

April 16, 2015

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. 50-184/2015-201

Dear Dr. Dimeo:

From March 16–20, 2015, the U.S. Nuclear Regulatory Commission (NRC or the Commission) conducted an inspection at the National Institute of Standards and Technology's 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 March 19, 2015, with Dr. Paul Brand, Acting Chief, Reactor Operations and Engineering and other 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 inspectors observed various activities in progress, interviewed personnel, and reviewed selected procedures and representative records.

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

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, and requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

R. Dimeo

- 2 -

Should you have any questions concerning this inspection, please contact Mr. Craig H. Bassett at (301) 466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Kevin Hsueh, 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. 50-184/2015-201

cc w/encl: See next page

National Institute of Standards and Technology

Docket No. 50-184

cc:

Environmental Program Manager III
Radiological Health Program
Air & Radiation Management Adm.
Maryland Dept of the Environment
1800 Washington Blvd, Suite 750
Baltimore, MD 21230-1724

Director, Department of State Planning
301 West Preston Street
Baltimore, MD 21201

Director, Air & Radiation Management Adm.
Maryland Dept of the Environment
1800 Washington Blvd., Suite 710
Baltimore, MD 21230

Director, Department of Natural Resources
Power Plant Siting Program
Energy and Coastal Zone Administration
Tawes State Office Building
Annapolis, MD 21401

President
Montgomery County Council
100 Maryland Avenue
Rockville, MD 20850

Dr. Paul Brand, Acting Chief, Reactor Operations
and Engineering
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

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

R. Dimeo

- 2 -

Should you have any questions concerning this inspection, please contact Mr. Craig H. Bassett at (301) 466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Kevin Hsueh, 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. 50-184/2015-201

cc w/encl: See next page

DISTRIBUTION:

PUBLIC	PROB r/f	RidsNrrDprPrta
RidsNrrDprPrtb		MCompton (Ltr only O5-A4)
MNorris (MS T3B46M)		CBassett XYin

ACCESSION NO.: ML15089A047 *concurrent via e-mail **NRC-002**

OFFICE	NRR/DPR/PROB: PM*	NRR/DPR/PROB: BC
NAME	CBassett	KHsueh
DATE	4/14/2015	4/16/2015

OFFICIAL RECORD COPY

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2015-201

Licensee: National Institute of Standards and Technology

Facility: National Bureau of Standards Reactor

Location: Gaithersburg, MD

Dates: March 16–20, 2015

Inspectors: Craig H. Bassett
Mike Morlang

Approved by: Kevin Hsueh, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

National Institute of Standards and Technology
National Bureau of Standards Reactor
NRC Inspection Report No. 50-184/2015-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the National Institute of Standards and Technology (the licensee's) Class I 20 megawatt test reactor facility safety program including: (1) organizational functions and staffing, (2) review, audit, and design change functions, (3) procedures, (4) radiation protection program, (5) environmental monitoring program, and (6) transportation of radioactive materials since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's safety program was directed toward the protection of public health and safety and was generally in compliance with NRC requirements. One non-cited Severity Level IV violation of NRC requirements was identified.

Organizational Functions and Staffing

- The organizational structure was consistent with Technical Specifications 6.1 and 6.3.
- Health physics staffing appeared to be adequate for the current level of operations.

Review, 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 Program

- Surveys were being completed and documented as required.
- Postings met the regulatory requirements specified in Title 10 of the *Code of Federal Regulations* Parts 19 and 20.
- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.

- Radiation work permits were generated as needed to provide guidance and precautionary requirements for on-going and emergent work at the facility.
- The radiation protection training program being implemented by the licensee satisfied regulatory requirements.

Environmental Monitoring Program

- Effluent monitoring satisfied NRC requirements and releases were within regulatory limits.

Transportation of Radioactive Materials

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

REPORT DETAILS

Summary of Facility Status

The National Institute of Standards and Technology's (NIST's or the licensee's) Center for Neutron Research (NCNR) reactor, a 20 megawatt test reactor commonly known as the National Bureau of Standards Reactor (NBSR), continued to be operated in support of laboratory experiments and various types of research. During the inspection, the reactor was shut down for maintenance in accordance with the licensee's normal operations cycle.

1. Organizational Functions and Staffing

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

To verify that the licensee was complying with the requirements specified in Technical Specifications (TS) Sections 6.1 and 6.3: the inspector reviewed selected aspects of the following:

- Current NBSR organization and staffing
- Management and staff responsibilities outlined in the TS
- NBSR Administrative Rule 2.0, "Personnel Requirements," issued July 30, 2009

b. Observations and Findings

The inspector noted that the organizational structure had changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report (IR) No. 50-184/2014-201). As noted in the 2014-201 IR, the group leader of the NIST reactor health physics (HP) group previously reported to the NIST campus Director of Radiation Protection. Because of an organizational change at NIST, the reactor HP group leader now reports to the Director, NIST Center for Neutron Research. The inspector noted that this change was not clearly reflected in the current TS. The licensee indicated that they were preparing an amendment request to obtain NRC approval to modify the TS to more accurately reflect the revised organizational structure. The licensee was informed that the submission of an amendment request for a change to the TS would be followed by the NRC as an Inspector Follow-up Item (IFI) and would be reviewed during a subsequent inspection (IFI 50-184/2015-201-01).

The inspector also noted that the reactor HP group was composed of the group leader and nine staff members. Six of these individuals, including the group leader, were health physicists; the other four were HP technicians. The staffing level appeared to be adequate to support the current level of activity at the facility.

c. Conclusion

The organizational structure was consistent with TS 6.1 and 6.3 requirements. The reactor HP group staffing 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 6.2, "Review and Audit," and Title 10 of *Code of Federal Regulations* (10 CFR) Section 50.59, were being implemented in accordance with NRC requirements:

- Safety Evaluation Committee (SEC) meeting minutes for March 2012 through the present (Meeting Nos. 373–377)
- NBSR Procedure No. NBSR-0007-DOC-04, "Engineering Manual," Rev. 4, dated June 2009
- Reactor Health Physics Procedure, HP-1.2, Revision (Rev.) A, "ALARA [As Low As Reasonably Achievable] and Program Review," dated October 22, 2014
- 2014 Reactor Audit in Accordance with TS 6.2.4(1-4), conducted by the Audit Subcommittee of the NCNR Safety Evaluation Committee, dated October 22, 2014
- 2014 Annual Report of the Safety Assessment Committee for Calendar Year 2014, issued December 17, 2014
- Annual Review of the Reactor Radiation Protection Program, completed by the Group Leader, Reactor Facilities Group, for 2013 and a portion of 2014, dated November 17, 2014
- Quarterly Facility Audit Reports completed by HP staff members for 2014
- NBSR Engineering Change Request No. 631, "Area Radiation Monitor System Modifications/Expansion," Level I review, approval dated February 17, 2012
- NBSR Engineering Change Notice (ECN) No. 849, "Cartridge Style Mechanical Seal for Main Primary D₂O Pumps," Major ECN – Level II review, approval dated July 8, 2014, and work completed on September 4, 2014
- Operations Report No. 65, "NBSR Annual Report," for the period from January 1, 2012, through December 31, 2012, issued March 28, 2013
- Operations Report No. 66, "NBSR Annual Report," for the period from January 1, 2013, through December 31, 2013, issued March 31, 2014

b. Observations and Findings

(1) Review and Audit Functions

Records of the meetings held by the SEC from March 2014 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 a Safety Assessment Committee as required by TS 6.2. The inspector reviewed the audit and noted that the audit team provided an independent review of the NCNR reactor operations and the performance of the SEC as outlined in the TS. The audit team also made various observations which the licensee was taking action to address.

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 facility conditions, radiation level readings and contamination surveys of various areas, and recommendations for improvements as required by procedure.

(2) Design Change Functions

The inspector met with the quality assurance engineer who managed the engineering change request program. The inspector reviewed two changes pertaining to radiation protection systems and/or equipment that had been proposed and implemented. The changes were acceptably documented and reviewed in accordance with the TS and the licensee's guidelines. It was noted that both of the ECNs included: (1) a design description; (2) safety considerations; (3) Safety Analysis Report changes, if needed; and (4) a safety evaluation and conclusions. Neither of the changes met the criteria in 10 CFR 50.59 for further review or NRC approval. The design change program was being implemented in accordance with NRC requirements.

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 Safety Assessment Committee was conducting audits as required. The design change program was being implemented by the licensee in accordance with NRC requirements.

3. Procedures

a. Inspection Scope (IP 69008)

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

- Procedure revision, review, and approval process
- SEC meeting minutes for March 2014 through the present
- Selected reactor Health Physics Procedures (HPPs) for the NBSR
- NBSR Administrative Rule 5.0, "Procedures and Manuals," issued June 5, 2010

b. Observations and Findings

The inspector noted that the reactor HP group at NCNR continued to use three types of procedures. One type was high-level guidance documents developed by the NIST Office of Safety, Health, and Environment (OSHE), to implement the radiation safety program for the various NIST sites. Another type consisted of the HPPs for the NBSR issued by the reactor operations group. These procedures applied only to the NCNR and the work conducted there. The third set of procedures consisted of interdivisional procedures developed by the NIST Gaithersburg Radiation Safety Division (GRSD). These procedures were used to document the basis and process for issues that affected various different NIST divisions at the Gaithersburg campus.

It was noted that since the HP group now reported to the Director of the NCNR, the group had transitioned from the use of OSHE instructions to using predominately HPP procedures for the NBSR. These HPPs had been rewritten and reformatted in accordance with an initiative which was underway to revise and rewrite the licensee's operations procedures.

c. Conclusion

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

4. Radiation Protection Program

a. Inspection Scope (IP 69012)

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

- Selected HPPs
- ALARA Policy, outlined in various HPPs
- Copies of radiation work permits (RWPs) for 2014
- Selected HP survey records documented on "Duty HP Weekly Data Summary" sheets and "Swipe Survey" analysis results data sheets for 2014 and to date in 2015
- Quarterly Facility Audit Reports completed by reactor HP staff members for 2014
- NIST Personnel Dosimetry Summary records for facility personnel for 2013 and the first three quarters of 2014
- Calibration and periodic check records for portable radiation monitoring

- instruments documented on "NIST HP Survey Instrument Calibration" forms
- Calibration records for area radiation monitors (ARMs) documented on the form "Area Radiation Monitors," RM 1-1, dated December 8, 2009
 - Facility Operations Reports for the past 2 years (Nos. 66 and 67)

The inspector also observed the use of dosimetry and radiation monitoring equipment during tours of the facility. In addition, the inspector accompanied the duty HP during surveys in the C-200, C-100, basement, and guide hall areas.

b. Observations and Findings

(1) Surveys

The inspector reviewed the results of selected surveys including: (1) daily general area radiation surveys of work areas, (2) weekly contamination surveys of controlled areas at the facility, (3) monthly general area radiation surveys of the interior uncontrolled areas and the area around the exterior of the NCNR, (4) radiation and contamination surveys conducted during the quarterly audits, and (5) contamination surveys of various items being removed from the controlled areas of the facility for 2014 and to date in 2015. The surveys had been completed as stipulated by procedure and the results were documented on the appropriate forms. Areas or items found to be contaminated were decontaminated and then surveyed again to verify there was no contamination present. The survey program appeared to be adequate.

The inspector observed NCNR personnel, assisted by a facility Health Physicist (HP), as they replaced shield plugs and associated shielding in the area of Beam Tube Number (No.) 2. The HP provided coverage and radiation monitoring during completion of the job inside containment. The inspector noted that the HP and the other workers were knowledgeable of their assignments and demonstrated the appropriate actions to reduce the spread of any possible contamination and maintain their respective doses ALARA.

The inspector also accompanied an HP Technician during rounds of the facility to check on instrument availability and calibration status, facility conditions, and portal monitor and frisker availability and status. The technician was knowledgeable and diligent in checking for any problems that might exist.

In addition, on various occasions during tours of the facility, the inspector noted that exit frisking was completed by facility 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

Through direct observation of licensee staff members, the inspector determined that dosimetry was worn acceptably. An examination of the TLD results indicating radiation exposures at the facility for 2013 and the first three quarters of 2014 showed that occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits.

The facility also collected and analyzed urine samples for tritium bioassay purposes. The highest attributable doses in 2013 and 2014 from tritium were also within 10 CFR Part 20 limits.

The inspector also verified that NRC Form 5 letters were issued to those facility personnel who had received a dose greater than 100 millirem during 2013. The final dose data had not yet been made available for the NCNR personnel; thus, the letters/reports for 2014 had not been issued to date. It was noted that all those who should have received a letter had been issued the appropriate letter and form in 2013.

(4) Calibration and Operation of Radiation Monitoring Equipment

The calibration of portable survey meters was typically completed by NIST OSHE personnel as well as by reactor HP staff. Calibration of fixed radiation detectors, air monitoring instruments, and other instrumentation associated with the reactor was completed by the reactor engineering group. The calibration records of selected portable survey meters, friskers, and ARMs that were in use at the facility were reviewed. The inspector verified that portable instruments were now being calibrated annually and records were being maintained as required. The ARMs were checked monthly and calibrated annually. The inspector verified that the radiation monitoring equipment required in TS 3.7 and 4.7 was operable and was being tested and calibrated as required.

(5) Radiation Work Permit Program

The inspector reviewed RWPs that had been written and used in 2014 and those issued to date in 2015. There were various "standing" RWPs that remained in effect for the entire year due to the repetitive nature of the work they covered. Other RWPs were generated for specific work, such as fuel storage pool activities, maintenance work, and fuel handling. It was noted that the controls specified in the RWPs were acceptable and applicable for the work being done. Also, the RWPs had been reviewed and approved as required.

(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;" (2) HPPs for the NBSR; and (3) Health Physics Instructions. 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 was consistent with the requirements in 10 CFR Part 20.

(7) Radiation Protection Training

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

The inspector verified through records review, direct observation, and licensee interviews that facility employees, guest researchers, and emergency responders had received the required training at the required frequency. The inspector also participated in the biennial refresher training provided by the facility.

(8) Facility Tours

The inspector observed activities in various laboratories, the C-100 or the experimental floor area, and the guide hall. The inspector also toured other areas, including the C-200 area (which included the control room), portions of the basement area, including the pneumatic tube (rabbit) labs, and other selected areas including the spent fuel storage area and the process area. 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. Specifically, (1) surveys were being completed as required, (2) postings met regulatory requirements, (3) personnel dosimetry was being worn as required and doses were within the NRC's regulatory limits, (4) radiation monitoring equipment was being maintained and calibrated as required, and (5) radiation protection training was provided to facility employees and guest users.

5. Environmental Monitoring Program

a. Inspection Scope (IP 69004)

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

- Selected HPPs and HPIs
- Tritium and Argon-41 release data sheets
- Building 235 environmental survey sheets
- Licensee COMPLY code calculations for 2013 and 2014
- Gammatracer data results for 2014 and to date in 2015
- NIST environmental sample analysis results for 2013 and 2014
- TLD results for environmental stations for 2014 through the date of the inspection
- Facility Operations Report for the past 2 years (Nos. 66 and 67)

b. Observations and Findings

Environmental vegetation samples were collected and prepared quarterly for analysis during April through September using standard techniques in accordance with HPI 8-2. Environmental soil samples were collected and prepared quarterly for analysis during October through March. Environmental water samples were collected and prepared quarterly for analysis throughout the year. The 2013 and 2014 results of these various analyses were acceptably

documented and the results, which showed no significant changes when compared with previous years, were outlined in the licensee's Annual Operations Report.

The inspector reviewed the records documenting liquid and airborne releases to the environment for the past 2 years. The inspector determined that liquid and gaseous releases continued to be calculated as required by procedure and were acceptably documented. Calculations were performed by the licensee using the Environmental Protection Agency's COMPLY computer code. The releases were determined to be within the annual dose constraints of 10 CFR 20.1101(d), 10 CFR 20.1301, and TS limits.

On-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor and various environmental TLDs in accordance with the applicable procedures. The data indicated that there were no measurable doses above any regulatory limits. These results were reported in the facility Annual Operations Reports for 2013 and 2014. Through observation of the facility, the inspector found no new potential release paths.

The inspector reviewed the calibration records of the gas and stack monitoring systems. The systems were being calibrated annually according to procedure.

c. Conclusion

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

6. Transportation of Radioactive Materials

a. Inspection Scope (IP 86740)

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

- Selected HPI procedures
- Material Transfer Request forms for 2014
- Radioactive material shipment records for 2014

b. Observations and Findings

The inspector reviewed records of shipments of radioactive material made during 2014. Through this review and discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities of these materials were calculated and dose rates measured as required. The records also indicated that the shipping containers were appropriate and had been labeled if required. The radioactive

material shipping records reviewed by the inspector had been completed as required.

The inspector verified that the licensee was maintaining copies of consignees' radioactive material possession licenses as required. If the current copy of the license was not available at NCNR, the licensee was aware that they were required to contact the consignee and obtain a current copy before a shipment could be made. The licensee also maintained on file the certificates of compliance pertaining to those shipping containers that were used to ship radioactive material as required. In addition, the inspector verified that the licensee staff members assigned to complete and/or review the shipping paperwork were trained and that refresher training was being completed at least triennially as required.

c. Conclusion

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

7. Follow-up on Licensee Identified TS Violation

a. Inspection Scope (IP 92701)

The inspectors reviewed the following in response to a licensee identified failure to comply with TS requirements:

- NBSR Procedure, Technical Specification Procedure (TSP) 4.3.2 (2), "Operability of the Emergency Sump Pump with Water," Rev. A
- Letter from the licensee to the NRC dated March 20, 2015, reporting the NCNR Violation of Limiting Conditions for Operation (LCOs)

The inspectors also entered the area where the emergency core cooling sump pump connect/disconnect switch is located and observed operation of the switch.

b. Observations and Findings

(1) Event Description

TS 3.3.2 states that the reactor shall not be operated unless: (1) the D₂O (Deuterium oxide) emergency core cooling system is operable, and (2) a source of makeup water to the D₂O emergency core cooling tank is available.

On March 7, 2015 at 8:30 a.m., NCNR personnel discovered an apparent violation of the Limiting Conditions for Operation of the facility TS while performing maintenance during a scheduled reactor shutdown period. The licensee found that the local switch for the emergency core cooling sump pump control power was in the disconnect position. The last time

that the system was verified to be operable was while conducting annual sump pump surveillance on July 2, 2014. Since that time there had been no other maintenance on the sump pump, nor was there any other known reason that the switch would have been placed in the disconnect position. After discovery of this situation, the sump pump disconnect switch was immediately placed in the connect position.

(2) Analysis and Investigation of the Event

Through its design, the emergency core cooling system, in the event of loss of core coolant, provides sufficient D₂O to passively provide adequate coolant for approximately 2.5 hours to cool the fuel and protect against the release of fission products. That part of the emergency core cooling system was operable from July 2, 2014, until the present. However, the emergency core cooling system employs one sump pump to return spilled coolant to the overhead storage tank following the 2.5 hours of passive cooling. Because there is only one sump pump, it must be operational whenever the reactor is in operation as required by TS 3.3.2(1). This condition was not met from July 2, 2014, until the present. It should be noted that, in the event that the pump fails or is inoperable and the D₂O supply in the overhead storage tank is exhausted, domestic water or a suitable alternative would be used to furnish water for once through cooling as required by TS 3.3.2 (2). A source of domestic water to the D₂O emergency core cooling tank was available during the period from July 2, 2014, until the present.

The licensee's investigation of the event revealed that the only time the lockout switch is used is during the sump pump annual surveillance. Licensee personnel found that the lockout switch for the sump pump is of a different design from the rest of the lockout switches used in the facility. Also, the operation of the sump pump lockout switch is not intuitive. All other lockout switches have a single move locking bar. The sump pump lockout switch requires that the operator first rotate a bezel surrounding the push button and then engage the locking bar. An operator could easily be confused into believing that removing the latch was sufficient to switch the lockout to the connect position, when in reality the bezel needs to be rotated in addition to removing the latch in order for the spring loaded button to be released to allow the disconnect to be in the connect position.

Upon reviewing the procedure associated with this surveillance, NBSR Procedure, TSP 4.3.2 (2), "Operability of the Emergency Sump Pump with Water," Rev. A, the licensee found a deficiency. Following completion of the surveillance/maintenance on the sump pump, Step 4.7.4 instructs the operator to "Verify that neither the Emergency Sump Pump lockout, nor the Sump Pump to Hot Waste Lockout is engaged." Step 4.7.4 does not indicate that, not only does the locking bar

have to be moved downward but, the bezel around the push button must be rotated as well.

(3) Root Cause Analysis and Corrective Actions

Through root cause analysis, the licensee determined that procedure TSP 4.3.2(2) allowed for the disconnect switch to be inadvertently left in the disconnect position and, as such, would go unnoticed. To address this and the other issues found during the investigation, the licensee has undertaken various corrective actions. First, the licensee began immediately training all operators in the proper use of the lockout switch in question. Furthermore, the licensee will augment its requalification training program so that all operators will be specifically trained on the use of this lockout switch at least every two years. Second, the licensee is revising the procedure to indicate that the sump pump is observed to be running at which point the power to the pump will cut by operating the pump switch in the control room. This will ensure that the disconnect switch is in the connect position at the conclusion of the procedure. In other words, the licensee is adding a step for the control room operator to cycle the start button on the control room console to verify that power is applied to the sump pump (i.e. the lockout is in the "connect" position). If the lockout is in the connect position this will result in a visual indication that a red (running) light on the reactor console will illuminate. Only if this "bump" of the sump pump gives proper indication (i.e. the red light comes on) can the annual surveillance procedure be signed off as complete. The third corrective action will be the addition of a visual verification of the status of the sump pump lockout switch to the pre-startup checklist.

(4) NRC Review

The inspectors reviewed the event and the findings of the licensee, as well as the corrective actions. The inspectors found that the licensee's analysis and review of the event appeared to be comprehensive. Also, once implemented, the corrective actions should be adequate to prevent recurrence of such an event.

The inspectors determined that the problem had been identified and reviewed by the licensee and reported to the NRC. Corrective actions had been identified and were in the process of being completed as well. As a result, the licensee was informed that this non-repetitive, licensee-identified and corrected violation would be treated as a Non-Cited Violation (NCV), consistent with section 2.3.2 of the NRC Enforcement Policy (NCV 50-184/2015-201-02). This issue is considered closed.

c. Conclusions

One licensee-identified NCV was noted for failure to follow an LCO in TS 3.3.2 involving the emergency core cooling sump pump during reactor operations. This issue was reviewed and is considered closed.

8. Exit Interview

The inspection scope and results were summarized on March 19, 2015, with members of licensee management. The inspector described the areas inspected and discussed the preliminary inspection findings. The licensee acknowledged the results of the inspection and did not identify as proprietary any of the material provided to or reviewed during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. Barvitskie	Reactor Health Physicist
P. Brand	Acting Chief, Reactor Operations and Engineering
D. Brown	Senior Reactor Health Physicist and Leader, Reactor HP Group
K. Consani	Reactor Health Physicist
R. Dimeo	Director, NIST Center for Neutron Research
G. Downing	Leader, Nuclear Methods Division and Chair, Safety Evaluation Committee
D. Hughes	Chief, Reactor Operations
F. Scarano	Reactor Health Physics Technician
M. Schwaderer	Reactor Health Physicist
R. Strader	Quality Assurance Program Manager
J. Tracy	Reactor Health Physicist

Other Personnel

J. Shupe	Certified Health Physicist, Radiation Facilities Group, Gaithersburg Radiation Safety Division, OSHE
A. Walton	Health Physics Technician, Radiation Facilities Group, Gaithersburg Radiation Safety Division, OSHE

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
IP 92701:	Follow-up

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-184/2015-201-01	IFI	Follow-up on the licensee's actions to request approval to modify the TS to more accurately reflect the current organizational structure with the facility HP group leader reporting to the Director of the NCNR.
50-184/2015-201-02	NCV	Failure to maintain the D ₂ O (Deuterium oxide) emergency core cooling system in an operable condition as required by TS 3.3.2(1) from July 2, 2014 until March 7, 2015, during which time the reactor was operated on various occasions.

Closed

50-184/2015-201-02 NCV Failure to maintain the D₂O (Deuterium oxide) emergency core cooling system in an operable condition as required by TS 3.3.2(1) from July 2, 2014 until March 6, 2015, during which time the reactor was operated on various occasions.

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access Management System
ALARA	As Low As Reasonably Achievable
ARM	Area Radiation Monitor
ECN	Engineering Change Notice
HP	Health Physics/Health Physicist
HPI	Health Physics Instruction
HPP	(Reactor) Health Physics Procedure
IAEA	International Atomic Energy Agency
IP	Inspection Procedure
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
OMARR	Operation and Maintenance Assessment of Research Reactors
RSI	Radiation Safety Instruction
RWP	Radiation Work Permit
SEC	Safety Evaluation Committee
OSHE	Office of Safety, Health, and Environment
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications