

February 10, 2012

Dr. Steven Reese, Director
Radiation Center and TRIGA Reactor
Oregon State University
Radiation Center, A100
Corvallis, OR 97331-5903

SUBJECT: OREGON STATE UNIVERSITY - NRC ROUTINE INSPECTION REPORT NO.
50-243/2012-201

Dear Dr. Reese:

On January 9-12, 2012, the U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection at the Oregon State University Radiation Center TRIGA Mark-II Reactor facility (Inspection Report No. 50-243/2012-201). The enclosed report documents the inspection results which were discussed on January 12, 2012, with you, Mr. Todd Keller, Reactor Administrator, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements has occurred. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section 2.3.2.b of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with Title 10 of the *Code of Federal Regulations*, Section 2.390, "Public inspections, exemptions, and requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at (301) 466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Johnny H. Eads, Jr., Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No.: 50-243
License No.: R-106

Enclosure: NRC Inspection Report No. 50-243/2012-201
cc w/encl.: Please see next page

Oregon State University

Docket No. 50-243

cc:

Mayor of the City of Corvallis
Corvallis, OR 97331

David Stewart-Smith
Oregon Office of Energy
625 Marion Street, N.E.
Salem, OR 97310

Dr. Richard Spinrad, Vice President
for Research
Oregon State University
Administrative Services Bldg., Room A-312
Corvallis, OR 97331-5904

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

Dr. Andrew Klein, Chairman
Reactor Operations Committee
Oregon State University
Radiation Center, A-100
Corvallis, OR 97331-5904

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

Should you have any questions concerning this inspection, please contact Craig Bassett at (301) 466-4495 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Johnny H. Eads, Jr., Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No.: 50-243

License No.: R-106

Enclosure: NRC Inspection Report No. 50-243/2012-201

cc w/encl.: Please see next page

DISTRIBUTION:

PUBLIC	PRTB r/f	RidsNrrDprPrta Resource	RidsNrrDprPrtb Resource
MNorris (MS T3B46M)		MCompton (Ltr only O5-A4)	GLappert, NRR
AAdams, NRR		CBassett, NRR	

ACCESSION NO.: ML120240004 *via e-mail TEMPLATE #: NRC-002

OFFICE	PROB:RI *	PRPB:LA	PROB:BC
NAME	CBassett	GLappert	JEads
DATE	1/20/2012	1/26/2012	2/10/2012

OFFICIAL RECORD COPY

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

Docket No: 50-243

License No: R-106

Report No: 50-243/2010-201

Licensee: Oregon State University

Facility: TRIGA Mark-II Reactor Facility

Location: Radiation Center
Oregon State University
Corvallis, Oregon

Dates: January 9-12, 2012

Inspector: Craig Bassett

Accompanied by: Taylor Lichatz, Inspector Trainee

Approved by: Johnny H. Eads, Jr., Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Oregon State University
TRIGA Mark-II Reactor Facility
Report No: 50-243/2012-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Oregon State University (the licensee's) 1.1 Megawatt Class II research and test reactor safety program including: 1) organization and staffing, 2) review and audit and design change functions, 3) reactor operations, 4) operator requalification, 5) procedures, 6) fuel movement, 7) maintenance and surveillance, 8) experiments, and 9) emergency preparedness 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. One non-cited violation was identified.

Organization and Staffing

- The licensee's organization and staffing were in compliance with the requirements specified in Section 6 of the Technical Specifications.

Review and Audit Functions and Design Change Control

- Review, audit, and oversight functions required by Technical Specification Section 6.2 were acceptably completed by the Reactor Operations Committee.
- Modifications or changes to the facility procedures, experiments, and structures, systems, and components had undergone the required screenings and evaluations and had been reviewed and approved by the Reactor Operations Committee.

Reactor Operations

- Reactor operations were conducted and documented in accordance with Technical Specification and applicable procedural requirements and guidance.

Operator Licenses, Requalification, and Medical Activities

- Operator requalification was conducted as required and the program was up-to-date and being acceptably maintained in accordance with the Operator Requalification Program.
- Medical examinations were being completed biennially for each operator as required.

Procedures

- Facility procedures were acceptable and satisfied Technical Specification Section 6.4 requirements for being revised by the licensee and reviewed and approved by the Reactor Operations Committee.
- Procedural compliance was observed and found to be acceptable.

Fuel Movement

- Fuel handling activities were conducted in accordance with facility procedures and fuel inspections were completed and documented as required by Technical Specification Sections 4.1.e and 5.3.

Maintenance and Surveillance

- Maintenance was being completed in accordance with Technical Specification and procedural requirements.
- The program for surveillance verifications and calibrations was being implemented in accordance with Technical Specification requirements.

Experiments

- The program for conducting and controlling experiments generally satisfied regulatory and Technical Specification requirements specified in Sections 3.8 and 4.8 with the exception of the violation discussed in the report.

Emergency Preparedness

- Emergency response facilities and equipment were being maintained as required and responders were knowledgeable of proper actions to take in case of an emergency.
- The licensee maintained current Emergency Support Agreements with offsite agencies which indicated that support would be available in case of an emergency.
- Annual drills were being held and documentation was maintained concerning the follow-up critiques and any needed corrective actions.
- Emergency preparedness training for staff and off-site personnel was being conducted as required.

REPORT DETAILS

Summary of Plant Status

Oregon State University (the licensee) continued to operate the 1.1 megawatt TRIGA Mark-II research and test reactor in support of laboratory demonstrations, reactor surveillances, and sample irradiations. Observation of reactor operation and a review of applicable records indicated that the reactor was typically operated approximately six hours per day, five days per week. During this inspection, the reactor was started up and operated several hours per day at varying power levels for sample irradiation and engineering class laboratories.

1. Organizational Structure and Staffing

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

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Section 6 of the Technical Specifications (TS), revised through Amendment No. 22 of the facility operating license, dated September 30, 2008, were being met:

- Oregon State University (OSU) Radiation Center and TRIGA Reactor facility organizational structure and staffing
- Selected portions of the Reactor Console Logbooks for the past two years which indicated staffing levels during routine reactor operations
- Oregon State University TRIGA Reactor Operating Procedure (OSTROP) 6, "Administrative and Personnel Procedures," Revision (Rev.) LEU-1, reprinted November 2008, which outlined various administrative controls
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2009 through June 30, 2010, submitted to the NRC on October 26, 2010
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011
- American National Standard ANSI/ANS 15.4-1988; R1999, "Selection and Training of Personnel for Research Reactors," dated 1999

b. Observations and Findings

The inspector noted that the Director of the Radiation Center continued to report to the President of the University through the Vice President for Research. It was also noted that the Radiation Center organizational structure and the responsibilities of the reactor staff were as outlined in TS Section 6 and OSTROP 6 and had not changed since the last inspection.

Staffing levels remained consistent with those noted during the last inspection of this facility. The current reactor operations organization consisted of the Director of the Radiation Center, the Reactor Administrator, the Reactor Supervisor, and a Scientific Instrument Technician. It was noted that all these individuals were qualified Senior Reactor Operators (SROs). The staff also included another full-time SRO and a part-time Reactor Operator (RO) as well. This organization was as required and consistent with that specified in the TS.

The inspector reviewed the qualifications of the reactor staff. All personnel satisfied the training and experience requirements stated in ANSI/ANS 15.4, "Standard for the Selection and Training of Personnel for Research Reactors," as stipulated in the TS. A review of the Reactor Console Logbooks and associated records confirmed that shift staffing met the minimum requirements for duty and on-call personnel.

c. Conclusion

Organizational structure and staffing were in compliance with the requirements specified in TS Section 6.

2. Review and Audit, and Design Change Functions

a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits as required by TS Section 6.2 and to determine whether modifications to the facility had been reviewed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59, the inspector reviewed:

- OSU 50.59 Screen Logbook
- OSU 50.59 Evaluation Logbook
- Design change functions outlined in OSTROP 6
- Reactor Operations Committee (ROC) meeting minutes from November 2009 to the present
- ROC Quarterly and Annual Audit and review records for the past two years
- Change screen reviews conducted under and documented in accordance with OSTROP 6, Figure 6.1 entitled, "Oregon State TRIGA Reactor (OSTR) 10 CFR 50.59 Screen Form," Numbers (Nos.) 10-01 through 10-08 and 11-01 through 11-05
- Change evaluations conducted under and documented in accordance with OSTROP 6, Figure 6.2 entitled, "OSU TRIGA Reactor (OSTR) 10 CFR 50.59 Evaluation Form," No. 10-01
- OSTROP 6, "Administrative and Personnel Procedures," Rev. LEU-1, reprinted November 2008, which also contained further examples of the responsibilities of the Reactor Operations Committee
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2009 through June 30, 2010, submitted to the NRC on October 26, 2010
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011

b. Observations and Findings

(1) Review and Audit Functions

The inspector reviewed the ROC meeting minutes from November 2009 to the present. These meeting minutes showed that the committee met quarterly and had considered the types of topics outlined by the TS Section 6.2. Review of the committee meeting minutes also indicated that the ROC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor.

It was noted that ROC members completed quarterly audits of reactor operations and related records, as well as, annual reviews of the reactor operator requalification, emergency preparedness, and security programs. The inspector noted that the audits and the resulting findings were acceptable and the audits were generally completed within the time frame stipulated by the TS.

(2) Design Control

The inspector reviewed recent 10 CFR 50.59 screen and evaluation forms and interviewed licensee personnel concerning proposed changes to facility procedures, tests, experiments, and/or structures, systems, and components (SSC). As a result, the inspector determined that screenings had been conducted as required and some mandated the completion of evaluations in accordance with the requirements of OSTROP 6. The screenings and evaluations had been documented as required, had been reviewed and approved by the ROC as needed, and had been signed off by the appropriate personnel. None of the evaluations were found to require a license amendment.

c. Conclusion

Review, audit, and oversight functions required by TS Section 6.2 were acceptably completed by the ROC. Modifications or changes to the facility procedures, experiments, and SSC had undergone the required screenings and evaluations and had been reviewed and approved by the ROC.

3. Operations

a. Inspection Scope (IP 69001)

To verify that the licensee was operating the reactor in accordance with TS Sections 2 and 3 and the applicable procedures, the inspector reviewed selected portions and/or aspects of:

- Staffing during routine reactor operations
- Licensed Operator Time Log Sheets for the past two years
- Selected portions of the Reactor Supervisor's Log, Volumes 14 & 15

- Selected OSU TRIGA Reactor Daily Power Log Sheets for the past six months
- Reactor operations documented in various Reactor Console Logbooks, Nos. 153 – 156
- Observation of startup, operations, and/or shutdown activities on January 10, 11, and 12
- Start-up activities documented on selected OSTROP 2 forms entitled “OSU TRIGA Reactor Startup Checklist,” from January through December 2011
- Shut down activities documented on selected OSTROP 3 forms entitled “Reactor Shutdown Checklists,” from January through December 2011
- Selected records of console instrumentation readings documented on OSU TRIGA Reactor Daily Power Log Sheets for the past year
- OSTROP 2, “Reactor Startup Checklist Procedures,” Rev. 12, reprinted April 2008
- OSTROP 3, “Reactor Shutdown Checklist Procedures,” Rev. 10, reprinted April 2008
- OSTROP 4, “Reactor Operation Procedures,” Rev. LEU-1 reprinted November 2008
- OSTROP 5, “Procedure for Maintaining Reactor Operational Records,” Rev. LEU-1, reprinted September 2010
- OSTROP 25, “Reporting Requirements,” Rev. LEU-1, reprinted November 2008
- OSTROP 27, “Procedures to Follow in the Event of a Commercial Electrical Power Failure,” Rev. 3, reprinted December 2005
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2009 through June 30, 2010, submitted to the NRC on October 26, 2010
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011

b. Observations and Findings

The inspector conducted observations of the reactor staff on January 10, 11, and 12 and reviewed Reactor Console Logbooks and associated records. The inspector noted that the licensed reactor operators were knowledgeable and competent. Observation of operational activities also confirmed that reactor operations, including start-ups, routine operations, and shutdowns, were carried out in accordance with written procedures and TS requirements. Adherence to procedures was acceptable.

Through these observations and reviews the inspector also confirmed that shift staffing during reactor operation met the TS requirements for duty and on-call personnel. The inspector noted that the logs were being maintained as required by procedure and the records and associated forms provided an acceptable indication of operational activities. The logs indicated that the recorded operational conditions were within the limits specified in the license and TS. The Reactor Console Logbooks, as well as other associated records, also

documented abnormal events that occurred and measures that had been taken to track and resolve the events.

c. Conclusion

Reactor operations were being completed and documented in accordance with TS and procedural requirements.

4. Operator Licenses, Requalification, and Medical Activities

a. Inspection Scope (IP 69001)

The inspector reviewed the following in order to determine that operator training and requalification activities were conducted as required by the requalification program and that medical requirements were met:

- Effective dates of current operator licenses
- Reactor operators' medical examination records for the past three years
- Operator training records documented in the Operator Requalification Manual
- TRIGA Reactor Operator Requalification Exam Results forms for 2009, 2010, and 2011
- Reactor operations documented in various Reactor Console Logbooks, Nos. 153 – 156
- Memorandum from T. Keller to T. Palmer and S. Reese dated December 23, 2010, discussing the 2010 Operator Requalification Program
- Memorandum from T. Keller to A. Klein and S. Reese dated November 14, 2011, discussing the 2011 Operator Requalification Program
- "Requalification Program for Licensed Operators of the Oregon State TRIGA Reactor," Rev. 1, reprinted September 30, 2004
- Logs and records of the number of hours spent operating the reactor maintained in the Operator Time Log and associated manual
- Active duty status and OSTR Annual Requalification Operating Test results documented in the Operator Time Log and associated manual
- OSTROP 16, "Annual Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets

b. Observations and Findings

At the time of the inspection, there were five qualified SROs and one RO working at the facility. The inspector verified that all the operators' licenses were current. It was noted that one operator's license had been due to expire in February 2012 but the licensee was aware of that and had prepared a license renewal application which was forwarded to the NRC in December 2011. As a result, the operator's license was renewed for another six years.

A review of the logs and records showed that training had been conducted in the areas stipulated in the licensee's requalification and training program such that all the material was covered within a two-year period. It was noted that lectures had been given as stipulated, training reviews had been documented, and written examinations had been completed. An annual operating test had been conducted for each operator by the Reactor Supervisor as required by the program as well. It was also verified that each operator had completed the required number of hours of reactor operations each calendar quarter as required. Records of these reactor manipulations, other operational activities, and/or Reactor Supervisor activities were being maintained, as were records of the Annual Operations Tests. The program was up-to-date and training was current.

In addition to the above, the inspector verified that medical examinations were being completed biennially for each operator as required.

c. Conclusion

The requalification and training program was up-to-date and acceptably maintained.

5. Procedures

a. Inspection Scope (IP 69001)

To determine whether facility procedures were being audited annually and whether the procedures met the requirements outlined in TS Section 6.4, the inspector reviewed:

- Selected operating (OSTROP) procedures
- Procedural reviews and updates documented in ROC meeting minutes.
- Change screen reviews conducted under and documented in accordance with OSTROP 6, Figure 6.1 entitled, "Oregon State TRIGA Reactor (OSTR) 10 CFR 50.59 Screen Form," Numbers (Nos.) 10-01 through 10-12, 11-01 through 11-05, and 12-01
- Change evaluations conducted under and documented in accordance with OSTROP 6, Figure 6.2 entitled, "OSU TRIGA Reactor (OSTR) 10 CFR 50.59 Evaluation Form," Nos. 10-01 through 10-04 and 11-01 through 11-03
- OSTROP 5, "Procedure for Maintaining Reactor Operational Records," Rev. LEU-1, reprinted September 2010
- OSTROP 6, "Administrative and Personnel Procedures," Rev. LEU-1, reprinted November 2008

b. Observations and Findings

The licensee's procedures were found to be acceptable for the facility's current operating status and staffing level. It was noted that the procedures specified the responsibilities of the various members of the staff. The inspector determined

that the procedures were being audited and reviewed annually by the ROC as required and revised as needed.

Changes to procedures were screened according to OSTROP 6. If the changes did not result in a change to the intent of the procedure, they were routed to all licensed SROs, the Senior Health Physicist, the Reactor Administrator, and the Director who signed and dated the change indicating review and concurrence. Substantive changes to procedures, checklists, and forms were required to undergo a 10 CFR 50.59 Evaluation. They were then presented to the ROC for review and approval as required by TS.

The operations observed by the inspector during this inspection were completed in accordance with the applicable procedures.

c. Conclusion

Facility procedures were being reviewed and audited annually as required by TS Section 6 and procedure revisions were reviewed and approved by the ROC. Procedural compliance was acceptable.

6. Maintenance and Surveillance

a. Inspection Scope (IP 69001)

To determine that surveillance requirements and Limiting Conditions for Operation (LCO) verifications were being completed as required by TS Sections 3 and 4, and that maintenance activities were conducted when required, the inspector reviewed:

- Selected portions of the Reactor Supervisor's Log, Volumes 14 & 15
- Reactor operations documented in various Reactor Console Logbooks, Nos. 153 – 156
- Selected surveillance and calibration test data sheets and records maintained in the Surveillance and Maintenance Records Notebook
- OSTROP 8, "Reactor Power Calibration Procedures," Rev. 6, reprinted October 2005
- OSTROP 9, "Control Rod Calibration Procedures," Rev. LEU-1, reprinted November 2008
- OSTROP 12, "Control Rod Maintenance, Removal, and Replacement Procedures," Rev. LEU-1, reprinted November 2008
- OSTROP 13, "Monthly Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets
- OSTROP 14, "Quarterly Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets
- OSTROP 15, "Semi-Annual Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets
- OSTROP 16, "Annual Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets

- OSTROP 19, "Equipment Maintenance and Calibration Procedures," Rev. 1, reprinted July 2004
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2009 through June 30, 2010, submitted to the NRC on October 26, 2010
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011

b. Observations and Findings

The inspector noted that selected daily, monthly, quarterly, semiannual, and annual checks, tests, verifications, and/or calibrations for TS-required surveillances and LCO verifications were being completed as stipulated. All the surveillances and LCO verifications reviewed were completed on schedule and in accordance with licensee procedures. All the recorded results were within the TS and procedurally prescribed parameters. The records and logs reviewed were complete and being maintained as required.

The maintenance logs and records indicated that problems were addressed and preventive maintenance operations completed as required by procedure. Records showed that routine maintenance activities were conducted at the required frequencies and in accordance with the TS and/or the applicable procedure. Maintenance activities ensured that equipment remained consistent with the Safety Analysis Report and TS requirements.

The Reactor Supervisor maintained a schedule for reactor operations and tracked the completion of maintenance and surveillance activities. This practice ensured that the staff was aware of upcoming activities and helped ensure good administrative control over operational aspects of the facility.

c. Conclusion

The program for surveillance and LCO confirmations was being carried out in accordance with TS and procedural requirements. Maintenance was also being completed as required.

7. Fuel Movement

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify adherence to fuel handling, positioning, and inspection requirements specified in TS Sections 4.1.e and 5.3:

- Fuel handling equipment and instrumentation
- Selected portions of the Reactor Supervisor's Log, Volumes 14 & 15
- Reactor operations documented in various Reactor Console Logbooks, Nos. 153 – 156

- Fuel handling and examination records for the past two years documented on "Oregon State University TRIGA Mark II Research Reactor Fuel Element History File" cards maintained in the LEU Fuel Element History Logbook and on "Fuel Element Transfer Index Sheet" forms maintained in a separate notebook
- OSTROP 11, "Fuel Element Handling Procedures," Rev. LEU-1, reprinted November 2008
- OSTROP 16, "Annual Surveillance and Maintenance Procedures," Rev. LEU-1, reprinted November 2008 and related log sheets
- OSTROP 20, "Special Nuclear Material Control and Accounting Procedures," Rev. 6, reprinted July 2004

b. Observations and Findings

The inspector noted that the licensee was operating with LEU Core No.1. It was also noted that the reactor could be operated in different configurations depending upon what equipment was installed in the B-1 or G-14 position of the core. The actual configuration was noted in the Reactor Console Logbook by using colored markers to mark the edge of each applicable logbook page.

The inspector determined that the licensee was maintaining the required records of the various fuel movements that were completed and verified that the movements were conducted in compliance with procedure. The procedures used for fuel movement and inspection were acceptable, as were the precautions that were required to be established during such evolutions. Fuel element locations were being tracked by annotations to the applicable fuel element forms in the log book and on a Fuel Status Board maintained in the Reactor Control Room.

The inspector noted that new reactor fuel was inspected upon initial receipt. Thereafter, twenty percent (20%) of the elements were inspected each year such that the entire core would be inspected over a five year period. The elements were visually inspected to check for damage and deterioration and measured to check for concentric or other swelling. The results of these inspections were being documented in the Reactor Console Logbook and on the applicable fuel element history forms as required. The latest inspection of 20% of the fuel was completed on September 26, 2011.

c. Conclusion

Reactor fuel movements were made and documented in accordance with procedure. The fuel was being inspected as stipulated by TS Section 4.1.e and 5.3.

8. Experiments

a. Inspection Scope (IP 69001)

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

- Irradiation Request (IR) Index #3
- OSU Radiation Center TRIGA User's Certification Form
- Potential hazards identification and control of irradiated items
- Documentation of experiment review and approval by the ROC
- General Limitations of Experiments Performed Using the OSU TRIGA Reactor
- Selected OSU TRIGA Reactor Irradiation Request Information Sheet forms for the past two years
- Reactor operations documented in various Reactor Console Logbooks, Nos. 153 – 156
- Selected Irradiation Request Pneumatic Transfer Sample Information Forms for the past year
- OSU Approved Experiments including the following:
 - No. A-1, "Normal TRIGA Operations," Rev. 1, approval dated July 17, 1992
 - No. B-3, "Irradiation of Materials in the Standard OSTR Irradiation Facilities," Rev. 5, approval dated December 16, 2008
 - No. B-33, "Irradiation of Combustible Liquids in the Rotating Rack," Rev. 0, approval dated August 27, 2003
 - No. B-35, "Irradiation of Enriched Uranium Materials in the Prompt Gamma Neutron Activation Analysis (PGNAA)," Rev. 0, approval dated April 29, 2009
- OSTROP 10, "Operating Procedures for Reactor Experimental Facilities," Rev. LEU-4, reprinted July 2011
- OSTROP 18, "Procedures for the Approval and Use of Reactor Experiments," Rev. 8, reprinted March 2005
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2009 through June 30, 2010, submitted to the NRC on October 26, 2010
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011

b. Observations and Findings

(1) Routine Experiments

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. Class A experiments were those that involved small changes in reactivity, required no external shielding, and/or produced limited amounts of radioisotopes. Class B experiments involved larger changes in reactivity, required external shielding, and/or produced larger amounts of radioisotopes. Class C experiments were special experiments involving unusual experimental setups, the irradiation of special materials such as explosives, unusual fuel element arrangements, large in-core experimental facilities, etc. Currently one Class A experiment and nine Class B experiments were considered active. The

inspector verified that all the active experiments had been reviewed and approved by the ROC as required. The inspector noted that there have been no changes since the previous inspection period.

Most of the experiments conducted at the facility were well-established procedures that have been in place for many years. Nevertheless, it was noted that one new experiment had been initiated in 2009. The planned experiment involved irradiation of enriched uranium foil in the licensee's Prompt Gamma Neutron Activation Analysis (PGNAA) Facility with the intention of monitoring radiation signatures produced during and shortly after fission. The inspector verified that it had been approved by the Reactor Supervisor, the Senior HP, and finally by the ROC as required. Also, a 10 CFR 50.59 Evaluation had been completed for the experiment. The licensee informed the inspector that there are plans to make changes to the experiment during the upcoming year.

A review of the records maintained by the licensee indicated that all experiments were completed under the cognizance of the Reactor Supervisor as required. The results of the experiments were documented in the reactor operations log book. Irradiation Request (IR) forms, required for reactor use, were also reviewed. The IR forms were being completed as required. The forms documented the individual users, the required approvals and licenses, the length of the irradiations, the expected resulting radionuclides that would be produced, and the ultimate disposition of the material following the irradiations.

(2) Follow-up On Technical Specification Violation

TS 3.8.1, Reactivity Limits, states that the absolute value of the reactivity worth of any single unsecured experiment shall be less than \$0.50.

During the spring of 2011, the licensee was designing a new experiment which would utilize reactivity oscillation to measure reactor parameters. In order to examine the reactivity worth versus the axial position of the absorber in the core at low power, the licensee created a preliminary test absorber. On April 6, 2011 the licensee made an attempt to measure the worth of the preliminary test absorber, and it was determined that the worth was \$0.60. The manner in which the measurements were taken qualified the experiment as a "moveable" experiment. Therefore, the reactivity limit was in excess of that allowed by the TS by \$0.10. The licensee reported the event on the morning of April 7, 2011. During the May 10, 2011 ROC meeting, the ROC discussed the event and necessary corrective actions. During the August 22, 2011 ROC meeting, the ROC verified that corrective actions had been completed.

The inspectors discussed the self-reported TS violation with the licensee and interviewed various reactor staff personnel. The event information was verified and the inspector verified that the licensee completed the necessary corrective actions. The experiment will be made into a secured experiment rather than a moveable experiment.

As indicated above, the inspector determined that the problem had been identified and reviewed by the licensee and reported to the NRC. Corrective actions had been identified and completed as well. As a result, the licensee was informed that this non-repetitive, licensee-identified and corrected violation would be treated as a Level IV Non-Cited Violation (NCV), consistent with section VI.A.8 of the NRC Enforcement Policy (NCV 50-243/2012-201-01). This issue is considered closed.

c. Conclusion

The license's program for the control of experiments generally satisfied regulatory and TS requirements with the exception of the violation discussed above.

9. Emergency Preparedness

a. Inspection Scope (IP 69001)

To verify proper implementation of the licensee's Emergency Preparedness Program, the inspector reviewed selected aspects of:

- Training and emergency drill records for the past two years
- Offsite support as documented in Emergency Support Agreements
- Emergency response facilities, supplies, equipment, and instrumentation
- Oregon State University Radiation Center and Oregon State TRIGA Reactor (OSTR) Emergency Response Plan and Emergency Response Implementing Procedures (ERIP), originally approved May 17, 1984, and last revised December 2010, Rev. 9, including in Appendix C:
 - ERIP 0, "Emergency Procedures for Emergency Response Personnel – Class 0 Emergency - Personnel and Operational Events," revised December 2011
 - ERIP 1, "Emergency Procedures for Emergency Response Personnel – Class 1 Emergency - Notification of Unusual Events," revised December 2011
 - ERIP 2, "Emergency Procedures for Emergency Response Personnel – Class 2 Emergency - Alert," revised December 2011
 - ERIP 3, "OSTROP 1, 'Emergency Operation Procedures,'" revised December 2011
 - ERIP 4, "RCHPP 34, 'Orientation and Training Programs for the OSU Radiation Center,'" revised December 2011
 - ERIP 5, "Radiation Center Complex Evacuation Procedures," revised December 2011
 - ERIP 6, "Emergency Procedures to Follow on Receipt of a Bomb Threat," revised December 2011
 - ERIP 7, "Emergency Activation and Notification Procedures," revised December 2011
 - ERIP 8, "News Release Policy and Guidelines – OSU Radiation Center," revised December 2011

- ERIIP 9, "DHS Alert Notification Procedures," revised December 2011
- OSTROP 1, "Emergency Operating Procedures," Rev. LEU-1, reprinted November 2008

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the facility was the same as the version approved by the NRC and was last revised December 2010. The E-Plan was audited and reviewed annually by the ROC as required. Implementing procedures were also reviewed annually and revised by the licensee as needed to implement the E-Plan effectively. It was also noted that emergency response equipment at the Radiation Center was being maintained and inventoried at the frequencies required in the E-Plan.

Through records review and interviews with licensee personnel, emergency responders were determined to be knowledgeable of the proper actions to take in case of an emergency. Emergency response facilities and equipment were being maintained as required. An Emergency Support Agreement with the Good Samaritan Hospital in Corvallis had been updated and maintained as necessary. Agreements were also being maintained with the City of Corvallis Fire and Police Departments as required. Communications capabilities were acceptable with these support groups and were tested periodically. Various crews and/or personnel from these off-site support organizations visited the facility periodically and were familiar with the facility and what would be required during a response.

Emergency preparedness and response training for staff and specific support group personnel was being completed annually as required. The licensee continued to conduct drills annually as stipulated in the E-Plan in order to test communications procedures and ensure proper response of facility personnel to simulated radiological, industrial, or security problems. The inspector verified that every two years the drills were structured to involve, and require the participation of, off-site support agencies and personnel. Critiques were conducted following the drills to discuss and identify any strengths and/or weaknesses noted. Evacuation drills had been conducted each year as well.

The inspector visited the Good Samaritan Regional Medical Center and observed the equipment staged in that location for response to an emergency at the Radiation Center. From this observation and as a result of reviewing the licensee's records documenting drills and training, the inspector verified that medical support personnel were well trained, properly equipped, and knowledgeable of the actions to take in case of an emergency at the reactor facility. The inspector determined that the licensee was maintaining a good working relationship with this support group.

The inspector noted that the licensee responded to the memoranda from the Division of Homeland Security (DHS) requesting changes to the Emergency Response Plan Implementation Procedures. Three of the four changes that were made were personnel changes, while the fourth change was in order to meet the

RIS guidance. DHS changed the advisory system from NORMAL to ELEVATED or IMMINENT. The ROC approved ERIP 9.

c. Conclusion

Emergency response facilities and equipment were being maintained as required and responders were knowledgeable of proper actions to take in case of an emergency. Emergency Support Agreements were being maintained with appropriate offsite agencies. Annual drills were being held and the appropriate documentation was maintained. Emergency preparedness training for staff and off-site personnel was being conducted as required.

10. Exit Interview

The inspection scope and results were summarized on January 12, 2012, with licensee representatives. The inspector discussed the findings for each area reviewed. The licensee acknowledged the findings and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection of these program areas.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

T. Keller	Reactor Administrator
S. Menn	Senior Health Physicist
S. Reese	Director, OSU Radiation Center
R. Schickler	Senior Reactor Operator
S. Smith	Scientific Instrument Technician
G. Wachs	Reactor Supervisor

Other Personnel

C. Boos	Manager, Emergency Department, Good Samaritan Regional Medical Center
---------	---

INSPECTION PROCEDURE USED

IP 69001	Class II Non-Power Reactors
IP 92701	Review of Previously Identified Items

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-243/2012-201-01	NCV	The absolute value of the reactivity worth of a single unsecured experiment was measured to be \$0.60 which was in excess of the limit of \$0.50 allowed by TS Section 3.8.1.
--------------------	-----	---

Closed

50-243/2012-201-01	NCV	The absolute value of the reactivity worth of a single unsecured experiment was measured to be \$0.60 which was in excess of the limit of \$0.50 allowed by TS Section 3.8.1.
--------------------	-----	---

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
DHS	Department of Homeland Security
ERIP	Emergency Response Implementing Procedure
IP	Inspection Procedure
IR	Irradiation Request
LEU	Low Enriched Uranium
LCO	Limiting Conditions for Operation
NCV	Non-Cited Violation
No.	Number
NRC	Nuclear Regulatory Commission
OSU	Oregon State University
OSTR	Oregon State University TRIGA Reactor

OSTROP	Oregon State University TRIGA Reactor Operating Procedure
PGNAA	Prompt Gamma Neutron Activation Analysis
Rev.	Revision
RO	Reactor Operator
ROC	Reactor Operations Committee
SRO	Senior Reactor Operator
SSC	Structures, systems, and components
TS	Technical Specifications