May 8, 2015

Vitto Nuccio, Reactor Administrator
Department of the Interior
U.S. Geological Survey
Box 25046, MS 975
Denver, CO 80225

SUBJECT: UNITED STATES GEOLOGICAL SURVEY – NRC ROUTINE INSPECTION REPORT NO. 50-274/2015-201

Dear Mr. Nuccio:

From April 6–9, 2015, the U.S. Nuclear Regulatory Commission (NRC or the Commission) conducted an inspection at your U.S. Geological Survey TRIGA reactor facility. The enclosed report documents the inspection results, which were discussed on April 9, 2015, with you; Mr. Timothy DeBey, Reactor Supervisor; and other members of your staff.

The 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 reviewed selected procedures and records, observed activities, and interviewed personnel. 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 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).

Should you have any questions concerning this inspection, please contact Mr. Mike Morlang at (301) 415-4092 or by electronic mail at Gary.Morlang@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. 50-274
License No. R-113

Enclosure:
NRC Inspection Report No. 50-274/2015-201

cc: See next page

cc:

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Test, Research, and Training
Reactor Newsletter
University of Florida
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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-274
License No:	R-113
Report No:	50-274/2015-201
Licensee:	United States Geological Survey
Facility:	U.S. Geological Survey TRIGA Reactor
Location:	Building 15, Denver Federal Center Denver Colorado
Dates:	April 6–9, 2015
Inspector:	Mike Morlang
Approved by:	Kevin Hsueh, Chief Research and Test Reactors Oversight Branch Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

United States Geological Survey
U. S. Geological Survey TRIGA Reactor
Report No. 50-274/2015-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the U.S. Geological Survey (the licensee's) Class II research reactor safety program including: (1) operator requalification; (2) radiation protection; (3) effluents and environmental monitoring; (4) design changes; (5) committees, audits, and reviews; (6) emergency preparedness; and (7) maintenance since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements.

Operator Requalification

- The requirements of the Operator Requalification Program were being met and the program was being acceptably implemented.

Radiation Protection

- Periodic surveys were completed and documented as required by procedure.
- Postings and signs met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were well within the NRC's regulatory limits.
- Radiation survey and monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection and As Low As Reasonably Achievable Programs met regulatory requirements.

Effluents and Environmental Monitoring

- Effluent monitoring was in accordance with license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits.
- The environmental protection program met NRC requirements.

Design Changes

- The licensee's design change process met NRC requirements.

Committees, Audits, and Reviews

- Audits and reviews were being conducted by the Reactor Operations Committee as required by Technical Specifications.

Emergency Preparedness

- The facility Emergency Plan was being reviewed by the Reactor Operations Committee as required.

- Emergency response equipment was being maintained and alarms were tested at the required periodicity.

- Annual evacuation drills and biennial emergency drills were being conducted as required by the emergency plan.

- Emergency preparedness training for staff and first responders was being completed as required.

Maintenance

- A detailed facility maintenance plan existed which included detailed procedures.

REPORT DETAILS

Summary of Facility Status

The U.S. Geological Survey (USGS or the licensee) one megawatt TRIGA research reactor was typically operated in support of USGS programs directed at improving methods and techniques to enhance scientific knowledge about water and earth materials. During the inspection the reactor was operated daily to support ongoing experimental and research work.

1. Operator Requalification

a. Inspection Scope (Inspection Procedure (IP) 69001)

To verify that the licensee was complying with the requirements of the NRC-approved Operator Requalification Program and 10 CFR Part 55, the inspector reviewed selected aspects of:

- Operator competence evaluation and written examination records for 2015
- Physical examination records documented on NRC Form 396 records
- Geological Survey TRIGA Reactor (GSTR) Reactor Operator Requalification On the Job Training forms for the 2013–2014 training cycle
- Individual operator training records documented on GSTR Reactor Operator Requalification On the Job Training forms for the periods from January 2015–December 2016
- Appendix 3-1 to Reactor Operations Manual (ROM) Section 3, entitled "U.S. Geological Survey TRIGA Reactor Operator Requalification Program," dated April 2014 with the latest Rev. dated April 2014 which included the "GSTR Fitness for Duty Policy for Licensed Reactor Operators," dated April 2010

b. Observations and Findings

There were three licensed senior reactor operators at the facility. The inspector reviewed the various operators' training records and confirmed they were being maintained as required. The records showed that the operators were knowledgeable of the appropriate subject material required by the program as demonstrated by successful completion of annual written examinations. Individual requalification records also showed that each operator demonstrated operational competence by completing annual operating performance exams administered by the Reactor Supervisor as required by the requalification program. The inspector further confirmed that all the operators had completed the required reactivity manipulations and the quarterly hours of operation required by the program. Requalification training lectures were documented for all operators on May 14, 2014 and October 23, 2014.

The inspector noted that the operators were also receiving biennial medical examinations as required by 10 CFR Part 55, Subpart C.

c. Conclusion

The requirements of the Operator Requalification Program were being met and the program was being acceptably implemented. Medical examinations were being completed biennially as required.

2. Radiation Protection

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Parts 19 and 20 and Technical Specifications Section F requirements:

- Radiological signs and posting in various areas of the facility
- Training records for GSTR staff and various support personnel
- Health Physics Quarterly Reports for 2014 through 2015 to date
- USGS TRIGA Reactor Quarterly Reports for 2014 through 2015 to date
- U.S. Geological Survey TRIGA Reactor Monthly Checklists for the past 2 years
- GSTR Annual Audit of Radiation Exposures and Radioactive Material Releases for 2013 and 2014
- Routine periodic survey and monitoring records for the past 2 years documented on radiological survey maps
- Maintenance and calibration records of radiation monitoring equipment for the past 2 years documented in the instrument calibration log
- GSTR Radiation Protection Program as outlined in ROM, Chapter 8, "Radiation Protection Program," latest revision dated April 22, 2011, including the following:
  - Section 8.1, "Radiation Protection Policy"
  - Section 8.2, "Health Physics Training"
  - Section 8.3, "Radioactive Material Control"
  - Section 8.4, "Radiation Monitoring"
  - Section 8.5, "Instrumentation"
  - Section 8.6, "Records"
  - Section 8.7, "Emergency Response and Exposure Guidelines"
  - Section 8.8, "Declared Pregnant Woman Guidelines"
  - Section 8.9, "Planned Special Exposures"
- ROM GSTR Procedure No. 15, "Pocket Dosimeter Drift Check Procedure," latest revision dated October 2011 and last review dated November 22, 2013
- ROM GSTR Procedure No. 16, "Pocket Dosimeter Calibration Procedure," latest revision dated October 2013 and last review dated November 22, 2013

- ROM GSTR Procedure No. 20, “Procedure for Radiation Instrument Calibrations,” latest revision dated October 2011, and last review dated November 22, 2013
- U.S. Geological Survey TRIGA Reactor Annual Report for the period from January 1, 2013, through December 31, 2013, submitted to the NRC January 30, 2014
- U.S. Geological Survey TRIGA Reactor Annual Reports for the period from January 1, 2014, through December 31, 2014, submitted to the NRC April 16, 2015
- The As Low As Reasonably Achievable (ALARA) Program outlined in ROM Chapter 8, dated November 22, 2011, and recent ALARA reviews
- Memorandum from the Reactor Supervisor to the Director, U.S. Geological Survey affirming USGS commitment to ALARA, dated March 19, 2012

b. Observations and Findings

(1) Surveys

Selected start-up and monthly radiation and/or contamination surveys were reviewed by the inspector. The surveys had been completed by staff members as required. Any contamination detected in concentrations above established action levels was noted and the area was decontaminated. Results of the surveys were documented so that facility personnel would be knowledgeable of the radiological conditions that existed in the controlled areas of the facility.

(2) Postings and Notices

Radiological signs were posted at the entrances to controlled areas. Caution signs, postings, and controls for radiologically controlled areas were as required in 10 CFR Part 20, Subpart J. Other postings at the facility showed the industrial hygiene hazards that were present in the areas as well.

Copies of NRC Form 3, “Notice to Employees,” noted at the facility were the latest version, as required by 10 CFR 19.11, and were posted in various areas throughout the facility. These locations included the bulletin boards in the hallways by each entrance to the facility protected area and in the hallway by the facility calibration range. Copies of other notices to workers were posted in appropriate areas in the facility.

(3) Dosimetry

The inspector determined that the licensee used thermoluminescent dosimeters (TLDs) for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee used TLD finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor. An examination of the TLD results, indicating exposure to radiation at the facility for the past 2 years, showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. The instrument calibration records indicated that calibration of portable survey meters was typically completed by licensee staff personnel. However, some instruments, including the neutron detection instruments, were shipped to vendors for calibration. Calibration frequency met procedural requirements and records were maintained as required. Area radiation monitors and stack monitors were also being calibrated as required.

(5) Radiation Protection and ALARA Programs

The licensee's Radiation Protection and ALARA Programs were established and described in ROM Chapter 8 and through associated GSTR procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, and reports. The ALARA Program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

The inspector also determined that the licensee had conducted an annual review of the Radiation Protection Program for 2013 and 2014 in accordance with 10 CFR 20.1101(c). This had been completed by the Reactor Supervisor. In addition, annual audits of the ALARA Program had been conducted by USGS Radiation Safety Committee.

The licensee did not require or have a respiratory protection program.

(6) Radiation Protection Training

The inspector reviewed the radiation worker training given to staff members, to those who are not on staff but who are authorized to use the experimental facilities of the reactor, and to support personnel. Initial radiation worker training was given to everyone before they started work in the facility. Refresher training for reactor staff was given every 2 years; everyone else received refresher training every 3 years. The inspector noted that the last refresher training had been conducted on February 1, 2013.

The initial and refresher training covered the topics specified in 10 CFR Part 19 as required. Training records showed that personnel were acceptably trained in radiation protection practices. The training program was acceptable.

c. Conclusion

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, were in accordance with regulatory requirements. Specifically, (1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; (2) notices and postings met regulatory requirements; (3) personnel dosimetry was being worn as required and recorded doses were well within the NRC's regulatory limits; (4) radiation survey and monitoring equipment was being maintained and calibrated as required; and (5) the radiation protection training program was acceptable.

3. Effluents and Environmental Monitoring

a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirements of 10 CFR Part 20 and Technical Specifications Section B, the inspector reviewed selected aspects of:

- GSTR "Argon-41 Record" logbook
- Environmental monitoring release records
- GSTR "Environmental TLD" results logbook
- GSTR "H-3 in Reactor Water" logbook tracking gross alpha and beta activity in reactor water and cooling water
- ROM GSTR Procedure No. 17, "Procedure for Determining Argon-41 Release," latest revision dated October 2011 and last review dated November 22, 2013
- ROM GSTR Procedure No. 20, "Procedure for Radiation Instrument Calibrations," latest revision dated October 2013 and last review dated November 22, 2013
- ROM GSTR Procedure No. 22, "Procedure for Analysis of Stack Gas Radionuclides," latest revision dated April 2011 and last review dated May 3, 2013

- Calibration records for the Ar-41 monitor (stack), area monitors, and the continuous air monitor for the past 2 years
- U.S. Geological Survey TRIGA Reactor Annual Report for the period from January 1, 2013, through December 31, 2013, submitted to the NRC January 30, 2014
- U.S. Geological Survey TRIGA Reactor Annual Reports for the period from January 1, 2014, through December 31, 2014, submitted to the NRC April 16, 2015

b. Observations and Findings

On-site and off-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor, various environmental monitoring TLDs, and area monitors in accordance with the applicable procedures. Data indicated that there were no measurable doses above any regulatory limits. Biennial environmental soil and water samples were taken and analyzed in 2014. No reactor-produced isotopes were identified in the samples.

The inspector determined that gaseous releases continued to be monitored and calculated as required, were acceptably documented, and were within the annual dose constraint of 10 millirem stipulated in 10 CFR 20.1101(d), 10 CFR Part 20, Appendix B concentrations, and Technical Specification limits. Environmental Protection Agency COMPLY code calculations indicated that the facility was in compliance with effluent emissions.

The program for the monitoring, storage, or transfer of radioactive liquid and solids was consistent with applicable regulatory requirements. No liquid discharges had been made during 2013 and 2014. Solid radioactive material was monitored and released when below acceptable limits or was shipped to a waste processing facility for disposal. The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits.

4. Design Changes

a. Inspection Scope (IP 69001)

In order to verify that the licensee had met the design change requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59, the inspector reviewed selected aspects of:

- Technical Specifications through Amendment 11, January 7, 2006
- Facility configuration records
- GSTR Experiment Review Checklist
- Facility design change (50.59) records for the past 2 years
- Safety review records and audit reports for the past 2 years
- Responses to the safety reviews and audit reports for the past 2 years
- Reactor Operations Committee meeting minutes from May 3, 2013, November 22, 2013, April 25, 2014 and October 17, 2014
- Reactor Operations Committee charter, outlined in the U.S. Geological Survey Manual, 308.44, "Reactor Operations Committee," dated February 5, 1999
- ROM Section 3, "Nuclear Center Organization," Rev. dated April 30, 2012

b. Observations and Findings

The inspector determined that design changes at the GSTR were initiated by a facility staff review followed by a Reactor Operations Committee review and subsequent approval of the changes. The inspector determined that all staff members were familiar with the design change procedure and would follow it if a change to the facility or to an experiment were proposed.

Four facility changes were proposed during 2013 and 2014, all of which followed the design change protocol. From review of these changes, as well as through interviews with licensee personnel, the inspector determined that an actual written procedure stipulating the steps to be taken to complete a 10 CFR 50.59 design change evaluation was completed.

c. Conclusion

The licensee's design change procedure was being followed and design changes were conducted in accordance with 10 CFR 50.59.

5. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits as required by Technical Specifications Section H.2, the inspector reviewed selected aspects of:

- Records of 50.59 changes to the GSTR
- Technical Specifications through Amendment 11, January 7, 2006
- GSTR Experiment Review Checklist
- Safety review records and audit reports for the past 2 years
- Responses to the safety reviews and audit reports for the past 2 years
- Reactor Operations Committee meeting minutes from May 3, 2013, November 22, 2013, April 25, 2014 and October 17, 2014
- Reactor Operations Committee charter outlined in the U.S. Geological Survey Manual, 308.44, "Reactor Operations Committee," dated February 5, 1999
- ROM Section 3, "Nuclear Center Organization," revision dated April 30, 2012
- Reactor Operations Committee Operational Audit dated May 2, 2013
- Reactor Operations Committee Operational Audit dated April 27, 2014

b. Observations and Findings

The Reactor Operations Committee was meeting semiannually as required and the committee membership satisfied Technical Specifications Section H.2, the Reactor Operations Committee charter, and ROM Section 3.8 requirements. Review of the meeting minutes for 2013 and 2014 indicated that the committee provided guidance, direction, and oversight for the reactor and ensured suitable and safe reactor operations.

The Reactor Operations Committee minutes and audit records showed that safety reviews and individual audits had been completed at the required frequency for the functional areas specified by Technical Specifications Sections H.2, H.5, and I.3. The inspector noted that audit topics included reactor operations, maintenance and operations logs, facility procedures, the operator requalification program, fuel movement, physical security plan and the radiation protection program. The inspector reviewed the results of the audits that had been completed and determined that the audit findings, and licensee actions taken in response to the findings, were acceptable.

c. Conclusion

Audits and reviews conducted by the Reactor Operations Committee were in accordance with the requirements specified in Section H.2 of the Technical Specifications and Section 3 of the ROM.

6. Emergency Preparedness

a. Inspection Scope (IP 69001)

To verify compliance with the facility Emergency Plan entitled, "Emergency Plan for the U.S. Geological Survey TRIGA Reactor Facility," Rev. 14, dated May 2014, the inspector reviewed selected aspects of:

- Training records for the past 2 years
- Emergency drills and critiques for 2013 and 2014
- GSTR Emergency Call List, last updated February 2015
- Offsite support agreement and related information
- Emergency response facilities, supplies, equipment, and instrumentation
- Emergency Plan implementing procedures contained in ROM Section 7, "Emergency Procedures," revision dated October 2012
- U.S. Geological Survey TRIGA Reactor Annual Report for the period from January 1, 2013, through December 31, 2013, submitted to the NRC January 30, 2014
- U.S. Geological Survey TRIGA Reactor Annual Reports for the period from January 1, 2014, through December 31, 2014, submitted to the NRC April 16, 2015

b. Observations and Findings

The inspector verified that the Emergency Plan in use at the facility was the same as the version most recently submitted to the NRC. The Emergency Plan was audited and reviewed at least biennially (this was typically done annually) by the Reactor Operations Committee as required by Technical Specifications Section H.5. The implementing procedures were also reviewed and revised as needed.

During observation of an emergency drills, the inspector determined that the emergency equipment and portable detection instrumentation listed in the emergency procedures were available and being maintained as required by the Emergency Plan. The inspector also verified that a letter of agreement with the offsite support organization was in place.

Through reviews of training records, observation of a drill, and through interviews with GSTR personnel, the inspector confirmed that emergency response training was given as required by the Emergency Plan and that emergency responders were knowledgeable of the proper actions to take in case of an emergency. It was noted that annual evacuation drills and biennial emergency drills had been conducted as required by the Emergency Plan. Each emergency drill provided a practical and reasonable test of the participants' knowledge and skills. Critiques were held following the drills to discuss the strengths and weaknesses identified during the exercise and to develop possible solutions for any problems identified.

c. Conclusion

The inspector concluded that the emergency preparedness program was conducted in accordance with the Emergency Plan. Specifically, (1) the Emergency Plan and implementing procedures were being reviewed biennially as required; (2) emergency response equipment was being maintained and alarms were being tested as required; (3) a letter of agreement with the offsite support organization was being maintained; (4) drills were being conducted as required; and (5) emergency preparedness training was being completed.

7. Maintenance

a. Inspection Scope (IP 69001)

To verify that the maintenance and surveillance programs were being conducted as required in Technical Specifications Sections C through E, the inspector reviewed selected aspects of:

- GSTR Procedure No. 12, “Procedure for Changing Demineralizer Resin,” dated October 2013 and last reviewed November 22, 2013
- GSTR Procedure No. 13, “Procedure for Use of Leak Testing Device,” dated April 2012 and last reviewed April 25, 2014
- GSTR Procedure No. 19, “Procedure for Test Equipment Calibration,” dated April 30, 2003 and last reviewed May 3, 2013
- GSTR Procedure No. 21, “Procedure for Measuring Control Rod Drop Time,” dated February 2011 and last reviewed May 3, 2013
- U.S. Geological Survey TRIGA Reactor Annual Report for the period from January 1, 2013, through December 31, 2013, submitted to the NRC January 30, 2014
- U.S. Geological Survey TRIGA Reactor Annual Reports for the period from January 1, 2014, through December 31, 2014, submitted to the NRC April 16, 2015
- USGS Triga Reactor Maintenance Log
- Facility design change (50.59) records for the past 2 years

b. Observations and Findings

The inspector reviewed selected maintenance guidance documents and records, including the maintenance log. This log was used effectively to document detailed maintenance activities completed on specific items of equipment including the primary and secondary pumps, exhaust fans, the cooling tower, and the sump pump. The records reviewed indicated that routine and preventive maintenance was controlled, conducted, and documented in the maintenance or operations log consistent with licensee procedures. Verifications and operational systems checks were performed to ensure system operability before an item of equipment or a system was returned to service. Unscheduled maintenance or repairs were reviewed to determine if they required a 10 CFR 50.59 evaluation.

c. Conclusion

The licensee's maintenance program was being implemented as required by GSTR procedures

8. Exit Interview

The inspector reviewed the inspection results with members of licensee management at the conclusion of the inspection on April 9, 2015. 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 Personnel

V. Nuccio	Reactor Administrator
A. Buehrle	Denver Federal Center Radiation Protection Officer
T. DeBey	Reactor Supervisor
C. Farwell	Senior Reactor Operator
B. Roy	Senior Reactor Operator

Other Personnel

S. Mahan	Reactor Oversight Committee Member
R. Chaney	Federal Protective Service Training Officer

INSPECTION PROCEDURE (IP) USED

IP 69001 Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

PARTIAL LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
ALARA	As Low As Reasonably Achievable
GSTR	Geological Survey TRIGA Reactor
IP	Inspection Procedure
No.	Number
NRC	U.S. Nuclear Regulatory Commission
ROM	Reactor Operations Manual
TLD	Thermoluminescent Dosimeter
USGS	United States Geological Survey