

May 9, 2016

Vitto Nuccio, Reactor Administrator
Department of the Interior
U.S. Geological Survey
P.O. Box 25046, MS 911
Denver, CO 80225

SUBJECT: UNITED STATES GEOLOGICAL SURVEY – NUCLEAR REGULATORY
COMMISSION ROUTINE INSPECTION REPORT NO. 50-274/2016-201

Dear Mr. Nuccio:

From April 11-14, 2016, 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 14, 2016, with you, Mr. Timothy DeBey, Reactor Supervisor, and 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, 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. Gary Morlang at (301) 415-4092 or by electronic mail at Gary.Morlang@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. 50-274
License No. R-113

Enclosure:
As stated

cc: See next page

U.S. Geological Survey

Docket No. 50-274

cc:

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Mr. Steve Tarlton
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Test, Research, and Training
Reactor Newsletter
University of Florida
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COMMISSION ROUTINE INSPECTION REPORT NO. 50-274/2016-201

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

Docket No. 50-274

License No. R-113

Report No. 50-274/2016-201

Licensee: United States Geological Survey

Facility: U. S. Geological Survey TRIGA Reactor

Location: Building 15, Denver Federal Center
Denver, Colorado

Dates: April 11-14, 2016

Inspector: Gary Morlang

Approved by: Anthony J. Mendiola, 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
Inspection Report No. 50-274/2016-201

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 and test reactor safety program including: (1) organization and staffing, (2) operations logs and records, (3) procedures, (4) surveillance and limiting conditions for operation, (5) experiments, (6) fuel handling, (7) transportation, and (8) safety conscious work environment 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.

Organization and Staffing

- The organizational structure and functions were consistent with the requirements specified in Section H, of the Technical Specifications (TSs) and Section 3, of the Reactor Operations Manual.

Operations Logs and Records

- Reactor operations and logs were acceptable and completed in accordance with procedural requirements.

Procedures

- The procedural control and implementation program met TSs requirements.

Surveillance and limiting conditions for operations

- The licensee's program for completing surveillance checks and tests and confirming Limiting Conditions for Operation satisfied TSs requirements.

Experiments

- Conduct and control of experiments and irradiations met the requirements specified in the TSs Section I, the applicable Experiment Authorizations and procedures.

Fuel Handling

- Fuel handling activities and documentation were as required by the TSs and facility procedures.

Transportation of Radioactive Material

- Radioactive material was being shipped in accordance with the applicable regulations.

REPORT DETAILS

Summary of Plant Status

The U.S. Geological Survey's (USGS, the licensee) one megawatt TRIGA research and test reactor was typically operated in support of USGS programs directed at improving methods and techniques to enhance scientific knowledge about water and earth materials and support research projects from the Colorado School of Mines. During the inspection the reactor was operated to support ongoing training, experimental work and research work.

1. Organization and Staffing

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

The inspector reviewed selected aspects regarding the licensee's organization and staffing to ensure that the requirements of Section H, of the Technical Specifications (TSs), implemented through License Amendment No. 12 to the Facility Operating License, No. R-113, dated March 23, 2016, as follows:

- Current staff qualifications
- Staffing requirements for operation of the reactor
- Organizational structure for the Geological Survey TRIGA Reactor (GSTR) Facility
- Reactor Operations Manual (ROM), Section 3, "Nuclear Center Organization," dated April 2016 with the latest Revision (Rev.) dated April 2016
- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015
- GSTR Quarterly (Operations) Report for each quarter between January 1, 2014 through March 31, 2016
- Reactor Operations Committee (ROC) Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; April 5, 2016

b. Observations and Findings

The organizational structure and staff responsibilities had not changed since the last U.S. Nuclear Regulatory Commission (NRC) inspection (refer to NRC Inspection Report No. 50-274/2014-201). The facility remained under the direct control of the Reactor Supervisor and he was responsible to the Reactor Administrator for safe operation and maintenance of the reactor and its associated equipment. The operations staff consisted of the Reactor Supervisor (licensed senior reactor operator), 2 licensed senior reactor operators and 1 licensed reactor operator.

The organization and staff responsibilities were as specified in, and required by, Section H, of the TSs, Section 3, of the ROM, and Figure 3.1 in the ROM. Section 3.4.1, of the ROM stated that the training and qualification requirements

contained in ANSI/ANS Standard 15.4, "Standards Selection and Training of Personnel for Research Reactors" were the minimum for USGS TRIGA Reactor Facility personnel. The inspector confirmed that the reactor staff met ANSI/ANS 15.4 education, training, and experience requirements.

c. Conclusion

The licensee's organization and staffing were in compliance with the facility TSs Section H, and ROM Section 3.

2. Operations Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects to verify operation of the reactor in accordance with TSs Sections C - E of the following:

- Reactor Operations Logbooks Numbers (Nos.) 160-166, dated May 21, 2014 to present
- Staffing for operations as required by Section 5.2 of the ROM, Rev. 4-1 dated April 2016
- Daily TRIGA Prestart Test data sheet printouts for 2015–2016 to date
- Selected GSTR Facility Monthly Checklists from 2015–2016 to date, checklist Rev. 12, checklist revision dated April 2015
- Selected GSTR Facility Shutdown Checklists from 2015 – 2016 to date, checklist Rev. 13, checklist revision dated April 2002
- Selected GSTR Facility Start-Up Checklists from the 2014 – 2016 to date including Page 1 of the checklist, Rev. 13 dated October 2014, and Page 2 of the checklist, Rev. 8 dated April 2011
- ROM, Section 5, "Operating Procedures," Rev. 4, dated October 1995
- GSTR Procedure No. 1, "Procedure for Reactor Startup, Operation, and Shutdown," dated October 11, 1991 and last reviewed April 5, 2016
- GSTR Procedure No. 3, "Procedure for Control Rod Calibration," dated April 1990 and last reviewed April 5, 2016
- GSTR Quarterly (Operations) Report for each quarter between January 1, 2014 through March 31, 2016
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; and April 5, 2016
- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015

b. Observations and Findings

The inspector reviewed the operations logs from April 2014 through the present. The inspector also reviewed selected Daily Start-Up and Shutdown Checklists and Monthly Checklists. From the records reviewed the inspector determined that reactor operations were carried out in accordance with written procedures as required by TSs Section H.3. Information on the operational status of the facility was appropriately recorded in log books or on checklists as required by Section 3.C. of the Facility License and ROM Section 5. Scrams were identified in the logs and records, and were reported and resolved as required before the resumption of operations. Through interviews with operators and review of the logs, the inspector confirmed that shift staffing met the minimum requirements of at least two reactor staff members on duty whenever the reactor was operating as required by ROM Section 5.2.4.

The inspector observed the insertion of a sample into the reactor core for reactivity measurement and subsequent irradiation at full power. All evolutions were conducted using approved procedures and in a safe manner.

c. Conclusion

Reactor operations and logs were acceptable and in accordance with procedural and TSs requirements.

3. Procedures

a. Inspection Scope (IP 69001)

To ensure that safety standards and written instructions for those activities specified in TSs Sections H.2 and H.3 were in effect, the inspector reviewed selected aspects of the following:

- Observation of procedural implementation
- Selected ROM Chapters and GSTR procedures
- Records of changes and temporary changes to procedures
- ROM, Chapter 4, "Administrative Procedures," latest revision dated April 2016
- ROM, Chapter 5, "Operating Procedures," Rev. 4, dated October 1995, which contained the various GSTR Procedures
- ROM, Chapter 8, "Radiation Protection Program," latest revision dated April 2015
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; April 5, 2016

b. Observations and Findings

The inspector reviewed ROM Chapters 4, and 8, and selected GSTR procedures contained in ROM Chapter 5. These ROM Chapters and GSTR procedures provided guidance for the administrative, operations, and health physics functions of the facility. The inspector confirmed that written procedures were available for those tasks and items required by TSs Sections H.2 and H.3. The licensee controlled changes to procedures and the ROC conducted the review and approval process as required. The inspector noted that the GSTR procedures were reviewed biennially as required by the ROM.

After reviewing the 2014 and 2015 training records and interviewing staff members, the inspector determined that the training of personnel on procedures was adequate. During tours of the facility, the inspector observed that personnel performed facility operations and tasks in accordance with applicable procedures.

c. Conclusions

The procedural control and implementation program was acceptably conducted and maintained.

4. Surveillance and Limiting Conditions for Operations

a. Inspection Scope (IP 69001)

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

- Reactor Operations Logbooks Nos. 160-166, dated May 21, 2014 to present
- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Reactor Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015
- GSTR Quarterly (Operations) Report for each quarter between January 1, 2012 through March 31, 2014
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; and April 5, 2016
- Reactor Activity Calendar maintained by the Reactor Supervisor
- Surveillance, calibration, and test data sheets and related records
- Selected GSTR Facility Monthly Checklists for the past 24 months, checklist Rev. 12, revision dated April 2015
- Selected GSTR Facility Shutdown Checklists for the past 24 months, checklist Rev. 14, revision dated April 2012

- Selected GSTR Facility Start-Up Checklists for the past 24 months including Page 1 of the checklist, Rev. 13 revision dated October 2014, and Page 2 of the checklist, Rev. 8, revision dated April 2011
- GSTR Procedure No. 2, "Procedure for Reactor Power Calibration," dated May 5, 2005 and last reviewed October 17, 2014
- GSTR Procedure No. 3, "Procedure for Control Rod Calibration," dated April 1990 and last reviewed April 5, 2016
- GSTR Procedure No. 7, "Procedure for Control Rod Measurement, Inspection, or Replacement," dated April 1990 and last reviewed April 5, 2016
- GSTR Procedure No. 12, "Procedure for Changing Demineralizer Resin," dated October 2013 and last reviewed October 26, 2016
- GSTR Procedure No. 13, "Procedure for Use of Leak Testing Device," dated April 1990 and last reviewed April 5, 2016
- GSTR Procedure No. 19, "Procedure for Test Equipment Calibration," dated April 30, 1993 and last reviewed April 13, 2015
- GSTR Procedure No. 21, "Procedure for Measuring Control Rod Drop Time," dated October 5, 1992 and last reviewed April 13, 2015

b. Observations and Findings

The inspector reviewed selected records of TSs required checks, tests, and limiting conditions for operation (LCO) verifications performed since January 2014. These included the daily checklists that provided documentation of control rod scram, withdraw prevent, interlock functions, and weekly conductivity tests, as well as monthly surveillance checks of the reactor ventilation system, building alarms, radiological safety, and reactor water system. Other periodic surveillances and verifications were reviewed including power calibrations, control rod inspections and fuel elements inspections. The review showed that the periodic checks, tests, and LCO verifications for TS required surveillances were completed as required. The results of these activities were within prescribed TS limits and procedure parameters and in agreement with the previous surveillance results.

The various surveillance checks, inspections, and verifications reviewed were being tracked through the Daily and/or Monthly Checklists. Documentation of completion of these activities was maintained in the Checklists and/or in the Operations or Fuel Logbooks. This system was found to provide adequate control of the reactor operational tests and checks, and LCO verifications. Good correlation was noted between the console logs, checklists and other log books.

c. Conclusion

The licensee's program for surveillance checks and LCO verifications satisfied TS requirements.

5. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects to verify that experiments were conducted in compliance with TSs Section I of the following:

- Reactor Operations Logbooks Nos. 160-166, dated May 21, 2014 to present
- Selected Experiment Authorizations, logs, and records
- Experiment program requirements contained in ROM Sections 4.5 through 4.8
- GSTR Experiment Authorization Forms including Parts I, II, and III for Experiment Nos. L-123, L-124, C-58, P-1, P-12, P-13, P-14, P-15, O-26, and O-27
- Selected GSTR Radioisotope Request and Receipt Forms which had been completed during October 2014 through the present
- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; April 5, 2016

b. Observations and Findings

Experiments at the GSTR were categorized as either Class I or Class II experiments by the Reactor Supervisor. This classification had to be reviewed and agreed upon by the ROC. Class I experiments were those that had been performed previously or were minor modifications to previous experiments. They were classified and approved by the Reactor Supervisor. Class II experiments were new experiments or major modifications of previously existing ones. These were reviewed and approved by the ROC. All current experiments at the facility were also required to be reviewed on an annual basis by the Reactor Supervisor.

The inspector reviewed various previously approved and ten new Experiment Authorization Forms. The authorization forms listed a description of the experiment, the experiment class, limiting conditions for reactor operations, personnel authorized to deliver and/or pick up samples, and the license number of the authorized recipient. All of the new experiments had the proper classification and review as required.

The review of current experiment authorizations, Radioisotope Request and Receipt (RR&R) Forms, and related reactor log book entries, also confirmed that experiments were installed, performed, and removed as outlined in the approved experiment authorizations. The inspector also verified that the various RR&R Forms were used to list the radioisotopes produced during the irradiation and the disposition thereof. The inspector determined that the resulting radioisotopes were appropriately controlled and held for decay or transferred as required. This information was documented on the RR&R Forms.

During the inspection, the inspector observed the insertion of a sample into the core and irradiation of the sample. All documentation for the experiment was reviewed by the inspector.

c. Conclusion

The control and performance of experiments were acceptable and in accordance with Experiment Authorization and TSs Section I, requirements.

6. Fuel Handling

a. Inspection Scope (IP 69001)

To verify that reactor fuel was handled, moved, and inspected in compliance with TS Sections D and G, the inspector reviewed selected aspects of the following:

- Reactor Operations Logbooks Nos. 160-166, dated May 21, 2014 to present
- Fuel movement and examination records
- Fuel handling equipment and instrumentation
- Fuel Element Location Board maintained in the Reactor Room
- GSTR Fuel Book containing the various USGS TRIGA Reactor Fuel Element History sheets for all the elements at the facility
- GSTR Procedure No. 4, "Procedure for Fuel Loading and Unloading," dated April 1990, last revised April 2008, and last reviewed April 5, 2016
- GSTR Procedure No. 8, "Procedure for Measuring Fuel Elements," dated October 11, 1991, last revised April 2010, and last reviewed April 13, 2015
- GSTR Procedure No. 9, "Procedure for Locating Fuel Element Cladding Failure," dated April 1990, last revised April 2010, and last reviewed April 15, 2016
- GSTR Quarterly (Operations) Report for each quarter between January 1, 2014 through March 31, 2016
- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; April 5, 2016

b. Observations and Findings

The inspector reviewed the GSTR fuel handling at the facility and found that the appropriate fuel logs and inspection records were being maintained. It was noted that fuel movements were planned and a written sequence developed prior to completing the actual transfers and were documented in the console log book and appropriate fuel log book. Log entries were as specified in the facility procedures and fuel inspection met TSs Section D.6 requirements. Through review of the fuel movement and inspection records and interviews with operations staff, the inspector verified that fuel was moved and controlled according to established procedure. The inspector also verified that fuel was being stored in the locations indicated by licensee records and as required in TSs Section G.

c. Conclusion

Fuel handling activities and the documentation thereof were acceptable and in accordance with procedural and TSs requirements.

7. Transportation

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for the transfer or shipment of licensed radioactive material, the inspector reviewed the following:

- GSTR HP Logbook No. 41
- Training records of staff members responsible for shipping licensed radioactive material
- ROM GSTR Procedure No. 18, "Instructions for Packaging Limited Quantities of Radioactive Materials," latest revision dated April 2014 and last review dated April 13, 2015
- Selected GSTR forms, "Radioisotope Request and Receipt Form," for 2014, 2015 and 2016 to date

b. Observations and Findings

The licensee routinely ships isotopes under the reactor license. A separate log was maintained with licenses of all facilities authorized to receive radioactive materials. Two of the licenses had expired and the inspector verified no radioactive shipments had been made to these facilities following the expiration of their license. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. The radioactive material shipment records reviewed by the inspector had been completed in accordance with Department Of Transportation (DOT) and NRC regulations.

Numerous log books of recent shipments were reviewed for correctness and accuracy. Training records were reviewed for all staff personnel to ensure they met the DOT requirements.

c. Conclusions

Radioactive material was being shipped in accordance with the applicable DOT and NRC regulations

8. Safety Conscious Work Environment

a. Inspection Scope (IP 71152)

To verify that a safety conscious work environment existed at the facility, the inspector interviewed all staff personnel and reviewed the following:

- GSTR Annual Report for January 1, 2015 through December 31, 2015, submitted January 12, 2016
- GSTR Annual Report for January 1, 2014 through December 31, 2014, submitted April 16, 2015
- ROC Meeting Minutes dated October 17, 2014; April 13, 2015; October 26, 2015; and April 5, 2016
- Copies of NRC Form 3, "Notice to Employees"
- Organizational structure for the GSTR Facility
- ROM Section 3, "Nuclear Center Organization," dated April 2016 with the latest revision dated April 2016

b. Observations and Findings

The inspector conducted in depth interviews with each member of the facility staff. All individuals were comfortable with their ability to address safety concerns at the facility and escalate the level of management involvement if they felt it was needed. All personnel were familiar with the various avenues available to address safety concerns and the ways in which disputed safety issues can be resolved.

c. Conclusions

A safety conscious work environment existed at the facility and facility personnel were comfortable addressing safety issues.

9. Exit Meeting Summary

The inspector reviewed the inspection results with members of licensee management at the conclusion of the inspection on April 14, 2016. 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. Nuzzio	Reactor Administrator
A. Buehrle	Radiation Safety Officer USGS
T. DeBey	Manager, GSTR and Reactor Supervisor
C. Farwell	Senior Reactor Operator
B. Roy	Senior Reactor Operator
C. Manning	Reactor Operator

INSPECTION PROCEDURE (IP) USED

IP 69001	Class II Research and Test Reactors
IP 86740	Transportation
IP 51152	Safety Conscious Work Environment

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None.

Closed

None.

PARTIAL LIST OF ACRONYMS USED

DOT	Department of Transportation
GSTR	Geological Survey TRIGA Reactor
LCO	Limiting Conditions for Operation
No(s).	Number(s)
NRC	U. S. Nuclear Regulatory Commission
Rev.	Revision
ROC	Reactor Operations Committee
ROM	Reactor Operations Manual
RR&R	Radioisotope Request and Receipt (form)
USGS	United States Geological Survey