April 26, 2012

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

SUBJECT: RHODE ISLAND ATOMIC ENERGY COMMISSION - NRC ROUTINE INSPECTION REPORT NO. 50-193/2012-201

The U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection on April 9 - 12, 2012, at the Rhode Island Nuclear Science Center Reactor facility (Inspection Report No. 50-193/2012-201). The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concern or noncompliance of requirements was identified. No response to this letter is required.

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

Should you have any questions concerning this inspection, please contact Patrick Isaac at 301-415-1019 or electronic mail at Patrick.Isaac@nrc.gov.

Sincerely,

/RA/

Johnny H. Eads, Jr., 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 w/ encl: See next page

cc:

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

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DATE	4/25/2012	4/25/2012	4/25/2012	4/26/2012

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

Docket No:	50-193
License No:	R-95
Report No:	50-193/2012-201
Licensee:	Rhode Island Atomic Energy Commission
Facility:	Rhode Island Nuclear Science Center Research Reactor
Location:	Narragansett, Rhode Island
Dates:	April 9-12, 2012
Inspector:	Patrick Isaac, Lead Taylor Lichatz, Inspector Trainee
Approved by:	Johnny H. Eads, Jr., Chief Research and Test Reactors Oversight Branch Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Rhode Island Atomic Energy Commission
Rhode Island Nuclear Science Center Reactor Facility
NRC Inspection Report No. 50-193/2012-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Rhode Island Atomic Energy Commission (the licensee's) Class I research reactor facility safety programs including organization and operations and maintenance activities; review and audit and design change function; experiments; procedures; radiation protection; effluent and environmental monitoring; and transportation. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with U.S. Nuclear Regulatory Commission (NRC) requirements.

Organization and Operations and Maintenance Activities

- Organization and Operations and Maintenance Activities generally remain in compliance with the requirements specified in Technical Specifications.

Review and Audit and Design Change Functions

- Within the scope of this review, the licensee's review and design change program was generally found in conformance with Technical Specification and regulatory requirements.

Experiments

- Within the scope of this inspection the licensee was observed to be conducting experiments in accordance with regulatory and license requirements.

Procedures

- Written procedures were being maintained in accordance with Technical Specification requirements.

Radiation Protection

- The licensee continued to maintain an effective radiation protection program in compliance with regulatory and Technical Specification requirements, resulting in low radiation exposures to facility workers and users.

Effluent and Environmental Monitoring

- The inspectors found environmental monitoring to conform to Technical Specification requirements and effluents to be in compliance with regulatory limits.

Transportation

- The licensee shipment of radioactive material under the reactor license was generally compliant with NRC (Title 10 of the *Code of Federal Regulations* Parts 20 and 71) and Department of Transportation (DOT) (49 CFR Parts 171-178) regulations.

REPORT DETAILS

Summary of Facility Status

The Rhode Island Atomic Energy Commission's (RIAEC, the licensee) Rhode Island Nuclear Science Center (RINSC) two megawatt research reactor continued to be operated in support of education, research, training, and surveillance. During the inspection, the reactor was operated to irradiate samples as part of its research mission.

1. Organization and Operations and Maintenance Activities

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

The inspectors reviewed the following as a limited review of this area:

- Reactor logbook #58, August 16, 2010 to December 2, 2011
- Reactor logbook #59, December 6, 2001 to present
- Maintenance logbook
- H. Bicehouse (RINSC) to W. Kennedy (NRC), Annual Report for the RINSC Pursuant to TS 6.8.4 for the period from July 1, 2010 to June 30, 2011, dated July 30, 2011
- Form NSC-1, Pre-Start Check Sheet, dated March 22, 2011

b. Observations and Findings

The inspectors observed a reactor checkout, startup, approach to critical, escalation to full power, and a shutdown. The Reactor Logbook entries were reviewed satisfactorily with key information documented during reactor operations including start-up and thru power operations. The inspectors verified compliance with staffing requirements of Technical Specifications (TS) Sections 6.1.2 and 6.1.3 and that the Reactor Operator (RO) and the Senior Reactor Operator (SRO) on duty were designated by name in the logbook.

A maintenance logbook had been utilized to document in greater detail than the reactor logbook the nature of significant maintenance performed on the reactor and auxiliary systems.

c. Conclusion

Organization and Operations and Maintenance Activities remain in compliance with the requirements specified in TS. The reactor was being maintained per TS requirements. Staffing was compliant with TS requirements.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

The inspectors reviewed the following to ensure that the requirements of TS Section 6.0, "Administrative Controls", and Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59 were being implemented effectively:

- RINSC Nuclear and Radiation Safety Committee (NRSC) Full committee Meeting Minutes, dated April 25, 2011
- RINSC NRSC Full committee Meeting Minutes, dated February 22, 2012
- H. Bicehouse (RINSC) to W. Kennedy (NRC), [Annual Report for the RINSC Pursuant to TS 6.8.4 for the period from July 1, 2010 to June 30, 2010], dated July 30, 2011
- Review of 10 CFR 50.59 file, December 2007 through present

b. Observations and Findings

Review of the minutes indicated that the meeting frequency, attendance, and actions met the requirements of TS Section 6.4, Review and Audit. Specifically, the inspector verified that the NRSC had reviewed the reactor instrumentation upgrade. The following changes were reviewed: a digital power trend display, a ventilation system annunciator, a vital area alarm annunciator, a digital area radiation level display, and a digital core and experiment status display. The master switch is also to be replaced. None of the safety related equipment will be affected.

Additionally, through interviews with licensee personnel, the inspectors determined that other various changes had been initiated and/or completed at the facility since the last NRC inspection. The inspectors reviewed the 10 CFR 50.59 review process used at the facility. It was noted that the reviews had been presented to the NRSC for review and approval. It was also noted that none of the changes required NRC approval prior to implementation. However, as there remained to be no formal 10 CFR 50.59 review process developed since the previous inspection and only four questions were being asked instead of the required eight for 10 CFR 50.59 changes, the licensee was informed that this issue would be identified as an Inspector Follow-Up Item (IFI) by the NRC and will be reviewed during a future inspection (IFI 50-139/2012-201-01).

c. Conclusion

Within the scope of this review, the licensee's review and design change program was generally found in conformance with TS and regulatory requirements.

3. Experiments

a. Inspection Scope (IP 69005)

The inspectors reviewed selected portions of the following documents and records to ensure that the requirements of TS Sections 3.8, "Limitations on Experiments", 4.8, "Surveillance of Experiments", and 6.4, "Review and Audit", were being met:

- Reactor Experiment Notebook, desk copy maintained by M. J. Davis
- Experiment Procedure XP-10, Dry Irradiation Facility Irradiations, Rev. 0, approval dated November 2, 2011
- Experiment Procedure XP-04, Incore Irradiations, Rev. 1, approval dated December 4, 2009
- Experiment Procedure XP-12, Glory Tube Gamma Irradiations, Rev. 1, approval dated December 4, 2009
- Experiment Procedure XP-02, Reactor Experiment Approval, Rev. 4, approval dated March 10, 2009
- Experiment Procedure XP-01, Reactor Experiment Request, Rev. 1, approval dated September 29, 2008
- Experiment Procedure XP-01 Attachment D, NSC (Nuclear Science Center) - Form 42, Reactor Experiment Request Form
- Experiment Procedure XP-02 Attachment C, NSC - Form 47, Reactor Experiment Approval
- RINSC NRSC Full committee Meeting Minutes, dated April 25, 2011
- RINSC NRSC Full committee Meeting Minutes, dated February 22, 2012

b. Observations and Findings

The licensee had approved five new experiments in the last calendar year. Experiments were screened pursuant to 10 CFR 50.59 requirements. Legacy experiments being done routinely had been subjected to the new review process to assure that safety considerations were known, documented, and properly applied. The inspectors reviewed evidence that experiments were reviewed and approved by the NRSC and in accordance with TS requirements.

The inspectors specifically reviewed Experiment Procedure XP-10 Dry Irradiation Facility (DIF) Irradiations as part of the procedure deals with moving the core from the high power end of the pool to the low power end. Corrective actions had been properly implemented since the previous inspection in which a gate was added to prevent inadvertent access to the DIF. Additionally, a strobe light warning system was added so that individuals in the area would be aware whenever the dose rate inside the DIF would reach 100 mR/hr or greater at the radiation window inside the facility. This experiment procedure was properly reviewed and approved by the NRSC.

The inspectors observed reactor operations in support of a user performing an experiment involving the irradiation of numerous samples using the pneumatic transfer system. The RO and experimenter maintained appropriate communication during the experiment, were both knowledgeable of their responsibility in executing the experiment, and exercised safety precautions in accordance with the approved procedure. .

c. Conclusion

Within the scope of this inspection the licensee was observed to be conducting experiments in accordance with regulatory and license requirements.

4. Procedures

a. Inspection Scope (IP 69008)

The inspectors reviewed the following to ensure that the requirements of TS Sections 6.4, "Review and Audit", and 6.5, "Operating Procedures", were being met:

- Procedures Manual, desk copy maintained by M. J. Davis
- Appendix OP-2, RINSC Pre-Start Checkout, Rev. 15, approval dated April 25, 2011
- Appendix OP-3, Reactor Power Changes, Rev. 4, approval dated December 10, 2008
- Form NSC - 1, Pre-Startup Check Sheet
- Form NSC - 1C, Shutdown Check Sheet
- Form NSC - 11, Shift record Data Sheet
- Form NSC - 18 RINSC Reactor Operations Data
- RINSC NRSC Full Committee Meeting Minutes, dated April 25, 2011
- RINSC NRSC Full Committee Meeting Minutes, dated February 22, 2012

b. Observations and Findings

The inspectors observed that the licensee maintained written procedures covering the areas specified in TS Section 6.5, "Operating Procedures". A systematic approach was being used to update and reissue procedures. Newly revised procedures and major changes were reviewed and approved by the NRSC in accordance with TS Section 6.4, "Review and Audit". The reviews and approvals were documented in the minutes of the NRSC meetings. The inspector noted that no major changes had been made since the previous inspection.

c. Conclusion

The licensee was maintaining and implementing written procedures in accordance with TS requirements.

5. Radiation Protection

a. Inspection Scope (IP 69012)

The following documents were reviewed to determine compliance with 10 CFR Parts 19 and 20 and with TS Sections 3.7.1, "Radiation Monitoring Systems", and 4.7, "Radiation Monitoring Systems and Effluents", requirements regarding radiation protection:

- RINSC Radiation Protection Annual Audit, H. Bicehouse, Radiation Safety Officer (RSO), February 7-12, 2012
- Survey Program Summary Data for 2011, printed April 10, 2012
- Survey Program Summary Data for 2012, printed April 10, 2012
- NRC Form 3, "Notice to Employees," dated August 2011
- File of Dosimetry Reports, Quarterly reports for 2011 and 2012
- RINSC Radiation Safety Office, Standard Operating Manual (SOP) Manual
- RINSC Radiation Safety Office, SOP 101, Radiation Safety Training, dated March 23, 2000
- RINSC Radiation Safety Office, SOP 300, Routine Surveys, dated February 10, 2004
- RINSC Radiation Safety Office, SOP 801, Instrument Calibration, dated November 6, 2000
- Radiation Safety Training file
- Radiation Safety Training Manual
- Instrumentation Calibration of Area Monitors (for reactor bridge, fuel safe, thermal column, heat exchanger area, and cleanup-demineralizer rooms), dated November 19, 2008
- Main and Stack [Continuous Air] Monitor file
- Survey Meter Calibration File (for GSM 110) to present
- Air Monitor Data Sheet file to present
- RINSC Operating Procedures, Main Floor Area Monitor Channel Test, Procedure Appendix AB, Rev. 1, dated July 2, 2003

b. Observations and Findings

Radiation Protection Procedures at the facility met regulatory requirements and license commitments. The inspectors verified Form NRC-3 "Notice to Employees" is posted as required and caution signs, labels and controls were posted as required. The inspector reviewed weekly, monthly and quarterly surveys. It was noted that annual surveys were incorporated into quarterly surveys. Through the review of procedures and records, observations during facility tours, and discussion with staff personnel, the inspectors determined that the licensee's radiation protection program was in accordance with TS requirements.

The licensee maintained and adhered to written procedures and instructions for all aspects of the radiation safety program. During tours through the facility the inspectors verified that postings for radiation workers were in accordance with regulations and procedures. Protective clothing was available if needed but areas were maintained in a clean condition such that it was not required during times of routine operation.

The inspectors toured the facility with licensee staff and observed workers wearing appropriate dosimetry throughout the facility. Routine radiation surveys, smear samples, and fixed monitor readings were taken throughout the facility to verify that radiation exposure rates were known and maintained As Low As Reasonably Achievable (ALARA). The licensee made effective use of data bases, monitoring for trends and abnormalities.

The inspectors found the scope of the radiation detection equipment calibration program to be sufficiently comprehensive and techniques used to be state-of-the-art.

The overall effectiveness of the radiation protection program was monitored with Optically Stimulated Luminescence Devices (OSLD) worn by workers. No worker received any significant exposure.

c. Conclusion

The licensee had maintained an effective radiation protection program in compliance with regulatory and TS requirements, resulting in low radiation exposures to facility workers and users.

6. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspectors reviewed the following to verify that the requirements of TS Section 4.7, “Radiation Monitoring Systems and Effluents”, were being met:

- Dosimetry Records for 2011 and 2012 to date
- H. Bicehouse (RINSC) to W. Kennedy (NRC), [Annual Report for the RINSC Pursuant to TS 6.8.4 for the period from July 1, 2011 to June 30, 2010], dated July 30, 2012

b. Observations and Findings

The inspectors toured the facility with a staff member doing a routine weekly facility radiation survey, observing where environmental releases of gaseous, liquid and solid radioactive material are generated and monitored. Survey points were re-designated to conform to new physical access characteristics.

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 gaseous release was significantly below the regulatory limit.

The licensee made one liquid release during the past year, a 50 gallon batch release discharged within permissible release limits.

The inspectors reviewed the data from an assumed small primary water leak. Analysis over several years indicates the leak rate to be about eight gallons/day. Leak collectors have been put in the locations where the leaks have typically occurred. Sodium (Na-24) has not been detected in the water and the Tritium concentrations are an order of magnitude below the 10 CFR Part 20 release limits. The RINSC staff continues to monitor for leakage daily and the NRSC has defined the magnitude of the leak at which additional actions are needed. However, through interviews with licensee personnel, it is believed that the loss of primary water is predominately due to evaporation.

The licensee maintained OSLDs at five locations around the exterior of the facility and sent them to a commercial processor quarterly along with personnel dosimeters. Since the areas monitored had limited public access the licensee adjusted the readings by occupancy times, resulting in dose rates at those locations less than a tenth of the regulatory limit.

c. Conclusion

The inspectors found environmental monitoring to conform to TS requirements and effluents to be in compliance with regulatory limits.

7. Transportation

a. Inspection Scope (IP 86740)

The inspectors reviewed the following documents to determine compliance with NRC (10 CFR Parts 20 and 71) Standards for Protection against Radiation and Packaging and Transportation of Radioactive Material and Department of Transportation (DOT) Title 49 of the *Code of Federal Regulations* Parts 171-178, transport regulations.

- RINSC Radiation Protection Annual Audit, H.J. Bicehouse, Radiation Safety Officer, February 7-12, 2012.
- Radioactive Material (RAM) Shipping Notebook
- Fuel Shipment #1, Babcock and Wilcox (B&W) dated September 27, 2010
- Cask Shipment from RINSC to B&W dated October 4, 2010

b. Observations and Findings

The last shipment was in September 2010. The inspectors reviewed the RINSC Radiation Protection Audit for radioactive shipments made under the R-95 reactor license. Through interviews of staff personnel and observance of transportation records, the inspectors found that shipments were generally in accordance of approved procedures. The inspectors noted to the licensee that two individuals had expired transportation training in case future shipments were to be made.

c. Conclusion

The licensee shipments of radioactive material under the R-95 reactor license were generally in accordance with NRC and DOT requirements.

8. Follow-up on Previous Identified Item

a. Inspection Scope (IP 92701)

The inspectors reviewed the licensee's actions taken in response to a previously identified Inspector Follow-up Item (IFI) in NRC Inspection Report No. 50-139/2011-202, dated October 6, 2011.

The inspectors also reviewed the licensee's actions taken in response to a previously identified Non-Cited Violation (NCV) in NRC inspection Report No. 50-139/2011-204, dated January 12, 2012.

b. Observations and Findings

IFI 50-139/2011-202-01 (Open) – Follow-up on the licensee's actions to investigate and analyze the reactor building cracks.

The inspectors observed that the licensee had formally investigated the cracks in the reactor building by hiring a contractor, AECOM. The letter from AECOM, dated March 14, 2012, and entitled "Letter Report Assessing Concrete Cracks in Reactor Building Foundation Walls," covered the observations made and samples taken on the individual cracks. The AECOM concluded that the cracks don't appear to be structural (i.e. from overload or settlement), but caused from shrinkage from stresses such as creep and thermal stresses. The main recommendation was to repair the roof, which had been completed prior to the April 2012 inspection. Therefore, this issue is considered a closed item.

NCV 50-139/2011-204-01 (Open) – Follow-up on the licensee's corrective actions to implement access control to High Radiation Areas commensurate with provisions of 10 CFR 20.1601(a).

The inspectors reviewed NRSC meeting minutes and procedures, toured the facility, and interviewed licensee management. It was determined that the

licensee had sufficiently implemented their corrective actions which include staff retraining on high radiation controls and procedures, the development of a procedure for operations of the Dry Irradiation Facility (DIF) in which the NRSC would formally review and approve, and the addition of a remote alarm system for the DIF gate. This issue is considered a closed item.

c. Conclusion

One IFI identified during a previous inspection was reviewed during this inspection and is considered closed. One NCV identified during a previous special inspection was reviewed, discussed, and closed.

9. Exit Interview

The inspection scope and results were summarized on April 12, 2012 with members of licensee management and staff. The inspectors described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

H. Bicehouse	Radiation Safety Officer and Assistant Director for Radiation and Reactor Safety
M. Damato	Health Physics Technician and Senior Reactor Operator
M.J. Davis	Assistant Director for Reactor Operations
S. Guarino	Health Physics
B. MacGregor	Facility Engineer and Senior Reactor Operator
Z. Richards	Reactor Operator Trainee
T. Tehan	Director, Rhode Island Nuclear Science Center

INSPECTION PROCEDURES USED

IP 69004	Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69005	Class 1 Research and Test Reactors Experiments
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

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-139/2012-201-01	IFI	Follow-up on the licensee's actions to implement a formal 10 CFR 50.59 review process

Closed

50-139/2011-202-01	IFI	Investigation and Analysis of Reactor Building Cracks
50-139/2011-204-01	NCV	The licensee failed to implement access control to High Radiation Areas commensurate with Provisions of 10 CFR 20.1601(a)

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
ALARA	As Low As Reasonably Achievable
10 CFR	Title 10 of the *Code of Federal Regulations*
B&W	Babcock and Wilcox
DOT	Department of Transportation
IP	Inspection Procedure
NRC	Nuclear Regulatory Commission
NRSC	Nuclear and Radiation Safety Committee
NSC	Nuclear Science Center
OSLD	Optically Stimulated Luminescent Device
Rev	Revision
RIAEC	Rhode Island Atomic Energy Commission
RINSC	Rhode Island Nuclear Science Center
RO	Reactor Operator
RSO	Radiation Safety Officer
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TS	Technical Specification