June 17, 2011

Dr. Robert Dimeo, Director
NIST Center for Neutron Research
National Institute of Standards and Technology
U.S. Department of Commerce
100 Bureau Drive, Mail Stop 8561
Gaithersburg, MD 20899-8561

SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY - NRC ROUTINE INSPECTION REPORT NO. 50-184/2011-201

Dear Dr. Dimeo:

On May 23-26, 2011, the U. S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection at the National Institute of Standards and Technology Center for Neutron Research facility. The inspection included a review of activities authorized for your facility. The enclosed report documents the inspection results, which were discussed on May 26, 2011, with you and members of your staff.

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 and with the conditions of your license. The inspector reviewed selected procedures and representative records, interviewed personnel, and observed activities in progress. Based on the results of this inspection, 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, and 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 (the Public Electronic Reading Room) http://www.nrc.gov/reading-rm/adams.html.

Should 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/

Johnny H. Eads, Jr., Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-184
License No. TR-5

Enclosure: NRC Inspection Report No. 50-184/2011-201
cc w/encl: See next page

cc:

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Dr. Sean O'Kelly, Chief Reactor Operations
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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	6/1/2011	6/14/2011	6/17/2011

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

Docket No:	50-184
License No:	TR-5
Report No:	50-184/2011-201
Licensee:	National Institute of Standards and Technology
Facility:	National Bureau of Standards Reactor
Location:	Gaithersburg, MD
Dates:	May 23 -26, 2011
Inspector:	Craig Bassett
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

National Institute of Standards and Technology
National Bureau of Standards Reactor
NRC Inspection Report No. 50-184/2011-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the National Institute of Standards and Technology (NIST, the licensee's) Class I twenty megawatt test reactor facility safety program including: 1) organization and staffing, 2) review and audit and design change function; 3) procedures, 4) radiation protection, 5) environmental monitoring; and 6) transportation of radioactive material since the last NRC inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety, and in compliance with U.S. Nuclear Regulatory Commission (NRC) requirements. No violations or deviations were identified.

Organizational Functions and Staffing

- The organizational structure was consistent with Technical Specifications Sections 6.1 and 6.3 requirements.

- Current Health Physics staffing, with possible augmentation from the NIST campus Radiation Protection division during the outage, was adequate for the current level of operations.

Review and Audit and Design Change Functions

- The Safety Evaluation Committee was meeting as required and reviewing the topics outlined in the Technical Specifications.

- The Safety Audit Committee was conducting annual audits as required.

- The design change program being implemented at the facility satisfied NRC requirements.

Procedures

- The procedure revision, control, and implementation program satisfied Technical Specification requirements.

Radiation Protection

- Surveys were being completed and documented as needed.

- Postings met the regulatory requirements specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 19 and 10CFR Part 20.

- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.

- Radiation monitoring equipment was being maintained and calibrated as required.

- Radiation Work Permits were generated as needed to provide guidance and precautionary requirements for on-going and emergent work at the facility.

- The radiation protection training program being implemented by the licensee satisfied regulatory requirements.

Environmental Protection Program

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

Transportation of Radioactive Materials

- The program for transportation of radioactive materials satisfied U.S. Department of Transportation and NRC requirements.

REPORT DETAILS

Summary of Facility Status

The National Institute of Standards and Technology (NIST, the licensee) Center for Neutron Research (NCNR) reactor, a 20-megawatt test reactor commonly known as the National Bureau of Standards Reactor (NBSR), was typically operated in support of laboratory experiments and various types of research. However, during the inspection, the reactor was not operated because it was shut down for extensive modifications to a variety of systems.

1. Organizational Functions and Staffing

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

To verify that the licensee was complying with the requirements specified in Sections 6.1 and 6.3 of the NBSR Technical Specifications (TS), designated as Appendix A of the NIST Test Reactor (NBSR) renewed Facility Operating License, TR-5, dated July 2, 2009, the inspector reviewed selected aspects of the following:

- Current NBSR organization and staffing
- Management and staff responsibilities outlined in the TS
- NBSR Administrative Rules (AR) 1.0, "Responsibilities of Operations Personnel," issued July 30, 2009
- NBSR AR 2.0, "Personnel Requirements," issued July 30, 2009

b. Observations and Findings

The inspector noted that the organizational structure had not changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report No. 50-184/2010-202). The NIST Reactor Health Physics (HP) Group was responsible to support the licensee in the implementation of the radiation protection and as low as reasonably achievable (ALARA) program at the reactor using the guidelines of the American National Standard for Radiation Protection at Research Reactor Facilities, American Nuclear Standards Institute/American Nuclear Society (ANSI/ANS) 15.11-2004. The NIST Reactor HP Group leader reported to the Director, NIST Center for Neutron Research for radiological matters concerning the NBSR.

The Reactor HP Group was staffed with a Group Leader, five Health Physicists, and five HP technicians. The Group Leader was a Senior Health Physicist. At the time of the inspection, all HP and technician positions at the facility were filled. Because the facility was in an extended outage, the inspector asked the licensee about periods of time when additional HP coverage might be needed because of the amount of ongoing work or when radiologically challenging tasks were in progress. The licensee indicated that arrangements had been made with the NIST campus Radiation Safety Officer (RSO) to reassign HP personnel from other areas at NIST to the NCNR on a short term basis as needed. The organizational structure was in accordance with the requirements of the TS and staffing appeared to be adequate for the current level of operations.

c. Conclusion

The organizational structure was consistent with TS Sections 6.1 and 6.3 requirements. The HP Group staffing, with possible augmentation from the NIST campus Radiation Protection division during the outage, was adequate for the current level of operations.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

The inspector reviewed the following to ensure that the requirements of TS Sections 6.2, "Review and Audit," and Title 10 of *Code of Federal Regulations* (10 CFR) Section 50.59, were being implemented effectively:

- Safety Evaluation Committee meeting minutes for April 2010 through the present (Meeting Numbers 369 through 371)
- NBSR Procedure Number (No.) NBSR-0007-DOC-04, "Engineering Manual," Rev. 4 dated June 2009, which included:
  - NBSR Procedure No. NCNR-1000-DOC-00, "Engineering Change Control for NBSR Reactor Operations and Engineering, NCNR," dated July 10, 2007
  - NBSR Procedure No. NBSR-0001-DOC-03, "NBSR Reactor Engineering Document Control Plan," Rev. 3 dated May 11, 2009
  - NBSR Procedure No. NBSR-0002-DOC-02, "Quality Assurance Program for Modifications to the NBSR Reactor and NCNR Facility," Rev. 2 dated August 27, 2007
  - NBSR Procedure No. NBSR-0003-DOC-05, "Guidelines for Completing Engineering Change Notices," Rev. 5 dated May 7, 2010
- 2010 Reactor Audit in Accordance with TS 6.2.4(1-4), conducted by the NCNR Audit Subcommittee of the NCNR Safety Evaluation Committee, dated September 22, 2010
- 2010 Audit Report for the Annual Safety Assessment Committee (SAC), Report No. 6668-RP-002, Revision B, prepared for the National Institute of Standards and Technology, dated October 28, 2010
- Annual Review of the Reactor Radiation Protection Program completed by the Group Leader, Reactor Facilities Group, for 2009, dated November 9, 2010
- NCNR Reactor Safety Evaluation Committee (SEC) Charter, approval dated July 2, 2010
- Safety Assessment Committee (SAC) Charter, approval dated August 2010
- NBSR Engineering Change Request (ECR) No. 559, "NBSR Thermal Shield Cooling System Upgrades: Moving Coolant by Vacuum," Level II review, approval dated April 28, 2009

- NBSR Engineering Change Notice (ECN) No. 559, "NBSR Thermal Shield Cooling System Upgrades: Moving Coolant by Vacuum," Major ECN – Level II review, NCNR Director approval dated December 8, 2010
- NBSR ECR No. 583, "Pool Coating," Level I review, approval dated April 22, 2010
- NBSR ECN No. 583, "Pool Coating," Minor ECN – Level I review, approval dated March 18, 2011
- Operations Report No. 62, NBSR Annual Report for the period from January 1, 2009 through December 31, 2009, issued March 26, 2010
- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2010

b. Observations and Findings

(1) Review and Audits Functions

Records of the meetings held by the SEC from April 2010 through the date of the inspection were reviewed. The meeting minutes showed that meetings were held at least semiannually as required by the SEC Charter and reviews of proposed changes and experiments were conducted by the SEC or a designated subcommittee. The minutes also indicated that the SEC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor.

Other records reviewed by the inspector showed that an annual independent audit had been conducted by the Safety Assessment Committee (SAC) as required by TS Section 6.2. Upon completion, the audit reports were forwarded to the SEC. They provided a review of NBSR operations and the performance of the SEC as outlined in the TS. The SAC made various comments and recommendations which were reviewed by the licensee and actions taken as necessary.

It was noted that the facility Radiation Protection Program was being reviewed annually as required by 10 CFR 20.1101(c).

(2) Design Change Functions

The inspector met with the Quality Assurance Engineer who managed the engineering change process. It was noted that none of the current change requests involved radiation protection systems. During a previous inspection, the inspector reviewed selected requests for changes to the facility and/or equipment that had been proposed. The changes were acceptably documented and reviewed in accordance with the TS and the licensee's guidelines and the work conucted as a result was generally being completed as stipulated.

c. Conclusion

The SEC was meeting as required and reviewing the topics outlined in the TS and an annual audit was being conducted as required. The design change program was being implemented by the licensee in accordance with NRC requirements.

3. Procedures

a. Inspection Scope (IP 69008)

The inspector reviewed the following to ensure that the requirements of TS Section 6.4 were being met concerning written procedures for radiation protection:

- Procedure revision, review, and approval process
- NBSR AR 5.0, "Procedures and Manuals," issued June 5, 2010
- SEC meeting minutes for April 2010 through the present
- Health Physics Instruction (HPI) 1-0, "Health Physics Policies," dated March 2001
- HPI 1-2, "Health Physics Skills, Duties, and Audits," dated March 2001
- HPI 3-2, "Radiation Work Permit," dated March 2001
- HPI 3-3, "Reactor Survey Operations," dated March 2001
- HPI 3-8, "Contaminated Materials at NBSR," dated March 2001
- HPI 4-9, "Transfer of Exempt Quantities," dated June 2004
- Health Physics Procedure for the NBSR (HPP), HPP 1.1-1.8, "General Health Physics Procedures: Introduction," date issued May 1, 2008
- Operations Report No. 62, NBSR Annual Report for the period from January 1, 2009 through December 31, 2009, issued March 26, 2010
- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2010

b. Observations and Findings

The inspector noted that two sets of procedures were used by the Reactor HP Group at NCNR. One set consisted of HPIs which were general guidance documents developed by the NIST Office of Safety, Health, and Environment (SH&E) Division to implement the radiation safety program for the entire NIST campus. Certain HPIs were written specifically for monitoring reactor operations. When these procedures needed to be revised, the revisions were reviewed and approved by the Radiation Protection Officer of NIST and by the two Senior Health Physicists who headed the Laboratory HP Group and the Reactor HP Group. While some of the HPIs had been updated more recently, most were generally issued in the 1993-1996 timeframe.

The second set of procedures was the HPPs for the NBSR issued by the Reactor Operations Group. These procedures applied only to the NCNR and the work conducted there. Changes to these procedures were required to be reviewed by

the SEC and approved in writing by the Chief, Reactor Operations or his Deputy. It was noted that the last major revision to these procedures was issued May 1, 2008.

The inspector determined that the licensee's written procedures and instructions concerning radiation and radioactive contamination control activities were being reviewed and revised as needed. As noted above, new NBSR HP procedures and major changes were required to be reviewed and approved by the SEC. No major changes had been proposed since the last inspection.

c. Conclusion

Licensee HP procedure changes were being reviewed and approved as required.

4. Radiation Protection

a. Inspection Scope (IP 69012)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Part 20, TS Sections 3.7 and 4.7, and procedural requirements:

- Copies of current active Radiation Work Permits (for 2011)
- Selected HP survey records documented on "Duty HP Weekly Data Summary" sheets and "Swipe Survey" analysis results data sheets for 2011
- Quarterly Facility Reviews completed by Reactor HP staff members for 2010
- National Institute of Standards and Technology (NIST) Personal Dosimetry Summary records for facility personnel through December 2010
- Calibration and periodic check records for portable radiation monitoring instruments documented on "NIST HP Survey Instrument Calibration" forms
- ALARA Policy stated in various HPP and HPIs
- NBSR AR 10.0, "Health Physics Clearance for Work," issued July 15, 2004
- HPI 1-0, "Health Physics Policies," dated March 2001
- HPI 1-1, "Health Physics Action Levels," dated January 1994
- HPI 1-4, "Radiological Safety Training," dated December 1993
- HPI 1-7, "Personnel Decontamination," dated December 1993
- HPI 2-2, "Personnel Monitoring Issuance/Return," dated December 1993
- HPI 2-3, "External Dosimetry," dated December 1993
- HPI 2-5, "Internal Activity Monitoring and Dose Assessment," dated December 1993
- HPI 3-1, "Reactor Inplant Monitoring Summary," dated December 1993
- HPI 3-2, "Radiation Work Permit," dated March 2001
- HPI 3-3, "Reactor Survey Operations," dated March 2001
- HPI 3-8, "Contaminated Materials at NBSR," dated March 2001

- HPI 7-4, “Survey Instrument Calibration (beta/gamma)” dated October 1995
- HPI 7-4, “Survey Instrument Calibration (neutron)” dated January 1990
- HPP 1.1-1.5, “General Health Physics Procedures: Program Policy,” date issued May 1, 2008
- HPP 2.1-2.7, “General Health Physics Procedures: Radiological Exposure Controls,” date issued May 1, 2008
- HPP 3.1-3.3, “General Health Physics Procedures: Radiological Surveillance for NBSR Operations,” date issued May 1, 2008

The inspector also observed the use of dosimetry and radiation monitoring equipment during tours of the facility. In addition, the inspector observed coverage of work involving BT-9 modifications in the C-100 area.

b. Observations and Findings

(1) Surveys

The inspector reviewed the results of selected daily general area radiation surveys of work areas, weekly contamination surveys of controlled areas at the facility, and monthly general area radiation surveys of the interior uncontrolled areas and the area around the exterior of the NCNR for 2011. The surveys had been completed as stipulated by procedure and the results were documented on the appropriate forms. Areas found to be contaminated were decontaminated and then surveyed again to verify the contamination-free status.

Also during this inspection the inspector noted that exit frisking was completed by facility and contractor personnel using hand and shoe monitors or portal monitors. Frisking practices were acceptable.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas including the C-100 area, the basement area, and active work areas. The postings were acceptable and indicated the radiation hazards present. Other postings also showed the industrial hygiene hazards present in the areas. The facility’s radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was found in the facility. Copies of current notices to workers, required by 10 CFR Part 19, were posted in the main hallways of the facility near or above the racks where personnel dosimeters were stored.

(3) Dosimetry

The licensee’s thermoluminescent dosimeters (TLDs) were processed by the Navy as stipulated in a Memorandum of Understanding between NIST and the National Naval Medical Center Hospital in Bethesda, dated

December 1983. An examination of the TLD results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits. The records showed that, for 2010, approximately one-third of the monitored personnel received occupational exposures of zero and ninety-three percent of the monitored personnel received an exposure of less than 50 millirem. The highest annual whole body exposure received by a single individual for 2009 was 641 millirem (mr) deep dose equivalent (DDE). The highest annual extremity exposure for 2009 was 2,073 mr shallow dose equivalent (SDE) and the highest skin dose that year was 584 mr SDE. The highest annual whole body exposure received by a single individual for 2010 was 444 mr DDE. The highest annual extremity exposure for 2010 was 4,087 mr SDE and the highest skin dose was 350 mr SDE. In 2009, the highest whole body exposure was received by a person in the operations group. In 2010, the highest whole body exposure was received by a beam user. The highest extremity exposure in 2009 was received by pneumatic system rabbit user and the same was true in 2010.

Through direct observation of licensee staff and contractor personnel working at NCNR, the inspector determined that dosimetry was worn acceptably. And even though activities with significant radiation levels were conducted during the past two years, the overall exposure for NCNR staff and users remained relatively low. The exposures for the current, ongoing modification work at the facility are also low to date.

(4) Calibration of Radiation Monitoring Equipment

The calibration of portable survey meters was typically completed by NIST SH&E Division personnel. Calibration of fixed radiation detectors, air monitoring instruments, and other instrumentation associated with the reactor was completed by the Reactor Engineering Group. The calibration records of selected portable survey meters, friskers, and area radiation monitors (ARMs) in use at the facility were reviewed. The portable instruments were being calibrated semi-annually and records were being maintained as required. The ARMs were checked monthly and calibrated annually.

(5) Radiation Work Permit Program

The inspector reviewed current Radiation Work Permits (RWPs) that had been written and were in use during the inspection. There were various “standing” RWPs that remained in effect for the entire year due to the repetitive nature of the work they covered. Other RWPs were generated for the BT-9 modification work and for neutron guide shielding removal. It was noted that the controls specified in the RWPs were acceptable and applicable for the work being done. Also, the RWPs had been reviewed and approved as required.

(6) Radiation Protection Program

The Radiation Protection Program was established and described in various licensee documents including: 1) NIST Administrative Manual, Chapter 12, "Safety," Subchapter 12.03, "Ionizing Radiation Safety," with an effective date of September 17, 2010, 2) HPPs for the NBSR, latest revision dated May 1, 2008, 3) HPIs, the most recent revision dated June 2004, and 4) Good Work Practice Guides. These documents were revised as needed and were approved by the appropriate organizations. The inspector noted that the documents contained acceptable instructions concerning audits, safety, training, and personnel responsibilities. As noted above, the Radiation Protection Program was reviewed each year as required by 10 CFR 20.1101(c).

The ALARA Policy was also outlined and established in the aforementioned documents. The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

(7) Radiation Protection Training

The training program was set up so that authorized beam users, rabbit users, laboratory users, radioisotope users, and all radiation workers, including NIST staff, received radiation protection training. The inspector noted that individuals who required unescorted access to the research reactor facility and/or who worked with radioactive material completed a Radiation Safety Principles course or provided evidence that they had received such training at another facility. Refresher training was given every two years and completion thereof was tied to a person's facility access authorization which was also renewed biennially. The initial and refresher training was conducted by the Reactor HP Group and the program was determined to be acceptable. The inspector verified, through records review and licensee interviews, that facility employees, guest researchers, and emergency responders had received the required training at the required frequency.

(8) Facility Tours and Observation of Modifications at BT-9

The inspector observed work that was in progress during the inspection in the BT-9 area of C-100 or the Experimental Floor. The inspector also toured other areas including the C-200 area which included the Control Room, portions of the basement area including the new fuel and spent fuel storage areas, the Guide Hall, and other selected support laboratories and offices. Work control and control of radioactive material and access to radiation and high radiation areas was acceptable. As noted earlier, the postings and signs for these areas were appropriate.

c. Conclusion

The inspector determined that the Radiation Protection and ALARA Programs being implemented by the licensee satisfied regulatory requirements because: 1) surveys were being completed as stipulated; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were within the NRC's regulatory limits; 4) radiation monitoring equipment was being maintained and calibrated as required; and 5) radiation protection training was provided to facility employees and guests.

5. Environmental Protection Program

a. Inspection Scope (IP 69004)

The inspector reviewed selected aspects of the following to ensure that the requirements in 10 CFR Part 20 were being met and the calibrations and monitoring required in TS Sections 3.7 and 4.7 were being conducted:

- Gaseous Release Log
- Tritium release data sheets
- Argon-41 release data sheets
- Building 235 Environmental Survey sheets
- Licensee COMPLY Code calculations for 2009 and 2010
- NIST Environmental Sample Analysis Results for 2009 and 2010
- TLD results for Environmental Stations for 2009 through the date of the inspection
- Calibration records for stack monitors documented on the form "Building Exhaust High Activity Alarm (Normal Air)," RM - 3-5, dated April 4, 1991
- Calibration records for gas monitors documented on the form "Helium Sweep Gas Monitor," RM - 3-2, dated March 9, 1995
- Calibration records for Radiation Monitors documented on the form NBSR Instrument Test Procedure, IP RM 3-4, "Major Scram Radiation Monitors RM 3-4&5," dated October 11, 1989
- Calibration records for Radiation Monitors documented on the form NBSR Instrument Test Procedure, IP RM 3-5, "Major Scram Radiation Monitors RM 3-4&5," dated October 11, 1989
- Calibration records for Radiation Monitors documented on the form NBSR Instrument Test Procedure, IP RM 4-1, "Building Exhaust Stack Radiation Monitor," dated May 24, 2001
- HPI 8-1, "Liquid Radioeffluent Release," dated November 2000
- HPI 8-2, "Environmental Sampling," dated December 1993
- HPI 8-4, "Reactor Stack Monitoring," dated December 1993
- HPI 8-5, "Environmental Thermoluminescent Dosimetry," dated December 1993
- HPI 8-6, "Environs Radiation Surveys," dated December 1993
- Operations Report No. 62, NBSR Annual Report for the period from January 1, 2009 through December 31, 2009, issued March 26, 2010

- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2010

b. Observations and Findings

Environmental soil and vegetation samples were generally collected and prepared quarterly for analysis using standard techniques in accordance with HPI 8-2. The 2010 results of the analyses were acceptably documented and the results, which showed no significant changes when compared with the previous two years, were outlined in the licensee's Annual Report.

The inspector reviewed the records documenting liquid and airborne releases to the environment for the past two years. The inspector determined that liquid and gaseous releases continued to be calculated as required by procedure and were acceptably documented. Calculations using the COMPLY Code indicated an annual dose to members of the public of 0.7 mr for 2009 and 0.8 mr for 2010. The releases were determined to be within the annual dose constraints of 10 CFR 20.1101(d), 10 CFR 20.1301, and TS limits.

On-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor and various environmental TLDs in accordance with the applicable procedures. The data indicated that there were no measurable doses above any regulatory limits. These results were reported in the facility Annual Reports for 2009 and 2010. Through observation of the facility, the inspector found no new potential release paths.

The inspector reviewed the calibration records of the gas and stack monitoring systems. These systems had been calibrated annually according to procedure.

c. Conclusion

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

6. Shipment of Radioactive Material

a. Inspection Scope (IP 86740)

The inspector reviewed the following to verify compliance with procedural requirements for transferring licensed material:

- Spent fuel shipment records for 2009
- Radioactive material shipment records for 2009 and 2010
- NBSR AR 5.0, "Procedures and Manuals," issued June 5, 2010
- NBSR Procedure No. NBSR-0004-DOC-04, "NIST Packaging and Shipping Quality Assurance Program for 10 CFR 71 – Transport of Radioactive Materials," Rev. 4, dated June 30, 2008

- NBSR Procedure No. NBSR-0001-CL-02, "BWXT Shipments 2008/9 Checklist Items," Rev. 2, dated June 9, 2009
- HPI 4-2, "Receiving of Radioactive Material," dated December 1994
- HPI 4-9, "Transfer of Exempt Quantities," dated June 2004
- HPI 4-13, "Shipping Radioactive Material," dated March 1996
- HPI 8-3, "Disposal of Radioactive Waste," dated December 1993

The inspector also interviewed licensee personnel.

b. Observations and Findings

Records of shipments of radioactive material made during 2009 and 2010 were reviewed. Through this review and discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities of these materials were calculated and dose rates measured as required. The records also indicated that the shipping containers were appropriate and had been labeled as required. The radioactive material shipment records reviewed by the inspector generally had been completed in accordance with Department of Transportation (DOT) and NRC regulatory requirements.

The inspector verified that the licensee was maintaining copies of consignees' radioactive material possession licenses as required. The licensee also maintained on file the Certificates of Compliance pertaining to those shipping containers that were used to ship radioactive material as required. The inspector also verified that the licensee staff members assigned to complete the shipments were trained and that refresher training was being completed at least triennially as required.

c. Conclusion

The program for transportation of radioactive materials satisfied DOT and NRC requirements.

7. Exit Interview

The inspection scope and results were summarized on May 26, 2011, with members of licensee management. The inspector described the areas inspected and discussed the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

P. Brand	Chief, Reactor Engineering and Chair, Hazards Review Committee
D. Brown	Senior Health Physicist and Chair, Irradiation Subcommittee
R. Dimeo	Director, NIST Center for Neutron Research
D. Hughes	Deputy Chief, Reactor Operations
M. Middleton	Cryogenic General Engineer and Member, Audit Subcommittee
T. Myers	Chief, Reactor Operations
S. O'Kelly	Chief, Reactor Operations and Engineering
W. Schuster	Quality Assurance Program Manager and Member, Audit Subcommittee

INSPECTION PROCEDURES USED

IP 69004:	Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69006:	Class 1 Research and Test Reactors Organization, 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 Reactor Procedures
IP 69012:	Class 1 Research and Test Reactor Radiation Protection
IP 86740:	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
ADAMS	Agencywide Document Access Management System
AR	Administrative Rule
ARM	Area Radiation Monitor
CFR	*Code of Federal Regulations*
DOT	Department of Transportation
ECN	Engineering Change Notice
HP	Health Physics

HPI	Health Physics Instruction
HPP	Health Physics Procedure
IP	Inspection procedure
IR	Inspection Report
mr	millirem
MW	Megawatt
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
Nos.	Numbers
NRC	U.S. Nuclear Regulatory Commission
OI	Operating Instruction
Rev.	Revision
RWP	Radiation Work Permit
SAC	Safety Audit Committee
SEC	Safety Evaluation Committee
SH&E	Office of Safety, Health, and Environment (Division)
SHP	Senior Health Physicist
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications