

December 19, 2008

Mr. Stephen Frantz, Director
Reed Research Reactor Facility
Reed College
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

SUBJECT: NRC INSPECTION REPORT NO. 50-288/2008-201 AND NOTICE OF VIOLATION

Dear Mr. Frantz:

This letter refers to the inspection conducted on November 17 – 20, 2008, at your TRIGA Mark-I Reed Research Reactor facility. The enclosed report documents the inspection results, which were discussed on November 20, 2008, with you and other members of your staff. The inspection examined activities conducted under your license as they relate to safety and compliance with the NRC's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel.

In a telephone conversation on December 18, 2008, Mr. Johnny Eads of my staff informed Mr. Stephen Frantz, Facility Director that the NRC was considering escalated enforcement for apparent violations involving facility operations at a power level in excess of the licensed full power of 250 kilowatts (kW). Mr. Eads also informed Mr. Frantz that we had sufficient information regarding the apparent violations and your corrective actions to make an enforcement decision without the need for a predecisional enforcement conference or a written response from you. Mr. Frantz indicated that Reed College did not believe that a predecisional enforcement conference or written response was needed.

Based on the information developed during the inspection and the information that you provided in your responses to the event dated July 31, 2008 and September 22, 2008, the NRC has determined that a violation of NRC requirements occurred. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The facility was operated at a power level in excess of the licensed full power of 250 kW. Based on thermal power calculations, the facility was operated at a power level of 281 kW (112 percent of 250 kW) for approximately 70 minutes. Due to the error in the nuclear instruments, the technical specification required scram setpoints on the linear and percent power channels would not have tripped at the required 110 percent of 250 kW. The overpower operations and scram setpoint error were caused by an unusually large disagreement between the indicated power and the calculated power due to the installation of a new fuel element into the core. The installation of a new fuel element resulted in shadowing of the nuclear instruments from the actual core power causing the erroneously low power indication.

As discussed in the Reed College letter dated September 22, 2008, the safety consequence of this event was low due to the significant safety margins included within the facility design and safety analysis. However, the facility did operate at 112 percent of licensed power level for approximately 70 minutes while the thermal power calculations were being performed. Although the safety consequence of this event was low, operating the facility in excess of the licensed power level represents a significant potential for impacting the NRC's ability to perform its

regulatory function. Therefore, this violation has been categorized in accordance with the NRC Enforcement Policy at Severity Level III.

In accordance with the NRC Enforcement Policy, a base civil penalty in the amount of \$3,250 is considered for a Severity Level III violation. Because your facility has not been the subject of escalated enforcement actions within the last 2 years, the NRC considered whether credit was warranted for *Corrective Action* in accordance with the civil penalty assessment process in Section VI.C.2 of the Enforcement Policy. As described in the Reed College letter dated July 31, 2008, corrective actions included the following: (1) power level was immediately reduced following identification, (2) nuclear instruments were recalibrated, and (3) procedures were revised to require preliminary power calibrations at 150 kW following any change in the core configuration other than routine fuel inspection. Based on a review of these corrective actions the NRC determined that credit was warranted for corrective actions which were prompt and comprehensive.

Therefore, to encourage prompt identification and comprehensive correction of violations, and in recognition of the absence of previous escalated enforcement action, I have been authorized, after consultation with the Director, Office of Enforcement not to propose a civil penalty in this case. However, significant violations in the future could result in a civil penalty.

The NRC has concluded that information regarding the reason for the violation, the corrective actions taken to correct the violation and prevent recurrence and the date when full compliance was achieved is already adequately addressed on the docket in letters from Reed College dated July 31, 2008 and September 22, 2008. Therefore, you are not required to respond to this letter unless the description therein does not accurately reflect your corrective actions or your position. In that case, or if you choose to provide additional information, you should follow the instructions specified in the enclosed Notice.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. The NRC includes significant enforcement actions on its Web site at (<http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/>).

Sincerely,

/RA/

Timothy J. McGinty, Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-288
License No. R-112

Enclosures: 1. Notice of Violation
2. NRC Inspection Report No. 50-288/2008-201
cc w/enclosure: Please see next page

Reed College

Docket No. 50-288

cc:

Mayor of City of Portland
1220 Southwest 5th Avenue
Portland, OR 97204

Reed College
ATTN: Dr. Peter Steinberger
Dean of the Faculty
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Reed College
ATTN: Dr. Colin Diver
President
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Oregon Department of Energy
ATTN: David Stewart-Smith, Director
Division of Radiation Control
625 Marion Street, N.E.
Salem, OR 97310

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

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NOTICE OF VIOLATION

Reed College
Reed Research Reactor Facility

Docket No. 50-288
License No. R-112
EA-08-339

During an NRC inspection conducted on November 17 – 20, 2008, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Reed College Facility License, R-112, stipulates in Section 3.A, "Maximum Power Level," that the licensee may operate the reactor at steady-state power levels up to a maximum of 250 kilowatts (thermal).

TS Section A.2 states that steady-state mode shall mean operation of the reactor at power levels not to exceed 250 kilowatts.

Contrary to the above, on July 24, 2008, the reactor was operated at an indicated power of 230 kilowatts following the installation of a new fuel element on July 21, 2008, resulting in an actual power level of 281 kilowatts as determined by thermal power calibration.

This is a Severity Level III violation (Supplement 1).

The NRC has concluded that information regarding the reason for the violation, the corrective actions taken and planned to correct the violation and prevent recurrence and the date when full compliance was achieved is already adequately addressed on the docket in your responses to the event dated July 31, 2008 and September 22, 2008. However, if the description therein does not accurately reflect your corrective actions or your position, you are required to submit a written statement or explanation pursuant to 10 CFR 2.201. In that case, or if you choose to respond, clearly mark your response as a "Reply to a Notice of Violation," include the EA number, and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Director, Office of Nuclear Reactor Regulation within 30 days of the date of the letter transmitting this Notice of Violation (Notice).

If you choose to respond, your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. Therefore, to the extent possible, the response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction."]

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 19th day of December 2008

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

Docket No: 50-288

License No: R-112

Report No: 50-288/2008-201

Licensee: Reed College

Facility: Reed Research Reactor Facility

Location: 3203 S.E. Woodstock Boulevard
Portland, Oregon

Dates: November 17 – 20, 2008

Inspector: Craig Bassett

Accompanied by: Mike Morlang

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

EXECUTIVE SUMMARY

Reed College
Reed Research Reactor Facility
Report No.: 50-288/2008-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the licensee's Class II research reactor safety program. This included a review of: organization and staffing, review and audit and design change functions, conduct of operations, operator requalification program, fuel handling, maintenance and surveillance, procedures, experiments, and emergency preparedness. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements. No deviations or violations were identified.

Organization and Staffing

- The organization and staffing remain in compliance with the requirements specified in Technical Specification Sections I and K.

Review, Audit, and Design Change Functions

- Review and oversight functions required by Technical Specification Sections I.2 - I.4 were acceptably completed by the Reactor Operations Committee and the Radiation Safety Committee. Audits were being completed as required.
- Various problems were discussed during a joint Reactor Operations Committee and Radiation Safety Committee meeting held on September 22, 2008.
- 10 CFR 50.59 changes had generally been reviewed and approved by the appropriate Committee as required. None were determined to constitute a safety concern or question.

Conduct of Operations

- Operations were generally being conducted in accordance with Technical Specification and procedural requirements.
- One apparent violation was noted for operating the reactor above the 250 kilowatt power level authorized by the Facility License and Technical Specifications.

Operator Licenses, Requalification, and Medical Activities

- The operator requalification/training program was up-to-date and being acceptably implemented. Documentation of the program was acceptable.
- Biennial medical examinations were being completed as required.

Fuel Handling and Movement

- Reactor fuel movements and inspections were made and documented in accordance with procedure.

- One-fifth of the fuel elements were being inspected on a biennial basis as allowed by Technical Specification Section E.3.

Maintenance and Surveillance

- Maintenance was being completed as needed.
- The surveillance program, including calibration of equipment, was being implemented in accordance with Technical Specification requirements specified in Sections D-G.

Procedures and Procedural Compliance

- Facility procedures and document reviews satisfied Technical Specification Section I.5 requirements. Procedural compliance was generally acceptable.

Experiments

- The program for the control of experiments satisfied Technical Specification Section J and regulatory requirements.

Emergency Preparedness

- The Emergency Plan and Emergency Implementation Procedures were being audited and reviewed annually as required.
- Letters of Agreements documenting emergency support to be provided by offsite agencies were being maintained and updated as required.
- Annual drills were being held and documentation was maintained concerning the follow-up critiques. Subsequent corrective actions were taken as needed.
- Emergency preparedness training for staff and offsite personnel was being conducted as stipulated in the Emergency Plan.

REPORT DETAILS

Summary of Plant Status

The Reed College two hundred and fifty kilowatt (250 kW) TRIGA Mark I research and test reactor (RTR) continued normal, routine operations. A review of the applicable records indicated that the reactor was typically operated in support of undergraduate instruction, laboratory experiments, reactor system testing, reactor surveillances, and operator training. During this inspection, the reactor was started up and operated on different days at varying power levels to provide operational demonstrations for different groups, to complete irradiation of a material, and to conduct laboratory experiments.

1. Organization and Staffing

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

To verify organization and staffing requirements specified in Technical Specifications (TS) Section I, Amendment Number (No.) 7, dated December 13, 2003, were being met, the inspector reviewed selected aspects of:

- Main (reactor console) Log – Numbers (Nos.) 70 and 71
- Organization and staffing for the Reed Research Reactor (RRR) Facility
- Administrative controls and management responsibilities specified in the TS
- Reed Research Reactor Facility Annual Report for September 1, 2006 - August 31, 2007
- Reed Research Reactor Facility Annual Report for September 1, 2007 - August 31, 2008
- RRR Administrative Procedures, Section 1, "Personnel," latest revision dated March 2008
- RRR Administrative Procedures, Section 3, "Reactor Operations," latest revision dated March 2008
- RRR Standard Operating Procedure (SOP) 60, "Logbook Entries," latest revision dated November 11, 2008

b. Observations and Findings

Through discussions with licensee representatives the inspector determined that management responsibilities and the organization at the Reed Reactor Facility had not changed since the previous NRC inspection in November 2007 (Inspection Report No. 50-288/2007-201). The inspector determined that the Facility Director retained direct control and overall responsibility for management of the facility as specified in the TS. The Facility Director reported to the President of Reed College through the Dean of the Faculty.

The licensee's current operational organization consisted of the Facility Director, an Associate Director, an Operations/Reactor Supervisor, and a Training Supervisor. In addition to their administrative duties, these individuals were qualified Senior Reactor Operators (SROs) as well. It was noted that there were also 12 other SROs and 23 Reactor Operators (ROs) qualified to operate the facility RTR. (The positions of Facility Director and Associate Director are full-time positions while the others are part-time.) This organization was consistent with that specified in the TS.

c. Conclusions

Organization and staffing met the requirements specified in TS Section I.

2. Review, 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 and to determine whether modifications to the facility were consistent with 10 CFR 50.59 and TS Sections I.2 – I.4, the inspector reviewed selected portions of:

- Completed audits and reviews for 2006-2007 and 2007-2008
- Design changes reviewed under 10 CFR 50.59 for 2007 and 2008
- Radiation Safety Committee meeting minutes from May 2006 through the present
- Reactor Review Committee meeting minutes from November 2006 through the present
- Reactor Operations Committee meeting minutes from May 2006 through the present
- RRR Administrative Procedures, Section 1, "Personnel," latest revision dated March 2008
- RRR SOP 62, "Changes, Tests, and Experiments Approval," latest revision dated September 23, 2008

b. Observations and Findings

(1) Review and Audit Functions

The inspector reviewed the Radiation Safety Committee (RSC), the Reactor Operations Committee (ROC), and the Reactor Review Committee (RRC) meeting minutes from May 22, May 25, and November 6, 2006, respectively, to the present. These meeting minutes showed that the committees were meeting at the required frequency and were considering the types of topics outlined by the TS.

The inspector noted that, since the last NRC inspection, the appropriate audits had been completed by the ROC and the RSC in those areas outlined in the TS. The audits were designed so that most aspects of the licensee's operations and safety programs were reviewed every year. Standard Operating Procedures were reviewed every 2 years while other major facility documents, such as the facility license and Technical Specifications, were reviewed every 4 years. The inspector noted that the audits and the resulting findings were detailed and that the licensee responded and took corrective actions as needed.

(2) Reactor Review Committee Meeting Minutes of September 22, 2008

During review of the minutes of the latest RRC meeting held on September 22, 2008, the inspector noted that a violation of a license and TS requirement was discussed as were various problems with failure to follow procedure or inadequate procedures. The violation involved a reactor over-power event that occurred in July 2008 (discussed in Part (2) of Section 3 below). One of the problems discussed involved inadequacies in the membership of the ROC and the RSC.

Another outlined not conducting 10 CFR 50.59 screenings and evaluations of facility changes prior to implementing the changes. A third problem involved Senior Reactor Operators not signing the Startup Checklist, as well as an SRO of record leaving the Control Room prior to completion of the initial criticality of the day. The last problem outlined procedural requirements that were not in accordance with approved experiment descriptions.

The RRC discussed each of these problems with reactor staff members and expressed concern about the increase in frequency of these types of events. Following discussion of the issues, the RRC directed that the reactor staff review and/or complete various actions. The licensee was directed to correct the problem with ROC/RSC membership. Regarding not completing the 10 CFR 50.59 screens and evaluations, the RRC asked that this be reported to the NRC and that the screens and evaluations be completed. The RRC was concerned that, with respect to the SROs failing to sign the checklists prior to startup, apparently no one knew who was in charge. This was to be reviewed with all operators and clarifications made. The licensee indicated that the problem with the discrepancies between procedures and experiment descriptions would be resolved by revising the descriptions. (As noted above, the over-power event, including the corrective actions, are discussed in Section 3 below.)

Since there were apparently some questions during some of these events as to what needed to be reported to the NRC, the RRC asked that the reactor staff review ANSI Standard 15.1 and follow those guidelines in developing proper reporting criteria. Also, an All Hands Meeting was to be held with all Reed Reactor staff to discuss all the problems, address the underlying issues, and develop a safety culture at Reed with an emphasis on adhering to the requirements and proper reporting of problems. The Director was also asked to contact the NRC Project Manager to apprise him of all these events.

The inspector informed the licensee that all but the apparent over-power reactor event appeared to be problems with failure to follow local procedures or inadequate procedures and were appropriately handled by the RRC. However, it also appeared that these problems and events seemed to indicate a negative trend at the facility, and lack of proper emphasis on safety, and failure to instill the proper attitude toward maintaining an appropriate safety culture at the facility. As noted by the RRC, increased emphasis should be placed on conducting all operations in accordance with the regulations, the TS, and the approved procedures. Also, an appropriate set of reporting criteria for the facility needs to be developed. More scrutiny will be given to these types of issues in the future. Nevertheless, the licensee was also informed that the self-identification of problems, discussing them with the RRC, and informing the NRC of these situations was one positive result of all these problems.

The inspector reviewed the actions taken by the licensee as a result of the RRC meeting. The licensee was preparing a TS change to be submitted to the NRC concerning the membership of the ROC and the RSC. It was noted that the 10 CFR 50.59 screens and evaluations had been completed. The inspector verified that meetings had been held with all facility staff to review the problems and to solicit ways to improve performance. It was noted that the licensee had contacted the NRC Project Manager to inform him of the various problems that had occurred. The task of reviewing ANSI 15.1 and developing proper reporting criteria was still

ongoing at the time of the inspection as was an effective means of promoting a Safety Conscious Work Environment and developing an adequate safety culture at the facility. The licensee was informed that these unfinished actions would be reviewed during a subsequent inspection and this issue would be identified as an Inspection Follow-up Item (IFI) (IFI 50-288/2008-201-01).

(3) Design Changes

Through review of applicable records and interviews with licensee personnel, the inspector determined that various facility changes had been initiated and/or completed at the RRR Facility since the last NRC operations inspection. Some of the changes had undergone a review by the ROC as required prior to implementation. Following the reviews, the changes were approved in accordance with the TS requirements. It was noted that none of the changes were determined to constitute a safety question or concern and none required a TS change or license amendment. However, as noted above, some of the changes had not been reviewed prior to implementation. These were addressed by the RRC during their review of the problem and the licensee subsequently completed the required screenings and evaluations. The evaluations were being reviewed by the appropriate committees during the inspection.

c. Conclusions

Review and oversight functions required by TS Sections I.2 – I.4 were acceptably completed by the ROC and the RSC. Audits were being completed as required. 10 CFR 50.59 changes generally had been reviewed and approved by the ROC as required and none were determined to constitute a safety concern.

3. **Conduct of Operations**

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify operation of the reactor in accordance with TS Sections D – I:

- Maintenance Logbook No. VI
- Main (reactor console) Log Nos. 70 and 71
- Reed Research Reactor Facility Annual Report for September 1, 2006 - August 31, 2007
- Reed Research Reactor Facility Annual Report for September 1, 2007 - August 31, 2008
- RRR Administrative Procedures, Section 3, "Reactor Operations," latest revision dated March 2008
- RRR SOP 1, "Reactor Operations," latest revision dated October 12, 2008
- RRR SOP 20, "Startup Checklist," latest revision dated October 12, 2008
- RRR SOP 20, Appendix A, "Startup Checklist Form," latest revision dated November 11, 2008
- RRR SOP 21, "Same Day Startup Checklist," latest revision dated September 15, 2008
- RRR SOP 21, Appendix A, "Same-Day Startup Checklist Form," latest revision dated September 15, 2008

- RRR SOP 22, "Shutdown Checklist," latest revision dated October 12, 2008
- RRR SOP 22, Appendix A, "Shutdown Checklist Form," latest revision dated September 16, 2008
- RRR SOP 23, "Weekly Checklist," latest revision dated September 26, 2008
- RRR SOP 23, Appendix A, "Weekly Checklist Form," latest revision dated September 15, 2008
- RRR SOP 24, "Bimonthly Checklist," latest revision dated September 16, 2008
- RRR SOP 24, Appendix A, "Bimonthly Checklist Form," latest revision dated October 12, 2008
- RRR SOP 25, "Semiannual Checklist," latest revision dated September 15, 2008
- RRR SOP 25, Appendix A, "Reed Research Reactor Semiannual Checklist," latest revision dated September 15, 2008
- RRR SOP 26, "Annual Checklist," latest revision dated September 15, 2008
- RRR SOP 26, Appendix A, "Annual Checklist Form," latest revision dated September 15, 2008
- RRR SOP 33, "Nuclear Instruments," latest revision dated September 15, 2008
- RRR SOP 34, "Control Rods," latest revision dated September 15, 2008
- RRR SOP 60, "Logbook Entries," latest revision dated November 11, 2008

b. Observations and Findings

(1) Operations Reviewed During the Inspection

The inspector reviewed selected reactor operating records from January 2008 through the present. These records included daily Startup Checklists, Shutdown Checklists, Experimental Startup and Shutdown Checklists, associated forms, Weekly Checklists, and the Main (reactor console) Logs. Additionally, the inspector observed the completion of a daily Startup Checklist and routine reactor operations in progress during the inspection. These activities were carried out in accordance with written procedures as required by TS Section I.

Information on the operational status of the facility was recorded accurately on the log sheets and/or checklists as required by procedure. Scrams were identified in the logs and were reported and resolved as required before the resumption of operations. Through interviews with operators and review of logs and records, the inspector confirmed that shift staffing met the minimum requirements for duty and on-call personnel as required by SOP 1.

(2) Reactor Over-Power Event

(a) Overview of the Event

Reed College Facility License, R-112, stipulates in Section 3.A, "Maximum Power Level," that the licensee may operate the reactor at steady-state power levels up to a maximum of 250 kilowatts (thermal).

TS Section A.2 states that steady-state mode shall mean operation of the reactor at power levels not to exceed 250 kilowatts.

Following routine maintenance and surveillance operations in January 2008, the licensee removed a fuel element from service that failed inspection. The reactor

was subsequently operated from January until mid-July with no fuel element in core position D-3. Without an element in that position, the reactor was unable to reach the normal operating power of 240 kilowatts (kW). From January to July the maximum attainable power level was from 180 to 220 kW depending on the operating history and fission product inventory.

On July 21, 2008, a new fuel element was installed in the core. Due to the installation of the new element, calibrations of the control rods and the nuclear instruments were required. The licensee completed the calibration of the control rods without any problems.

As required by SOP 44 (currently designated as RRR SOP-33), a thermal power calibration was conducted at 230 kW on July 24, 2008. In accordance with procedure, the reactor was operated for 1 hour to collect data. The results of the data indicated that the thermal power output of the reactor was 281 kW. This was 22 percent higher than the indicated power and 12.5 percent higher than the licensed steady state power.

(b) Licensee Review of the Event

In order to check this unexpected result, the licensee lowered the reactor power to 200 kW and completed another power calibration. At that point the power was calculated to be 206 kW, which was in good agreement with the expected value. Because it was late afternoon, the licensee decided to shut down the reactor and perform a check of pool temperature instrumentation the next day. Because the event appeared to be a violation of TS, the licensee debated on whether to contact the NRC. (The Reed Reactor License requires the licensee to notify the Atomic Energy Commission regional office staff of an apparent violation of this type but the licensee knew that the regional office no longer was the point of contact for research reactors.) The licensee subsequently left a voice message for the NRC Project Manager (at that point it was 8 p.m. in NRC Headquarters).

On the following day, July 25, the licensee completed an "unofficial" power calibration at an indicated power level of 200 kW which resulted in a calculated power level of 237 kW. (This was unofficial because the procedure specified that the reactor could not have been operated at a power level above 5 W for 48 hours prior to a power calibration. Also, the procedure required that a power calibration be conducted at 230 kW.) During the day, another NRC Project Manager contacted Reed College concerning a separate issue and he was informed of the over-power event. The Reactor Review Committee members were also informed of the event via E-mail.

Following an approved, albeit modified, power calibration at 150 kW on July 28, the nuclear instruments were adjusted per procedure and the reactor was shut down pending discussions between the Facility Director and the Chair of the Reactor Safety Committee and the Chair of the Reactor Operations Committee. The event was also discussed with the NRC Project Manager on July 28 and then again with other members of the NRC on July 29. The NRC Operations Center was notified of the event at 11:30 a.m. on July 29, 2008.

(c) Licensee Corrective Actions

The reactor was not operated following the event except to complete the aforementioned calibration at 150 kW in order to investigate the problem and properly adjust the instruments. The Reactor Review Committee discussed the event by conference call and by E-mail on July 31. An official power calibration was then completed at 230 kW. Since no further anomalies were noted, normal operations were authorized. Also, the Power Calibration Procedure, SOP 44 (now RRR SOP 33) was revised to require that a preliminary power calibration at 150 kW be completed following any change in the core configuration other than routine fuel inspection.

(d) NRC Review

It was noted that a new fuel element was placed in core position D-3 on July 21, 2008. Control Rod calibrations were completed on July 22 and 23, 2008. The previous control rod worth calculated on January 17, 2008, was \$8.04 while the new control rod worth, following installation of the new fuel element, was calculated to be \$8.87 on July 24. Control rod worth increased by \$0.83 as a result of the new fuel element being placed in core position D-3. This should have been an indication that caution was needed in taking any further actions or conducting any further calibrations.

Through a review of licensee records, it was noted further that the installation of the new fuel element on July 21, 2008, with a resultant 9 percent decrease in rod heights at 185 kW was an indication of reduced nuclear instrumentation efficiency due to their location with respect to the core. Given the error in the nuclear instruments, the Technical Specification section K.2 required scram setpoints on linear and percent power channels would not have tripped at 110 percent of 250 kW.

The licensee was informed that operating the reactor at a power level of 281 kW was an apparent violation of Facility License Section 3.A and TS Section A.2 (VIO 50-027/2008-201-02).

c. Conclusions

Based on the procedures and records reviewed and observations made during the inspection, the inspector determined that reactor operations and logs were acceptable and in accordance with procedural and TS requirements. One apparent violation was identified for operating the reactor above the Facility License and TS authorized power level.

4. Operator Licenses, Requalification, and Medical Activities

a. Inspection Scope (IP 69001)

The inspector reviewed selected portions of the following regarding the Reed Reactor Facility Requalification Plan to ensure that the requirements of the Plan and 10 CFR 55.59 were being met:

- Active license status of all current operators
- Medical examination records for selected operators
- Training lectures and records for the current training cycle
- NRC Form 398, "Personal Qualification Statement – Licensee"
- Written examinations given during 2007 and 2008 for selected operators
- Reed Research Reactor Facility Requalification Plan dated October 2007
- NRC Form 396, "Certification of Medical Examination – by Facility Licensee"
- Reed Research Reactor Facility Requalification Meeting Agenda and Attendance Sheets for September 8, 2008 and October 14, 2008
- "Requalification Hours and Reactivity Manipulation" Sheets documenting reactivity manipulations for 2007 through the present for selected operators
- Procedure Change Notice forms maintained for review by all licensed operators and dated from December 2007 to the present
- RRR SOP 63, "Requalification," latest revision dated September 26, 2008
- RRR SOP 63, Appendix A, "Applying for a Reactor Operator License," latest revision dated September 15, 2008
- RRR SOP 63, Appendix B, "Reactor Operator Physical Exam," latest revision dated September 15, 2008
- RRR SOP 63, Appendix C, "Operation Observation Form," latest revision dated September 15, 2008
- RRR SOP 63, Appendix D, "Accelerated Requalification Form," latest revision dated September 15, 2008

b. Observations and Findings

There are currently 15 qualified SROs and 23 qualified ROs at the RRR Facility. The inspector reviewed selected operators' licenses and noted that they were current.

The inspector observed various operators making entries on the "Requalification Hours and Reactivity Manipulation" Sheet that was located in the Control Room. Hours "on duty" and in what capacity (i.e., RO/SRO), as well as evolutions performed, were documented. The inspector reviewed the Requalification Meeting Agenda and Attendance Sheets for the September and October 2008 meetings. The inspector also reviewed various individual operators' Requalification Folders. The inspector reviewed the Requalification Program for July 2007 through June 2008 and the annual drill scenarios and attendance sheets as well.

The review of the various logs and records noted above showed that training had been conducted in accordance with the licensee's requalification and training program. Training reviews and examinations had been documented as required. The records of operator activities, including reactivity manipulations and so forth, were being maintained as required. Records indicating the completion of the annual operations tests and supervisory observations were also maintained. Biennial written examinations were being completed as required or credit was taken by the licensee for the SRO exams administered by the NRC to satisfy the requalification cycle exam requirements when applicable. The inspector noted that operators were receiving the required biennial medical examinations within the required time frame as well.

c. Conclusions

The requalification/training program was up-to-date and being acceptably maintained. Medical examinations were being completed as required.

5. Fuel Handling and Movement

a. Inspection Scope (IP 69001)

In order to verify adherence to fuel handling and inspection requirements specified in TS Section E, the inspector reviewed selected aspects of:

- Maintenance Logbook No. VI
- Fuel Element Inspection Cards
- Main (reactor console) Log Nos. 70 and 71
- Fuel Element information contained in the licensee's computer database
- RRR SOP 34, "Control Rods," latest revision dated September 15, 2008
- RRR SOP 34, Appendix A, "Control Rod Inspection Checklist," latest revision dated September 15, 2008
- RRR SOP 35, "Fuel Elements," latest revision dated October 12, 2008
- RRR SOP 35, Appendix A, "Fuel Handling Checklist," latest revision dated October 12, 2008

b. Observations and Findings

The inspector verified that fuel movements were conducted in compliance with procedure. The inspector also verified through records review that the licensee was maintaining the required records of fuel movements as they were completed. Also through records review it was noted that the reactor fuel was being inspected upon initial receipt and one-fifth of the fuel elements in the core were being inspected biennially as allowed by TS Section E.3.

c. Conclusions

Reactor fuel movements and inspections were completed and documented in accordance with procedure and the fuel was being inspected as specified by TS Section E.3.

6. Maintenance and Surveillance

a. Inspection Scope (IP 69001)

To verify that operations were conducted in accordance with TS Sections I and K, and to determine that surveillance activities and calibrations were being completed as required by TS Sections D – G, the inspector reviewed selected portions of:

- Maintenance Logbook No. VI
- Main (reactor console) Log Nos. 70 and 71
- Associated surveillance and calibration data and records for 2007-2008
- Reed Research Reactor Facility Annual Report for September 1, 2006 - August 31, 2007

- Reed Research Reactor Facility Annual Report for September 1, 2007 - August 31, 2008
- RRR Administrative Procedures, Section 3, "Reactor Operations," latest revision dated March 2008
- RRR SOP 1, "Reactor Operations," latest revision dated October 12, 2008
- RRR SOP 20, "Startup Checklist," latest revision dated October 12, 2008
- RRR SOP 20, Appendix A, "Startup Checklist Form," latest revision dated November 11, 2008
- RRR SOP 22, "Shutdown Checklist," latest revision dated October 12, 2008
- RRR SOP 22, Appendix A, "Shutdown Checklist Form," latest revision dated September 16, 2008
- RRR SOP 23, "Weekly Checklist," latest revision dated September 26, 2008
- RRR SOP 23, Appendix A, "Weekly Checklist Form," latest revision dated September 15, 2008
- RRR SOP 34, "Control Rods," latest revision dated September 15, 2008
- RRR SOP 34, Appendix A, "Control Rod Inspection Checklist," latest revision dated September 15, 2008
- RRR SOP 35, "Fuel Elements," latest revision dated October 12, 2008
- RRR SOP 35, Appendix A, "Fuel Handling Checklist," latest revision dated October 12, 2008
- RRR SOP 38, "Crane," latest revision dated September 15, 2008
- Annual Crane Inspection Reports completed by U.S. Crane and Hoist Company from 2002 through 2008

b. Observations and Findings

The licensee conducted various daily, weekly, bimonthly, semiannual, and annual maintenance and surveillance items. The inspector verified that these activities were conducted during the time frame required and according to procedure. The inspector observed a Startup Checklist performed in the Control Room and one completed in the reactor bay. Previously completed Startup and Shutdown Checklists were reviewed. All the recorded results reviewed were within the TS and procedurally prescribed parameters. The records and logs reviewed were accurate, complete, and being maintained as required.

A review of the RRR Facility Main Logs and current Maintenance Logbook showed that the records were being completed as required and problems, if any, were being documented. Through observation and review, the inspector also confirmed that maintenance was being conducted as needed, consistent with the TS.

c. Conclusions

Maintenance was being completed as required. The program for surveillance was being carried out in accordance with TS requirements.

7. Procedures and Procedural Compliance

a. Inspection Scope (IP 69001)

To determine whether facility procedures met the requirements outlined in TS Section I.5, the inspector reviewed portions of:

- Procedural reviews and updates documented in the RRC meeting minutes
- RRR Administrative Procedures, Section 8, "Adoption and Revision of Operating Procedures," latest revision dated March 2008
- RRR SOP 60, "Logbook Entries," latest revision dated November 11, 2008
- RRR SOP 61, "Procedure Writing," latest revision dated September 15, 2008
- RRR SOP 61, Appendix A, "Document Structure," latest revision dated September 15, 2008
- RRR SOP 61, Appendix B, "Document Locations," latest revision dated September 15, 2008

b. Observations and Findings

RRR Administrative Procedures and SOPs were found to be acceptable for the current staffing level and status of the facility. The Administrative Procedures and SOPs specified the responsibilities of the various members of the staff. The procedures were being audited and reviewed biennially as required and updated as needed.

It was noted that all the facility procedures had been recently restructured and renumbered. This appeared to have been an appropriate effort to make the procedures more standardized and the content more logical. The licensee was advised to ensure that the procedures were carefully scrutinized so that the various references to Appendices and other procedures had been revised and were appropriate.

The inspector observed various activities during this inspection including reactor startup and operation. It was noted that these activities were completed in accordance with the applicable procedures.

c. Conclusions

Facility procedures and document reviews satisfied TS Section I.5 requirements. Procedural compliance was acceptable.

8. Experiments

a. Inspection Scope (IP 69001)

In order to verify that experiments were being conducted within approved guidelines specified in TS Sections I and J, the inspector reviewed selected portions of:

- Experiment review and approval by the ROC
- Irradiation Request Forms for 2007 and 2008
- Approved Routine, Modified Routine, and Special Experiments
- RRR Administrative Procedures, Section 4, "Reactor Experiments," latest revision dated March 2008
- RRR SOP 10, "Irradiation Preparation," latest revision dated September 15, 2008
- RRR SOP 10, Appendix A, "Irradiation Request Form," latest revision dated September 15, 2008
- RRR SOP 10, Appendix B, "Rabbit Irradiation Request Form," latest revision dated September 15, 2008

- RRR SOP 10, Appendix C, "Gamma Irradiation Request Form," latest revision dated September 15, 2008
- RRR SOP 10, Appendix D, "Irradiation Request Log," latest revision dated September 15, 2008
- RRR SOP 11, "Irradiation Analysis," latest revision dated September 15, 2008
- RRR SOP 11, Appendix A, "NAA Certification Form," latest revision dated September 15, 2008
- RRR SOP 12, "Lazy Susan," latest revision dated September 15, 2008
- RRR SOP 13, "Rabbit," latest revision dated October 12, 2008
- RRR SOP 13, Appendix A, "Rabbit Irradiations Qualification Form," latest revision dated September 15, 2008
- RRR SOP 13, Appendix B, "Rabbit System Diagram (Insertion)," latest revision dated September 15, 2008
- RRR SOP 13, Appendix C, "Rabbit System Diagram (Withdrawal)" latest revision dated September 15, 2008
- RRR SOP 14, "Central Thimble," latest revision dated September 15, 2008
- RRR SOP 15, "Beam," latest revision dated September 15, 2008
- RRR SOP 15, Appendix A, "Beam IR Form," latest revision dated September 15, 2008
- RRR SOP 16, "Near Core," latest revision dated September 15, 2008
- RRR SOP 17, "Gamma Irradiations," latest revision dated September 15, 2008

b. Observations and Findings

The inspector noted that all the experiments conducted at the facility were well-established procedures that had been in place for several years. There were 17 Routine and/or Modified Routine experiments and 23 Special experiments that have been reviewed and approved by the ROC. The last routine experiment to be revised and approved was Experiment No. 3, "Routine Irradiation Utilizing an Evacuated Central Thimble," dated February 26, 2001. The last special experiment to be revised and/or approved was Special Experiment No. 25, "Antimony-Beryllium Source," dated November 2006.

The inspector noted that irradiations were conducted under the cognizance of the Facility Director and the Reactor Supervisor as required. The irradiations were documented in the Main Log and the results of the experiments were documented on the Irradiation Request Forms as required. The resulting radioactive material was being transferred to an authorized user or disposed of as stipulated by procedure.

c. Conclusions

The license's program for the control of experiments generally satisfied regulatory and TS Section J requirements.

9. **Emergency Preparedness**

a. Inspection Scope (IP 69001)

To verify compliance with the Reed Reactor Facility Emergency Plan, the inspector reviewed selected aspects of:

- Training records for the past 2 years
- Emergency drills and exercises held during 2006, 2007, and 2008
- Reed Reactor Facility Emergency Plan last revised January 2003
- Emergency response facilities, supplies, equipment and instrumentation
- Reed Reactor Facility Emergency Plan, Appendix A, Agreement Letters with off-site support organizations last updated in 2007
- Reed Reactor Facility Emergency Plan, Appendix B, Emergency Implementation Procedures (EIPs), dated March 2004

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the reactor was the same as the version most recently approved by the NRC. The E-Plan and Emergency Implementation Procedures were being audited and reviewed annually as required. Supplies, instrumentation, and equipment staged for emergency use were being maintained, controlled, and inventoried as 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. The inspector reviewed the Agreement Letters that had been signed with the City of Portland Police Bureau, the City of Portland Fire and Rescue, American Medical Response (AMR) Ambulance Service, Legacy Health System, and Oregon Department of Energy. These agreements with the various emergency support organizations were being maintained and had been updated as required. It was noted that the agreements would need to be renewed in 2009. Communications capabilities were acceptable and had been tested and emergency information updated as stipulated in the E-Plan.

Emergency drills had been conducted annually as required by the E-Plan. Off-site support organization participation was also as required by the E-Plan. Critiques were held following the drills to discuss the strengths and weaknesses identified during the exercise and to develop possible solutions to any problems identified. The results of these critiques were documented and reported to the RSC. Emergency preparedness and response training for off-site and reactor staff personnel was being conducted annually and documented as stipulated by the E-Plan.

The inspector visited the hospital identified in the E-Plan as the one which would care for injured personnel from the RRR Facility, if needed. The hospital, Good Samaritan Hospital of Portland, was well equipped and sufficiently staffed to handle such emergencies. Training of hospital personnel was adequate. The inspector noted that there was a good working relationship between the staff at the hospital and licensee personnel.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan.

10. Exit Interview

The inspection scope and results were summarized on November 20, 2008, with the Facility Director. 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.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Bjorkquist	Operations/Reactor Supervisor
T. Cook	Training Supervisor
S. Frantz	Facility Director
V. Holfeltz	Associate Director, Reed Reactor Facility

Other Personnel

B. Anderson	Radiation Safety Officer, Good Samaritan Hospital, Legacy Health System
J. Thornburgh	Emergency Department Manager, Good Samaritan Hospital, Legacy Health System
K. Fisher	Radiation Safety Officer and Campus Environmental Director

INSPECTION PROCEDURE USED

IP 69001 Class II Non-Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-288/2008-201-01	IFI	Follow-up on the licensee's actions to review ANSI 15.1 and develop proper reporting criteria, develop an effective means of promoting a Safety Conscious Work Environment, and develop an adequate safety culture at the facility
50-288/2008-201-02	VIO	Operating the reactor above the Facility License and TS authorized power level of 250 kW.

Closed

50-288/2008-201-02	VIO	Operating the reactor above the Facility License and TS authorized power level of 250 kW.
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LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
EIPs	Emergency Implementation Procedures
E-Plan	Emergency Plan
IFI	Inspector Follow-up Item
IP	Inspection Procedure
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
RO	Reactor operator
ROC	Reactor Operations Committee
RRC	Reactor Review Committee
RRR	Reed Research Reactor

RSC	Radiation Safety Committee
RTR	Research and Test Reactor
SOP	Standard Operating Procedure
SRO	Senior reactor operator
TS	Technical Specifications