

November 4, 2003

Dr. Andrew C. Klein, Director
Radiation Center and TRIGA Reactor
Oregon State University
Radiation Center, A100
Corvallis, OR 97331-5903

SUBJECT: NRC INSPECTION REPORT NO. 50-243/2003-202

Dear Dr. Klein:

This letter refers to the inspection conducted on October 20-22, 2003, at your Radiation Center TRIGA Mark-II Reactor Facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Craig Bassett at (404) 562-4712.

Sincerely,

/RA/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report

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

George Holdren, Vice Provost
for Research
Oregon State University
Administrative Services Bldg., Room A-312
Corvallis, OR 97331-5904

Dr. Steven Reese
Reactor Administrator
Oregon State University
Radiation Center, A-100
Corvallis, OR 97331-5904

Dr. J. Ringle, 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

November 4, 2003

Dr. Andrew C. Klein, Director
Radiation Center and TRIGA Reactor
Oregon State University
Radiation Center, A100
Corvallis, OR 97331-5903

SUBJECT: NRC INSPECTION REPORT NO. 50-243/2003-202

Dear Dr. Klein:

This letter refers to the inspection conducted on October 20-22, 2003, at your Radiation Center TRIGA Mark-II Reactor Facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Craig Bassett at (404) 562-4712.

Sincerely,
/RA/
Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-243
License No. R-106
Enclosure: NRC Inspection Report
cc w/encl: Please see next page

DISTRIBUTION:

PUBLIC RNRP\R&TR r/f AAdams CBassett
PDoyle TDragoun WEresian FGillespie
SHolmes DHughes EHylton Plsaac
JLyons PMadden MMendonca CNagel
BDavis (Ltr only O5-A4) KBrock (MS O6-H2)
NRR enforcement coordinator (Only for IRs with NOVs, O10-H14)

ACCESSION NO.: ML033020494

TEMPLATE #: NRR-106

OFFICE	RNRP:RI	RNRP:LA	RNRP:SC
NAME	CBassett:rd	EHylton	PMadden
DATE	11/ 03 /2003	11/ 03 /2003	11/ 03 /2003

C = COVER

**E = COVER & ENCLOSURE
OFFICIAL RECORD COPY**

N = NO COPY

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

Docket No: 50-243

License No: R-106

Report No: 50-243/2003-202

Licensee: Oregon State University

Facility: TRIGA Mark-II Reactor Facility

Location: Radiation Center, Oregon State University
Corvallis, OR

Dates: October 20-22, 2003

Inspector: Craig Bassett

Approved by: Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY
Oregon State University
Report No. 50-243/2003-202

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II research reactor safety programs including: organizational structure and staffing, review and audit, radiation protection, environmental protection, procedures, and transportation activities since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organizational Structure and Staffing

- The organizational structure and functions were consistent with Technical Specification requirements.

Review and Audit Functions

- The review and audit program was being conducted acceptably by the Reactor Operations Committee as stipulated in Technical Specifications Section 6.2.

Radiation Protection

- Periodic surveys were completed and documented as required by procedure.
- Postings and signs met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.
- Radiation survey and monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection and ALARA Programs satisfied regulatory requirements.
- Radiation protection training was acceptable.

Environmental Protection

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specification limits.
- The environmental protection program satisfied NRC requirements.

Procedures

- The procedural control and implementation program satisfied procedural requirements.

Transportation of Radioactive Material

- The program for transportation of radioactive materials satisfied NRC requirements.

Report Details

Summary of Plant Status

During the inspection, the licensee's TRIGA Mark-II reactor was operated several days to support experiments, education, operator training, and surveillance activities.

1. Organizational Structure and Staffing

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

The inspector reviewed the following regarding the licensee's organizational structure and functions to ensure that the requirements of Section 6.1 of Technical Specifications (TS), Amendment No. 18, dated November 4, 1999, were being met:

- Oregon State University (OSU) Radiation Center facility organizational structure and staffing
- qualifications of recently appointed personnel
- management responsibilities and administrative controls
- OSU TRIGA Reactor Annual Reports for the periods July 1, 2000 through June 30, 2001, July 1, 2001 through June 30, 2002, and July 1, 2002 through June 30, 2003
- administrative controls outlined in Oregon State TRIGA Reactor Operating Procedure (OSTROP) 6.0, "Administrative and Personnel Procedures," Revision (Rev) 9, dated May 2003

b. Observations and Findings

As noted in Inspection Report Number (IR No.) 50-243/2003-201, the organizational structure and staffing with respect to the health physics organization had changed since the last inspection in the area of radiation protection. The former Senior Health Physicist had accepted employment elsewhere and the individual filling the facility Health Physicist (HP) position was promoted to fill the Senior HP vacancy. In addition, one HP position had been eliminated from the organization.

The organizational structure and staffing were consistent with the requirements of the TS. Qualifications of the staff met those recommended in ANSI Standard 15.4, "Standard for the Selection and Training of Personnel for Research Reactors." Review of records verified that management responsibilities were administered as required by the TS and applicable procedures.

c. Conclusions

The organizational structure and functions were consistent with TS requirements.

2. Review and Audit Functions

a. Inspection Scope (IP 69001)

In order to ensure that the audits and reviews stipulated in the requirements of TS Section 6.2 were being completed, the inspector reviewed the following:

- Reactor Operations Committee (ROC) meeting minutes and records
- ROC safety review and audit records from May 2001 to the present
- responses to safety reviews and audits
- OSTROP 6.0, "Administrative and Personnel Procedures," Rev 9, dated May 2003
- minor and substantive procedural changes and the associated Reactor Operations Committee Approval Sheets

b. Observations and Findings

ROC meeting minutes and records from May 2001 through the present were reviewed. The records showed that safety reviews and audits were conducted by various members of the ROC or other designated persons as required and at the TS required frequency. Topics of these reviews were consistent with TS requirements to provide guidance, direction, and oversight, and to ensure acceptable use of the reactor and appropriate implementation of the radiation protection program. The inspector noted that the safety reviews and audits and the associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed.

c. Conclusions

Review and oversight functions required by TS Section 6.2 were acceptably completed by the ROC.

3. Radiation Protection

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Parts 19 and 20 and licensee administrative requirements:

- Oregon State University Radiation Protection Program
- radiological signs and posting in various areas of the facility
- routine periodic surveys and monitoring documented in the Notebooks listed below
- dosimetry/exposure records for 2001 through 2003 to date
- maintenance and calibration of radiation monitoring equipment
- As Low As Reasonably Achievable (ALARA) reviews
- Radiation Center Health Physics Procedure (RCHPP) Number (No.) 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev 4, dated June 2003
- RCHPP No. 18, "Maintenance and Calibration Procedures for Radiation Protection Instrumentation (Including Operator Training Manual and Operating Procedures for the Radiation Center Gamma Instrument Calibration Facility)," Rev 7, dated July 2003
- RCHPP No. 20, "Radiation Survey Procedures for the Release of Items for Unrestricted Use," Rev 3, dated July 2001
- RCHPP No. 24, "Procedures for Performing Routine (Daily, Weekly, Monthly, and Annual) Radiation Surveys and Non-Routine (Special) Radiation Surveys," Rev 9, dated October 2002

- RCHPP No. 27, "Procedure for Performing the Semi-Annual Floor Survey for Fixed and Removable Radioactive Contamination," Rev 5, dated March 2002
- RCHPP No. 34, "Orientation and Training Program for the OSU Radiation Center," Rev 15, dated July 2003
- RCHPP No. 37, "Dosimetry," Rev 1, dated May 2002
- Health Physics (HP) Notebook - Surveys, Volume I, "Daily/Weekly/Monthly/Neutron Generator/and Semi-Annual Floor Surveys"
- HP Notebook - Surveys, Volume II, "Special Surveys"
- HP Notebook - Surveys, Volume IV, "Work Surveillance Reports"
- training records for Radiation Center staff, HP Monitors, and facility users

b. Observations and Findings

(1) Surveys

Selected daily, weekly, monthly, quarterly, semi-annual, and annual radiation and/or contamination surveys were reviewed by the inspector. The surveys had been completed by HP staff members as required. Any contamination detected in concentrations above established action levels was noted and the area was decontaminated. Results of the surveys were documented so that facility workers would be knowledgeable of the radiological conditions that existed therein.

During the inspection the inspector conducted a radiation survey along side a licensee representative. Areas surveyed at the facility included the Reactor Bay and associated laboratories, and the Heat Exchanger Room. The radiation levels noted by the inspector were comparable to those found by the licensee and no anomalies were noted.

(2) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. Radiological signs and survey maps were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. The copies of NRC Form-3, "Notice to Employees," noted at the facility were the latest issue and were posted in various areas throughout the facility. These locations included on the main bulletin board in hallway by the front office, in the corridor leading to the Reactor Building, and in the Reactor Control Room, as required by 10 CFR Part 19.11.

Caution signs, postings, and controls for radiation areas were as required in 10 CFR Part 20, Subpart J. Licensee personnel observed the precautions for access to radiation areas.

(3) Dosimetry

The inspector determined that the licensee uses thermoluminescent dosimeters (TLD) for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee also used TLD

finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. An examination of the TLD results indicating radiological exposures at the facility for the past year showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations. The records showed that the highest annual whole body exposure received by a single individual for 2002 was approximately 77 millirem deep dose equivalent. The highest annual extremity exposure for the past year was approximately 441 millirem shallow dose equivalent.

Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel and exit frisking practices were in accordance with radiation protection requirements.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. The instrument calibration records indicated calibration of portable survey meters was typically completed by licensee staff personnel. However, some instruments were shipped to vendors for calibration. Calibration frequency met procedural requirements and records were maintained as required. Area Radiation Monitors and stack monitors were also being calibrated as required. These monitors were also typically calibrated by licensee staff personnel.

During the inspection the inspector observed the use of the calibration facilities at the Radiation Center and the calibration of an instrument by the Scientific Instrument Technician. The calibration was completed using the appropriate techniques and according to procedure. Proper precautions were used to maintain doses ALARA.

(5) Radiation Protection Program

The licensee's Radiation Protection and ALARA programs were established and described in the RCHPP No. 1 and through associated HP procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, reports, and maintaining doses ALARA. The programs, as established, appeared to be acceptable. The ALARA program provided guidance for keeping doses as low as reasonably achievable which was consistent with the guidance in 10 CFR Part 20.

The inspector determined that the licensee had completed an annual review of the radiation protection program in accordance with 10 CFR 20.1101(c) for 2000 and 2001 but no review had been completed to date for 2002. The licensee indicated that a review would be completed. In the interim, this issue was identified as an

Unresolved Item¹ (URI) by the inspector and will be reviewed during a future inspection (URI 50-243/2003-202-01).

The licensee did not require or have a respiratory protection program or planned special exposure program.

(6) Work Surveillance Reports (WSRs)

The inspector reviewed selected WSRs that had been written and used during 2001 and 2002 as stipulated in RCHPP No. 34. (WSRs were similar to Radiation Work Permits but were used by the licensee mainly in situations involving non-routine maintenance or other work being performed at the facility by outside contractors.) It was noted that the controls specified in the WSRs were acceptable and applicable for the type of work being done. The WSRs had been initiated, reviewed, and approved as indicated on the forms. However, it was noted that approximately three of the most recent WSRs had not been reviewed after the work was completed, i.e., the "Escort" and/or "Health Physicist" signature blocks were not signed off. There were no procedural requirements for completion of these signature blocks but the inspector informed the licensee that it would seem prudent that someone review the forms upon completion of the work. The issue of reviewing WSRs after the work involved was completed was identified as an Inspector Follow-up (IFI) and will be reviewed during a future inspection (IFI 50-243/2003-202-02).

(7) Radiation Protection Training

The inspector reviewed the radiation worker (or rad worker) training given to Radiation Center staff members, to those who are not on staff but who are authorized to use the experimental facilities of the reactor, and to student assistants working as part-time HP Monitors. The inspector also interviewed various individuals concerning the training they had received. All those interviewed were satisfied with the training received.

The licensee indicated that rad worker training for staff members was now given every three years and was scheduled for 2004. Training records showed that personnel were acceptably trained in radiation protection practices. The training program was acceptable.

(8) Facility Tours

The inspector toured the Reactor Bay, the Heat Exchanger Room, and selected support laboratories with licensee representatives on various occasions. The inspector noted that facility radioactive material storage areas were properly posted. No unmarked radioactive material was noted. Radiation and Radioactive Material Storage Areas were posted as required.

¹An Unresolved Item is a matter about which more information is required to determine whether the issue in question is an acceptable item, a deviation, a nonconformance, or a violation.

c. Conclusions

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, satisfied regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; 4) radiation survey and monitoring equipment was being maintained and calibrated as required; and 5) the radiation protection training program was acceptable.

4. Environmental Protection

a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirement of the regulations and TS Section 6.7.e, the inspector reviewed selected aspects of:

- the environmental monitoring program
- OSU Radiation Center and TRIGA Reactor Annual Reports for the periods of July 1, 2000 through June 30, 2001, July 1, 2001 through June 30, 2002, and July 1, 2002 through June 30, 2003
- Environmental monitoring release records documented in HP Notebooks listed below
- RCHPP No. 8, "Water Analysis," Rev 3, dated June 2003
- RCHPP No. 13, "Procedures for Collection and Biological Analysis of Environmental Soil, Water, and Vegetation Samples," Rev 3, July 2001
- RCHPP No. 15, "Operating Procedures for the Environmental Thermoluminescent Dosimetry (TLD) Program," Rev 3, July 2001
- RCHPP No. 31, "Procedure for Sampling and Pumping the Liquid Waste Hold-up Tank," Rev 3, dated February 2002
- RCHPP No. 32, "Stack Gas Effluent Analysis," Rev 2, dated June 2000
- HP Notebook - Environmental Monitoring, Volume I, "TLD"
- 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 and Findings

Soil, water, and vegetation environmental samples were collected, prepared, and analyzed consistent with procedural requirements. On-site and off-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor and various environmental monitoring station TLD monitors in accordance with the applicable procedures as well. The data indicated that the air emissions of radioactive material to the environment were below the 10 millirem constraint specified in 10 CFR 20.1101(d). Data also indicated that there were no measurable doses above any regulatory limits.

This was acceptably documented in the Annual Reports. Observation of the facility by the inspector found no new potential release paths.

The program for the monitoring, storage, or transferring of radioactive liquid, gases, and solids was consistent with applicable regulatory requirements. Radioactive material was monitored and released when below acceptable limits or was acceptably transferred to the broad-scope license for disposition. The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusions

Effluent releases were within the specified regulatory and Technical Specification limits. The environmental protection program satisfied NRC requirements.

5. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with OSTROP 6:

- administrative controls documented in OSTROP 6 and exercised by the Senior HP
- records of changes to RCHPP procedures
- procedural implementation
- records of ROC review and approval
- selected RCHPP procedures

b. Observations and Findings

Administrative controls of changes and associated review and approval processes were as stipulated by procedure. Training of personnel on procedures and changes was acceptable. Licensee personnel conducted activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive material ingestion and contaminations) were available for implementation as needed.

c. Conclusions

The procedural control and implementation program satisfied procedural requirements.

6. Transportation

a. Inspection Scope (IP 86740)

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

- selected records of various types of radioactive material shipments
- training records of staff members responsible for shipping licensed radioactive material
- RCHPP No. 5, "Procedures for Receipt Radiation Surveys and Unpacking of Packages Containing Radioactive Material," Rev 4, dated June 2003
- RCHPP No. 6, "OSU Procedures for Transfer, Packaging, and Transport of Radioactive Materials Other Than Radioactive Waste," Rev 9, dated October 2003
- RCHPP No. 11, "Procedures for Testing and Certification of OSU Radioactive Materials Shipping Containers," Rev 3, dated June 2000
- HP Notebook - "Radioactive Material Transfer Records"
- HP Notebook - "Quarterly ROC Audits and Training"

b. Observations and Findings

Records showed that radioactive waste was transferred to the OSU Radiation Safety Office for packaging, shipment, and disposal in accordance with licensee requirements. This program for radioactive material transfer was consistent with the requirements specified in RCHPP No. 1.

The transport of other radioactive material was also reviewed. Through records review and discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. The records also indicated that the shipping containers were appropriate and had been labeled as required. All radioactive material shipment records reviewed by the inspector had been completed in accordance with Department of Transportation and NRC regulatory requirements.

The inspector verified that the licensee maintained copies of the recipients' licenses to possess radioactive material as required and that the licenses were verified to be current prior to initiating a shipment.

During the inspection conducted at OSU on August 25-27, 2003, the inspector observed the preparation of radioactive material for shipment. The material was properly packaged and surveyed, and then the appropriate labels were attached. The shipping paperwork was completed and in accordance with the applicable regulatory requirements. No problems or deficiencies were noted.

The training of the staff members responsible for shipping the material were reviewed. Training had been conducted according to licensee procedure but it was unclear whether or not the training met the requirements specified in the regulations. Therefore, the issue was identified as an URI and will be reviewed during a future inspection (URI 50-243/2003-202-03).

c. Conclusions

The program for transportation of radioactive materials satisfied NRC requirements.

7. Exit Interview

The inspection scope and results were summarized on October 22, 2003, with licensee representatives. The inspector discussed the findings for each area reviewed. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

J. Darrough, Health Physicist
A. Klein, Director, Radiation Center
S. Menn, Senior Health Physicist
S. Reese, Reactor Administrator
J. Ringle, Chairman, Reactor Operations Committee
S. Smith, Scientific Instrument Technician and Senior Reactor Operator
G. Wachs, Reactor Supervisor and Senior Reactor Operator

INSPECTION PROCEDURES USED

IP 69001: Class II Non-Power Reactors
IP 86740: Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-243/2003-202-01	URI	Determine whether an annual review of the radiation protection program was completed in accordance with 10 CFR 20.1101(c) for 2002.
50-243/2003-202-02	IFI	Follow-up on the licensee's review of WSRs after the work involved is completed.
50-243/2003-202-03	URI	Determine whether the training of the staff members responsible for shipping the material met the requirements specified in the regulations,

Closed

None

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
HP	Health Physics/Physicist
IFI	Inspector Follow-up Item
IP	Inspection Procedure
Mw	Megawatt
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
OSU	Oregon State University
OSTROP	Oregon State University TRIGA Reactor Operating Procedure
RCHPP	Radiation Center Health Physics Procedure
Rev	Revision
ROC	Reactor Operations Committee
TLD	Thermoluminescent dosimeter
TS	Technical Specifications
URI	Unresolved Item
WSR	Work Surveillance Report