

November 30, 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. 50-184/2011-204

Dear Dr. Dimeo:

On October 30 - November 3, 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 (Inspection Report No. 50-184/2011-204). The inspection included a review of activities authorized for your facility. The enclosed report documents the inspection results, which were discussed on November 3, 2011, with you and various 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. 50-184/2011-204
cc w/encl: See next page

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

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ACCESSION NO.: ML113250001

*** concurrence via e-mail**

TEMPLATE #: NRC-002

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DATE	11/18/2011	11/21/2011	11/30/2011

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2011-204

Licensee: National Institute of Standards and Technology

Facility: National Bureau of Standards Reactor

Location: Gaithersburg, MD

Dates: October 30 - November 3, 2011

Inspector: Craig Bassett

Accompanied by: Samina Kanwal, Foreign Assignee
Taylor Lichatz, Inspector Trainee
Farhana Naseer, Foreign Assignee

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. 50-184/2011-204

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 20 megawatt test reactor facility safety program including: 1) organization and staffing, 2) review and audit and design change function; 3) reactor operations, 4) operator requalification, 5) maintenance and surveillance, 6) fuel movement; 7) experiments, 8) procedures and procedure control, and 9) emergency preparedness 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 in compliance with NRC requirements. No violations or deviations were identified.

Organizational Functions and Staffing

- The organizational structure and supervisory qualifications were consistent with Technical Specification Section 6.1 requirements.
- Staffing levels at the facility were 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.

Reactor Operations

- The facility was in an extended shutdown condition however shift staffing was being maintained and operator cognizance of facility conditions was acceptable.

Operator Requalification

- Operator requalification was being conducted and completed as required by the Requalification Program and the program was being maintained current.
- Physical examinations for the operators were being completed every two years as required.

Maintenance and Surveillance

- The maintenance program was being conducted in accordance with applicable procedural requirements.

- The surveillance program was being completed in a timely manner and as specified in Technical Specification requirements.

Fuel Handling

- Fuel movement was accomplished in accordance with Technical Specification and procedural requirements.

Experiments

- The program for experiment review and approval satisfied Technical Specification and procedural requirements.

Procedures

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

Emergency Preparedness

- The Emergency Plan and Emergency Instruction Manual (or Implementing Procedures) were being audited and reviewed biennially as required.
- Drills and exercises were being held and follow-up critiques were conducted to identify corrective actions that could be taken as needed.
- Emergency preparedness training for staff and offsite personnel was being conducted as stipulated in the Emergency Plan.
- Adequate offsite emergency support was being provided by various agencies as required.

REPORT DETAILS

Summary of Facility Status

The National Institute of Standards and Technology (NIST, the licensee) NIST Center for Neutron Research (NCNR) reactor, a 20-megawatt test reactor commonly known as the National Bureau of Standards Reactor (NBSR), continued to be operated in support of laboratory experiments and various types of research. 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 Section 6.1, "Organization," of the NBSR Technical Specifications (TS), designated as Appendix A of the NBSR Renewed Facility Operating 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 Console Logbooks Numbers (Nos.) 139 through 140
- 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

Through discussions with licensee personnel and review of pertinent documents, the inspector determined that the licensee's organizational structure had not changed since the last inspection in the area of reactor operations (refer to NRC Inspection Report No. 50-184/2010-202). As a result, the organizational structure remained consistent with the requirements of TS Section 6.1 and Figure 6.1. The inspector also found that the various management and supervisory personnel in the Reactor Operations Group exceeded the minimum qualifications specified in the TS with regard to education and experience.

In discussing staffing with management personnel, the inspector noted that there were 20 qualified Senior Reactor Operators (SROs) at the facility. Through interviews with operations personnel, the inspector determined that there were four operating crews at the facility who worked rotating shifts. There was also a fifth "day shift" crew that worked during the week days and provided coverage on occasions when individuals from the other crews were on vacation or were ill. Except when an operator retired or left for other employment, each crew typically was staffed with four individuals who were licensed senior reactor operators. This provided an adequate number of operators for the current level of operations at the facility. Through a review of the Console Logbooks for the period from January 2011 to the present and interviews with operations personnel, the inspector verified that staffing during reactor operation and during the current extended outage satisfied the requirements specified in TS Section 6.1.3.

c. Conclusion

The organizational structure and supervisory qualifications were consistent with TS Section 6.1 requirements and the operations staffing level 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* Section 50.59, were being implemented effectively:

- Safety Evaluation Committee meeting minutes for April 2010 through the present (Meeting Numbers 369 through 372)
- 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
- 2011 Annual [Audit] Report of the Safety Assessment Committee, dated October 12, 2011
- 2011 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 12, 2011
- Safety Assessment Committee (SAC) Charter, approval dated August 2010
- NCNR Reactor Safety Evaluation Committee (SEC) Charter, approval dated July 2, 2010
- Charter for the NCNR Audit Subcommittee of the NCNR Safety Evaluation Committee, approval dated July 2, 2010
- Charter for the NCNR Beam Experiment Subcommittee of the NBSR Safety Evaluation Committee, approval dated July 2, 2010

- Charter for the NCNR Irradiation Subcommittee of the NBSR Safety Evaluation Committee, approval dated July 2, 2010
- NBSR Engineering Change Request (ECR) No. 635, "New Secondary Cooling Pump Building (SCPB), Secondary Cooling Water System, and Cooling Tower Addition," Level II review, approval dated January 28, 2011
- NBSR Engineering Change Notice (ECN) No. 635, "New SCPB, Secondary Cooling Water System, and Cooling Tower Addition," Major ECN – Level II review, NCNR Director approval dated April 5, 2011
- NBSR ECR No. 618, "Removal of Rabbit Tube #4 (RT-4) (aka – 1U) and Associated Systems," Level I review, approval dated February 4, 2011
- NBSR ECN No. 618, "Removal of Rabbit Tube #4 (RT-4) (aka – 1U) and Associated Systems," Minor ECN – Level I review, approval dated July 11, 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, 2011

b. Observations and Findings

(1) Review and Audits Functions

Records of the meetings held by the Safety Evaluation Committee (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.

The inspector noted that the charter of the SEC delineated the committee's membership, organization, quorum and meeting requirements, and responsibilities. The charter also authorized the formation of subcommittees to assist the SEC. Three subcommittees had been organized for that purpose, including the Audit Subcommittee, the Beam Experiment Subcommittee, and the Irradiation Subcommittee. A charter had been developed each subcommittee and the various charters had been reviewed and approved by the SEC.

Other records reviewed by the inspector showed that an annual independent audit had been conducted by the Safety Audit Committee (SAC) as required by TS Section 6.3. Upon completion, the audit report was forwarded to the SEC. The report provided a review of NBSR operations and the performance of the SEC as outlined in the TS. The SAC made various noteworthy comments and recommendations which were being considered by the licensee.

(2) Design Change Functions

The inspector reviewed selected requests for changes to the facility and/or equipment that had been proposed within the last two years. The change requests were designated as Minor or Major Engineering Change Requests (ECRs) and numbered sequentially during the year. Each ECR documented what was proposed to be changed, the facility drawings that would need to be changed, the procedures that would require revision, and any tests or measurements that would need to be completed following the change.

Once an ECR was approved, an Engineering Change Notice (ECN) was developed which contained various sections. The sections detailed the design description, safety considerations and analysis, a safety evaluation, and the 10 CFR 50.59 screening criteria results. Minor ECRs were required to be reviewed and approved by the Chief, Reactor Operations and the Chief, Reactor Engineering. Major ECRs were to be reviewed by various groups including Reactor Operations, Electrical Engineering, Mechanical Engineering, Health Physics, and the SEC, and were approved by the Chief, Reactor Operations and Engineering and the Director, NCNR. The ECRs and ECNs reviewed by the inspector had been properly prepared and reviewed, and the work approved as required.

The ECNs reviewed demonstrated that changes were acceptably documented and reviewed in accordance with the TS and the licensee's guidelines and that the work and the required document revisions were generally being completed as stipulated. It was noted that the changes were being tracked to completion by the licensee. None of the changes reviewed by the inspector met any of the criteria of 10 CFR 50.59(c)(2) but it was noted that one would require a TS change. Documentation of that change was being prepared to be submitted to the NRC for review and approval.

c. Conclusion

The Safety Evaluation Committee 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 being implemented by the licensee satisfied NRC requirements.

3. Reactor Operations

a. Inspection Scope (IP 69006)

To verify that the licensee was operating the reactor and conducting operations in accordance with TS Sections 2 and 3 and procedural requirements, the inspector reviewed selected portions of the following:

- NBSR Console Logbook Nos. 139 through 140
- Various NIST Reactor Control Room Log sheets
- Selected NIST Reactor Area Inspection Log sheets
- Shift Supervisors Instructions and Special Log sheets
- NBSR Reactor Shift Supervisor Logbook Nos. 36 and 37
- Associated reactor operations records from October 2010 to the present
- NBSR AR 2.0, "Personnel Requirements," issued July 30, 2009
- NBSR AR 9.0, "Reactor Startup and Operation," issued July 30, 2009
- NBSR Operating Instruction (OI) 1.1, "Reactor Startup", issued November 9, 2010, containing:
 - NBSR OI 1.1, Checklist A, "Reactor Startup Checklist (Shutdown >24 Hours)," issued December 3, 2009
 - NBSR OI 1.1, Checklist B, "Reactor Startup Checklist (Unplanned Shutdown <24 Hours)," issued November 16, 2004
- NBSR OI 1.2, "Reactor Normal Operation," issued August 8, 2008
- NBSR OI 1.3, "Reactor Shutdown," issued August 8, 2008
- NBSR OI 2.1, "Startup, Operation, and Shutdown of Primary Coolant System," issued June 27, 2011, containing:
 - NBSR OI 2.1 Checklist, "Primary Coolant System Checklist," issued January 22, 2007
- NBSR OI 2.2, "Operation of the D₂O Auxiliary Systems," issued July 3, 2006
- NBSR OI 3.1, "Operation of the Secondary Cooling System," issued August 1, 2008, containing:
 - NBSR OI 3.1 Checklist, "Secondary Cooling System Valve Check List," issued December 22, 2006
- NBSR OI 3.4, "Operation of the Thermal Shield Cooling System," issued July 27, 2009
- NBSR OI 4.5, "Operation of Pneumatic Tube System," issued August 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, 2011

b. Observations and Findings

During the inspection it was noted that the facility was in an extended shutdown and major modifications were being made to the various systems involved with operation of the reactor as well as the conduct of neutron experimentation. The facility was not scheduled to restart until early 2012.

Nevertheless, the inspector reviewed various operations logs and related records. The logs and records were clear and provided an indication of ongoing activities. The records demonstrated that shift staffing was being maintained as required by TS despite the shutdown condition of the reactor.

The records reviewed also showed that, prior to the shutdown, operational conditions and parameters were consistent with TS and procedural requirements and that these conditions and requirements were satisfied. Reactor startup procedure, NBSR OI 1.1, required verification of each of the limiting conditions for operation specified in TS Sections 3.1 through 3.11 prior to startup. These verifications had been completed and recorded as required. The inspector noted that various other procedural requirements were also being met.

Through record review and direct observation, the inspector also verified that shift turnover briefings were held during each shift change and that activities of the previous shift were discussed in detail. The records kept and the briefings that were given ensured that the operators were aware of the conditions in the facility and the status of changes being made.

c. Conclusion

The facility was in an extended shutdown condition however shift staffing was being maintained and operator cognizance of facility conditions was acceptable.

4. Operator Requalification

a. Inspection Scope (IP 69003)

To verify compliance with the Requalification Program for the NBSR, which was last updated March 2009, the inspector reviewed:

- Medical examination records from 2008-2011
- NBSR Console Logbooks Nos. 139 through 140
- Current status of selected qualified operators' licenses
- NBSR Requalification Examinations (biennial) for 2008 and 2010
- Operator training records for the years 2008-2009 and 2010-2011, documented on forms entitled, "Requalification Program Documentation Review and Reactivity Changes," no revision date
- Supervisor's annual operator evaluation documented on forms entitled, "Operator Evaluation," form revised November 2009
- Letter from the licensee to the NRC dated May 11, 2011, documenting the licensee's plans for training and compliance with the Requalification Plan during and following the extended reactor shutdown

b. Observations and Findings

As noted previously, there were currently 20 SROs employed at the facility. Through a review of various requalification and training documents, the inspector verified that, even though some of the SROs were in supervisory/management positions, the licenses were current and records of every licensed operator's requalification status were being maintained as required.

A review of program records also showed that operator training was consistent with the NBSR Requalification Program requirements. NBSR Console Logbooks

and related records, completed previous to the current shutdown, showed that operators maintained active duty status by participating in the reactivity manipulations and document reviews as outlined and required in the Requalification Program. The inspector also confirmed that the operators had been given annual operating evaluations and were acceptably completing biennial written examinations.

The inspector also verified that each qualified operator was receiving a biennial physical examination as required.

The inspector reviewed the letter the licensee had submitted to the NRC documenting their plans for training and compliance with the Requalification Plan during and following the extended reactor shutdown. The letter indicated that the licensee will ensure that all operators receive training on all systems and procedures that were changed or modified as a result of any upgrade work on the reactor. The licensee also indicated that all operators would perform a startup and shutdown following the shutdown and prior to resuming routine reactor operation. The inspector indicated that the issue of training the reactor operators prior to resuming routine reactor operations following the shutdown would be followed by the NRC as an Inspector Follow-up Item (IFI) and would be reviewed during an upcoming inspection (IFI 50-184/2011-204-01).

c. Conclusion

Operator requalification was being conducted and completed as required by the licensee's Requalification Program. Physical examinations for each operator were being completed every two years as required.

5. Maintenance and Surveillance

a. Inspection Scope (IP 69006 and IP 69010)

To ensure that maintenance activities were being completed and to determine that surveillance activities and calibrations were being completed as required by TS Section 4, the inspector reviewed selected aspects of:

- NBSR Console Logbooks Nos. 138 through 139
- Reactor Technical Specification Log Book, Volume 2
- Selected Technical Specification Surveillance Schedules/Records for the period from May to November 2011
- Selected NIST Reactor Area Inspection Log sheets for the past 12 months
- Selected NIST Reactor Control Room Log sheets for the past 12 months
- Maintenance Procedure, "Pump Shaft End Bearing Changes," dated September 2002
- Technical Specification (TS) Procedure 4.1.2, "Core Excess Reactivity/Shutdown Margin Reactivity Worth of Each Shim Arm and Reg Rod," issued August 4, 2009

- TS Procedure 4.2.1(1), "Withdrawal and Insertion Speed of Each Shim Arm," (and associated Data Sheet), issued July 2, 2009
- TS Procedure 4.2.1(2), "Scram Time of Each Shim Arm's First 5° Drop," (and associated Data Sheet), issued May 10, 2010
- TS Procedure 4.4(3), "Test to be Performed When Any Addition, Modification, or Maintenance Has Been Made to Confinement," issued October 20, 2011, including the Test That Building Can Maintain Required Leak Tightness
- NBSR Instrument Test Procedure FIA-8B, "Cold Source D₂O Cooling Water Flow Indicator Alarm – Channel B," issued January 8, 2010
- 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, 2011

b. Observations and Findings

(1) Maintenance Activities

Because the reactor was shut down during the inspection, the inspector had the opportunity to observe various reactor maintenance activities in progress. The inspector also had a discussion with the Chief, Reactor Operations about major maintenance activities carried out or soon to be accomplished since the last inspection. These activities included replacement of thermal shield cooling system, new spent fuel pool coating, D₂O storage tank replacement, secondary cooling system replacement, control room instrumentation upgrade, and the rabbit system replacement. In addition, the inspector also reviewed selected maintenance procedures. It was noted that the maintenance activities were noted in various records including Console Logbooks and data sheets. These were used to document routine maintenance activities and the frequency thereof in accordance with the applicable procedure or equipment manual. Maintenance activities ensured that equipment remained consistent with the Safety Analysis Report and TS requirements.

(2) Surveillance Activities

In addition to the subject of maintenance, the inspector also discussed surveillance activities with the Chief, Reactor Operations. He explained that it was not possible to complete some of the surveillances because they required reactor operation. However, other surveillance requirements were being fulfilled as required by the TS. He also explained that during the inspection no surveillance activities were planned. The inspector reviewed the list of surveillances that had been completed since last inspection and selected a number of surveillances for detailed review. This included a review of selected TS required procedures for conducting surveillances and calibrations and the

checklists and tables used for recording data documenting completion of the required surveillance activities.

The completion and results of the surveillances and calibrations were tracked by the Chief, Reactor Operations, as well as by operations personnel. Tracking was done by means of the TS Surveillance Schedule which was updated as the tasks were completed and then revised, and a new Surveillance Schedule issued monthly. A review of the monthly Surveillance Schedules, Console Logbooks, and related data recorded on the appropriate forms indicated that the surveillances and calibrations were completed in accordance with the frequency specified in the TS and as per procedure. If a surveillance activity could not be completed within the established time frame, the reason for the delay was typically documented in the logs or records. All results reviewed by the inspector were within the TS or the procedurally prescribed parameters.

c. Conclusion

The maintenance program was being conducted and documented as required by procedure. The surveillance program was being conducted as specified by TS requirements.

6. Fuel Handling

a. Inspection Scope (IP 69009)

The inspector reviewed selected aspects of the following to verify that fuel movement and handling was being conducted as required by TS Sections 3.9 and 5.3:

- NBSR Console Logbooks Nos. 139 through 140
- Core Loading/Reloading Sheets Nos. 602 through 605
- Current Core Configuration designated as Core No. 605
- Core Loading, Offloading, and Reloading Verification and Sign-off sheets
- Pool Log No. 3 and fuel transfer records from January 2011 to the present
- NBSR AR 6.0, "Refueling Operations," issued August 22, 2006
- NBSR OI 6.1, "Fueling and Defueling Procedures," issued December 14, 2006, with Pen & Ink changes dated September 15, 2010
- NBSR OI 6.2, "Operation of the Fuel Transfer System," issued July 27, 2009
- NBSR OI 6.3, "Operation of Spent Fuel Cutting Saw," issued August 1, 2008

b. Observations and Findings

Operating Instructions 6.1 through 6.3 provided prescribed methods to move and handle fuel, and cut spent fuel consistent with the provisions of the TS and the licensee safety analysis. The inspector reviewed the core loading and fuel

handling records for the previous year and found them to be complete and properly documented. Fuel movement, fuel loading/reloading, and fuel examination records documented that fuel was moved and controlled as required. The records also showed that the fuel movements were verified by various individuals as required and that fuel elements were in the designated locations. Records further showed that fuel handling and monitoring equipment was operable. Personnel were familiar with and knowledgeable of the procedural requirements that ensured criticality control and fuel integrity.

c. Conclusion

The licensee maintained and followed procedures which effectively implemented TS requirements for fuel handling.

7. Experiments

a. Inspection Scope (IP 69005)

To ensure that the requirements of TS Sections 3.8, 4.8, and 6.5, and licensee administrative procedures were being met governing the experimental program, the inspector reviewed selected aspects and/or portions of:

- Approval Procedure for Experimental Proposals
- Beam Experiment Subcommittee (BES) report to the SEC dated September 26, 2011
- Experimental Proposal Approval Sheet, No. 461, "Single Crystal Reflectivity Measurements Using NG-6A Beam Line," approval dated May 4, 2010
- Experimental Proposal Approval Sheet, No. 468, "Operation of PEMFCs at NG-6A," approval dated June 23, 2011
- Experimental Proposal Approval Sheet, No. 469, "Operation of an Ion Source for Investigating the aCORN Proton Detector at NG-6A," approval pending
- NBSR Irradiation Request/Proposal, 2S-456, dated June 25, 2010, dealing with the irradiation of gold metal
- NBSR Irradiation Request/Proposal, 2S-457, dated March 11, 2011, dealing with the irradiation of potassium perchlorate powder

b. Observations and Findings

Experiments at the NBSR, as outlined in the TS, include irradiation and beam experiments. For irradiation experiments, the reactivity worth and other criteria were delineated in Technical Specification. The Irradiation Subcommittee and/or the Beam Experiment Subcommittee reviewed experimental proposals as required and provided recommendations.

The inspector interviewed the Irradiation Subcommittee Chairman. He explained the approval process and discussed two recent experiments that had been approved by the committee. It was noted that the Irradiation Subcommittee, as

well as Health Physics personnel, had reviewed the experiments. The inspector reviewed the package of various recent experiments.

Since the TS did not include criteria for beam port experiments, the licensee developed administrative guidelines to extend the review and approval requirements in TS Section 6.5 to include the beam port and guide hall experiments. The licensee also developed a separate database of approved beam experiments, similar to the in-core irradiation experiments, which was being maintained and used by a separate subcommittee, the Beam Experiment Subcommittee.

The inspector interviewed the Beam Experiment Subcommittee Chairman. He explained the procedure followed for approval and discussed two recent experiments that were reviewed by his committee. The inspector reviewed the approval procedure and package for two experiments, and verified that they had been reviewed by the SEC and approved by the Director. The inspector also noted that specified conditions were written on the approval page to make sure they were visible to all signatories. The experiments were also reviewed by the Hazards Review Committee. The inspector also noted that engineering and radiation protection controls were detailed and were required to be implemented to limit radiation exposure to personnel conducting the experiments.

c. Conclusion

The program for experiment review and approval satisfied TS and procedural requirements.

8. 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:

- Procedure change process
- Procedural review and approval
- NBSR AR 5.0, "Procedures and Manuals," issued June 5, 2010
- Safety Evaluation Committee meeting minutes for April 2010 through the present (Meeting Numbers 369 through 372)
- NBSR Instrument Test Procedure FIA-8B, "Cold Source D₂O Cooling Water Flow Indicator Alarm – Channel B," issued January 8, 2010
- NBSR Operating Instruction (OI) 1.1, "Reactor Startup", issued November 9, 2010, containing:
 - NBSR OI 1.1, Checklist A, "Reactor Startup Checklist (Shutdown >24 Hours)," issued December 3, 2009
 - NBSR OI 1.1, Checklist B, "Reactor Startup Checklist (Unplanned Shutdown <24 Hours)," issued November 16, 2004

- 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, 2011

b. Observations and Findings

Written procedures for the activities listed in TS Section 6.4 were available as required. Those activities included normal reactor operations, abnormal operations, emergency conditions involving the potential or actual release of radioactivity, radiation protection, site emergency actions, and fuel handling. The inspector verified that the official, approved copies of the Reactor Operations Group procedures were kept in the control room as stipulated by procedure. The inspector also verified that the procedures were reviewed by the SEC and approved by the Chief, Reactor Operations as specified in the TS.

The inspector interviewed the Chief, Reactor Operations regarding changes in procedures. He explained that there were many anticipated changes in procedures as a result of facility updates/modification. He indicated that major changes will be made in the secondary cooling system, D₂O experimental cooling, and the Thermal Shield cooling system. The facility will make changes to procedures once the equipment/system is fully operational.

During the procedure review, the inspector noted that the majority of the operations-related procedures had been revised recently. The inspector also noted that many of the licensee's procedures, with the exception of the Operating Instructions, were reviewed annually by the operators during the requalification process. The inspector also looked at the recommendations for improvement of procedures given in SAC audit report. These suggestions will help the facility improve its procedures.

c. Conclusion

The procedure revision, control, and implementation program satisfied TS requirements.

9. Emergency Preparedness

a. Inspection Scope (IP 69011)

In order to verify compliance with the NBSR Emergency Plan, dated December 2008, the inspector reviewed selected aspects of:

- Emergency Preparedness training records for 2010 - 2011
- Selected NIST Reactor Area Inspection Log sheets for the past 12 months
- Support provided by offsite support groups (i.e., NIST Fire Department and Police Department)

- Records documenting annual evacuation drills and the last biennial emergency exercise
- Emergency response facilities, supplies, equipment, and instrumentation
- Emergency Instruction (EI) Manual (containing the Emergency Plan Implementing Procedures), including:
 - Section 1, "Immediate Action Information," last revised November 15, 2008
 - Section 2, "Follow-up Action Information," last revised November 15, 2008
 - Section 3, "Supplemental Action Information," last revised November 15, 2008
 - Section 5, "Instructions to NBS Support Groups," last revised November 15, 2008
- EI Procedure 0.2, "Emergency Organization Phone Numbers," dated December 15, 2009, with Pen and Ink changes dated August 30, 2010
- EI Procedure 0.3, "Emergency Classification and Criteria," dated September 21, 2009

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the reactor and support facilities was the same as the last version approved by the NRC. The E-Plan was being audited and reviewed biennially as required. Implementing Procedures, contained in the Emergency Instruction Manual, were reviewed and revised as needed to effectively implement the E-Plan. The inspector verified that operators understood their duties in response to emergency conditions.

Records showed that radio communications with the NIST Police Department (PD) were checked weekly. Other communications capabilities were checked periodically and phone numbers for the various support organizations were verified annually, as stipulated in the E-Plan.

The last biennial emergency exercise was conducted on November 30, 2010, and the last annual evacuation drill was held on October 19, 2011. Critiques were held following the exercise and the drill to discuss the strengths and weaknesses identified and to develop possible solutions to any problems identified. The results of the critiques were documented and filed. It was noted that the next biennial Emergency Exercise was scheduled for November 2012.

Emergency preparedness and response training for NBSR personnel was being completed as required. Emergency response training for NIST Fire Department (FD) and PD personnel was being conducted biennially by the Health Physics Group as well. The inspector verified that the last training for these groups had been conducted during October 2010.

The results of selected emergency equipment inventories required by E-Plan Section 8.5 were reviewed by the inspector. It was noted that the emergency equipment in the locker located in the Front Lobby had been inventoried even more frequently than required.

The inspector verified that the agreement with the Bethesda Naval Medical Hospital for medical support in case of an emergency, originally signed December 22, 1983, remained in effect and was acceptable. It was noted that other hospitals in the vicinity of NIST were also equipped to handle emergencies involving a contaminated injured person if needed.

c. Conclusion

The emergency preparedness program was being conducted in accordance with the Emergency Plan.

10. Exit Interview

The inspection scope and results were summarized on November 3, 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
G. Downing	Group Leader, Nuclear Methods Division; and Chair, Safety Evaluation Committee; and Chair, Audit Subcommittee
D. Flynn	Reactor Supervisor/Senior Reactor Operator and Irradiation Coordinator
D. Hughes	Deputy Chief, Reactor Operations
R. Ibberson	Group Leader, Research Facility Operations Group and Chair, Beam Experiment Subcommittee
P. McCarty	Industrial Hygiene Specialist
M. McDonald	Reactor Supervisor/Senior Reactor Operator
W. Mueller	Reactor Supervisor/Senior Reactor Operator
T. Myers	Chief, Reactor Operations
S. O'Kelly	Chief, Reactor Operations and Engineering
W. Schuster	Quality Assurance Program Manager and Member, Audit Subcommittee
R. Sprow	Reactor Supervisor/Senior Reactor Operator
A. Toth	Reactor Supervisor/Senior Reactor Operator

INSPECTION PROCEDURES USED

IP 69003:	Class 1 Research and Test Reactor Operator Licenses, Requalification, and Medical Activities
IP 69005:	Class 1 Research and Test Reactors Experiments
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 69009:	Class 1 Research and Test Reactors Fuel Movement
IP 69010:	Class 1 Research and Test Reactors Surveillance
IP 69011:	Class 1 Research and Test Reactors Emergency Preparedness

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-184/2011-204-01	IFI	Follow-up on the completion of training for all reactor operators concerning changes to systems and procedures resulting from the modifications to the reactor and related systems following the extended shutdown and the performance of a reactor startup and shutdown by all operators prior to resuming routine operations.
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Closed

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access Management System
AR	Administrative Rule
CFR	<i>Code of Federal Regulations</i>
ECN	Engineering Change Notice
EI	Emergency Instruction
E-Plan	Emergency Plan
FD	Fire Department
IP	Inspection Procedure
IR	Inspection Report
MW	Megawatt
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
Nos.	Numbers
NRC	Nuclear Regulatory Commission
OI	Operating Instruction
Rev.	Revision
SAC	Safety Audit Committee
SEC	Safety Evaluation Committee
SRO	Senior Reactor Operator
TS	Technical Specification