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

April 23, 2022

Dr. Steven R. Reese, Director
Oregon State University
100 Radiation Center
Corvallis, OR 97331-5903

SUBJECT: OREGON STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION SAFETY INSPECTION REPORT NO. 05000243/2022201

Dear Dr. Reese:

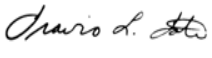
From February 7-10, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Oregon State University TRIGA reactor. The enclosed report documents the inspection results, which were discussed on February 10, 2022, with you and members of your staff.

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 various 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 Roomor from the Publicly Available Records component of NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRCWeb site at https://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Kevin Roche at (301) 415-1554, or by electronic mail at Kevin.Roche@nrc.gov.

Sincerely,


Signed by Tate, Travis
on 04/23/22

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. 50-243
License No. R-106

Enclosure:
As stated

cc: See next page

cc:

Mayor of the City of Corvallis
Corvallis, OR 97331

Maxwell Woods, Assistant Director
Nuclear Safety and Emergency
Preparedness Division
550 Capitol St. NE
Salem, OR 97301

Dr. Irem Tumer, Vice President
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Oregon State University
A312 Kerr Administrative Services Bldg
Corvallis, OR 97331-5904

Mr. Robert Schickler
Reactor Administrator
Oregon State University
100 Radiation Center, A-100
Corvallis, OR 97331-5903

Mr. Daniel Harlan, Chairman
Reactor Operations Committee
Oregon State University
100 Oak Creek Building
Corvallis, OR 97331-5904

Test, Research and Training
Reactor Newsletter
Attention: Amber Johnson
Dept of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

SUBJECT: OREGON STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000243/2022201
DATED: APRIL 23, 2022

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

Docket No.:	50-243
License No.:	R-106
Report No.:	05000243/2021201
Licensee:	Oregon State University
Facility:	Oregon State University TRIGA reactor
Location:	Corvallis, Oregon
Dates:	February 7-10, 2022
Inspector:	Kevin Roche
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

Oregon State University
Oregon State University TRIGA Reactor
Inspection Report No. 05000243/2021201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Oregon State University (OSU, the licensee's) 1.1 megawatts Class II research reactor safety program, including: (1) operations logs and records, (2) requalification training, (3) surveillance and limiting conditions for operation (LCO), (4) experiments, (5) emergency planning, (6) maintenance logs andrecords and (7) fuel handling logs and records. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Operations Logs and Records

- The operations logs and records were maintained in accordance with facility procedures and technical specifications (TSs).

Requalification Training

- The requalification program was conducted in accordance with the NRC regulations, TSs and licensee procedures.

Surveillance and Limiting Conditions for Operation

- Operations followed the LCO and surveillance requirements in the TSs.

Experiments

- The program for conducting and controlling experiments satisfied the requirements specified in the regulations and TS Sections 3.8 and 4.8.

Emergency Planning

- The Emergency Plan (E-Plan), oversight, drills, and training were implemented as required by facility procedures and regulations.

Maintenance Logs and Records

- The licensee maintained records documenting principal maintenance activities in compliance with TS requirements and facility procedures.

Fuel Handling Logs and Records

- The licensee conducted and documented fuel handling activities in accordance with TS requirements and facility procedures.

REPORT DETAILS

Summary of Facility Status

The OSU continued to operate the 1.1 megawatts TRIGA Mark-II research reactor in support of laboratory demonstrations, reactor surveillances, and sample irradiations. During this inspection, the reactor was started up and operated several hours per day at varying power levels for sample irradiation.

1. Operations Logs and Records

a. Inspection Scope (IP 69001-02.02)

To ensure that the requirements of TS 6.4 and TS 6.8 were met, the inspector reviewed:

- Oregon State TRIGA Reactor (OSTR) Operating Procedures (OSTROP) 2, "Reactor Startup Checklist Procedures," Revision low-enriched uranium (LEU)-12
- OSTROP 3, "Reactor Shutdown Checklist Procedures," Revision LEU-6
- OSTROP 4, "Reactor Operating Procedures," Revision LEU-9
- OSTROP 5, "Procedures for Maintaining Reactor Operations Records," Revision LEU-12
- OSTR reactor daily power log
- selected entries from OSTR log books 175-179
- reactor supervisor's log, Volume 16, for the past 2 years
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2019-July 1, 2020
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2020-July 1, 2021

b. Observations and Findings

The inspector observed that logbook entries were maintained in accordance with approved procedures. The inspector found that logs and records are maintained as required by the licensee's administrative procedures. The inspector verified that records also showed that operational conditions and parameters were consistent with the license and TS requirements.

c. Conclusion

The inspector determined the licensee's logbook records and record keeping programs were maintained as required by licensee administrative procedures and met the retention requirements of the TSs.

2. Requalification Training

a. Inspection Scope (IP 69001-02.04)

To ensure that the requalification training requirements of TSs 6.1.4, and 6.7.3, and Title 10 of the *Code of Federal Regulations* Section 55.53, "Conditions of licenses," paragraphs (e) and (h), were met, the inspector reviewed the following:

- "Requalification Program for Licensed Operators of the Oregon State TRIGA Reactor," Revision 1, dated September 21, 2004
- operator physical examination records of selected operators
- OSTR operator requalification training sessions for 2020 and 2021
- OSTR operator requalification written examination records for 2020 and 2021
- OSTROP 5, "Procedures for Maintaining Reactor Operations Records," Revision LEU-12
- completed forms from OSTROP 5 for 2020 and 2021
- OSTR operator requalification operational exercise records for 2020 and 2021
- OSTR console operating experience records for 2020 and 2021

b. Observations and Findings

The inspector found that the requalification plan contains annual on-the-job training, oral test, and operational test requirements. The inspector verified that training in the areas required were performed throughout the training cycle. The inspector found that written, operations, and emergency preparedness exams were completed during the training cycle, as required. The inspector verified that a sample of licensed operators performed the required quarterly hours of reactor operations. Further, the inspector confirmed by record review that all active operators completed a biennial medical examination.

c. Conclusion

The inspector determined that the licensee's requalification program was conducted as required by NRC regulations, TSs, and licensee procedures.

3. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001-02.05)

To ensure that the requirements of TS 3.0, and TS 4.0 were met, the inspector reviewed the following:

- Appendix A to Facility Operating License No. R-106, Amendment No. 25
- OSTROP 13, "Monthly Surveillance and Maintenance Procedures," Revision LEU-10
- OSTROP 14, "Quarterly Surveillance and Maintenance Procedures," Revision LEU-7
- OSTROP 15, "Semi-Annual Surveillance and Maintenance Procedures," Revision LEU-9
- OSTROP 16, "Annual Surveillance and Maintenance Procedures," Revision LEU-9

- completed OSTROP 13 Sheets from 2020 and 2021
- completed OSTROP 14 Sheets from 2020 and 2021
- completed OSTROP 15 Sheets from 2020 and 2021
- completed OSTROP 16 Sheets from 2020 and 2021
- OSTROP 9, "Control Rod Calibration Procedures," Revision LEU-5
- selected entries from OSTR log books 175-179
- reactor supervisor's log, Volume 16, for the past 2 years
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2019 – July 1, 2020
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2020 – July 1, 2021

b. Observations and Findings

The inspector selected a sample of the TS-required surveillances to verify implementation and determined that the frequency and outcome met TS requirements. The inspector verified surveillance results were retained as required by TS 6.8 and licensee's procedural requirements.

c. Conclusion

The inspector determined that the licensee's operations followed the LCOs and surveillance requirements as stated in the TSs.

4. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify that experiments were conducted within approved guidelines specified in TS Sections 3.8 and 4.8:

- selected OSTR irradiation request information sheet forms for the past 2 years
- reactor operations documented in various reactor console log books, 175-179
- OSTROP 10, "Operating Procedures for Reactor Experimental Facilities, Revision LEU-7
- OSTROP 18, "Procedures for the Approval and Use of Reactor Experiments," Revision LEU-2
- OSTROP 18 Appendix A, "Procedures for Irradiating Samples in the Oregon State TRIGA Reactor," Revision LEU-5
- experiment records

b. Observations and Findings

The inspector noted that the licensee had three types of experiments at the facility, based generally on the reactivity, amount of shielding required, and the amounts of radioisotopes produced. The inspector also noted that there were currently five approved reactor experiments available for use. The inspector verified that all the active experiments were reviewed and approved by the Reactor Operations Committee.

The inspector found that all experiments were completed as required by the licensee's procedures. The inspector verified that the results of the experiments were documented appropriately. The inspector also verified irradiation request

forms, required for irradiating samples in the reactor, were completed as required by TS.

While onsite the inspector observed the insertion of a radioactive isotope. The inspector observed that proper radiological and safety precautions outlined in OSTROP 10 were taken including radiation level monitoring, additional sample shielding, and maximizing distance from the sample.

c. Conclusion

The inspector concluded that experiments were reviewed and performed in accordance with the TS requirements and the licensee's written procedures.

5. Emergency Planning

a. Inspection Scope (IP 69001-02.10)

To verify compliance with the OSU E-Plan, the inspector reviewed selected aspects of the following:

- "Oregon State University Radiation Center and Oregon State TRIGA Reactor (OSTR) Emergency Response Plan," Revision 11
- Record of Emergency Response Plan #20-06, "Record of Emergency Response Plan Annual ERP Drill"
- Record of Emergency Response Plan #20-02, "Record of Emergency Response Plan Coordination with Support Agency"
- Record of Emergency Response Plan #21-01, "Emergency Response Plan Annual ERP Drill"
- annual records from for the past 2 years
  - E-Plan Training for staff and outside organizations
  - Plan Review
  - Inventory of emergency supplies

b. Observations and Findings

The inspector verified that the E-Plan in use at the reactor and emergency facilities was an updated version approved in January of 2021. The inspector confirmed that the latest revision did not reduce the effectiveness of the E-plan. The inspector verified that emergency response facilities, supplies, instrumentation, and equipment were maintained and controlled as required in the E-Plan.

Through records review and interviews with licensee personnel, the inspector found that emergency responders were knowledgeable of the proper actions to take in case of an emergency. The inspector found that letters of agreement with outside response organizations were maintained and updated.

The inspector determined that emergency drills were conducted annually as required by the E-Plan. The inspector determined that critiques were held following the drills to discuss the strengths and weaknesses identified during the exercises and to develop possible solutions to any problems identified. The inspector noted that the results of these critiques were documented. The inspector found that emergency

preparedness and response training for reactor staff personnel was conducted and documented as stipulated in the E-Plan.

c. Conclusion

Based upon the review of emergency response documents, facility walkdowns,and interviews of licensee personnel, the inspector concluded that the licensee met the requirements of the approved E-Plan.

6. Maintenance Logs and Records

a. Inspection Scope (IP 69001-02.11)

To ensure that the maintenance requirements of TS 6.8.1 were met, the inspector reviewed the following:

- selected entries from OSTR log books 175-179
- reactor supervisor's log, Volume 16, for the past 2 years
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2019 – July 1, 2020
- "Radiation Center and TRIGA Reactor Annual Report," dated June 30, 2020 – July 1, 2021

b. Observations and Findings

The inspector found that the selected significant maintenance items were documented and resolved as required by the licensee's administrative procedures. Additionally, the inspector verified by document review that maintenance records were retained for at least 5 years or the life of the component as required by TS 6.8.1.

c. Conclusion

The inspector determined the licensee maintained records documenting maintenance activities in compliance with TS requirements and the licensee's procedures.

7. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001-02.12)

To ensure that the requirements of TSs 3.1.6 and 4.1.e were met, the inspector reviewed the following:

- reactor supervisor's log, Volume 16, for the past 2 years
- console log books 175-179
- OSTROP 11, "Fuel Element Handling Procedures," Revision LEU-6
- OSTROP 12, "Control Rod Maintenance, Removal, and Replacement Procedures," Revision LEU-4
- LEU fuel element transfer index sheets
- OSTR Mark II Research Fuel Element History File

b. Observations and Findings

The inspector determined that three fuel inspections have occurred since this module was previously inspected. The inspector confirmed that fuel elements were inspected in accordance with TSs 4.1.e. The inspector verified that all fuel elements met the TS requirements.

The inspector verified core configuration changes were documented and followed established procedures.

c. Conclusion

The inspector determined that the licensee conducted and documented fuel handling activities in accordance with TS requirements and licensee procedures.

8. Exit Interview

The inspector reviewed the inspection results with members of licensee management at the conclusion of the inspection on February 10, 2022. The licensee acknowledged the results and conclusions presented by the inspector.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Reese	Director, OSU Radiation Center
R. Schickler	Reactor Administrator
C. Oney	Reactor Supervisor
C. Kulah	Senior Reactor Operator
S. Menn	Senior Health Physicist

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None