

November 9, 2016

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

SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY – U.S. NUCLEAR
REGULATORY COMMISSION ROUTINE INSPECTION REPORT
NO. 50-184/2016-203

Dear Dr. Dimeo:

From October 17-20, 2016, 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 October 20, 2016, with members of your staff.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector observed various activities in progress, interviewed personnel, and reviewed selected procedures and representative records. 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, 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 Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

R. Dimeo

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If 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/

Anthony J. Mendiola, 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:
As stated

cc: See next page

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

R. Dimeo

- 2 -

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2016-203

Licensee: National Institute of Standards and Technology

Facility: NIST Center for Neutron Research (NCNR)
NCNR National Bureau of Standards Reactor

Location: Gaithersburg, MD

Dates: October 17–20, 2016

Inspector: Craig Bassett

Accompanied by: Mike Takacs, Security Specialist and Inspector Trainee

Approved by: Anthony J. Mendiola, 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
Center for Neutron Research
National Bureau of Standards Reactor
Report No. 50-184/2016-203

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, audit, and design change functions, (3) reactor operations, (4) operator requalification, (5) maintenance and surveillance, (6) fuel movement, (7) experiments, (8) procedures, 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 was in compliance with NRC requirements. No violations or deviations were identified.

Organization and Staffing

- The established organization was consistent with Technical Specifications (TSs) Section 6.1 requirements.
- Staffing levels at the facility were adequate for the current level of operations.

Review, Audit, and Design Change Functions

- The facility Safety Evaluation Committee was meeting as required and reviewing the topics outlined in the TSs.
- Annual independent audits were being conducted by a Safety Assessment Committee as required.
- The design change program being implemented at the facility satisfied NRC requirements.

Reactor Operations

- Acceptable reactor operations were being conducted and the appropriate shift staffing was being maintained.
- Adequate shift turnover briefings were being conducted and each operating crew was appropriately cognizant of facility conditions.

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 operators were being completed every 2 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 the facility's TSs.

Fuel Movement

- Fuel movement and handling was accomplished in accordance with TSs and procedural requirements.

Experiments

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

Procedures

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

Emergency Preparedness

- The Emergency Plan (E-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 E-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 or 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 week of the inspection the reactor was in a maintenance and refueling shutdown the first day but was started up the second day and continued routine operations for the remainder of the inspection.

1. Organizational and Staffing

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

To verify that the licensee was complying with the organizational and staffing requirements specified in NBSR Technical Specification (TS) Section 6.1, "Organization," the inspector reviewed selected aspects of the following:

- Current NCNR organization and staffing
- Reactor Console Logbooks Nos. 155 through 158
- Management and staff responsibilities outlined in the TS
- NBSR Administrative Rules (AR) 1.0, "Responsibilities of Operations Personnel"
- NBSR AR 2.0, "Personnel Requirements"
- NBSR Emergency Instruction (EI) 0.2, "Emergency Organization and Phone Numbers," listing emergency contact information for Reactor Operations personnel

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. 50-184/2015-202). Also, the organizational structure remained consistent with the requirements of TS Section 6.1 and Figure 6.1. In addition, the inspector 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 17 qualified senior reactor operators (SROs) at the facility who were either in management positions or assigned to various operating crews. Through interviews with operations personnel, the inspector determined that there were four operating crews at the facility who worked rotating shifts. Additionally, there was a fifth "day shift" crew and individuals on that crew typically only worked during the weekdays, but also provided coverage on occasions when individuals

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from the other crews were unavailable. Each crew was typically staffed with three or four individuals who were licensed SROs and possibly a trainee.

Through a review of selected entries in the console logbooks for the period from January 2016 to the present and through interviews with operations personnel, the inspector verified that staffing during routine reactor operation was as required and appeared to be adequate. It was also noted that a list of reactor facility personnel by name and telephone number was available to the reactor operators in the control room and was updated at least annually as required by TS Section 6.1.3, "Staffing." The list was last updated on August 16, 2016.

c. Conclusion

The established organization was consistent with TS 6.1 requirements and the operations staffing level appeared to be adequate for the current level of operations.

2. Review, Audit, and Design Change Functions

a. Inspection Scope (IP 69007)

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

- NCNR Safety Evaluation Committee (SEC) meeting minutes for March 2015 through the present (Meeting Nos. 378 through 381)
- NBSR Procedure No. NBSR-0007-DOC-04, "Engineering Manual," Revision 4, which included procedures and instructions for completing changes at the facility
- 2015 reactor audit conducted in accordance with TS 6.2.4, "SEC Audit Function," (1-4) by the NCNR Audit Subcommittee of the SEC, dated October 19, 2015
- 2016 reactor audit conducted in accordance with TS 6.2.4 (1-4) by the NCNR Audit Subcommittee of the SEC, dated October 17, 2016
- "2015 Annual [Audit] Report of the Safety Assessment Committee," audit conducted during November 2-4, 2015, dated March 15, 2016
- NCNR SEC Charter, approval dated June 16, 2016
- NBSR Engineering Change Request/Engineering Change Notice (ECR/ECN) No. 944, "Replacement of the Reactor Inlet (TRCA-3) RTD and Transmitter," ECR Level II review, approval dated January 27, 2016, and ECN Level II review and approval dated February 26, 2016, (with the associated 10 CFR 50.59 Evaluation)
- NBSR ECR/ECN No. 947, "Reactor Vessel Level Wet Leg Update for Procedures and Drawings," ECR Level I review, approval dated February 28, 2016, and ECN Level I review and approval dated April 8, 2016

- NBSR ECR/ECN No. 957, "Modifications to Refueling Plug Fuel Element Pickup Tools," ECR Level II review, approval dated March 28, 2016, and ECR Level II review and approval dated April 22, 2016, (with the associated 10 CFR 50.59 Evaluation)
- Operations Report No. 67, "NBSR Annual Report," for the period from January 1, 2014, through December 31, 2014, issued April 8, 2015
- Operations Report No. 68, "NBSR Annual Report," for the period from January 1, 2015, through December 31, 2015, issued April 13, 2016

b. Observations and Findings

(1) Review and Audits Functions

The inspector reviewed the charter of the SEC required by the TS. It was noted that the charter delineated the committee's membership, organization, and responsibilities, as well as quorum and meeting requirements. The charter also authorized the formation of subcommittees to assist the SEC. Four subcommittees had been organized for that purpose including: (1) the Audit Subcommittee, (2) the Beam Experiment Subcommittee (BES), (3) the Irradiation Subcommittee, and (4) the Procedure Review Subcommittee. A charter had been developed for each subcommittee and the various charters had been reviewed and approved by the SEC.

Records of the meetings held by the SEC from March 2015 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 completed by the SEC or by 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 was able to attend a meeting of the SEC on Wednesday, October 19, 2016. A new chair of the SEC and other new members were introduced. The meeting was informative and appropriately directed toward reviewing reactor operations and the support needed for continued successful operation.

A review of audit records indicated that the SEC Audit Subcommittee conducted an annual audit of the safety program at the facility in accordance with TS 6.2.4. The audits appeared to be appropriate. The audits were reviewed by the full SEC and licensee management responded to the subcommittee's findings and recommendations. In addition, corrective actions were taken as warranted.

Other records reviewed by the inspector showed that, as required by TS 6.2.5, "Safety Assessment Committee (SAC)," was convened annually to conduct an independent audit. The 2015 audit was conducted by

individuals who worked at other Research and Test Reactors in the United States including representatives from the University of Maryland, University of Missouri – Columbia, University of Massachusetts - Lowell, and Massachusetts Institute of Technology. The SAC audit provided good insight into the licensee's program and the committee made various worthwhile recommendations for program improvement. The licensee responded to the findings and took actions/corrective actions as needed.

(2) Design Change Functions

The inspector reviewed selected requests for changes to the facility (i.e., changes to structures, systems, or components) that had been proposed within the last 2 years. At NIST these change proposals were designated as ECRs. 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. In order to track the change requests, they were numbered sequentially during the year. These were screened to determine whether or not a 10 CFR 50.59 review would be required. Based on the safety significance and the 10 CFR 50.59 screen results, the changes were classified as either Level I (Minor) or Level II (Major). All Level II ECRs required a 10 CFR 50.59 review which often resulted in the completion of a 10 CFR 50.59 evaluation.

Once an ECR was approved, indicating that the change project could move forward, an 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 or review criteria results.

A review of selected ECRs and ECNs demonstrated that changes were acceptably documented and reviewed in accordance with NRC requirements and the licensee's guidelines. It also indicated that the work and the required document revisions were being completed as necessary. 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), which would have required a license amendment from the NRC.

c. Conclusion

The facility SEC was meeting as required and reviewing the topics outlined in the TSs. Independent annual audits were being conducted by a SAC as required. The licensee's design change program 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 Section 2.0, "Safety Limit and Limiting Safety System Settings," and TS Section 3.0, "Limiting Conditions for Operations," and procedural requirements, the inspector reviewed selected portions of the following:

- Reactor Console Logbooks Nos. 155 through 158
- Various NIST reactor control room log sheets
- Selected NIST reactor area inspection log sheets
- Shift supervisor's instructions and special log sheets
- NBSR Reactor Shift Supervisor Logbook Nos. 41 and 42
- Selected reactor operations shift turnover log notebook entries
- Associated reactor operations records from October 2015 to the present
- NBSR AR 2.0, "Personnel Requirements"
- NBSR AR 9.0, "Reactor Startup and Operation"
- Selected NBSR Operating Instructions (OIs) (i.e., operating procedures)
- Facility "NBSR Annual Reports," for the past 2 years

b. Observations and Findings

The inspector observed a reactor start-up and routine reactor operations. Observation and a review of logs and related records indicated that, when the reactor was operated, operations were conducted in accordance with facility procedures as required. The logs and records were clear and provided an indication of ongoing activities. Direct observation and records review demonstrated that shift staffing during reactor operation, as well as during maintenance periods, was being maintained as required by TS 6.1.3.

The records reviewed also showed that 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 operations specified in TS 3.1 through 3.9 prior to startup. These verifications were being completed and recorded as required. The inspector noted that various other procedural requirements were also being met.

Through logbook review and direct observation, the inspector also verified that shift turnover briefings were held prior to each shift change. It was noted that activities of the previous shift, and events or job evolutions scheduled for the upcoming shift, were discussed in detail. A status board was also maintained in the Control Room to ensure all operators were aware of ongoing work and current plant conditions. The records kept and the briefings that were given ensured that the operators were aware of the current conditions in the facility and what was planned for the upcoming shift.

c. Conclusion

Acceptable shift staffing was being maintained. Adequate shift turnover was being conducted and each operating crew was cognizant of facility conditions.

4. Operator Requalification

a. Inspection Scope (IP 69003)

To verify compliance with the operator requalification program for the NBSR, which was last updated March 2009, the inspector reviewed:

- Reactor Console Logbooks Nos. 155 through 158
- Medical examination records from 2014 through 2016
- Current status of selected qualified operators' licenses
- NBSR requalification examinations (biennial) for 2012 and 2014
- NBSR 2014-2015 and 2016-2017 requalification programs consisting of training provided in the areas of: reactor theory, radiation protection, emergency plan and actions, safety systems, physical security, reactor systems, and TS requirements
- Operator training records for the years 2014, 2015, and 2016 to date, documented on forms entitled, "Requalification Program Documentation Review and Reactivity Changes," no revision date
- Supervisor's annual operator evaluations documented on forms entitled, "Operator Evaluation," form revised November 2009

b. Observations and Findings

As mentioned previously, there were 17 qualified SROs employed at the facility. It was noted that three individuals were to be offered positions at the facility and could potentially be hired in the near future as reactor operator trainees. Through a review of various requalification and training documents, the inspector verified that the SRO operators' licenses were current and records of the 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. The inspector verified that all operators had completed the requalification training and had taken the written biennial requalification examination. Additional training on various plant systems and industrial hygiene/safety was also provided. NBSR console logbooks and requalification records 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 as required. In addition, the inspector verified that the qualified operators were receiving a biennial physical examination as well.

c. Conclusion

Operator requalification was being conducted and completed as required by the licensee's requalification program. Physical examinations for the operators were being completed every 2 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 4.0, "Surveillance Requirements," the inspector reviewed selected aspects of:

- Reactor Console Logbooks Nos. 155 through 158
- Reactor TS Log Book, Volume 2
- Selected TS surveillance schedules for each month for the period from January to October 2016, which indicated which surveillance activities were due for completion during that month
- Selected NIST reactor area inspection log sheets (completed every shift during routine operation) for the past 12 months
- Selected NIST reactor control room log sheets (data taken every hour during routine operation) for the past 12 months
- Selected NBSR Instrument Test Procedures and TS Procedures
- Facility "NBSR Annual Reports," for the past 2 years

b. Observations and Findings

(1) Maintenance Activities

During the first day of the inspection the reactor was in a maintenance shutdown and various activities were scheduled to be completed. The inspector was able to observe a limited number of maintenance activities including the routine calibration of the probes used for measuring the Thermal Shield cooling water pH levels. The technicians had the associated maintenance procedure with them throughout the test and successfully completed the task.

The inspector also reviewed various maintenance records, console logbooks, and data sheets which indicated that routine maintenance activities were conducted at the required frequency and 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

Various surveillance activities were conducted during the inspection. The reactor had been refueled the previous week and the staff was in the process of returning to normal reactor operations. In support of the reactor startup, the inspector was able to observe (in the control room) the TS procedure for measuring the reactivity worth of each shim arm and the regulating rod. During this evolution, the operators followed all of the steps in the procedure and documented all of the required data. In addition, the inspector reviewed various other TS-required procedures used to conduct surveillances and calibrations. These procedures included checklists and tables for recording data which were being used to document completion of the required surveillance activities. The frequency that these activities were to be performed was specified in the TS.

The completion and results of the surveillances and calibrations were tracked by the Chief of 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. A new surveillance schedule was 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 at the frequency specified in the TS and in accordance with 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 TS or 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 Movement

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 3.9, "Facility Specific and TS 5.3, Reactor Core and Fuel":

- Reactor Console Logbooks Nos. 155 through 158
- NBSR Reactor Shift Supervisor Logbook Nos. 41 and 42
- Current core configuration, designated as Core No. 642
- Pool Log No. 3 and fuel transfer records from July 2015 to the present

- Core reload/refuel and core defuel/refuel verification and sign-off sheets for Core Nos. 626 through 632
- NBSR Operating Instruction 6.2, "Operation of Fuel Transfer System," Revision F, dated February 1, 2016.
- NBSR Operating Instruction 3.3, "Operation of the Storage Pool Cooling System," Revision A, dated September 24, 2015.

b. Observations and Findings

Licensee procedures and operator instructions provided approved methods to move and handle fuel consistent with the provisions of the TS and the licensee safety analysis. The inspector reviewed the core loading and fuel handling records for recent refueling cycles 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 knowledgeable of the procedural requirements that ensured criticality control and fuel integrity.

As noted above, the core was recently reloaded. Spent fuel elements were transferred from the reactor core to the spent fuel pool. The elements in the core were shuffled into new locations and four new fuel elements were placed into the core.

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 TSs 3.8, 4.8, "Experiments," and TS 6.5, "Experiment Review and Approval," and licensee's administrative procedures were being met governing the experimental program, the inspector reviewed selected aspects and/or portions of:

- BES Report to the SEC dated May 12, 2016
- Experimental control procedures for various instruments located in the C-100 area and the guide hall
- Rabbit Request List maintained in the Control Room which contained the irradiation requests that have been authorized for the pneumatic system
- Experimental Proposal Approval Sheet, No. 509, "BT-2 Neutron Imaging Facility," approval by the NCNR Director, dated August 3, 2016

- Experimental Proposal Approval Sheet, No 413, "NG-2 HFBS (High Flux Backscattering Spectrometer)," approval by the NCNR Director, dated October 16, 2012

b. Observations and Findings

Experiments at the NBSR included: (1) irradiation experiments and (2) beam experiments. Irradiation experiments were those conducted in a pneumatic tube or in any other NBSR irradiation facility inside the thermal shield. Beam experiments were ones which were conducted in or with experimental instruments outside the reactor thermal shield. Beam experiments were typically conducted in the C-100 area or the guide hall. For irradiation experiments, the reactivity worth and other criteria were delineated in the TS; no criteria were listed in the TS for beam experiments. Depending upon the type of experiment being proposed, either the Irradiation Subcommittee or the BES reviewed the experimental proposal as required and provided recommendations. 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 6.5 to include the beam port and guide hall experiments.

The inspector interviewed the Chair of the BES. He explained the procedure followed for experiment approval and discussed two recent experiments that were reviewed by his committee. The inspector reviewed the approval procedure and package for two recent beam experiments and noted that the BES had reviewed these experiments. The NCNR Hazards Review Committee had reviewed these experiments as well. The inspector verified that the beam experiment proposals were forwarded to the SEC for review and subsequently to the Director for approval. The inspector also noted that the approved beam experiment documentation required specific engineering and radiation protection controls that were required to be implemented to limit radiation exposure to personnel conducting the experiments.

The inspector also interviewed the Chair of the Irradiation Subcommittee. It was noted that no new proposals dealing with experiments in the thermal shield or the pneumatic system had been forwarded to the subcommittee. The review and approval process for the Irradiation Subcommittee remained in effect.

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 6.4, "Procedures," were being met concerning written procedures:

- Procedure change, review, and approval process
- NBSR AR 5.0, "Procedures and Manuals," Revision A, dated April 25, 2016
- NBSR-0005-CH-00, "Charter for the NCNR Safety Evaluation Committee Procedure Review Subcommittee," approval dated June 16, 2016
- SEC meeting minutes for April 2015 through the present (Meeting Nos. 379 through 381)
- Facility "NBSR Annual Reports," for the past 2 years

b. Observations and Findings

Written procedures for the activities listed in TS 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 noted that the licensee had recently completed reformatting all procedures so that they would all be in a standard format. This was a project that took a great deal of time and effort to complete, and the issue was identified in a previous report as an Inspector Follow-up Item (IFI) (see Paragraph 10 below).

In 2014, the licensee had established a Procedure Review Subcommittee (PRS) which reported to the SEC to review the newly reformatted and revised procedures. The inspector verified that the official, approved copies of reactor operations procedures were kept in the control room as stipulated by procedure. The inspector also verified that the procedures were being reviewed by the SEC PRS. The procedures were then approved by the Chief of Reactor Operations or the Chief of Reactor Operations and Engineering as required in the TS.

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 (E-Plan) dated December 2008, the latest revision submitted December 21, 2015, the inspector reviewed selected aspects of:

- Emergency preparedness training records for 2015 and 2016
- Selected NIST reactor area inspection log sheets for the past 12 months
- Support provided by support groups (i.e., NIST Fire Department, NIST Police Department, and law enforcement officials from Montgomery County, Maryland)
- Records documenting annual evacuation drills and the latest biennial emergency exercise

- Documentation of inventories of emergency response supplies, equipment, and instrumentation
- NBSR EI Manual (containing the E-Plan implementing procedures)
- NBSR EI Procedure 0.2, "Emergency Organization Phone Numbers"
- NBSR EI Procedure 0.3, "Emergency Classification and Criteria"

b. Observations and Findings

The E-Plan in use at the reactor and support facilities was the same as the latest version submitted to the NRC. The E-Plan was being audited and reviewed biennially as required. 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 TS. The inspector conducted an onsite tour of the licensee's Emergency Support Center and determined that communication equipment, radiological response supplies, and radiation detection equipment was functional.

The inspector observed the most recent annual emergency drill which was conducted on October 19, 2016. It was noted that this was a Table Top exercise with a scenario involving an active shooter, core damage, and a radioactive release. The exercise involved NIST Public Affairs, Fire Department (FD), and PD personnel, as well as NCNR reactor operations and health physics staff members. Offsite participants included several members of the Montgomery County PD, including a member from its Special Operations Division. A critique was held following the exercise to discuss the strengths and weaknesses identified and to develop possible solutions to any problems identified.

The most recent biennial emergency exercise was conducted on September 9, 2015. A critique was held following the drill to discuss those things that were done well and how to correct the problems that occurred.

Emergency preparedness and response training for NBSR personnel was being completed as required. This was accomplished through the initial training for incoming personnel and the refresher training provided for all NCNR employees. The licensee's health physics group conducted biennial emergency response training for the NIST FD and PD, as well. The inspector verified that the last training for these groups had been conducted during June and July 2016.

The inspector reviewed the results of selected emergency equipment inventories required by Section 8.5 of the E-Plan. It was noted that the emergency equipment in the lockers located in the A-wing front lobby/break area, in Basement Level 2, and in the C-200 area had been inventoried as required. The TSs required an annual inventory; the lockers were being inventoried monthly.

The inspector verified that the Memorandum of Understanding (MOU) with the Walter Reed National Military Medical Center 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. The inspector also verified that the MOU with Montgomery County Police Department, dated April 24, 2013, remained in effect.

The inspector reviewed the NBSR E-Plan dated December 21, 2015 and found a discrepancy on page 11 regarding emergency notification to the NRC during an ALERT declaration, specifically for an event involving a security breach. The E-Plan stated on page 11, that NRC Operations Center shall be notified as soon as possible or within 8 hours for an event leading to the declaration of an ALERT emergency classification level. However, 10 CFR Part 73, Appendix G, "Reportable Safeguards Events," requires that, for a security breach affecting the reactor facility, an ALERT will be declared and the NRC Operations Center shall be notified within one hour of discovery. Only non-security related emergency events leading to an ALERT declaration were to require notification to the NRC operations center as soon as possible or within 8 hours as stated in the NBSR E-Plan. The licensee was informed that the issue of changing the E-Plan to require notification of the NRC Operations Center within one hour of a security breach would be followed by the NRC as an IFI and would be reviewed during subsequent inspections (IFI 50-184/2016-203-01).

c. Conclusion

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

10. Follow-up on Previously Identified Item

a. Inspection Scope (IP 92701)

The inspector reviewed the actions taken by the licensee to address a previously identified IFI concerning facility procedures.

b. Observation and Findings

50-184/2013-202-01 – IFI – Follow-up on the licensee's actions to reformat existing procedures, review and revise the procedures, and develop written guidance on procedure writing and revision.

During a review of procedures in December 2013, the inspector noted that the licensee was in the process of reformatting all procedures so that they would all be in a standard format. Once this was completed the licensee planned to conduct a review of each procedure and ensure that it was correct, reflected current practice, and was in accordance with the TS. This was identified by the NRC as an IFI.

During this inspection the inspector reviewed the progress made by the licensee regarding reformatting their procedures and incorporating the appropriate changes as needed. The inspector found that all of the various types of facility procedures and instructions had been revised and approved.

c. Conclusions

One IFI was reviewed. This issue is now closed.

11. Exit Interview

The inspection scope and results were summarized on October 20, 2016, with members of licensee management. The inspector described the areas inspected and discussed the inspection findings. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

P. Brand	Chief, Reactor Engineering and Chair, Hazards Review Committee
D. Brown	Senior Reactor Health Physicist, Leader, Reactor HP Group, and Chair of the Irradiation Subcommittee
F. Clark	Reactor Supervisor/Senior Reactor Operator
D. Hughes	Chief, Reactor Operations
T. Johnston	Reactor Health Physicist
B. Kirby	Chair of the Beam Experiment Subcommittee
S. MacDavid	Engineering Technician
T. Newton	Chief, Reactor Operations and Engineering and NCNR Deputy Director
R. Strader	Quality Assurance Program Manager
R. Sprow	Reactor Supervisor/Senior Reactor Operator
D. Wilkison	Reactor Supervisor/Senior Reactor Operator
R. Williams	Senior Nuclear Engineer and Chair, Safety Evaluation Committee

Other Personnel

S. Shahan	Chief, Fire Protection Group, Emergency Services Division, Office of Facilities and Property Management, NIST
A. Washington	Lieutenant, Police Department, Emergency Services Division, Office of Facilities and Property Management, NIST

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
IP 92701	Follow-up on Open Items

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-184/2016-203-01	IFI	Follow-up on licensee's action to correct page 11 of the NBSR E-Plan regarding notification requirements to the NRC Operations
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Center, within 1 hour of discovery, for an ALERT declaration involving a security breach.

Closed

50-184/2013-202-01 IFI Follow-up on the licensee's actions to reformat existing procedures, review and revise the procedures, and develop written guidance on procedure writing and revision.

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
AR	Administrative Rule
BES	Beam Experiment Subcommittee
ECN	Engineering Change Notice
ECR	Engineering Change Request
EI	Emergency Instruction
E-Plan	Emergency Plan
FD	Fire Department
IFI	Inspector Follow-up Item
IP	Inspection Procedure
MOU	Memorandum of Understanding
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
OI	Operating Instruction
PD	Police Department
PRS	Procedure Review Subcommittee
SAC	Safety Assessment Committee
SEC	Safety Evaluation Committee
SRO	Senior Reactor Operator
TS	Technical Specification