



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

June 3, 2021

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. 05000243/2021201

Dear Dr. Reese:

From May 17-20, 2021, 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 May 20, 2021, 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 Room or from the Publicly Available Records component of 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).

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

Sincerely,

*for*

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

Oregon State University

Docket No. 50-243

cc:

Mayor of the City of Corvallis  
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Mr. Daniel Harlan, Chairman  
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Test, Research and Training  
Reactor Newsletter  
Attention: Amber Johnson  
Dept of Materials Science and Engineering  
University of Maryland  
4418 Stadium Drive  
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SUBJECT: OREGON STATE UNIVERSITY – U.S. NUCLEAR REGULATORY  
COMMISSION ROUTINE INSPECTION REPORT NO. 05000243/2021201  
DATED: JUNE 3, 2021

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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: May 17-20, 2021

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 on-site review of selected aspects of the Oregon State University (OSU, the licensee) 1.1 megawatt Class II research reactor facility safety program including: (1) organization and staffing (2) procedures; (3) health physics (HP); (4) design changes; (5) committees, audits and reviews; and (6) transportation. 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 NRC requirements.

#### Organization and Staffing

- Facility organization and staffing followed the requirements specified in technical specification (TS) 6.1

#### Procedures

- The inspector found that procedural review, revision, control, and implementation satisfied TS requirements.

#### Health Physics

- The inspector found that surveys, postings, and personnel dosimetry met regulatory requirements.
- The inspector found that radiation monitoring equipment was maintained and calibrated as required by TSs.
- The inspector found that calculations of effluents released from the facility satisfied license and regulatory requirements and releases were within the specified regulatory limits.

#### Design Changes

- The inspector found that changes to the facility were evaluated using the criteria specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests and experiments," and were reviewed and approved by the Reactor Operations Committee (ROC) as required.

#### Committees, Audits and Reviews

- The inspector found that review, audit, and oversight functions required by the TSs were completed by the ROC.

#### Transportation

- The inspector found that radioactive material was shipped in accordance with the applicable regulations.

## REPORT DETAILS

### Summary of Facility Status

The licensee's 1.1 megawatt TRIGA research reactor was operated in support of laboratory experiments, and various types of irradiation projects. During the inspection, the reactor was started up, operated, and shut down as required to support these ongoing activities.

#### 1. Organization and Staffing

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

To ensure that the requirements of TS 6.1 were met, the inspector reviewed the following:

- Facility Operating License No. R-106, Docket No. 50-243, Amendment No. 25
- Appendix A to Facility Operating License No. R-106, Amendment No. 25
- Organization Chart, Radiation Science and Engineering Center
- Console Logbooks since the last inspection
- Radiation Center and TRIGA Reactor Annual Report, July 1, 2018, through June 30, 2019
- Radiation Center and TRIGA Reactor Annual Report, July 1, 2019, through June 30, 2020

##### b. Observations and Findings

The inspector found that since the previous NRC inspection (Inspection Report No. 50-248/2019-201, Agencywide Documents Access and Management System Accession No. ML19031C929), there were personnel changes in the organization at the OSU TRIGA reactor as specified by TS 6.1.1. The licensee selected a new Level 1, Dr. Irem Tumer as the Vice President of Research. Dr. Tumer previously served as the interim Vice President of Research. The inspector determined that this individual met the requirements specified in TS 6.1.2.a and the guidance in "American National Standards Institute/American Nuclear Society-15.4-1988," as required by TS 6.1.4. Additionally, Taighlor Story was hired as a health physicist.

The inspector verified that a list of facility personnel was posted in the control room in accordance with TS 6.1.3.b. The inspector found the list to contain the names and contact information for management, operations, radiation safety, and other support personnel. In discussions with the licensee and review of documents, the inspector verified that the current management and operations personnel are listed. Further, the inspector confirmed the accuracy of the contact information for a few offsite support organizations.

The inspector reviewed OSU TRIGA reactor logbook entries and determined that staffing satisfied the requirements of TS 6.1.3.a.

c. Conclusion

The inspector determined the OSU TRIGA reactor organization and staffing were consistent with the requirements in TS 6.1.

**2. Procedures**

a. Inspection Scope (Inspection Procedure (IP) 69001, Section 02.03)

The inspector reviewed the following documents to verify compliance with the licensee's TS requirements for procedures:

- Oregon State TRIGA Reactor Operating Procedure (OSTROP) 6, "Administrative and Personnel Procedures," Revision LEU-6
- OSTROP 2, "Reactor Startup Checklist Procedures," Revision LEU-12
- OSTROP 8, "Reactor Power Calibration Procedures," Revision LEU-5
- Reviewed 50.59 screens for procedure revisions:
  - 19-01, "Revisions to OSTROP 16 and 31"
  - 19-06, "Revisions to OSTROPS 11, 17, and 25"
  - 19-09, "Revisions to OSTROPS 10, and 18 App A."
  - 20-04, "Revisions to RCHPP 34"
  - 20-05, "Changes to OSTROPS 23, 25, and 26"
  - 20-06, "Changes to Radiation Center HVAC and Relevant OSTROP Revisions"
  - 21-01, "Revisions to OSTROPS 13, 26, and 31"
  - 21-03, "Revisions to OSTROP 8"

b. Observations and Findings

The inspector reviewed the facility procedures and the processes to write, review, approve, and change procedures. The inspector noted that facility procedures were developed as required by TS 6.4. The inspector confirmed that procedures were written, reviewed, approved, and changed in accordance with TS 6.2.3.b and OSTROP 6, "Administrative and Personnel Procedures," Revision LEU-6. During the inspection, the inspector observed licensee staff following procedures to complete tasks. Additionally, the inspector found that the procedures used were effective and able to be implemented for the intended purposes.

c. Conclusion

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

**3. Health Physics**

a. Inspection Scope (IP 69001, Section 02.07)

The inspector reviewed the following documents to verify compliance with 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and



Investigations,” 10 CFR Part 20, “Standards for Protection against Radiation,” and TS requirements for health physics:

- Radiation Center and TRIGA Reactor Annual Report, July 1, 2018, through June 30, 2019
- Radiation Center and TRIGA Reactor Annual Report, July 1, 2019, through June 30, 2020
- select Radiation Center Health Physics Procedures (RCHPPs)
- The following completed forms:
  - RCHPP-24 Appendix A, “Daily Routine Radiation Survey Record”
  - RCHPP-24 Appendix B, “Weekly Routine Radiation Survey Record”
  - RCHPP-24 Appendix C, “Monthly Routine Radiation Survey Record”
  - RCHPP-24 Appendix D, “Non-Routine (Special) Radiation Survey Record”
- 2019 and 2020 records of calibration for TS radiation monitoring instruments
- personnel dosimetry results for the years 2019 and 2020
- environmental dosimetry results for the years 2019 and 2020
- RCHPP 34, “Orientation and Training Programs for the OSU Radiation Center,” Revision 21
- refresher training records for staff for the years 2019 and 2020
- HP Notebook - Environmental Monitoring, Volume I, “Airborne Gamma Emitters, TLD Reports, Ion Chamber and TE & FE Results”
- HP Notebook - Environmental Monitoring, Volume II, “Soil, Water, and Vegetation Data”
- HP Notebook - Environmental Monitoring, Volume III, “Solid and Liquid Waste, Hold-up Tank”
- HP Notebook - Environmental Monitoring, Volume IV, “Gaseous Waste Discharge Summary”

b. Observations

(1) Surveys

The inspector reviewed selected radiation and contamination surveys from 2019 to the present. The inspector found that surveys were completed as required by procedures and in accordance with the requirements in Subpart F, “Surveys and Monitoring,” to 10 CFR Part 20.

During the inspection, the inspector confirmed the radiation survey readings to verify that radiation levels were consistent with expected radiation levels.

(2) Postings and Notices

The inspector toured the facility and observed that signage, posting, and labels were used in accordance with requirements in Subpart J, “Precautionary Procedures,” to 10 CFR Part 20. Radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was detected in the facility. The inspector observed that copies of notices to workers were posted in the facility, including a

copy of the most recent revision of NRC Form 3, "Notice to Employees," as required by 10 CFR 19.11, "Posting of notices to workers."

(3) Dosimetry

The inspector determined that the licensee monitored individuals for radiation exposure in accordance with the requirements in 10 CFR 20.1502, "Conditions requiring individual monitoring of external and internal occupational dose." The inspector examined the dosimetry records for the past 2 years and confirmed that the highest occupational doses were within Subpart C, "Occupational Dose Limits," to 10 CFR Part 20 limits and licensee action levels.

(4) Radiation Monitoring Equipment

The inspector reviewed the records of selected meters, detectors, and air monitoring equipment in use at the facility. The inspector found that annual calibration and quarterly source check frequency of the portable and fixed meters and monitors were consistent with manufacturer's recommendations and appropriate calibration records were maintained. The inspector found that portable survey meters were maintained as required by TS 4.7, and Subpart F to 10 CFR Part 20.

The inspector observed storage and use of portable survey instrumentation at the facility. The inspector found that portable survey instrumentation capable of measuring beta, gamma, and neutron exposure and dose rates were available and operable during times when the reactor was operating as required by TS 3.7.1.

(5) Radiation Protection Training

The inspector reviewed documentation of the initial and annual radiation protection training given to staff and facility users. The inspector verified that training was provided to new users as well as staff members. The inspector found the content of the training program satisfied the requirements in 10 CFR 19.12, "Instruction to workers."

(6) Radiation Safety Program

The inspector found that the licensee's radiation protection program was established in the RCHPPs. The inspector found that the senior health physicist reviewed the radiation safety program yearly in accordance with licensee procedures. The inspector confirmed that no deficiencies related to the radiation safety program at the OSU TRIGA reactor were identified during reviews of the program.

(7) As Low As Reasonably Achievable Policy

The inspector found that a policy for maintaining radioactive exposure to personnel as low as reasonably achievable (ALARA) was outlined and established in the RCHPPs. The inspector confirmed that the policy

discussed and set expectations for radiation safety culture and provided guidance for keeping doses ALARA, including local action levels for personnel radiation exposure doses, consistent with the requirements in 10 CFR 20.1101, "Radiation protection programs."

(8) Environmental Monitoring and Effluents

The inspector reviewed the calibration records of the area radiation monitors and the gaseous effluent (or stack) monitor. The inspector found that these systems were calibrated annually in accordance with the requirements in TS 4.7. The inspector also reviewed selected records from the past 2 years of the daily channel test for these systems. During the inspection, the inspector observed these systems operating while the reactor was in operation, as required by TS 3.7.

The inspector reviewed the records documenting solid, liquid, and airborne radioactive material releases to the environment. No releases of solid radioactive material to the environment occurred. No liquid radioactive material releases from operation of the OSU TRIGA reactor occurred during the period reviewed. The inspector determined that gaseous radioactive material release activity continued to be calculated and the results were adequately documented. The inspector found that releases were determined to be within the concentrations specified in Appendix B to 10 CFR Part 20, "Annual Limits on intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," and TS limits. The inspector found the highest calculated dose that could be received by a member of the public because of gaseous emissions from reactor operations was determined to be well below the requirements of 10 CFR 20.1101(d).

The inspector verified that environmental gamma radiation monitoring was conducted using thermoluminescent dosimeters in accordance with the applicable procedures. The inspector found the data indicated that there were no radiation doses in uncontrolled areas from operation of the reactor that would result in a member of the public exceeding the limits in Subpart D, "Radiation Dose Limits for Individual Members of the Public," to 10 CFR Part 20.

c. Conclusion

The inspector determined that the radiation protection program implemented by the licensee satisfied regulatory requirements.

**4. Design Changes**

a. Inspection Scope (IP 69001, Section 02.08)

The inspector reviewed the following documents to verify compliance with 10 CFR 50.59 and TS requirements for design changes:

- OSTROP 6, “Administrative and Personnel Procedures,” Revision LEU-6.
- Figure 1 of OSTROP 6, “Oregon State TRIGA Reactor (OSTR) 10 CFR 50.59 Screen Form,” Revision LEU-6
- Figures 2, 3, 4 of OSTROP 6, “OSU TRIGA Reactor (OSTR) 10 CFR 50.59 Evaluation Form,” Revision LEU-6
- The following completed 10CFR 50.59 Screen Forms:
  - 19-02, “Modification of Center Channel”
  - 19-04, “New Safety Power Channel”
  - 19-07, “Console Change in Support of IFE Removal”
  - 19-10, “New Wide-Range Log/Linear Channel”
  - 19-13, “Adjustments to Power Channels and Secondary Control Systems”
  - 20-08, “Upgrade to Reactor Bay Supply Fan Filtration”
  - 21-02, “Bulk Shield Tank Cleanup Skid Upgrades and OSTROP 7 Revisions”

b. Observations and Findings

The inspector reviewed “OSU TRIGA Reactor (OSTR) 10 CFR 50.59 Screen” forms, the associated 10 CFR 50.59 screening, and the corresponding design change packages for the facility changes since the last inspection in this area. The inspector determined that the facility design change evaluations contained adequate supporting documentation and information required by procedure. Additionally, the inspector found that the ROC reviewed proposed changes in accordance with the requirement in TS 6.2.3.

c. Conclusion

The inspector determined that changes to the facility were evaluated using the 10 CFR 50.59 criteria and were reviewed and approved by the ROC.

## 5. Committees, Audits and Review

a. Inspection Scope (IP 69001)

The inspector reviewed the following documents to verify compliance with the TS requirements for review and audit:

- Facility Operating License No. R-106, Docket No. 50-243, Amendment No. 25
- Appendix A to Facility Operating License No. R-106, Amendment No. 25
- ROC meeting minutes from February 26, 2019, meeting until present
- OSTROP 6, “Administrative and Personnel Procedures,” Revision LEU-6
- RCHPP No. 1, “Guidelines for the Radiation Protection Program at the OSU Radiation Center,” Revision 10
- Audit of the OSU Radiation Center Radiation Protection Program for calendar year (CY) 2020
- 2020 Annual Evaluation of the OSU Radiation Center Health Physics Program
- audit of the OSU Radiation Center Radiation Protection Program for CY 2019

- 2019 Annual Evaluation of the OSU Radiation Center Health Physics Program
- Audit of the OSU Radiation Center Radiation Protection Program for CY 2018
- 2018 Annual Evaluation of the OSU Radiation Center Health Physics Program

b. Observations and Findings

The inspector found that the composition of the ROC and the meeting frequency satisfied the requirements of TS 6.2.1 and TS 6.2.2. The inspector verified minutes of these meetings demonstrated that the ROC provided the review and conducted the audits required by the TS 6.2.3 and TS 6.2.4. The inspector found issues brought up by the ROC were resolved in an appropriate time frame and were noted in ROC meeting minutes. While onsite, the inspector attended the ROC virtual meeting. The inspector observed that the ROC had the correct number of members in accordance with TS.

c. Conclusion

The inspector found that review, audit, and oversight functions required by the TSs were completed by the ROC.

## 6. Transportation

a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to verify compliance with the regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," and 49 CFR, "Transportation":

- RCHPP 5, "Procedures for Receipt Radiation Surveys and Unpacking of Packages Containing Radioactive Material," Revision 6
- RCHPP 6, "OSU Procedures for Transfer, Packaging and Transport of Radioactive Materials Other than Radioactive Waste," Revision 16
- Radioactive Material Transfer, Volume I, "General Shipping Forms, Training Records and Audit Records"
- Radioactive Material Transfer, Volume II, "Shipping Container Tests"
- Radiation Center and TRIGA Reactor Annual Report, July 1, 2018, through June 30, 2019
- Radiation Center and TRIGA Reactor Annual Report, July 1, 2019, through June 30, 2020

b. Observations and Findings

The inspector found that the licensee shipped various types of radioactive material since the last inspection in this area. The records indicated that the radioisotope types and quantities were calculated, and dose rates measured as required. The inspector noted that staff members received the required training and were certified for shipping radioactive material. The inspector observed packaging of a Yellow II shipment to another university and did not note any deficiencies. All radioactive

material shipment records reviewed by the inspector were completed in accordance with Department of Transportation and NRC regulatory requirements.

c. Conclusion

The inspector determined that radioactive material was shipped in accordance with the applicable regulations and licensee procedures.

**7. Exit Interview**

The inspection scope and results were summarized on May 20, 2021, with members of licensee management and staff. The inspector described the areas inspected and discussed the inspection results.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee Personnel**

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

### **Other Personnel**

D. Harlan	Chairman, Reactor Operations Committee
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## **INSPECTION PROCEDURES USED**

IP 69001	Class II Non-Power Reactors
IP 86740	Transportation

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

None

### **Closed**

None

### **Discussed**

None