

May 22, 2007

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

SUBJECT: RHODE ISLAND NUCLEAR SCIENCE CENTER - NRC ROUTINE INSPECTION  
REPORT NO. 50-193/2007-201

Dear Dr. Tehan:

This letter refers to the inspection conducted on April 24-26, 2007, at the Rhode Island Nuclear Science Center Research Reactor facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of this inspection.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions in your license. Within these areas, the inspection consisted of a selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's Web site. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The violation is of concern because it indicates a failure to follow written operating procedures.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/readingrm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

T. Tehan

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Should you have any questions concerning this inspection, please contact Mr. Kevin M. Witt at 301-415-4075.

Sincerely,

**/RA by Jennifer M. Golder for Michael Case/**

Michael J. Case, Division Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

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

Enclosures:

1. Notice of Violation
2. NRC Inspection Report No. 50-193/2007-201

cc w/encl. Please see next page

Rhode Island Atomic Energy Commission

Docket No. 50-193

cc:

Governor Donald Carcieri  
State House Room 115  
Providence, RI 02903

Dr. Stephen Mecca, Chairman  
Rhode Island Atomic Energy Commission  
Providence College  
Department of Engineering-Physics Systems  
River Avenue  
Providence, RI 02859

Dr. Harry Knickle, Chairman  
Nuclear and Radiation Safety Committee  
University of Rhode Island  
College of Engineering  
112 Crawford Hall  
Kingston, RI 02881

Dr. Andrew Kadak  
253 Rumstick Road  
Barrington, RI 02806

Dr. Bahram Nassersharif  
Dean of Engineering  
University of Rhode Island  
102 Bliss Hall  
Kingston, RI 02881

Dr. Peter Gromet  
Department of Geological Sciences  
Brown University  
Providence, RI 02912

Dr. Alfred L. Allen  
425 Laphan Farm Road  
Pascoag, RI 02859

Mr. Jack Ferruolo, Supervising Radiological Health Specialist  
Office of Occupational and Radiological Health  
Rhode Island Department of Health  
3 Capitol Cannon, Room 206  
Providence, RI 02908-5097

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

T. Tehan

-2-

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**ACCESSION NO.: ML071370234**

**TEMPLATE #: NRR-106**

OFFICE	PRTB		PRTB:LA		PRTB:BC		DPR:DD	
NAME	KWitt		EHylton		JEads		MCase	
DATE	05/17/2007		05/17/2007		05/21/2007		05 / 22 /2007	

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## NOTICE OF VIOLATION

Rhode Island Atomic Energy Commission  
Rhode Island Nuclear Science Center

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

During an NRC inspection conducted on April 24-26, 2007, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Technical Specification 4.8 states, "Experiments shall be reviewed, approved, and properly installed and operational in accordance with written operating procedures." Operating Procedure 12, "Use of Pneumatic Irradiation Facilities," states, "The authorization is provided by the Assistant Director before the irradiations begin when he signs the irradiation request form."

Contrary to the above, on January 30, 2007, four experimental samples were irradiated in the reactor pneumatic irradiation experimental facility that were not reviewed and approved in accordance with the written operating procedures.

This is a Severity Level IV violation (Supplement I).

Pursuant to the provisions of 10 CFR 2.201, the Rhode Island Atomic Energy Commission is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 and a copy to the NRC Inspector of the facility that is the subject of this Notice, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. Therefore, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your

Enclosure 1

response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 22 of May 2007

**/RA by Jennifer M. Golder for Michael Case/**

Michael J. Case, Division Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

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

Docket No: 50-193

License No: R-95

Report No: 50-193/2007-201

Licensee: Rhode Island Atomic Energy Commission

Facility: Rhode Island Nuclear Science Center

Location: Narragansett, Rhode Island

Dates: April 24-26, 2007

Inspector: Kevin M. Witt

Approved by: Michael J. Case, Division Director  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Enclosure 2

## EXECUTIVE SUMMARY

### Rhode Island Atomic Energy Commission Rhode Island Nuclear Science Center Reactor Inspection Report No. 50-193/2007-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the licensee's Class I research and test reactor safety programs including: organizational and staffing, effluent and environmental monitoring, experiments, design changes, committees, audits and reviews, procedures, radiation protection, and transportation activities.

The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

#### Organization and Staffing

- The licensee's organization and staffing and assignment of responsibilities remained in compliance with the requirements specified in Technical Specification Section 6.

#### Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the regulatory limits.

#### Experiments

- The approval and control of experiments generally met Technical Specification and applicable regulatory requirements. One violation was noted for failure to properly review and approve experiment samples in accordance with written operating procedures.

#### Design Changes

- Based on the records reviewed, the inspector determined that the licensee's design change program was being implemented as required.

#### Committees, Audits, and Reviews

- The Nuclear and Radiation Safety Committee acceptably completed the review, oversight, and audit functions required by Technical Specification Section 6.4.

#### Procedures

- The procedural review, revision, and implementation program satisfied Technical Specification requirements.



#### Radiation Protection

- Surveys were being completed and documented as required.
- Postings met regulatory requirements.
- Personnel dosimetry was being worn and recorded doses were within the NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection Program satisfied regulatory requirements.
- The radiation protection training program was being administered as required.

#### Transportation

- No radioactive material shipments had been made under the auspices of the reactor license within the past year.

## **REPORT DETAILS**

### **Summary of Plant Status**

The licensee's nuclear science center reactor, licensed to operate at a maximum steady-state thermal power of two megawatts (2 MW), continues to be operated in support of operator training, surveillance, and utilization involving neutron activation analysis. During the inspection the reactor was operated at two megawatts for an operator licensing examination. The reactor was also operated on Tuesday and Thursday at full power to conduct sample irradiations.

### **1. Organization and Staffing**

#### **a. Inspection Scope (Inspection Procedure [IP] 69006)**

The inspector reviewed the following to verify compliance with the staffing requirements in Technical Specification (TS) Sections 6.1, 6.2 and 6.3:

- staff qualifications and management responsibilities
- staffing requirements for the safe operation of the reactor
- selected portions of the operations logbooks for the past twelve months
- Rhode Island Nuclear Science Center (RINSC) organizational structure and staffing
- Rhode Island Atomic Energy Commission (RIAEC) meeting minutes, dated November 6, 2006 and April 5, 2007
- RINSC Operating Procedures, Section 1, "General Considerations," original version - not revised to date
- RINSC Annual Report for July 1, 2005 through June 30, 2006
- TS for the RINSC, Amendment No. 29, dated December 28, 2004

#### **b. Observations and Findings**

The organizational structure and functions of the RINSC had not functionally changed since the last inspection (refer to NRC Inspection Report No. 50-193/2006-204). The licensee's current operational organization and assignment of responsibilities, as reported in the latest Annual Report, were consistent with those specified in the TS Sections 6.1, 6.2 and 6.3. All positions were filled with qualified personnel and a review of the applicable records verified that staffing was as required by TS Section 6.1 and the licensee's procedures. There have been no changes in the staffing since the last inspection. The inspector noted that the staffing at the facility was acceptable to support the ongoing activities. During the inspection, the NRC conducted a licensing examination for one Senior Reactor Operator and one Reactor Operator. A separate report will be sent to the licensee and the candidates summarizing the results of the examination.

#### **c. Conclusions**

The licensee's organization and staffing and assignment of responsibilities remained in compliance with the requirements specified in TS Section 6.

## 2. Effluent and Environmental Monitoring

### a. Inspection Scope (IP 69004)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Sections 3.7.2, 4.7, and 6.8.4:

- the licensee's environmental monitoring program
- counting and analysis records associated with airborne releases
- Completed Stack Monitor Air Particulate Detector Efficiency Check Forms, dated July 27 and October 13, 2006
- Completed Stack Monitor Channel Test Forms, dated July 27 and October 13, 2006
- Completed RINSC Forms NSC-13, "Stack Gas Monitor - Argon-41 Calibration Factor Calculation Form," dated July 31 and October 17, 2006
- Radioassay Report of RINSC Retention Tank Water Prior to Sewer Discharge, RINSC Form NSC-09, dated September 19, 2006
- Completed RINSC Forms NSC-3d, "Weekly Gross Radioactivity Record for Primary Water," dated from January 4, 2006 to present
- Quarterly isotopic analyses of primary coolant water samples, dated from January 4, 2006 to present
- Weekly isotopic analyses of secondary coolant water samples, dated from January 4, 2006 to present
- Monthly environmental dosimetry records for January 1, 2006 to present
- Comply calculations for gaseous effluents for the period July 1, 2005 to June 30, 2006, dated October 24, 2006
- RINSC Radiation Safety Office SOP 201, "External Monitoring," Revision (Rev.) 0, dated March 23, 2000
- RINSC Annual Report for July 1, 2005 through June 30, 2006

### b. Observations and Findings

The licensee ensures compliance with NRC regulations for environmental monitoring by ensuring that all doses at the site boundary are less than the dose limits specified in 10 CFR 20.1301. Several Optically Stimulated Luminescence Dosimeter (OSLD) badges are strategically placed in several locations around the perimeter of the reactor bay and outside of the building. Records for 2006 indicate radiation exposures that are below the applicable requirements. The licensee also monitored primary and secondary coolant radioactivity levels on a weekly basis. No abnormal readings were discovered. The inspector also reviewed the licensee's records for disposal of liquid radioactive waste. One disposal of 600 gallons of liquid waste was disposed of to the sanitary sewer system. The inspector verified that the monitoring of the disposal was conducted in accordance with the applicable requirements.

To demonstrate compliance with the annual dose constraints of 10 CFR 20.1101(d), the licensee calculated the amount of Argon-41 produced by experiments and the operation of the reactor through measurement of gaseous exhaust. The results indicated that the releases were well within 10 CFR Part 20 Appendix B, Table 2

concentrations, and TS limits. The highest dose calculated that could be received as a result of gaseous emissions from reactor operations was less than 2.0 millirem (mrem) per year. These doses were well below the limit set in 10 CFR 20.1101(d) of 10 mrem per year. The licensee has stated that the levels measured outside of the facility are within the regulatory requirements.

c. Conclusions

Effluent monitoring satisfied license and regulatory requirements and releases were within the regulatory limits.

**3. Experiments**

a. Inspection Scope (IP 69005)

The inspector reviewed selected aspects of the following in order to verify that experiments were being conducted consistent with TS Sections 3.1, 3.8 and 4.8:

- potential hazards identification
- experimental administrative controls and precautions
- RINSC Operations Log Books No. 54, dated from December 6, 2005 to present
- Nuclear and Radiation Safety Committee (NRSC) meeting minutes dated October 30 and December 14, 2006
- NRSC Draft meeting minutes dated March 8, 2007
- NRSC Charter, Rev. 0, dated November 14, 2005
- RINSC Operating Procedures, Section 1, "General Considerations," original version - not revised to date
- RINSC Operating Procedures, Section 8, "Operations at Power and Adjustments in Power Level," latest revision dated January 26, 1995
- RINSC Operating Procedures, Section 12, "Use of Pneumatic Irradiation Facilities," original version, - not revised to date
- RINSC Operating Procedures, Appendix P, "Incore Irradiations," Rev. 0, dated August 2, 2006
- Form NSC-7a, "Neutron Irradiation Request Form - Short Irradiation," latest revision dated September 1994
- Form NSC-7b, "Pneumatic System Long Irradiation Request Form," latest revision dated September 1994
- Form NSC-8, "Gamma Irradiation Request Form," latest revision dated February 1994
- Form NSC-11, "Shift Record Data Sheet," Rev. 2, dated March 28, 2003 - associated with RINSC Operating Procedures, Section 8
- Form NSC-18, "RINSC Reactor Operations Data," Rev. 0, dated March 28, 2003 - associated with RINSC Operating Procedures, Section 8
- Form NSC-70, "RINSC Irradiation Sample Tracking Summary Form," latest revision dated September 1994
- Completed Forms NSC-7a, "Neutron Irradiation Request Form [1-15 minute irradiations]," Rev. 0, dated from December 5, 2006 to present

- Completed Form NSC-73, "RINSC Facility Use Request Form - Proposal entitled, 'Sterilization of Sediments with Gamma Irradiation'," dated June 15, 2006
- RINSC Annual Report for July 1, 2005 through June 30, 2006

b. Observations and Findings

One of the experiments routinely conducted at the RINSC is the irradiation of various materials for the purpose of neutron activation analysis. The most frequently used experimental facilities are the pneumatic irradiation facility and the in-core devices. Samples that have been irradiated at RINSC include materials such as biological tissues, geological samples, and various other materials. The SRO and HP approves all routine samples to be irradiated in accordance with the TS limitations for each sample to be irradiated in the core. No new experiments had been initiated, reviewed, or approved since the previous inspection at the facility. If any new experiments were to be initiated, they would be reviewed and approved by the NRSC. The inspector confirmed that most of the experiments conducted were in accordance with TS limits and procedural requirements. The inspector also verified that all of the experiment authorizations were reviewed on an annual basis.

While conducting a review of the experiment sample irradiations conducted using the pneumatic irradiation facility, the inspector noted that the review and approval forms for several experiment samples could not be located. The licensee's procedure for reviewing and approving experiment samples is documented on form NSC-7a. The purpose of this particular experiment was to provide a proof of principle. These irradiations were conducted under the experiment authorization for general irradiations. A total of four samples of geological material were irradiated in the reactor on January 30, 2007, at a power level of 2 MW. The licensee noted that the TS requirements for experiment conditions were met although the inspector could not find any record indicating that a review and approval was completed before the samples were irradiated. Some mitigating factors in the safety significance of this issue include the mass of materials was much lower than what would normally be used in an experimental sample, and this event was an isolated incident of which the inspector did not note any other similar instances during this inspection.

TS 4.8 states, "Experiments shall be reviewed, approved, and properly installed and operational in accordance with written operating procedures." RINSC Operating Procedure 12 §12.1 states, "The authorization is provided by the Assistant Director before the irradiations begin when he signs the irradiation request form." Contrary to this requirement, the licensee irradiated four experiment samples without properly completing the record of experiment review and approval in accordance with the written operating procedure. The inspector communicated to the licensee the importance of following the established procedures for review and approval of an experiment. The licensee was informed that failure to review and approve experiments in accordance with written operating procedures was an apparent violation (VIO) of TS 4.8 (VIO 50-193/2007-201-01).

The inspector observed the licensee conduct operations for an experiment utilizing the pneumatic irradiation facility on April 24, 2007. All of the procedures required for loading and extracting the samples were strictly followed and the personnel

conducting the operation did so in a safe and knowledgeable manner. The inspector verified that all of the checks conducted were in compliance with TS required values and parameters.

c. Conclusions

The approval and control of experiments generally met TS and applicable regulatory requirements. One violation was noted for failure to properly review and approve experiment samples in accordance with written operating procedures.

**4. Design Changes**

a. Inspection Scope (IP 69007)

In order to verify that any modifications to the facility were consistent with 10 CFR 50.59, the inspector reviewed selected aspects of:

- facility configuration documents
- proposed facility design changes for the past two years
- NRSC meeting minutes dated October 30 and December 14, 2006
- NRSC Draft meeting minutes dated March 8, 2007
- safety reviews and audits conducted by the committees and noted in the respective committee and subcommittee meetings minutes
- NRSC Charter, Rev. 0, dated November 14, 2005
- RINSC Operating Procedures, Section 1, "General Considerations," original version - not revised to date
- RINSC Annual Report for July 1, 2005 through June 30, 2006

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that no significant changes requiring prior NRC approval had been completed at the facility since the last inspection. The inspector verified that administrative controls were in place that required the appropriate review and approval of all changes prior to implementation. The Assistant Director for Reactor Operations and the Reactor Supervisor normally determine whether change authorizations need to be reviewed by the NRSC based on the complexity of the project and the relation to the safety of the reactor. Letters describing facility changes are completed to inform operations personnel of operating information and to document RINSC activities which are not recorded in the operating log book. The inspector noted that 10 CFR 50.59 reviews and approvals conducted by the NRSC were focused on safety and met the applicable TS and procedural requirements.

c. Conclusions

Based on the records reviewed, the inspector determined that the licensee's design change program was being implemented as required.

## 5. Committees, Audits, and Reviews

### a. Inspection Scope (IP 69007)

In order to verify that the licensee had established and conducted reviews and audits as required in TS Section 6.4 the inspector reviewed selected aspects of:

- Radiation Safety Records Review Form
- NRSC meeting minutes dated October 30 and December 14, 2006
- NRSC draft meeting minutes dated March 8, 2007
- safety reviews and audits conducted by the committees and noted in the respective committee and subcommittee meetings minutes
- NRSC Charter, Rev. 0, dated November 14, 2005
- RINSC Operating Procedures, Section 1, "General Considerations," original version - not revised to date
- RINSC Annual Report for July 1, 2005 through June 30, 2006

### b. Observations and Findings

The licensee has established the NRSC to review operations to assure that the facility is operated in a manner consistent with public safety and within the terms of the facility license as required by TS 6.4.1. A charter is established in licensee procedures for the NRSC and the inspector verified that the NRSC is following all aspects of the charter. The NRSC had meetings more frequently than required and a quorum was always present as required. Review of the minutes indicated the NRSC provided guidance, direction and oversight, and ensured suitable use of the reactor. The minutes provided an acceptable record of appropriate review functions and safety oversight of reactor operations.

The inspector noted that the NRSC charter had been revised to change the voting eligibility of several committee members. The change removed the voting privileges from all of the RINSC staff on the NRSC, including the Director, Assistant Director, and Radiation Safety Officer. TS 6.4.4 states, "A quorum of the NRSC shall consist of not less than four (4) members and shall include the Radiation Safety Officer or designee, the Director or the Assistant Director for Operations and the Chairman or designee." The inspector noted that if all of the RINSC staff members did not have voting privileges, it is possible for the chairman or designee to be the only voting member during a committee meeting. ANSI/ANS-15.1-1990, "The Development of Technical Specifications for Research Reactors," states, "there shall be a minimum of three persons for review." The inspector communicated to the licensee the need for a reliable and effective oversight committee with at least three voting members. The licensee committed to fix the NRSC written charter before the next inspection to require three NRSC voting members to be present for a NRSC meeting quorum. This issue will be considered by the NRC as an Inspection Follow-up Item (IFI) and will be reviewed during the next inspection at the facility (IFI 50-193/2007-201-02).

Audits required by TS Sections 6.2.4 and 6.2.5 were performed by NRSC members and met the applicable requirements. The audits appeared to be acceptable. The

inspector noted that the safety reviews and audits, and the associated findings, were acceptably detailed and that the RINSC staff were supportive of the audits. During review of the audits, the inspector noted that the licensee immediately corrected any minor issues. The audits did not identify any issues related to the safe operation of the RINSC.

c. Conclusions

The NRSC acceptably completed the review, oversight, and audit functions required by TS Section 6.4.

**6. Procedures**

a. Inspection Scope (IP 69008)

To verify that facility procedures were being reviewed, revised, and implemented as required by TS Section 6.5, the inspector reviewed selected aspects of:

- NRSC meeting minutes dated October 30 and December 14, 2006
- NRSC draft meeting minutes dated March 8, 2007
- NRSC Charter, Rev. 0, dated November 14, 2005
- RINSC Operating Procedures, Section 1, "General Considerations," original version - not revised to date
- RINSC Operating Procedures, Appendix Y, "Facility Access for Visitors," latest revision dated August 2, 2006
- RINSC Radiation Safety Office SOP 100, "Standard Operating Procedures," Rev. 0, dated March 23, 2000
- RINSC Annual Report for July 1, 2005 through June 30, 2006

b. Observations and Findings

Procedures had been formulated for the safe, routine operation of the reactor. Records showed that procedures for potential malfunctions (e.g., radioactive releases and contaminations, and abnormal events) had also been developed and were available to be implemented as required. The inspector noted that procedural changes were being reviewed and approved by the NRSC as required by TS. Training of personnel on procedures and changes was acceptable. Through observation of various activities at the facility, including reactor operation and sample handling, the inspector determined that licensee personnel conducted activities in accordance with applicable procedures. The inspector observed the completion of a reactor start-up, routine operation, and shut-down. It was noted that the required checks, verifications, and actions were completed in accordance with the applicable procedure.

c. Conclusions

The procedural review, revision, and implementation program satisfied TS requirements.



## 7. Radiation Protection Program

### a. Inspection Scope (IP 69012)

The inspector reviewed the following to verify compliance with 10 CFR Parts 19 and 20, and the requirements outlined in TS Table 3.2 and Sections 3.7, 4.2, and 4.7:

- radiological signs and posting in various areas of the facility
- facility and equipment during tours
- organization and staffing
- radiation protection training records
- instrument calibration records
- RINSC Radiation Safety Office SOP 101, "Radiation Safety Training," Rev. 0, dated March 23, 2000
- RINSC Radiation Safety Office SOP 110, "Radiation Protection Audits," Rev. 0, dated March 23, 2000
- RINSC Radiation Safety Office SOP 201, "External Monitoring," Rev. 0, dated March 23, 2000
- RINSC Radiation Safety Office SOP 202, "Bioassay," Rev. 0, dated March 23, 2000
- RINSC Radiation Safety Office SOP 203, "Determining TEDE and TODE," Rev. 0, dated March 23, 2000
- RINSC Radiation Safety Office SOP 204, "Skin Exposures," Rev. 1, dated April 29, 2002
- RINSC Radiation Safety Office SOP 220, "Pocket Dosimeter Calibration," Rev. 0, dated March 28, 2003
- RINSC Radiation Safety Office SOP 300, "Routine Surveys," Rev. 1, dated February 10, 2004
- RINSC Radiation Safety Office SOP 801, "Instrument Calibration," Rev. 0, dated November 6, 2000
- RINSC Radiation Safety Office SOP 802, "Pocket Dosimeter Calibration," Rev. 0, dated November 6, 2000
- facility weekly, monthly, quarterly, and other periodic contamination and area radiation surveys from 2006 to present
- Quarterly dosimetry records for staff and researchers for January 1, 2006 to present
- Survey Program Summary Data for January 1, 2006 to present
- RINSC Visitor Dosimetry Logbook
- calibration records for the Area Radiation Monitors, the Continuous Air Monitor (CAM), and the Water Monitor from 2004 to present
- RINSC Survey Instrument Calibration Reports, dated from January 1, 2006 to present
- Completed RINSC Forms NSC-12, "Reactor Main Floor Particulate Air Monitor Panel Meter Channel Test," dated July 28 and October 17, 2006
- Completed Main Floor Air Particulate Monitor Detector Calibration Forms, dated July 27 and October 17, 2006
- RINSC Radiation Protection Special Audit, dated January 29-31, 2007
- Rhode Island Nuclear Science Center Radiation Safety Guide (RSG), Rev. 0

b. Observations and Findings

(1) Surveys

The inspector reviewed weekly radiation and contamination surveys of the reactor building, which were conducted by radiation safety personnel. The results were documented on the appropriate forms, evaluated as required, and corrective actions taken when readings or results exceeded set action levels. The number and location of survey points was adequate to characterize the radiological conditions. Surveys by the radiation safety personnel were conducted in accordance with the appropriate procedure and logged on the appropriate forms. The licensee has a tracking program for ensuring the surveys are completed in the appropriate time frame. The inspector verified that the Radiation Safety Officer (RSO) reviews all of the survey records. No abnormal readings were discovered.

(2) Postings and Notices

The inspector reviewed the postings required by 10 CFR Part 19 at the entrances to various controlled areas including the Reactor Bay, and radioactive material storage areas. The postings were acceptable and indicated the radiation and contamination hazards present. The facility's radioactive material storage areas were found to be properly posted. No unmarked radioactive material was found in the facility.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation Program-accredited vendor to process personnel dosimetry. Through direct observation, the inspector determined that dosimetry was used in an acceptable manner by facility personnel. For visitors to the facility, a direct read pocket dosimeter is issued to individuals for general tours. Records indicate that no abnormal readings were obtained.

An examination of the records for the inspection period showed that all exposures were well within NRC limits and within licensee action levels. All of the staff and researchers associated with the facility wear OSLD badges and minimal doses were recorded for 2006 through present. The licensee investigates any dosimetry readings that indicate a monthly exposure above typical levels for a reactor staff member. The as low as reasonably achievable (ALARA) goal specified in the RSG is to keep deep dose exposures to less than 500 mrem per year and the licensee consistently meets this goal.

(4) Radiation Monitoring Equipment

The calibration of portable survey meters and friskers was completed by radiation safety personnel at the calibration lab while fixed radiation detectors, the CAM and stack monitor were calibrated at the detector location. The calibration records of portable survey meters, friskers, fixed radiation detectors, and air

monitoring equipment in use at the facility were reviewed. Calibration frequency met the requirements established in the applicable procedures while records were being maintained as required. These systems had been calibrated semi-annually as required by procedure. The daily set point verifications for the monitoring equipment were completed as required. CAM filters were changed and analyzed monthly as required. No activity above the lower limit of detection was detected on the air filters. The inspector reviewed the licensee's tracking system for ensuring the instrument calibrations are completed on time and found it to be useful.

During the inspection, the inspector visited the calibration range located in the basement of the laboratory building. The radiation safety personnel described the equipment in the facility for the inspector. The calibration records reviewed were thorough and were completed using the appropriate techniques and according to procedure. The inspector observed that proper precautions are always used to maintain doses ALARA.

(5) Radiation Protection Program

The licensee's RSG provides the licensee's policy on the safe use of radioactive materials around the reactor facility. The ALARA program provides guidance for keeping doses as low as reasonably achievable and is consistent with the guidance in 10 CFR Part 20. The inspector verified that the radiation protection program was being reviewed annually as required by 10 CFR 20.1101(c). No safety related issues were identified in the review of the program. The NRSC reviews radiation protection documents during the NRSC meetings, and the RSO has provided an additional audit of the overall implementation of the Radiation Protection Program.

The RSG requires that all personnel who work with radioactive materials receive training in radiation protection, policies, procedures, requirements, at the facilities prior to having unescorted access at the facility. The radiation safety personnel is responsible for conducting the training and all of the training is typically conducted with the RSO. A test is administered at the end of the training to verify that the individuals understood the material presented. The training covered the topics required to be taught in 10 CFR Part 19 and the review of training materials and tests indicated that the staff was instructed on the appropriate subjects.

(6) Facility Tour

The inspector toured the reactor facility, the radiation detector calibration room and accompanying facilities. Control of radioactive material and control of access to radiation and high radiation areas were observed to be acceptable. The postings and signs for these areas were appropriate. Licensee personnel followed the indicated precautions for access to controlled areas.

c. Conclusions

The inspector determined that: (1) surveys were being completed and documented as required, (2) postings met regulatory requirements (3) personnel dosimetry was being worn and recorded doses were within the NRC's regulatory limits, (4) radiation monitoring equipment was being maintained and calibrated as required, (5) the radiation protection program satisfied regulatory requirements, and 6) the radiation protection training program was being administered as required.

**8. Transportation Activities**

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed radioactive material, the inspector reviewed the following:

- selected records of various types of radioactive material shipments
- RINSC Radiation Safety Office SOP 501, "Radioactive Waste Packaging," Rev. 0, dated November 6, 2000
- RINSC Radiation Safety Office SOP 512, "BioPAL Wastes," Rev. 1, dated March 26, 2004

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector determined that the licensee had not shipped any radioactive material since the previous inspection in this area.

c. Conclusions

No radioactive material shipments had been made under the auspices of the reactor license during the past year.

**9. Exit Interview**

The inspector presented the inspection results to licensee management at the conclusion of the inspection on April 26, 2007. The inspector described the areas inspected and discussed in detail the inspection observations. No dissenting comments were received from the licensee. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee Personnel**

H. Bicehouse, Radiation Safety Officer and Assistant Director for Reactor Safety  
J. Davis, Reactor Supervisor  
M. Damato, Health Physics Technician and Reactor Operator Trainee  
D. Johnson, Health Physicist  
B. MacGregor, Reactor Operator and Facility Engineer  
M. Middleton, Assistant Director for Reactor Operations  
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 Reactor Experiments
IP 69006	Class 1 Research and Test Reactors Organization, Operations, and Maintenance Activities
IP 69007	Class 1 Research and Test Reactor Review and Audit and Design Change Functions
IP 69008	Class 1 Research and Test Reactor Procedures
IP 69012	Class 1 Research and Test Reactors Radiation Protection
IP 86740	Transportation Activities

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

50-193/2007-201-01	VIO	Failure to review and approve experiments in accordance with written operating procedures
50-193/2007-201-02	IFI	Follow-up to verify the licensee changes the NRSC written charter to require three outside voting members to be present for a NRSC meeting quorum

### **Closed**

None

## **LIST OF ACRONYMS USED**

ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Reasonably Achievable
CAM	Continuous Air Monitor
CFR	Code of Federal Regulations
IFI	Inspection Follow-up Item
IP	Inspection Procedure
mrem	millirem
MW	Megawatt
NRC	Nuclear Regulatory Commission
NRSC	Nuclear and Radiation Safety Committee

Rev.	Revision
RIAEC	Rhode Island Atomic Energy Commission
RINSC	Rhode Island Nuclear Science Center
RSG	Radiation Safety Guide
RSO	Radiation Safety Officer
TS	Technical Specifications
VIO	Violation