HP) during completion of routine weekly radiation and contamination surveys of the reactor bay and a laboratory where radioactive samples were processed. The inspector noted that the techniques used by the HP during the survey were adequate and the survey was conducted and documented as required. The inspector also conducted a radiation survey of these areas using an NRC meter. The radiation levels noted by the inspector were comparable to those found by the licensee HP and no anomalies were noted.

(2) Postings and Notices

Radiological signs were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas. Caution signs, postings, and controls for radiation areas and high radiation areas were as required in 10 CFR Part 20, Subparts G and J. The inspector noted that licensee personnel observed the signs and postings and the precautions for access to the various controlled areas in the facility.

Copies of current notices to workers were posted in appropriate areas in the facility. The copies of NRC Form 3, "Notice to Employees," noted at the facility were the latest issue and were posted in various areas of the facility as required by 10 CFR 19.11. These locations included the main bulletin board in the hallway by the Radiation Safety Office and the control room.

(3) Dosimetry Reports/Personnel Exposure

The inspector determined that the licensee used pocket ion chambers and thermoluminescent dosimeters (TLDs) for whole body monitoring of x-ray, beta, gamma, and neutron radiation exposure. The licensee also used TLD finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor. An examination of the TLD results indicating radiological exposures at the facility for the past 2 years showed that all of the occupational doses for facility personnel, as well as doses to the public, were within 10 CFR Part 20 limits. Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel.

(4) Maintenance and Calibration of Radiation Monitoring Equipment

Examination of selected items of radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. Review of the instrument calibration records for various meters indicated the calibration of portable survey meters was completed by both licensee staff and contractor personnel depending on the type of calibration that was required. The licensee typically conducted electronic calibrations while the vendor conducted source range calibrations. The inspector verified that the survey instruments were calibrated annually as required and the appropriate calibration records were maintained.

The inspector observed an electronic calibration of a survey meter by the facility HP. The licensee had written a procedure for the calibration but it had not been through the review and approval process with the NRSC. The HP used a procedure provided by the meter vendor for the calibration but also referenced the one written at the facility to determine what changes might be needed before being finalized. The calibration was conducted according to the vendor's procedure and appeared to be appropriate. No problems were noted.

(5) Radiation Safety Training

The inspector reviewed the licensee's radiation safety training program. It was noted that training was given to RINSC staff members, to those who are not on staff but who are authorized to use the experimental facilities of the reactor (Authorized Users), to students taking classes at the facility, and to visitors. The training was typically given by the RSO at the facility. Initial radiation worker training was given for those new to the facility. Following initial training, refresher training was given on an annual basis. The training consisted of various subjects including: basic concepts and terms, radiobiology, basics of radiation safety, radiation detection, personnel dosimetry, as low as reasonably achievable (ALARA), and radioactive waste management. Additional training was given to each person as appropriate based upon the position and/or duties of the individual.

The inspector reviewed the training given to staff members and other radiation workers who used facility resources. It appeared to be appropriate. The inspector verified that initial training was being given to new arrivals and annual refresher training was given as required. The training program was acceptable.

(6) Radiation Safety Program

The licensee's Radiation Safety and ALARA programs were established and described in the RINSC Radiation Safety Manual, dated February 2016, and through associated radiation safety procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, handling radioactive material, and maintaining doses ALARA. The program, as established, appeared to be acceptable and satisfied regulatory requirements.

The licensee did not have a respiratory protection program or planned special exposure program; neither program was required based on the current level of activity at the facility.

(7) Facility Tours

The inspector toured the facility including the reactor bay and Control Room; the basement area; and selected support laboratories with licensee representatives on various occasions. The inspector noted that facility radioactive material storage areas were properly posted. No unmarked radioactive material was noted.

c. Conclusion

The inspector determined that the Radiation Safety and ALARA programs, as implemented by the licensee, satisfied regulatory requirements. Specifically, (1) periodic surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; (2) postings and signs met regulatory requirements; (3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; (4) radiation survey and monitoring equipment was being maintained and calibrated as required; and (5) the radiation safety training program was being implemented as stipulated in procedure.

4. Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify that the requirements of TSs Sections 3.7 and 4.7 were being met:

- Files containing air monitor data sheets
- Main and stack continuous air monitor records
- Environmental dosimetry records for 2014 through 2015
- Selected RINSC calibration procedures, including CP-06 and CP-07
- RINSC Radiation Safety Annual Audits for the past 2 years

- RINSC Annual Report for the last two reporting periods

b. Observations and Findings

(1) Environmental Radiation Monitoring

Environmental radiation monitoring was accomplished using TLDs placed at three different monitoring stations. Since the areas monitored had limited public access, the licensee adjusted the readings by using occupancy factors to approximate annual dose. After applying the occupancy factors, the results of the readings at those locations indicated dose rates less than the regulatory limit.

(2) Gaseous Effluent Releases

The inspector determined that gaseous releases continued to be monitored as required, calculated according to procedure, and acceptably documented in the annual reports. The predominant environmental release from the facility was Argon-41 resulting from activated air entrained in the reactor pool water, present in beam tubes, and used for cooling pneumatic transfer tubes. The airborne concentrations of the gaseous releases were within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2. Also, the dose rate to the public as a result of the gaseous releases was well below the dose constraint of 10 millirem per year specified in 10 CFR 20.1101(d).

(3) Liquid Effluent Releases

A review of the liquid effluent releases from the facility to the sanitary sewer indicated that proper methods were followed prior to the releases. This included recirculation and sampling of the liquid, analyses of samples taken of the liquid, and review and authorization of each batch. The releases were well within the monthly average concentration limits established in 10 CFR Part 20, Appendix B, Table 3.

(4) Monitoring Equipment Calibration and Maintenance

The inspector reviewed the calibration and maintenance records of various area radiation monitors (ARMs) and stack monitors. It was noted that the ARMs and stack monitors were being calibrated annually as required and were typically calibrated by licensee staff personnel. Records were current and acceptably maintained. Observation of the facility by the inspector indicated no new potential release paths.

c. Conclusion

Effluent releases were within the specified regulatory and TSs limits. The environmental protection program satisfied NRC requirements.

5. Procedures

a. Inspection Scope (IP 69008)

The inspector reviewed the following to ensure that the requirements of TS Sections 6.4 and 6.5 were being met:

- Selected RINSC Operations SOPs
- Selected RINSC Radiation Safety SOPs
- NRSC meeting minutes from 2014 through the present

b. Observations and Findings

The inspector observed that the licensee maintained written procedures covering the areas specified in TSs 6.5, "Operating Procedures." A systematic approach was being used to update and reissue procedures. New procedures and major changes to existing procedures were required to be reviewed and approved by the NRSC. These reviews and approvals were typically documented in the minutes of the NRSC meetings.

The inspector noted that minor and major changes to various procedures had been made since the previous inspection. Also, several new procedures had been developed. The inspector verified that the major procedure changes and the new procedures had been reviewed and approved by the NRSC as required.

The activities and operations observed by the inspector during this inspection were completed in accordance with the applicable procedures. These activities and operations included reactor startup, equipment checkouts, reactor operation, conducting a radiation/contamination survey, and calibration of a radiation survey meter.

c. Conclusion

The licensee was maintaining and implementing written procedures in accordance with TSs Section 6.5 requirements. Procedural compliance was acceptable.

6. **Transportation of Radioactive Material**

a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to determine compliance with NRC and Department of Transportation (DOT) regulations governing the transportation of radioactive material as specified in 10 CFR Parts 20 and 71 and in 49 CFR Parts 171-178.

- Licenses of shipment recipients
- Radioactive material shipping papers and related records
- Training records for those designated as “shippers”
- RINSC Radiation Safety Annual Audit for the past 2 years
- Selected RINSC Radiation Safety Office SOPs, including RS-04

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector determined that the licensee had not shipped radioactive material (RAM) during 2015, but had made various RAM shipments in 2014 including three Limited Quantity shipments and one exempt quantity shipment. The records indicated that the shipments had been surveyed as required. All radioactive material shipment records reviewed by the inspector had been completed in accordance with DOT and NRC regulations.

The inspector verified that the licensee was maintaining copies of shipment recipients' licenses to possess radioactive material on file as required. The licenses were verified to be current prior to initiating a shipment. The inspector also reviewed the training of RINSC staff members responsible for shipping radioactive material. The inspector verified that the two licensee personnel designated as “shippers” had received the appropriate training covering the DOT, International Air Transport Association, and International Civil Aviation Organization requirements within the past 3 years.

c. Conclusion

The licensee shipments of RAM under the facility's reactor license were in accordance with NRC and DOT requirements.

7. **Follow-up on Previously Identified Item**

a. Inspection Scope (IP 92701)

The inspector reviewed the licensee's actions taken in response to an NRC-identified Inspector Follow-up Item (IFI).

b. Observation and Findings

IFI 50-193/2015-201-01 – Follow-up on the licensee's actions to complete the review and revision of the RINSC Radiation Safety Office SOPs.

During an inspection in February 2015, it was noted that various RINSC Radiation Safety SOPs were being reviewed by the RSO. These procedures were to be either revised or eliminated and replaced with new procedures as deemed necessary. The licensee was informed that completion of the review and revision of the RINSC Radiation Safety Office SOPs would be considered as an IFI.

During this inspection it was noted that four procedures, RS-01, RS-02, RS-03, and RS-04 had been revised/written and submitted to the NRSC. The NRSC had reviewed the procedures and approved them as required. The licensee anticipated to have all the radiation safety SOPs submitted to the NRSC for review by the end of 2016. Although progress had been made in this area, this issue will remain open until all the previous Radiation Safety SOPs are written/revised or removed from use. This issue will remain open.

c. Conclusion

One IFI was reviewed but will remain open pending further licensee action.

8. Exit Interview

The inspection scope and results were summarized on February 25, 2016, with members of licensee management and staff, as well as the Chairman of the Rhode Island Atomic Energy Commission. The inspector described the areas inspected and discussed in detail the inspection findings. The licensee acknowledged the results of the inspection and did not identify as proprietary any material provided to or reviewed by the inspector during the inspection of these program areas.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

C. Chichester	Chairman, Rhode Island Atomic Energy Commission
J. Davis	Assistant Director, Rhode Island Nuclear Science Center
C. Goodwin	Director, Rhode Island Nuclear Science Center
C. Hathaway	Health Physicist
M. Marrapese	Principal Reactor Operator
P. Martin	Reactor Supervisor
S. Nam	Radiation Safety Officer
B. Sirr	Facility Engineer

INSPECTION PROCEDURES USED

IP 69004	Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69006	Class 1 Research and Test Reactors Organization and Operations and Maintenance Activities
IP 69007	Class 1 Research and Test Reactors Review and Audit and Design Change Functions
IP 69008	Class 1 Research and Test Reactors Procedures
IP 69012	Class 1 Research and Test Reactor Radiation Protection
IP 86740	Transportation
IP 92701	Follow-up on Previously Identified Items

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

50-193/2015-201-01	IFI	Follow-up on the licensee's actions to complete the review and revision of the RINSC Radiation Safety Office SOPs.
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LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As Low As Reasonably Achievable
ARM	Area Radiation Monitor
CY	Calendar Year
DOT	Department of Transportation
HP	Health Physicist
IFI	Inspector Follow-up Item
IP	Inspection Procedure
NRC	U.S. Nuclear Regulatory Commission
NRSC	Nuclear and Radiation Safety Committee
RAM	Radioactive Material
Rev.	Revision
RINSC	Rhode Island Nuclear Science Center
RSO	Radiation Safety Officer
SOP	Standard Operating Procedure
TLD	Thermoluminescent Dosimeter
TSS	Technical Specification