

May 22, 2012

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. 50-184/2012-202

Dear Dr. Dimeo:

On May 14-17, 2012, 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 17, 2012, with the Chief of Reactor Operations and Engineering 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, 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](mailto: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. 50-184/2012-202  
cc w/encl: See next page

cc:

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Test, Research, and Training  
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**/RA/**

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cc w/encl: See next page

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**ACCESSION NO.: ML12143A001**

**\* concurrence via e-mail**

**TEMPLATE #: NRC-002**

OFFICE	PROB:RI *	PRPB:LA	PROB:BC
NAME	CBassett	GLappert	JEads
DATE	5/20/2012	5/22/2012	5/22/2012

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2012-202

Licensee: National Institute of Standards and Technology

Facility: National Bureau of Standards Reactor

Location: Gaithersburg, MD

Dates: May 14 -17, 2012

Inspector: Craig Bassett

Accompanied by: Johnny H. Eads, Jr., Branch Chief

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. 50-184/2012-202

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.
- 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) Part 19 and 10 CFR 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. During the inspection, the reactor was operating twenty-four hours per day, seven days per week (24/7) on a normal cycle (which typically last about 38½ days) and was about fifty percent through that 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 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. 50-184/2011-201). 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 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 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 composed of a Group Leader and 10 staff members. Six of these individuals, including the Group Leader, were Health Physicists; the other five were HP technicians. At the time of the inspection, the group was fully staffed and all HP and technician positions at the facility were filled. 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 Sections 6.1 and 6.3 requirements. The 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 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 March 2011 through the present (Meeting Numbers 371 through 373)
- NBSR Procedure Number (No.) NBSR-0007-DOC-04, "Engineering Manual," Rev. 4 dated June 2009
- Health Physics Instruction (HPI) 1-0, "Health Physics Policies," dated March 2001
- 2011 Reactor Audit in Accordance with TS 6.2.4(1-4), conducted by the NCNR Safety Audit Subcommittee of the NCNR Safety Evaluation Committee, dated September 12, 2011, and the NCNR response dated September 30, 2011
- 2011 Annual [Audit] Report of the Safety Assessment Committee, dated October 12, 2011
- Annual Review of the Reactor Radiation Protection Program completed by the Group Leader, Reactor Facilities Group, for 2010, dated December 22, 2011
- Quarterly Facility Audit Reports completed by HP staff members for 2011 and to date in 2012
- NBSR Engineering Change Request (ECR) No. 631, "Area Radiation Monitoring System Modification/Expansion," Level I review, approval dated January 28, 2011
- NBSR Engineering Change Notice (ECN) No. , "Area Radiation Monitoring System Modification/Expansion," Minor ECN – Level I review, approval dated February 22, 2012
- NBSR ECR No. 706, "Tritium Monitoring System Upgrade," Level I review, approval dated December 5, 2011
- NBSR ECN No. 583, "Tritium Monitoring System Upgrade," Minor ECN – Level I review, approval dated December 6, 2011
- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2011
- Operations Report No. 64, NBSR Annual Report for the period from January 1, 2011 through December 31, 2011, issued March 28, 2012



b. Observations and Findings

(1) Review and Audits Functions

Records of the meetings held by the Safety Evaluation Committee (SEC) from March 2011 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).

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 two proposed change requests 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. Neither 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 Section 6.4 were being met concerning written procedures for radiation protection:

- Procedure revision, review, and approval process
- SEC meeting minutes for March 2011 through the present
- Selected Health Physics Procedures (HPPs) for the NBSR
- NBSR AR 5.0, "Procedures and Manuals," issued June 5, 2010
- Selected Health Physics Instructions (HPIs) for the NIST Campus
- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2011
- Operations Report No. 64, NBSR Annual Report for the period from January 1, 2011 through December 31, 2011, issued March 28, 2012

#### 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 instructions (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 1993-2001 timeframe.

The second set of procedures was the HP procedures for the NBSR (HPPs) 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 last major revision to these 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 and approved by the SEC. The inspector verified that this process was being followed.

#### 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:

- Selected HPPs and HPIs
- ALARA Policy stated in various HPPs and HPIs
- Copies of Radiation Work Permits (RWPs) for 2011 and 2012
- Selected HP survey records documented on "Duty HP Weekly Data Summary" sheets and "Swipe Survey" analysis results data sheets for 2011 and 2012
- Quarterly Facility Audit Reports completed by Reactor HP staff members for 2011 and to date in 2012
- National Institute of Standards and Technology (NIST) Personnel Dosimetry Summary records for facility personnel for 2010 and 2011
- Calibration and periodic check records for portable radiation monitoring instruments documented on "NIST HP Survey Instrument Calibration" forms
- NBSR AR 10.0, "Health Physics Clearance for Work," issued July 15, 2004

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 and coverage of work in the C-100 area.

##### 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 2011 and to date in 2012, and 4) radiation and contamination surveys conducted during the quarterly audits. 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. The survey program appeared to be adequate.

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, 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, 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 and 2011, approximately one-half of the monitored personnel received occupational exposures of zero and about ninety percent of all those monitored received an exposure of less than 50 millirem. The highest whole body exposure received by a single individual for all of Calendar Year (CY) 2010 was 444 millirem (mr) deep dose equivalent (DDE). The highest extremity exposure for CY 2010 was 4,087 mr shallow dose equivalent (SDE) and the highest skin dose that year was 350 mr SDE. The highest whole body exposure received by a single individual for CY 2011 was 764 mr DDE. The highest extremity exposure for CY 2011 was 1277 mr SDE and the highest skin dose was 729 mr SDE. In 2010, the highest whole body exposure was received by a person in the beam user group. In 2011, the highest whole body exposure was received by a reactor operator. The facility collective person-rem for all monitored NCNR staff and guests for CY 2010 was 12.2 rem. For CY 2011, the facility collective person-rem was 18.9 rem.

The facility also collected and analyzed urine samples for Tritium (H-3) bioassay purposes. The highest attributable dose in 2010 from H-3 was approximately 51 mr committed effective dose equivalent (CEDE). The highest H-3 attributable dose in 2011 was approximately 283 mr CEDE.

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 recently completed modification work at the facility were not excessive.

(4) Calibration and Operation 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 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 Sections 3.7 and 4.7 was operable and was being tested and calibrated as required.

(5) Radiation Work Permit Program

The inspector reviewed Radiation Work Permits (RWPs) that had been written in 2011 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 cover. Other RWPs were generated for specific work such as the fuel storage pool, for neutron guide shielding removal and replacement, and for 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.

(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 December 21, 2011, 3) HPis, the most recent revision to an HP Instruction dated September 2010, 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.

(7) Radiation Protection Training

The training program was set up so that authorized beam users, 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 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 inspector recently completed the training and verified that it was provided by the Reactor HP Group as required and was 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 Work and Experiments in Progress

The inspector observed work that was in progress during the inspection in various laboratories, in the C-100 or the Experimental Floor area, and in the Guide Hall. The inspector also toured other areas including the C-200 area (which included the Control Room), portions of the basement area including the fuel storage area, 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 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
- Selected HPPs and HPIs
- Tritium release data sheets
- Argon-41 release data sheets
- Building 235 Environmental Survey sheets
- Licensee COMPLY Code calculations for 2010 and 2011
- Gammatracer data results for 2011 and to date in 2012
- NIST Environmental Sample Analysis Results for 2010 and 2011
- Argon-41 Stack Monitor Calibration Check sheets for 2010 and 2011
- TLD results for Environmental Stations for 2011 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
- Operations Report No. 63, NBSR Annual Report for the period from January 1, 2010 through December 31, 2010, issued March 25, 2011
- Operations Report No. 64, NBSR Annual Report for the period from January 1, 2011 through December 31, 2011, issued March 28, 2012

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 and 2011 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 0.8 mr for 2010 and 0.2 mr for 2011. 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 2010 and 2011. 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. Some systems had been calibrated annually according to procedure and some calibrations had been delayed due to the facility shutdown that had just concluded. The inspector verified that all systems had been calibrated prior to the licensee resuming normal/routine operations.

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
- Spent fuel shipment records for 2010 and 2011
- Radioactive material shipment records for 2010, 2011, and to date in 2012
- 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

The inspector also interviewed licensee personnel.

b. Observations and Findings

Records of shipments of radioactive material made during 2011, and to date in 2012, were reviewed. Through this review and discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material, including spent fuel, 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 and review 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 17, 2012, 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

D. Brown Senior Health Physicist and Chair, Irradiation Subcommittee  
R. Dimeo Director, NIST Center for Neutron Research  
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  
CEDE Committed Effective Dose Equivalent  
CFR *Code of Federal Regulations*  
CY Calendar Year  
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
Rev.	Revision
RWP	Radiation Work Permit
SAC	Safety Audit Committee
SDE	Shallow Dose Equivalent
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