May 29, 2013

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. 50-184/2013-201

Dear Dr. Dimeo:

From April 29–May 2, 2013, the U.S. Nuclear Regulatory Commission (NRC or 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 2, 2013, with you, the Chief of Reactor Operations, the Senior Health Physicist, and other 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, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. This violation is being treated as non-cited violation (NCV), consistent with Section 2.3.2 of the Enforcement Policy. This violation is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to: (1) the Director, Office of Nuclear Reactor Regulation, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and (2) the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

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/

Gregory T. Bowman, 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. 50-184/2013-201
cc w/encl: See next page

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University of Florida
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ACCESSION NO.: ML13133A298 *** concurrence via e-mail** **TEMPLATE #: NRC-002**

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DATE	5/10/13	5/29/13

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

Docket No:	50-184
License No:	TR-5
Report No:	50-184/2013-201
Licensee:	National Institute of Standards and Technology
Facility:	National Bureau of Standards Reactor
Location:	Gaithersburg, MD
Dates:	April 29–May 2, 2013
Inspector:	Craig Bassett
Approved by:	Gregory T. Bowman, 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. 50-184/2013-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the National Institute of Standards and Technology (the licensee's) Class I 20 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 U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety and was generally in compliance with NRC requirements. One Severity Level IV non-cited violation was identified.

Organizational Functions and Staffing

- The organizational structure was consistent with Technical Specifications 6.1 and 6.3.
- Health physics staffing 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) Parts 19 and 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.

- One Severity Level IV non-cited violation was identified associated with failure to provide periodic occupational dose information to workers as required by 10 CFR 19.13.

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's (NIST's or the licensee's) 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. During the inspection, the reactor was operated twenty four hours per day, seven days per week on a normal cycle.

1. Organizational Functions and Staffing

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

To verify that the licensee was complying with the requirements specified in Technical Specifications (TS) 6.1 and 6.3, designated as Appendix A of the NBSR renewed license, 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) 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 Number (No.) 50-184/2012-202). The NIST reactor health physics (HP) group was tasked with providing support for licensed operations and implementing the radiation protection and as low as reasonably achievable (ALARA) programs at the reactor. To accomplish this, the reactor HP group was 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 reactor HP group leader reported to the Director, NIST Center for Neutron Research, for radiological matters concerning the NBSR.

The reactor HP group was composed of a group leader and nine staff members. Six of these individuals, including the group leader, were health physicists; the other four were HP technicians. At the time of the inspection, it was noted that one person had transferred from the reactor HP group to another group at NIST. However, the reactor HP group leader was in the process of hiring another individual to fill that vacant position. The staffing level appeared to be appropriate and capable of providing adequate support and coverage for the current level of activity at the facility.

c. Conclusion

The organizational structure was consistent with TS 6.1 and 6.3 requirements. The reactor HP group staffing 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 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 (SEC) meeting minutes for March 2012 through the present (Meeting Numbers 373 through 375)
- NBSR Procedure No. NBSR-0007-DOC-04, "Engineering Manual," Revision (Rev.) 4, dated June 2009
- Health Physics Instruction (HPI) 1-0, "Health Physics Policies," dated March 2001
- Reactor Health Physics Procedure, HP-1.2, "ALARA and Program Review," issued December 21, 2011
- 2012 Reactor Audit in Accordance with TS 6.2.4(1-4), conducted by the Audit Subcommittee of the NCNR Safety Evaluation Committee, dated August 28, 2012, and the NCNR response, dated December 19, 2012
- 2012 Annual Report of the Safety Assessment Committee, which was comprised of, and conducted by, the International Atomic Energy Agency (IAEA) Operation and Maintenance Assessment of Research Reactors (OMARR) mission during the period from November 28 through December 4, 2012
- Annual Review of the Reactor Radiation Protection Program, completed by the Group Leader, Reactor Facilities Group, for 2012, dated November 26, 2012
- Quarterly Facility Audit Reports completed by HP staff members for 2012 and to date in 2013
- NBSR Engineering Change Request (ECR) No. 704, "Monitoring Tritium Monitor System," Level I review, approval dated December 1, 2011
- NBSR Engineering Change Notice (ECN) No. 704, "Monitoring Tritium Monitor System," Minor ECN – Level I review, approval dated December 1, 2011, and closed out October 10, 2012
- NBSR ECR No. 706, "Tritium Monitoring System Upgrade," Level I review, approval dated December 5, 2011
- NBSR ECN No. 706, "Tritium Monitoring System Upgrade," Minor ECN – Level I review, approval dated December 6, 2011, and closed out October 10, 2012
- NBSR ECR No. 707, "Secondary Cooling N-16 Radiation Monitors RM 3-1 and RM 3-3 Relocation," Level I review, approval dated December 6, 2011
- NBSR ECN No. 707, "Secondary Cooling N-16 Radiation Monitors RM 3-1 and RM 3-3 Relocation," Minor ECN – Level I review, approval dated

February 1, 2012, and closed out June 4, 2012
- Operations Report No. 64, "NBSR Annual Report," for the period from January 1, 2011, through December 31, 2011, issued March 28, 2012
- Operations Report No. 65, "NBSR Annual Report," for the period from January 1, 2012, through December 31, 2012, issued March 28, 2013

b. Observations and Findings

(1) Review and Audits Functions

Records of the meetings held by the SEC from March 2012 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 6.2. It was noted that, for the year 2012, the licensee had taken credit for an audit and review conducted by the IAEA OMARR mission during the period from November 28 through December 4, 2012. The inspector reviewed the OMARR audit and noted that the audit team provided an independent review of the NCNR reactor operations and the performance of the SEC as outlined in the TS. The SAC/OMARR made various comments and recommendations which were reviewed by the licensee. The licensee was considering what actions to take in response to the audit recommendations.

It was noted that the facility radiation protection program was being reviewed annually as required by 10 CFR 20.1101(c).

The inspector also reviewed quarterly audits of the facility completed by HP staff members. The audits included observations of plant conditions, radiation level readings and contamination surveys of various areas, and recommendations for improvements as required by HPI 1.0.

(2) Design Change Functions

The inspector met with the Quality Assurance Engineer who managed the engineering change request program. The inspector reviewed three proposed changes pertaining to radiation protection systems and/or equipment. The changes were acceptably documented and reviewed in accordance with the TS and the licensee's guidelines. It was noted that each ECN included: (1) a design description; (2) safety considerations; (3) Safety Analysis Report (SAR) changes, if needed; and (4) a safety evaluation and conclusions. None of the change requests met the criteria in 10 CFR 50.59 for further review.

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 6.4 were being met concerning written procedures for radiation protection:

- Procedure revision, review, and approval process
- SEC meeting minutes for March 2012 through the present
- Selected Reactor Health Physics Procedures (HPPs) for the NBSR
- NBSR AR 5.0, "Procedures and Manuals," issued June 5, 2010
- Selected HPIs for the NIST campus

b. Observations and Findings

The inspector noted that two sets of procedures continued to be 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) 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 many of the HPIs had been updated more recently, several were dated in the 1993–2001 timeframe.

The second set of procedures consisted of the HPPs for the NBSR issued by the reactor operations group. These procedures applied only to the NCNR and the work conducted there. Substantive/safety significant 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 latest revision to these HPP procedures was issued December 21, 2011.

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/substantive changes were required to be reviewed by the SEC. The inspector noted that none of the recent procedure changes had been deemed to be safety significant and thus no procedural changes had been reviewed by the SEC in the past several years.

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 3.7 and 4.7, and procedural requirements:

- Selected HPPs and HPIs
- ALARA Policy stated in various HPPs and HPIs
- Copies of radiation work permits (RWPs) for 2012 and 2013
- Selected HP survey records documented on "Duty HP Weekly Data Summary" sheets and "Swipe Survey" analysis results data sheets for 2012 and 2013
- Quarterly Facility Audit Reports completed by reactor HP staff members for 2012 and to date in 2013
- NIST Personnel Dosimetry Summary records for facility personnel for 2011 and 2012
- Calibration and periodic check records for portable radiation monitoring instruments documented on "NIST HP Survey Instrument Calibration" forms
- Calibration records for area radiation monitors (ARMs) documented on the form "Area Radiation Monitors," RM 1-1, dated December 8, 2009
- Operations Report No. 64, "NBSR Annual Report," for the period from January 1, 2011, through December 31, 2011, issued March 28, 2012
- Operations Report No. 65, "NBSR Annual Report," for the period from January 1, 2012, through December 31, 2012, issued March 28, 2013

The inspector also observed the use of dosimetry and radiation monitoring equipment during tours of the facility. In addition, the inspector accompanied the duty HP during surveys in the C-100, basement, and guide hall areas.

b. Observations and Findings

(1) Surveys

The inspector reviewed the results of selected surveys including: (1) daily general area radiation surveys of work areas, (2) weekly contamination surveys of controlled areas at the facility, (3) monthly general area radiation surveys of the interior uncontrolled areas and the area around the exterior of the NCNR for 2012 and to date in 2013, (4) radiation and contamination surveys conducted during the quarterly audits, and (5) contamination surveys of various items being removed from the controlled areas of the facility. The surveys had been completed as stipulated by procedure and the results were documented on the

appropriate forms. Areas or items found to be contaminated were decontaminated and then surveyed again to verify there was no contamination present. The survey program appeared to be adequate.

The inspector accompanied one of the HPs during completion of a radiation survey of various work areas inside containment and the guide hall. The survey was conducted appropriately. The inspector conducted a radiation survey of the general area as well and no problems or discrepancies were noted.

The inspector also 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, and inside, various controlled areas including the C-100 area, the basement area, and the guide hall. 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 as well as near or above the racks where personnel dosimeters were stored.

(3) Dosimetry and Personnel Exposure

The thermoluminescent dosimeters (TLDs) worn by NIST staff members were processed by the Navy as stipulated in a memorandum of understanding between NIST and the National Naval Medical Center Hospital in Bethesda, MD, dated December 1983. An examination of the TLD results indicating radiation exposures at the facility for 2011 and 2012 showed that occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits.

The facility also collected and analyzed urine samples for tritium (H-3) bioassay purposes. The highest attributable doses in 2011 and in 2012 from H-3 were also within 10 CFR Part 20 limits.

Through direct observation of licensee staff and contractor personnel working at NCNR, the inspector determined that dosimetry was worn acceptably. While activities involving significant radiation levels had been conducted during the past 2 years, the overall exposure for those at the facility was somewhat less than had been received in the past during periods of similar work. It should be noted that the licensee was maintaining personnel doses low and practicing the ALARA principles.

(4) NRC Form 5

10 CFR 19.13(b) states that each licensee shall make dose information available to workers as shown in records maintained by the licensee under the provisions of 10 CFR 20.2106. The licensee shall provide an annual report to each individual monitored under 10 CFR 20.1502 of the dose received in that monitoring year if: (1) the individual's occupational dose exceeds 1 mSv (100 mrem) total effective dose equivalent (TEDE) or 1 mSv (100 mrem) to any individual organ or tissue, or (2) the individual requests his or her annual dose report.

10 CFR 20.1502 states, in part, that each licensee shall monitor exposures to radiation at levels sufficient to demonstrate compliance with the occupational dose limits of this part, and requires that each licensee monitor occupational exposure to radiation from licensed and unlicensed radiation sources under the control of the licensee and supply and require the use of individual monitoring devices to adults likely to receive in 1 year from sources external to the body, a dose in excess of 10 percent of the limits of 20.1201(a).

Prior to this inspection, the licensee notified the inspector that they had identified a problem associated with occupational dose information provided to workers at the facility. The inspector reviewed the dosimetry records of staff members and noted that, for the period from 2008 through 2011, various individuals had received a whole body dose (TEDE) greater than 100 mrem. Because the doses exceeded the limit established that required a dose report to be issued, an NRC Form 5 (which can be used to provide such information) or equivalent should have been provided annually for these individuals. NCNR and NIST campus radiation safety personnel indicated that the last annual report of dose that anyone had received was for the year 2007.

When this problem was discovered at the end of the year in 2012, letters were sent out to the individuals affected by this oversight. The letters, dated December 20, 2012, contained the annual radiation dose at NIST for each of the years from 2008 through 2011. The letters also contained information on the dose each person had received to that point in 2012. Subsequently, in 2013, annual radiation dose report letters were sent out to the appropriate individuals summarizing their 2012 dose. The licensee indicated that the issue of providing annual dose reports to individuals receiving greater than 100 mrem during the year would be followed closely to ensure that there was no repeat of this problem in the future.

The licensee was informed that failure to provide facility personnel with annual dose information for the period from 2008 through 2011 was a Severity Level IV violation of 10 CFR 19.13. However, as indicated above, the inspector determined that the problem had been identified and reviewed by the licensee and reported to the NRC. Appropriate corrective actions had been identified and completed. As a result, the

licensee was informed that this non-repetitive, licensee-identified, and corrected violation would be treated as a non-cited violation (NCV), consistent with Section VI.A.8 of the NRC Enforcement Policy (NCV 50-184/2013-201-01). This issue is considered closed.

(5) Calibration and Operation of Radiation Monitoring Equipment

The calibration of portable survey meters was typically completed by NIST SH&E division as well as by reactor HP staff. 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 ARMs in use at the facility were reviewed. The inspector verified that portable instruments were being calibrated semi-annually and records were being maintained as required. The ARMs were checked monthly and calibrated annually.

The inspector verified that the radiation monitoring equipment required in TS 3.7 and 4.7 was operable and was being tested and calibrated as required.

(6) Radiation Work Permit Program

The inspector reviewed RWPs that had been written in 2012 and current RWPs that were in use during the inspection. There were various "standing" RWPs that remain in effect for the entire year due to the repetitive nature of the work they covered. Other RWPs were generated for specific work, such as fuel storage pool activities, maintenance work, and fuel handling. 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.

(7) 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 December 21, 2011; (3) HPIs; 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 in the aforementioned documents. The ALARA program provided guidance for keeping doses as low as

reasonably achievable and appeared to be consistent with the guidance in 10 CFR Part 20.

(8) Radiation Protection Training

The training program was set up so that authorized beam users, pneumatic tube (rabbit) users, laboratory users, radioisotope users, and all other types of radiation workers, including NIST staff, received radiation protection training. The inspector noted that individuals who required unescorted access to the reactor facility and/or who worked with radioactive material completed a course on radiation safety principles or provided evidence that they had received such training at another facility. Refresher training was given every 2 years and completion was tied to a person's facility access authorization which was also renewed biennially.

During the inspection, the inspector completed the refresher training and verified that it was being provided by the reactor HP group as required and was acceptable. The inspector verified through records review, direct observation, and licensee interviews that facility employees, guest researchers, and emergency responders had received the required training at the required frequency.

(9) Facility Tours and Observation of Work and Experiments in Progress

The inspector observed work that was in progress during the inspection in various laboratories, the C-100 or the experimental floor area, and the guide hall. The inspector also toured other areas, including the C-200 area (which includes the control room), portions of the basement area, including the pneumatic tube (rabbit) labs, and other selected support areas 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 generally satisfied regulatory requirements because: (1) surveys were being completed as required, (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 guest users. One Severity Level IV NCV was identified associated with failure to provide periodic occupational dose information to workers as required by 10 CFR 19.13.

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 3.7 and 4.7 were being conducted:

- Selected HPPs and HPIs
- Tritium and Argon-41 release data sheets
- Building 235 environmental survey sheets
- Licensee COMPLY code calculations for 2011 and 2012
- Gammatracer data results for 2012 and to date in 2013
- NIST environmental sample analysis results for 2011 and 2012
- TLD results for environmental stations for 2012 through the date of the inspection
- Calibration records for stack monitors documented on the form "Building Exhaust Stack Radiation Monitor," RM 4-1, dated June 9, 2010
- Calibration records for gas monitors documented on the form "Helium Sweep Gas Monitor," RM 3-2, dated September 9, 2009
- Calibration records for radiation monitors documented on the form NBSR Instrument Test Procedure, IP RM 3-4, "Major Scram Radiation Monitors RM 3-4," dated September 10, 2009
- Calibration records for radiation monitors documented on the form NBSR Instrument Test Procedure, IP RM 3-5, "Major Scram Radiation Monitors RM 3-5," dated September 10, 2009
- 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
- Operations Report No. 64, "NBSR Annual Report" for the period from January 1, 2011, through December 31, 2011, issued March 28, 2012
- Operations Report No. 65, "NBSR Annual Report" for the period from January 1, 2012, through December 31, 2012, issued March 28, 2013

b. Observations and Findings

Environmental vegetation samples were collected and prepared quarterly for analysis during April through September using standard techniques in accordance with HPI 8-2. Environmental soil samples were collected and prepared quarterly for analysis during October through March. Environmental water samples were collected and prepared quarterly for analysis throughout the year. The 2011 and 2012 results of these various analyses were acceptably documented and the results, which showed no significant changes when compared with previous years, were outlined in the licensee's Annual Operations Report.

The inspector reviewed the records documenting liquid and airborne releases to the environment for the past 2 years. The inspector determined that liquid and

gaseous releases continued to be calculated as required by procedure and were acceptably documented. Calculations indicated an annual dose to members of the public of 0.2 mrem for 2011 and 0.5 mrem for 2012. 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 Operations Reports for 2011 and 2012. 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. The systems were being 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:

- Selected HPI procedures
- Radioactive material shipment records for 2012 and to date in 2013
- NBSR Procedure No. NBSR-0004-DOC-04, “NIST Packaging and Shipping Quality Assurance Program for 10 CFR 71 – Transport of Radioactive Materials,” Rev. 5, dated March 2013

The inspector also interviewed licensee personnel.

b. Observations and Findings

The inspector reviewed records of shipments of radioactive material made during 2012 and to date in 2013. Through this review and discussions with licensee personnel, the inspector determined that the licensee had shipped a relatively small amount 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 if required. The radioactive material shipping records reviewed by the inspector 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. If the current copy of the license was not available at NCNR, the licensee was aware that they were required to contact the consignee and obtain a current copy before a shipment could be made. The licensee also maintained on file the certificates of compliance pertaining to those shipping containers that were used to ship radioactive material as required. In addition, the inspector verified that the licensee staff members, assigned to complete and/or review the shipping paperwork 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 2, 2013, with members of licensee management. The inspector described the areas inspected and discussed the preliminary inspection findings. The licensee acknowledged the results of the inspection and did not identify any information to be withheld from public disclosure.

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
G. Downing	Leader, Nuclear Methods Division and Chair, Safety Evaluation Committee
D. Hughes	Chief, Reactor Operations
S. O'Kelly	Deputy Director, NIST NCNR and Chief, Reactor Operations and Engineering
F. Scarano	Health Physics Technician
W. Schuster	Quality Assurance Program Manager and Member, Audit Subcommittee
J. Tracy	Health Physicist

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

50-184/2012-201-01	NCV	Failure to comply with 10 CFR 19.13(b), which requires that individuals monitored under 10 CFR 20.1502 be provided with an annual report of the dose received in that monitoring year if the individual's occupational dose exceeds 1 mSv (100 mrem).

Closed

50-184/2012-201-01	NCV	Failure to comply with 10 CFR 19.13(b), which requires that individuals monitored under 10 CFR 20.1502 be provided with an annual report of the dose received in that monitoring year if the individual's occupational dose exceeds 1 mSv (100 mrem).

LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
ADAMS	Agencywide Document Access Management System
ALARA	As Low As Reasonably Achievable
AR	Administrative Rule

ARM	Area Radiation Monitor
CFR	*Code of Federal Regulations*
DOT	Department of Transportation
ECN	Engineering Change Notice
ECR	Engineering Change Request
HP	Health Physics/Health Physicist
HPI	Health Physics Instruction
HPP	Health Physics Procedure
IAEA	International Atomic Energy Agency
IP	Inspection procedure
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
No.	Number
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
OMARR	Operation and Maintenance Assessment of Research Reactors
Rev.	Revision
RWP	Radiation Work Permit
SAC	Safety Audit Committee
SEC	Safety Evaluation Committee
SH&E	Office of Safety, Health, and Environment (Division)
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications