



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 7, 2022

Dr. Glenn E. Sjoden, Interim Director
Utah Nuclear Engineering
Program Professor
Energy Solutions Presidential Endowed
Chair Department of Civil
and Environmental Engineering
University of Utah
110 Central Campus Drive, Room 2000
Salt Lake City, UT 84112

SUBJECT: UNIVERSITY OF UTAH – U.S. NUCLEAR REGULATORY COMMISSION
ROUTINE INSPECTION REPORT NO. 05000407/2022201

Dear Dr. Sjoden:

From July 11-14, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at your University of Utah TRIGA Nuclear Reactor Facility. The enclosed report documents the inspection results which were discussed on July 14, 2022, with you, Frederick Monette, Radiation Safety Officer and Director, Environmental Health and Safety Department, and Andrew Allison, Reactor Supervisor.

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 representative records, interviewed personnel, and observed activities in progress. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

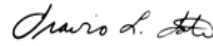
In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the 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).

Dr. Sjoden

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Should you have any questions concerning this inspection, please contact Craig Bassett at (240) 535-1842, or via email at Craig.Bassett@nrc.gov.

Sincerely,



Signed by Tate, Travis
on 10/07/22

Travis L. Tate, Chief
Non-Power Production and Utilization Facility
Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-407

License No. R-126

Enclosure:
As stated

cc w/enclosure: See next page

University of Utah

Docket No. 50-407

cc:

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Test, Research and Training
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Andrew Allison, Reactor Supervisor
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SUBJECT: UNIVERSITY OF UTAH – U.S. NUCLEAR REGULATORY COMMISSION
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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No.: 50-407

License No.: R-126

Report No.: 05000407/2022201

Licensee: University of Utah

Facility: University of Utah TRIGA Reactor

Location: Salt Lake City, Utah

Dates: July 11-14, 2022

Inspector: Craig Bassett

Accompanied by: Juan Arellano, Inspector Trainee
Michael Takacs, RTR Security Specialist/Inspector

Approved by: Travis L. Tate, Chief
Non-Power Production and Utilization Facility
Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

University of Utah
University of Utah TRIGA Nuclear Reactor Facility
Inspection Report No. 05000407/2022201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of Utah (the licensee's) 100 kilowatts Class II research reactor safety program, including: (1) organization and staffing; (2) procedures; (3) health physics; (4) design changes; (5) committees, audits, and reviews; (6) emergency planning; and (7) transportation of radioactive material. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's program was acceptably directed toward the protection of public health and safety and in compliance with the NRC's requirements.

Organization and Staffing

- The licensee's organizational structure complied with requirements outlined in the technical specifications (TSs).

Procedures

- The facility procedural review, revision, control, and implementation satisfied the TS requirements.

Health Physics

- The radiation safety program was conducted in compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation" requirements, TSs, and licensee procedures.

Design Changes

- The design change program developed by the licensee was established in accordance with the 10 CFR 50.59, "Changes, tests and experiments" guidance.

Committees, Audits and Reviews

- The Reactor Safety Committee (RSC) met and conducted audits and reviews in accordance with the requirements specified in TS Section 6.2.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan (E-Plan) and implementing procedures.

Transportation of Radioactive Material

- The licensee transferred radioactive waste material to the campus Radiation Safety (Rad Safety) Office for disposal as needed and the Rad Safety Office handled any shipments of radioactive material from the facility.

REPORT DETAILS

Summary of the Facility Status

The University of Utah continued to operate the 100-kilowatt Training, Research, Isotope, General Atomics (TRIGA) Mark I research reactor (UUTR) as needed for sample irradiation, reactor operator training, educational demonstrations, preventive maintenance, and operational surveillance testing required by the TSs. During this inspection, the reactor was operated at low power in support of a research project.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure (IP) 69001, Section 02.01)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of TS Section 6.1, were met:

- qualifications and responsibilities of the facility personnel
- Utah Nuclear Engineering Program (UNEP) Procedure, P-001, "Description of Operations," Revision 1, (UNEP P-001R1), Section 1, "Organization and Responsibilities"
- current facility TSs which were established through amendment number (No.) 9 to Facility Operating License No. R-126
- UUTR annual operating report for the period of July 1, 2019, through June 30, 2020
- UUTR annual operating report for the period of July 1, 2020, through June 30, 2021

b. Observations and Findings

Through discussions with licensee representatives, the inspector confirmed that there were no changes to management responsibilities or the organizational structure at the UUTR facility since the last NRC inspection of this area conducted in October 2020 (NRC Inspection Report No. 50-407/2020-201). The inspector noted that the person who held the position of Vice President for Research (designated by the licensee as the reactor administration Level 1) took a post at another university. Because of that, another individual was assigned as the Interim Vice President. The inspector verified that the licensee notified the NRC staff of this change as required by the TS via letter dated January 4, 2022.

c. Conclusion

The inspector determined that the organizational structure was consistent with the TS requirements.

2. Procedures

a. Inspection Scope (IP 69001, Section 02.03)

The inspector reviewed the selected aspects of the following to verify that the licensee complied with the requirements of TS Section 6.4:

- records and logs of procedure changes and implementation
- various administrative and radiation protection procedures
- UNEP-035 R4, "Audit and Review Program Checklist"
- RSC meeting minutes from March 2021 to the present

b. Observations and Findings

The inspector noted that the licensee used procedures to conduct operations at the facility and the procedures were available for those tasks and items required by the TSs. The inspector confirmed that substantive changes to the procedures were reviewed and approved by the RSC. The inspector confirmed that reactor personnel also made use of the procedures maintained by the Rad Safety Office which were contained in the "Radiological Procedures and Records [RPR]" manual. Those procedures were reviewed and approved by the Rad Safety Committee.

c. Conclusion

The inspector determined that the procedural review, revision, control, and implementation has satisfied TS requirements.

3. Health Physics

a. Inspection Scope (IP 69001, Section 02.07)

To verify compliance with TS Sections 3.4, 3.7, 4.3, 4.7, 5.4, 6.3, and 6.7, as well as 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," and 10 CFR Part 20 requirements, the inspector reviewed the following selected aspects of:

- radiological signs and postings at the facility
- RSC meeting minutes from March 2021 to the present
- various facility and Rad Safety Office RPR procedures and forms
- personnel dosimetry records for 2020, 2021, and to date in 2022
- environmental dosimetry records for 2020, 2021, and to date in 2022
- various radiation and contamination surveys conducted by licensee and Rad Safety Office personnel for the past 2 years
- "Assessment of Radiation Dose from Air Emissions of Radioactive Material, Calendar Year 2020," which was completed by Rad Safety Office personnel
- UUTR annual operating reports for the last two reporting periods

b. Observations and Findings

(1) Surveys, Postings and Notices

The inspector verified that the results of radiation and contamination surveys were documented, reviewed, and evaluated, as required by the documented procedures, and corrective actions were taken when readings or contamination results exceeded set action levels.

During tours of the facility, the inspector confirmed that the caution signs, postings, and controls established for the controlled areas were acceptable for the hazards involving radiation, high radiation, and contamination, and were posted as required by 10 CFR Part 20, Subpart J, "Precautionary Procedures." The inspector also verified that copies of NRC Form 3, "Notice to Employees," were posted at the facility as required by 10 CFR 19.11, "Posting of notices to workers," and were the current version.

(2) Dosimetry and Radiation Monitoring Equipment Use and Calibration

The inspector verified that the licensee used thermoluminescent dosimeters (TLDs) for whole body radiation monitoring and finger ring TLDs for monitoring radiation exposure of the extremities. The inspector confirmed that individual dosimetry results for the past 2 years showed all occupational doses were within regulatory limits.

The inspector reviewed calibration records maintained by the Rad Safety Office and licensee personnel. Through this review the inspector confirmed that records were maintained as required and that calibration frequencies met the requirements established in the applicable surveillance procedures. The inspector verified that the monitoring equipment was used in accordance with the procedural guidelines.

(3) Radiation Protection Program and ALARA Policy

The inspector confirmed that the licensee's Radiation Protection Program was established through various University of Utah campus documents including: (1) the Rad Safety Office RPRs, (2) "The University of Utah Radiation Safety Policy Manual;" and, (3) "The University of Utah Radiation Protection Program." The inspector also confirmed that the Radiation Protection Program was reviewed annually. The inspector noted that the ALARA Policy was outlined and established in the manuals mentioned above, provided appropriate guidance for keeping doses as low as possible, and was consistent with the requirements in 10 CFR Part 20.

(4) Radiation Worker Training

The inspector verified that all university personnel who worked in radiation areas or handled radioactive material, including licensee staff, were required to receive training in radiation protection. The inspector

confirmed that the reactor staff members had completed the required training and were issued a dosimeter. The inspector noted that the personnel training program satisfied requirements in 10 CFR 19.12, "Instruction to workers," and that the content and periodicity of the training were in accordance with the regulations.

(5) Environmental and Effluent Monitoring

The inspector confirmed that gaseous releases continued to be monitored as required. The inspector noted that the doses resulting from the releases were calculated by the Rad Safety Office according to established procedures, using the Environmental Protection Agency "COMPLY" code. The dose rate to the public was well below the dose constraint of 10 millirem per year specified in 10 CFR 20.1101, "Radiation protection programs," paragraph (d). The inspector noted that airborne concentrations of gaseous releases were also calculated by the Rad Safety Office. The inspector confirmed that the concentrations of gaseous releases were well within those stipulated in 10 CFR Part 20, Appendix B, Table 2, and TS limits. The results were documented in the facility annual reports, as required.

The inspector verified that there were no liquid releases from the facility to the sanitary sewer within the past 2 years and no solid waste was transferred from the facility to the campus Rad Safety Office during that period.

The inspector confirmed that onsite and off-site gamma radiation monitoring was completed using environmental TLDs in accordance with university procedures. The inspector noted that the data indicated no measurable doses above any regulatory limits in the areas surrounding the UUTR facility. These results were also reported in the facility's annual reports.

c. Conclusion

The inspector determined that the Radiation Protection Program, as implemented by the licensee, satisfied the regulatory requirements.

4. Design Changes

a. Inspection Scope (IP 69001, Section 02.08)

The inspector reviewed the following to verify compliance with 10 CFR 50.59 and TS Section 6.2:

- RSC meeting minutes from March 2021 to the present
- UNEP Job-Aid 002 R1, "10 CFR 50.59 Screening"
- various forms designated as Form UNEP-022 R4, "Maintenance Log"
- UUTR Annual Operating Reports for the last two reporting periods

b. Observations and Findings

The inspector noted that various 10 CFR 50.59 reviews were conducted since the last inspection. The inspector found that screening reviews for these projects were completed by the licensee to determine whether full evaluations were needed. The inspector reviewed the screening reviews and the evaluations of those projects which required one. The inspector noted that they were completed in accordance with the licensee's procedure; the RSC reviewed the evaluations, and none of the projects required submission to the NRC for a license amendment.

c. Conclusion

The inspector determined that the licensee's design change control program was implemented as required.

5. Committees, Audits and Reviews

a. Inspection Scope (IP 69001, Section 02.09)

The inspector reviewed the following to ensure that the review and audit requirements in TS Section 6.2 were met:

- RSC meeting minutes from March 2021 to the present
- radiation safety and ALARA reviews and audits completed during the past year and licensee responses to the reviews and audits
- selected forms designated as UNEP-035 R4, "Audit and Review Program Checklist"
- UUTR annual operating reports for the last two reporting periods

b. Observations and Findings

The inspector verified that the RSC met at least annually as required by the TSs. The inspector confirmed that all required audits of reactor facility activities and reviews of programs, procedures, equipment, and proposed tests or experiments were completed and documented. The inspector confirmed that the audits and the associated findings were detailed, and the licensee responded and took corrective actions when needed. Additionally, the annual reviews of the Radiation Protection Program and the Emergency Plan were conducted and documented.

c. Conclusion

The inspector determined that the RSC met at the required frequency and that audits and reviews were conducted as required and in accordance TS Section 6.2.

6. Emergency Preparedness

a. Inspection Scope (IP 69001, Section 02.10)

To verify that the licensee complied with the “University of Utah, Utah Nuclear Engineering Program (UNEP) Emergency Plan for NRC License R-126: TRIGA Nuclear Reactor,” Revision 8, dated July 20, 2011, the inspector reviewed the following selected aspects of:

- selected Emergency (Implementing) Procedures
- training records for the licensee staff and offsite support personnel
- emergency response supplies, equipment, and instrumentation
- documentation of emergency drills and critiques for calendar years 2021 and 2022
- UNEP Annual Emergency Training Attendance Record forms for calendar years 2021 and 2022
- various UNEP forms including: UNEP-015R4, “Emergency Kit Check;” UNEP- 021R28, “UNEP Emergency Call List;” and, UNEP-037, “Radiological Emergency Classification Checklist”
- Letter of Agreement with Gold Cross Ambulance, dated October 22, 2021

b. Observations and Findings

The inspector confirmed that the E-Plan in use at the reactor was the same as the version most recently reviewed by the NRC staff. The inspector noted that the E-Plan was audited annually, and the last audit was completed August 13, 2021. Implementing procedures were reviewed and revised as needed.

The inspector verified that semiannual inventories of the various first aid kits and other equipment were conducted and that the supplies, instrumentation, and equipment were maintained as required in the E-Plan. The inspector confirmed that training for the reactor staff and the support personnel was conducted and documented. The inspector also noted that the UNEP Emergency Call List was up-to-date with the current revision dated May 12, 2021.

The inspector confirmed that emergency drills were conducted annually, and critiques were held following each drill documenting strengths and areas for improvement. The inspector found drills to be challenging and the critiques appropriate.

The inspector reviewed the agreement between the licensee and a local company to provide transportation services for a person injured at the facility and verified that it was maintained. The inspector also noted that communications capabilities with the various support groups were acceptable and were tested periodically.

c. Conclusion

The inspector determined that the emergency preparedness program was implemented as required by the E-Plan.

7. Transportation of Radioactive Material

a. Inspection Scope (IP 86740)

The inspector reviewed selected aspects of:

- UNEP-027 R6, "TRIGA Reactor Irradiation Request and Performance"
- RPR Procedures including: No. 13, "Radioisotope Acquisition and Disposition;" No. 14, "Shipment of Limited Quantity of Radioisotopes;" and No. 55, "Transportation of Radioactive Materials"
- Various forms including Form RPR 13A, "Radioisotope Package Arrival Report;" Form RPR 13B, "Radioisotope Receipt and Verification;" and, Form RPR 13C, "Radioisotope Disposition Record"

b. Observations and Findings

The inspector noted that the shipping records indicated that UUTR radioactive waste designated for disposal was transferred from the reactor facility to the University of Utah's broad scope license, Utah Department of Environmental Quality, License No. 1800001, in accordance with Rad Safety Office requirements. The inspector verified that this process was followed.

The inspector noted that none of the licensee personnel had the current training required to ship radioactive material as required by the Department of Transportation. Therefore, in any instance involving the shipment of radioactive material, the paperwork and shipments would be completed by qualified Rad Safety Office personnel.

c. Conclusion

The inspector determined that the licensee transferred radioactive waste material to the campus Rad Safety Office as needed and the Rad Safety Office handled any shipments of radioactive material from the facility.

8. Follow-up on Previous Items

a. Inspection Scope (IP 92702)

The inspector reviewed the following licensee's actions taken in response to previously identified items.

b. Observation and Findings

- (1) IFI 50-407/2019-202-01 – (Open) – Follow-up on the licensee's actions to complete the revision of the E-Plan and have it reviewed and approved by the RSC.

In August 2019, the inspector noted that the RSC did not complete a biennial review of the E-Plan. This was because a revision of the E-Plan to incorporate suggested changes was not finished. The licensee indicated that the revision was in progress and would be ready for review by the December meeting of the RSC. The licensee was informed that the revision of the E-Plan, and review and approval by the RSC would be designated as an Inspector Follow-up Item (IFI).

During this inspection, the inspector reviewed the issue and found that the E-Plan was revised and reviewed by the Environmental Health and Safety Department. It was also reviewed and approved by the RSC. Once a list of changes to the E-Plan is developed, the E-plan and the list of changes will be submitted to the NRC staff. This issue remains open.

- (2) URI 05000407/2020201-02 – (Closed) – Review the licensee’s completed 10 CFR 50.59 screening and/or evaluation of the installation of a new reactor console.

During the inspection in October 2020, the inspector determined that the licensee was conducting a 10 CFR 50.59 review related to the installation of a new reactor console. The review was not finalized at the time of the inspection. The inspector informed the licensee that the review needed to be complete to determine if the change was appropriately implemented and requested a copy of the completed 10CFR 50.59 review, along with all the associated documentation. During an inspection in 2021, the inspector obtained a copy of the 10 CFR 50.59 screening and evaluation pertaining to the installation of its new Thermo-Fisher reactor control console which was reviewed, approved, and signed by the UNEP Director and the RSC as required by procedure. The licensee also provided a copy of the console operating procedure which was designated as proprietary.

The inspector forwarded the 10 CFR 50.59 documentation to the Non-Power Production and Utilization Facility Licensing Branch for assistance with assessing implementation of the design change process. During the NRC staff’s review and assessment of the reactor console 10 CFR 50.59 documentation, it was determined that the review and evaluation conducted by the licensee was appropriate and nothing further was needed. This Unresolved Item (URI) is considered closed.

- (3) Follow-up on Licensee Report Regarding Minor Fuel Damage – NRC Event #55914

During the licensee’s required bi-annual fuel inspection in May 2022, fuel element #4138E was noticed to have low-level surface pitting and discoloration at several locations. As the fuel element was being moved, bubbles began to form at one of the pitted locations. The licensee immediately placed the fuel element in a storage rack.

Throughout the entire process radiation levels remained at background levels. The licensee notified the NRC of the event on May 24, 2022, and subsequently sent an electronic mail detailing the minor fuel damage.

The inspector reviewed licensee-submitted reports and associated documentation concerning the fuel damage, including:

- electronic mail from the licensee to the U.S. Nuclear Regulatory Commission, dated May 24, 2022, reporting on the event
- UNEP Logbook 42 entries May 23,2022 – June 15,2022
- UNEP Core Log

The inspector also held several discussions with the reactor supervisor. The inspector noted that, throughout the fuel inspection, required radiation monitors were available and indicated stable background levels. The inspector verified that the fuel element was permanently removed from service and visually observed the fuel element in the storage rack. The inspector verified with the licensee that the fuel element will never be placed back in service. The inspector confirmed that the licensee's response to the event and corrective actions were in accordance with TS and procedural requirements. This issue is considered closed.

c. Conclusion

The inspector determined that one IFI remains open, one URI is closed, and NRC Event #55914 is closed.

9. Exit Meeting Summary

The inspection scope and results were summarized on July 14, 2022, with university management and facility staff. The inspector discussed the findings for each area reviewed. The licensee did not identify any of the material provided to or reviewed by the inspector as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

A. Allison Reactor Supervisor and Senior Reactor Operator
G. Sjoden UNEP Director and Reactor Administrator
V. Wang Research Scientist and Senior Reactor Operator

Other Personnel

D. Dolan Health Physicist, Radiation Safety Office, Environmental Health and Safety
Department, University of Utah
M. Handy Assistant Radiation Safety Officer, Radiation Safety Office, Environmental
Health and Safety Department, University of Utah
T. Holt Radiation Analyst, Radiation Safety Office, Environmental Health and Safety
Department, University of Utah
F. Monette Radiation Safety Officer and Director of Environmental Health and Safety
Department, University of Utah

INSPECTION PROCEDURE (IP) USED

IP 69001: Class II Non-Power Reactors
IP 86740: Inspection of Transportation Activities
IP 92702 Follow-up on Previously Identified Items

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

05000407/2020201-02 URI Review the licensee's completed 10 CFR 50.59 screening
and/or evaluation of the installation of a new reactor console.

PARTIAL LIST OF ACRONYMS USED

10 CFR Title 10 of the *Code of Federal Regulations*
ALARA As Low As Reasonably Achievable
E-Plan Emergency Plan
IFI Inspector Follow-up Item
IP Inspection Procedure
No. Number
NRC U.S. Nuclear Regulatory Commission
Rad Safety Radiation Safety
RPR Radiological Procedures and Records
RSC Reactor Safety Committee

TLD	Thermoluminescent dosimeter
TRIGA	Training, Research, Isotope, General Atomics
TSs	Technical Specifications
UNEP	Utah Nuclear Engineering Program
URI	Unresolved Item
UUTR	University of Utah TRIGA Reactor