

September 14, 2007

Dr. James N. Petersen
Vice Provost for Research
Washington State University
Pullman, WA 99164-1030

SUBJECT: NRC INSPECTION REPORT NO. 50-027/2007-201

Dear Dr. Petersen:

This letter refers to the inspection conducted on August 27-30, 2007, at your Washington State University TRIGA research reactor in the Nuclear Radiation Center. The enclosed report documents the inspection results, which were discussed on August 30, 2007, with various members of your staff including Eric Corwin, Reactor Supervisor, James Elliston, Chair of the Reactor Safeguards Committee, and Donald Wall, Director of the Nuclear Radiation Center.

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 inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified.

In accordance with Section 2.390, "Public inspections, exemptions, and requests for withholding," of Title 10 of the *Code of Federal Regulations*, a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's 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 404-358-6515.

Sincerely,

/RA/

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

Docket No. 50-027
License No. R-76

Enclosure: NRC Inspection Report
cc w/enclosure: Please see next page

Washington State University

Docket No. 50-027

cc:

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

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

Docket No: 50-027

License No: R-76

Report No: 50-027/2007-201

Licensee: Washington State University

Facility: Nuclear Radiation Center

Location: Pullman, WA

Dates: August 27-30, 2007

Inspectors: Craig Bassett
Philip Young

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

EXECUTIVE SUMMARY

Washington State University
Nuclear Radiation Center
Report No. 50-027/2007-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the Washington State University Nuclear Radiation Center TRIGA Conversion research reactor safety program including: organizational structure and staffing, review and audit and design change functions, reactor operations, experiments, operator requalification, fuel handling, maintenance and surveillance, facility procedures, and emergency preparedness since the last NRC inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety and was in compliance with NRC requirements. No safety concerns or violations of regulatory requirements were identified.

Organizational Structure and Staffing

- The operations organizational structure and responsibilities were consistent with Technical Specifications requirements.
- Shift staffing met the requirements for current operations.

Review and Audit and Design Change Functions

- The review and audit program was being conducted acceptably by the Reactor Safeguards Committee.
- The design change program satisfied NRC requirements.

Operations

- Operational activities were consistent with applicable Technical Specifications and procedural requirements.

Experiments

- Conduct and control of experiments and irradiations met the requirements specified in the Technical Specifications, the applicable experiment and irradiation authorizations, and associated procedures.

Operator Licenses, Requalification, and Medical Activities

- Operator requalification was conducted as required by the Reactor Staff Requalification Program.
- A medical examination for each reactor operator with an active license was being completed every two years as required.

Fuel Handling

- Fuel handling activities and documentation were as required by Technical Specifications and facility procedures.

Maintenance and Surveillance

- Maintenance logs, records, performance, and reviews satisfied Technical Specifications and procedure requirements.
- The program for tracking and completing surveillance checks and Limiting Conditions for Operation verifications satisfied Technical Specifications requirements and licensee administrative controls.

Procedures

- Facility procedural review, revision, control, and implementation satisfied Technical Specifications requirements.

Emergency Preparedness

- The Emergency Plan and Implementing Procedures were being reviewed and updated biennially as required and were acceptable.
- Emergency response facilities and equipment were being maintained as required and responders were knowledgeable of proper actions to take in case of an emergency.
- Off-site support was acceptable and communications capabilities were adequate.
- Annual drills were being conducted and critiques were being held as required by the Emergency Plan.

Transportation of Radioactive Materials

- The licensee had not shipped any radioactive material of the type listed in NRC Order EA-05-007 but verified that they would comply with the Order if that quantity of material was shipped in the future.

REPORT DETAILS

Summary of Plant Status

The Washington State University's one megawatt (1 MW) TRIGA conversion research and test reactor continued normal, routine operations. A review of the applicable records indicated that the reactor was operated as needed in support of education, operator training, irradiation of various materials, and experiments involving Boron Neutron Capture Therapy work. During the inspection, the reactor was operated on Tuesday and Wednesday as required and in accordance with applicable procedures to support ongoing irradiation activities.

1. Organizational Structure and Staffing

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

The inspectors reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Sections 6.1-6.3 of Technical Specifications (TS), Amendment No. 18, dated August 26, 2004, were being met:

- staff qualifications
- management responsibilities
- staffing requirements for the safe operation of the facility
- Washington State University (WSU) Nuclear Radiation Center organizational structure and staffing
- WSU Nuclear Radiation Center Reactor Operating Log (O.1) sheets from January through August 2007
- WSU Nuclear Radiation Center Administrative Procedure Number (No.) 1, "Responsibilities and Authority of Reactor Operating Staff," (not dated)
- ANSI/ANS Standard 15.4, "Selection and Training of Personnel for Research Reactors," dated 1977

b. Observations and Findings

The inspectors noted that the Nuclear Radiation Center organizational structure and the responsibilities of the reactor staff had not changed since the last inspection at the facility in September 2006. However, the inspectors noted that staffing levels had changed and licensed reactor staff currently consisted of the Facility Director, a Reactor Supervisor, and an Engineering Technician. One Reactor Technician trainee had recently taken the operator examination and was waiting on information from the NRC about the issuance of a license. The Facility Director and Reactor Supervisor were Senior Reactor Operators (SROs) while the Engineering Technician was a Reactor Operator (RO). It was also noted that the former Facility Director and two other individuals, who had all held SRO licenses, were no longer at the facility.

The inspectors determined that the reactor operations staff met the training and experience requirements outlined in ANSI/ANS-15.4, "Selection and Training of Personnel for Research Reactors," as stipulated in the TS. In addition, the operations log and associated records confirmed that shift staffing satisfied the minimum requirements for duty and on-call personnel.

c. Conclusions

The operations organizational structure and responsibilities were consistent with TS requirements. Shift staffing met the requirements for current operations.

2. Review and Audit Functions and Design Control

a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits as required in TS Section 6.5 and to determine whether modifications to the facility were consistent with 10 CFR 50.59, the inspectors reviewed selected aspects of:

- Reactor Safeguards Committee (RSC) meeting minutes for 2005 and to date in 2007
- safety review and audit records documented on WSU Nuclear Radiation Center forms entitled, "Reactor Safeguards Committee Facility Records Quarterly Audit," for the period from April 2005 through the present
- licensee annual reports submitted to the NRC which were entitled "Annual Report on the Operation of the Washington State University TRIGA Reactor" for the periods from July 1, 2005 through June 30, 2006, and July 1, 2006 through June 30, 2007
- WSU Nuclear Radiation Center Administrative Procedure No. 3, "Approval and Review of Facility Modifications and Special Tests or Experiments," (not dated)

b. Observations and Findings

(1) Review and Audit Functions

The RSC membership satisfied TS requirements and the Committee's procedural rules. The RSC, or a subcommittee thereof, generally held quarterly meetings as required and a quorum was present. Review of the committee meeting minutes indicated that the RSC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor. The inspectors noted that audits were conducted during the meetings held by the RSC.

Since the last inspection, all required audits of reactor facility records and reviews of operating abnormalities, changes to procedures, equipment changes, and proposed tests or experiments had been completed and documented. The licensee had taken action as necessary in response to any deficiencies noted in the audits. Additionally, the annual review of the radiation protection program and the biennial reviews of the standard operating procedures, the emergency plan, and the security plan had been conducted and acceptably documented.

(2) Design Control Functions

Records and observations showed that changes made at the facility from 2005 to the present were acceptably reviewed in accordance with 10 CFR 50.59 and applicable administrative controls. Prior to implementing the changes, the

licensee submitted them to the RSC and they were reviewed, determined to be acceptable, and approved as required. None of the changes constituted a safety question or required a change to the TS.

The latest modification initiated by the licensee involved removal of the core temperature monitoring system and replacing it with a new Omega temperature indication and control system. The licensee's facility modification procedure was followed and an evaluation was completed as required. The licensee considered the criteria included in 10 CFR 50.59 and concluded that the change was an acceptable change under the regulations. Although not required by procedure in this particular instance, a review by the RSC was requested and conducted, and the RSC approved the change. The change review and approval process appeared to be acceptable.

c. Conclusions

The review and audit program was being completed acceptably by the RSC. The design change program satisfied NRC requirements.

3. Operations

a. Inspection Scope (IP 69001)

The inspectors reviewed selected aspects of the following to verify compliance with TS Section 6.2 and the applicable procedures:

- staffing for operations as recorded on the Reactor Log sheets
- observation of selected operations activities on August 28 & 29, 2007
- Scram Summary Log (S.1) entries from January 2006 through July 2007
- Pulsing Summary Log (S.2) entries from November 2005 through August 2007
- Reactor Operating Log (O.1) sheets from January 2007 through August 2007, entitled "WSU Nuclear Radiation Center Reactor Log," NRC Form No. 22, latest Revision (Rev.) dated March 2004
- selected entries on Reactor Start-Up Checkoff (O.3) forms entitled WSU Nuclear Radiation Center Form No. 34, "WSU Reactor Start-Up Checkoff," latest Rev. dated January 2, 2007
- licensee annual reports submitted to the NRC which were entitled "Annual Report on the Operation of the Washington State University TRIGA Reactor" for the periods from July 1, 2005 through June 30, 2006, and July 1, 2006 through June 30, 2007
- WSU Nuclear Radiation Center Standard Operating Procedure (SOP) No. 1, "Standard Procedure for Use of the Reactor," dated November 29, 2006
- WSU Nuclear Radiation Center SOP No. 4, "Standard Procedure for Startup, Operation, and Shutdown of the Reactor," dated September 30, 2005

b. Observations and Findings

(1) Routine Operations

Reactor operations were carried out following written procedures and in accordance with TS requirements. Information on the operational status of the facility was recorded in log books and on checklists as required by procedures and TS. Use of maintenance and repair logs satisfied procedural requirements. Operational problems and events noted in the operations log were reported, reviewed, and resolved as required by TS and administrative procedures. Scrams were identified in the logs and records, reported as required, and their cause(s) resolved before the resumption of operations under the authorization of an SRO.

The inspectors verified that the date and log entries required to be made by the TS and procedure were logged and cross referenced with other logs and/or forms, as required, and that TS operational limits had not been exceeded. As noted above, shift staffing satisfied the minimum requirements for duty and on-call personnel.

(2) Pulsing Capability – Follow-up on Unresolved Item 50-027/2005-201-01

TS Section 4.3.1(5) requires that the reactor shall be pulsed semiannually to compare fuel temperature measurements and peak power levels with those of previous pulses of the same reactivity.

Following a 50.59 evaluation and review, the facility staff changed out the NLW-2 Channel in April 2005 because it had failed. It was replaced with a modern NLW-1000 wide range channel. However, when the licensee attempted to conduct the required semiannual pulse in May 2005, they found that they were unable to perform a test pulse due to the installation and configuration of the new NLW-1000 Channel. Consequently, the licensee identified the fact that they would not be in compliance with TS Section 4.3.1(5) as a result and submitted a letter to the NRC on July 10, 2005, detailing the situation.

During an NRC inspection in 2005, the inspector reviewed the problem. At that time the licensee indicated that they would attempt to correct the situation and that they would perform a test pulse as soon as the NLW-1000 could be configured to prevent rod withdrawal when in the pulse mode. Since corrective action was still pending at the time of that inspection, the issue was identified as an Unresolved Item¹ (URI) by the inspector.

During this inspection, the inspectors again reviewed the situation with the NLW-1000 wide range channel. It was noted that the licensee had consulted with the vendor of the wide range channel concerning the problem they had encountered while initiating a pulse. With concurrence from the vendor, the licensee had

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.

removed the high voltage scram function from the NLW-1000 when in pulse mode. The licensee then conducted various tests and test pulses in November 2005 to verify that the wide range channel functioned as required and that no scrams occurred during a pulse as had happened in the past. This solution appeared to correct the problem and normal routine operations and pulsing operations were resumed. This issue and URI 50-027/2005-201-01 are considered closed.

c. Conclusions

The operational activities were found to be consistent with applicable TS and procedural requirements.

4. Experiments

a. Inspection Scope (IP 69001)

To verify compliance with the licensee's program for conducting experiments and irradiations as outlined in TS Sections 3.10 and 6.5.4 and in various procedures, the inspectors reviewed selected aspects of:

- WSU Nuclear Radiation Center Reactor Operating Log (O.1) sheets from the week of August 20, 2007
- experiment approvals documented on WSU Nuclear Radiation Center Form No. 2, entitled "Experiment Request Form," form dated December 1972, with the associated WSU Nuclear Radiation Center Form No. 4, entitled "Experiment Authorization Form," form dated August 1975
- irradiation approvals documented on WSU Nuclear Radiation Center Form No. 1, entitled "Irradiation Request Form," (O.10) dated April 15, 2003, with the associated WSU Nuclear Radiation Center Form No. 3, entitled "Irradiation Authorization Form," form dated September 2003

b. Observations and Findings

The licensee classified experiments as either being "operational" or "non-operational" experiments. Operational experiments were those which required reactor control manipulation to measure reactor parameters or characteristics. These were typically those experiments that included routine reactor operations and were covered by an SOP. Non-operational experiments were those which required the insertion of any apparatus, device, or material which was not a normal part of the core or experimental facilities into any of the facilities or in the beam line. These were generally those that were new or required special facilities or the modification of an existing facilities. Operational experiments were usually approved by the Reactor Supervisor and the Facility Director after a review of the completed Experiment Request Form. Non-operational experiments were typically required to be reviewed and approved by the Reactor Safeguards Committee. It was noted that the experiments that were currently being conducted at the facility were classified as operational.

No new experiments or irradiation requests had been initiated, reviewed, or approved since the last inspection. The inspectors verified that if a new experiment or irradiation

were to be initiated, it would be reviewed and approved by the RSC and would be completed under the supervision of the Reactor Supervisor and in accordance with TS requirements.

The inspectors reviewed the existing experiment and irradiation authorization documents, Irradiation Data Log sheets, and the Reactor Logbook, and interviewed staff members. The inspectors verified that the approved experiments and irradiations that were completed were installed, constrained, conducted, and removed as required by the TS. The appropriate data was recorded and the radioactive material produced was handled and controlled as required.

c. Conclusions

The conduct and control of experiments and irradiations met the requirements specified in the TS and the applicable experiment and irradiation authorizations and procedures.

5. Operator Licenses, Requalification, and Medical Activities

a. Inspection Scope (IP 69001)

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

- biennial written examination records for 2005 through 2007
- operator medical examination records from 2005 to the present
- operator license status and effective dates of current operator licenses
- WSU NRC Reactor Staff Requalification Program, latest Rev. dated January 4, 1994
- active duty status and Annual Reactor Operating Test results noted and maintained in the Requalification Schedule forms (A.3)
- logs and records of reactivity manipulations maintained in the Quarterly RO/SRO Activity Report (O.15) Notebook and documented on forms entitled, "Quarterly Operational Hours for RO and SRO," latest Rev. dated January 2000

b. Observations and Findings

(1) Requalification Program

As noted above, at the time of the inspection, there were two qualified SROs and one qualified RO working at the facility. The inspectors noted that all of the operators' licenses were current. The inspectors also noted that the facility was waiting the results of a recent operator licensing examination.

A review of the logs and records showed that the training and requalification program was being followed and that biennial written examinations had been completed as required. An annual operating test had been conducted for each operator by the Reactor Supervisor as required by the program as well (except as

noted below). It was also verified that each operator had completed the required number of hours of reactor operations/reactivity manipulations 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. The inspectors noted that all operators were receiving the required biennial medical examinations as well.

(2) Failure to Comply with the Requalification Program

In a letter dated July 6, 2007, the licensee informed the NRC that an SRO had not completed an annual operating test within the required 15 month timeframe allowed between operating examinations. As corrective action, the letter indicated that the facility had conducted training for all operators concerning the requirements contained in the Requalification Plan. The letter also indicated that, in the future, the licensee planned to schedule the operations exams such that all qualified operators would take the exam in the same month. It was thought that this would eliminate any confusion about when an operations exam was due. The licensee also indicated that this issue (the completion of the operations exams) would be added to the yearly administrative surveillance checklist. In addition, the letter also indicated that the licensee planned to change the Requalification Plan to clarify what steps to take when the 15 month interval between operations exams was not met.

During this inspection, the inspectors reviewed the problem and the corrective actions. The inspectors verified that the operator in question had completed training on the Requalification Plan and had completed an operations exam as required. It was also noted that the completion of the operations exams had been added to the yearly administrative surveillance checklist (in February of each year). However, it was noted that no change to the Requalification Plan had been submitted to the NRC for approval. The inspectors informed the licensee that the issue of completing the final corrective action involving changing the Requalification Program and submitting it to the NRC for approval will be identified by the NRC as an Unresolved Item and will be reviewed during a subsequent NRC inspection (URI 50-027/2007-201-01).

c. Conclusions

The requalification and training program was up-to-date and acceptably maintained. A medical examination for each operator was being completed biennially as required. An Unresolved Item was noted involving completion of a change to the Requalification Plan.

6. Fuel Handling

a. Inspection Scope (IP 69001)

The inspectors reviewed selected aspects of the following to ensure that the licensee was complying with TS Sections 4.4, 5.1, 5.2, and 6.9:

- Core Change Log (O.6)
- Core Reactivity Parameters Log (O.7)
- fuel handling equipment and instrumentation
- WSU Nuclear Radiation Center Reactor Log sheets from 2005 through the present
- WSU Special Nuclear Material Physical Inventory Log sheets from 2006 through the present
- WSU Nuclear Radiation Center Administrative Procedure No. 9, "Special Nuclear Material Accountability Plan," dated May 1989
- WSU Nuclear Radiation Center SOP No. 7, "Standard Procedure for Core Changes and Fuel Movement," dated August 25, 2005
- WSU Nuclear Radiation Center SOP No. 8, "Standard Procedure for Control Element Maintenance, Removal, and Replacement," dated February 17, 1995

b. Observations and Findings

(1) Routine Fuel Movements

Procedures for refueling, fuel movement, and TS required surveillances ensured controlled operations for Core 34-A, which was a mixed core of FLIP (Fuel Lifetime Improvement Program) fuel elements and standard fuel elements. A detailed plan for performing fuel movement was required to be developed prior to each fuel movement operation.

The inspectors noted that the data recorded for fuel movements that had been conducted in the past were acceptable and were required to be cross referenced in the operations logs. Log entries, indicating fuel movements, were generally completed under the direct supervision of an SRO as required. Through records review and interviews with licensee personnel, the inspectors determined that various fuel movement operations had been conducted since the last NRC inspection in this area occurred at the facility in September 2005. The most recent significant fuel movement involved changing the core configuration from 33X to 34-A in late 2003.

(2) Report of an Observed Inadequacy - Failure to Follow Procedure

By letter dated August 8, 2007, the licensee informed the NRC of an observed inadequacy in the implementation of administrative or procedural controls as required by TS Section 6.10(3)(d). The report outlined the circumstances surrounding an apparent failure to follow procedure.

WSU Nuclear Radiation Center SOP No. 8, "Standard Procedure for Control Element Maintenance, Removal, and Replacement," requires in Section B.1.b that, for control element drive removal and replacement, the reactor shall be maintained subcritical by least \$5.00 throughout the operation without xenon, assuming that any experiment installed in the reactor may be removed.

WSU Nuclear Radiation Center SOP No. 13, "Reactor Power Calibrations," requires in Section A that a reactor power calibration shall be performed immediately following any fuel movement into, out of, or between core positions other than after the removal and reinstallation of a single fuel cluster, provided the same fuel cluster is returned to its identical position in the reactor core. . . . The reactor shall not be operated at any power level for any reason other than calibration operations until the power calibration is completed.

On Monday, July 30, 2007, staff members at the facility removed three fuel bundles from the reactor and transferred them to storage racks within the pool. The fuel was moved in preparation for the removal and inspection of the transient pulse rod. Removal of the three bundles rendered the core subcritical by at least \$5.00 with the rod removed as required by SOP No. 8. (Prior to September 2003 there was no need to remove more than a single fuel bundle to achieve the \$5.00 subcritical margin that SOP No. 8 required to perform the transient pulse rod inspection. However, reconfiguration of the core from 33X to 34A in September 2003 initiated the need to remove three fuel bundles to meet procedural requirements.)

Following the transient pulse rod inspection, the rod was reinstalled and it was verified that the transient pulse rod system functioned properly. The three fuel bundles that had been removed were then replaced in the core in the same grid positions and same orientations that the bundles were in prior to removal. The reactor was returned to normal operations. Subsequently, the licensee noted the requirement in SOP No. 13 that required a reactor power calibration following any fuel movement into, out of, or between core positions.

Upon reviewing this problem, the licensee noted that three fuel bundles had been removed from the core and subsequently replaced in their original grid positions during each of the last four transient pulse rod inspections in calendar years 2004, 2005, 2006, and including 2007. Power calibrations were not performed after these fuel movements. Further investigation indicated that, following the core change from 33X to 34A in September 2003, SOP No. 13 was not updated to integrate the changed requirements for fuel movement to allow compliance with SOP No. 8 without a reactor power calibration. The licensee also determined that there was no indication that the reactor performance had been affected by the fuel movements that were performed as part of the requirement for transient pulse rod inspection. All subsequent routine power calibrations indicated normal core operational parameters. Also, all other core parameters have indicated normal behavior subsequent to the transient pulse rod inspections.

As corrective actions to prevent recurrence, the licensee planned to change SOP No. 13, and SOP No. 7, "Standard Procedure for Core Changes and Fuel Movement," to more fully describe the power calibration requirements and to direct the staff to perform a power calibration after significant fuel movement. According to the proposed change, a power calibration would not be required following the movement of three fuel bundles, associated with the transient pulse rod inspections, under specific conditions. The change was to be reviewed and approved by the RSC during the next scheduled meeting. Also, once the

procedures changes were approved, the licensee planned to provide training for all the operators.

The inspectors reviewed the licensee's report of the event, the investigation, and the planned corrective actions taken. It was noted that the review and investigation appeared to be adequate. It was also noted that the proposed procedural changes had not yet been reviewed and approved by the RSC and the training for all operators had not been completed. The licensee was informed that, since all the anticipated corrective actions had not been completed, this issue would be considered as an URI and would be reviewed during a future inspection (URI 50-027/2007-201-02).

c. Conclusions

The fuel handling activities and documentation were as required by facility TS and procedures. One URI was identified regarding corrective actions in response to failure to follow procedure for reactor power calibration following fuel movement associated with the transient pulse rod inspections.

7. Maintenance and Surveillance

a. Inspection Scope (IP 69001)

To verify compliance with TS Sections 3, 4, and 5, the inspectors reviewed selected aspects of:

- Control Element Calibration Log (O.4)
- Control Element Inspection Log (O.5)
- Core Reactivity Parameters Log (O.7)
- Maintenance Log (O.8), pages 95 - 106
- Preventative Maintenance Checklists (O.2) for 2006 and to date in 2007
- RSC meeting minutes for the past two years through the date of the inspection
- Power Calibration Log forms (also in O.2) for 2005 through the date of the inspection
- Monthly Console and Auxiliary Equipment Checklist Log (O.9) containing documentation of equipment maintenance as indicated on the WSU Nuclear Radiation Center Form No. 40, entitled "Console Auxiliary Equipment Maintenance Checklist," form dated January 2006
- WSU Nuclear Radiation Center Reactor Operating Log (O.1) sheets from January through September 2007
- licensee annual reports submitted to the NRC which were entitled "Annual Report on the Operation of the Washington State University TRIGA Reactor" for the periods from July 1, 2003 through June 30, 2004, and July 1, 2004 through June 30, 2005
- WSU Nuclear Radiation Center Administrative Procedure No. 5, "Surveillance Documentation Review," (not dated)
- WSU Nuclear Radiation Center Administrative Procedure No. 6, "Performance of Maintenance Activities," (not dated)

- WSU Nuclear Radiation Center SOP No. 5, "Standard Procedure for Performing Preventive Maintenance on the Reactor and Associated Equipment," dated September 29, 2005
- WSU Nuclear Radiation Center SOP No. 8, "Standard Procedure for Control Element Maintenance, Removal, and Replacement," dated February 17, 1995
- WSU Nuclear Radiation Center SOP No. 13, "Standard Procedure for Performing Power Calibrations," dated September 30, 2005
- WSU Nuclear Radiation Center SOP No. 14, "Standard Procedure for Alignment of the Fuel Temperature System," dated November 29, 2006
- WSU Nuclear Radiation Center SOP No. 15, "Standard Procedure for Control Element Calibration," dated December 4, 2003
- WSU Nuclear Radiation Center SOP No. 24, "Standard Procedure for Purification System Resin and Filter Change," dated December 4, 2003
- WSU Nuclear Radiation Center SOP No. 32, "Standard Procedure for the Transfer of Non-Fuel Devices and Experimental Apparatus into and out of the Reactor Pool," dated December 4, 2003

b. Observations and Findings

(1) Maintenance

The Inspectors noted that routine and preventive maintenance was controlled by, and documented in, the maintenance or reactor operations logs and the monthly Console Auxiliary Equipment Maintenance Checklists consistent with the TS and licensee procedures. Unscheduled maintenance or equipment repair was reviewed to determine if the work required a 50.59 evaluation. Verifications and operational systems checks were performed following completion of the maintenance to ensure system operability before the equipment was returned to service.

(2) Surveillance

The Inspectors determined that the daily, weekly, monthly, semiannual, and other periodic checks, tests, and verifications for TS required Limiting Conditions for Operations (LCOs) were being completed as required. In addition, all surveillance and LCO verifications reviewed were completed on schedule as required by TS and in accordance with licensee procedures. Extensive checklists were used to track completion of the various required surveillances and LCO verifications. The checklists included the date the activity was completed and by whom. These checklists provided acceptable documentation of the results and proper control of reactor operational tests and surveillances. Some of the daily and periodic checks of equipment operability included recording system parameters such as temperature, pressure, and flow. All recorded results observed by the inspectors were within prescribed TS and procedure parameters and in close agreement with the previous surveillance results.

c. Conclusions

The maintenance logs, records, performance, and reviews satisfied TS and procedure requirements. The program for tracking and completing surveillance checks and LCO verifications satisfied TS requirements and licensee administrative controls.

8. Procedures

a. Inspection Scope (IP 69001)

The inspectors reviewed selected aspects of the following to verify that the licensee was complying with the requirements of TS Sections 6.5.4 and 6.8:

- selected administrative and standard operating procedures
- related logs and records documenting procedure implementation
- records documenting procedure changes and temporary changes
- administrative controls as outlined in WSU Nuclear Radiation Center Administrative Procedure No. 2, "Standard Procedure for the Approval, Revision, and Review of Standard Operating Procedures," (not dated)

The inspector also observed the use and implementation of procedures by licensee personnel.

b. Observations and Findings

(1) Procedure Review and Training

Procedures were available for those tasks and items required by the TS and facility directives. Written changes were reviewed and approved by the RSC as required. The SOPs were reviewed biennially as required by TS Section 6.5.4 with the last review being completed August 25, 2005, and the most recent changes to facility SOPs reviewed and approved by the RSC on November 29, 2006.

Training of personnel on procedures and the applicable changes was acceptable. Through observation of reactor surveillance and maintenance operations, the inspectors verified that personnel conducted TS activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive releases, contaminations, and reactor equipment problems) had been developed and were implemented as required.

(2) Compliance with Procedure Change Requirements

TS Section 6.8 required the licensee to have operating procedures. WSU Nuclear Radiation Center Administrative Procedure No. 2, "Standard Procedure for the Approval, Revision, and Review of Standard Operating Procedures," required that there be a form at the end of each procedure: 1) to certify that the procedure had been approved and to indicate the date of approval and/or review, and 2) to certify that the procedure had been reviewed by the RSC and to indicate the date of review. Administrative Procedure No. 2 also required each licensed member of

the reactor operating staff to review all revisions and/or additions at the time such changes are made.

The inspectors reviewed various procedures in use at the facility. It was noted the procedures did include the form required by Administrative Procedure No. 2. The required form indicated the date of the biennial review by the Reactor Supervisor. However, the forms at the end of several procedures revised after August 25, 2005, did not contain the required information including the date or approval and/or review and the certification that the procedures had been reviewed by the RSC and the date thereof. When asked about this situation, the licensee indicated that there had been a lapse in the record keeping and the forms had not been updated as required. Also, the licensee could not produce a record showing that each licensed member of the reactor operating staff had reviewed these revisions.

The licensee was informed that failure to comply with the requirements of WSU Nuclear Radiation Center Administrative Procedure No. 2 for processing procedure revisions and changes was an apparent violation of TS Section 6.8. However, this issue is considered a violation of minor significance and is not subject to enforcement action consistent with section IV.5.a of the NRC Enforcement Policy.

(3) Adequacy of WSU Nuclear Radiation Center SOP No. 6

The inspectors reviewed WSU Nuclear Radiation Center SOP No. 6, "Standard Procedure in the Event of an Emergency Situation," and compared the wording and requirements listed therein with the licensee's Emergency Plan. It was noted that the wording of escalating events from Safety Event Class 0 Non-Reactor to Unusual Event to Alert, left room for interpretation as an event elevated from one classification to another. Also, the wording used to describe events in SOP #6 (Safety Event Class 0 Non-Reactor, Unusual Event and Alert) differed from the wording used in the Emergency Plan in the Emergency Classification System and in the Emergency Action Level descriptions. These differences could lead to differing interpretations on how to classify an event at the facility.

When this was discussed with the licensee, they acknowledged the apparent discrepancies and indicated that they would attempt to correct the situation but that, with the current limited staff, reactor operations and reactor operator training had to take precedence. In the interim, the licensee was informed that this issue will be identified as an Inspector Follow-up Item (IFI) by the NRC and will be reviewed during a subsequent NRC inspection (IFI 50-027/2007-201-03).

c. Conclusions

The review, revision, and control of procedures by the licensee satisfied TS requirements. One NCV was noted for failure to follow procedure regarding processing procedure revisions and changes. One IFI was identified to follow-up on apparent differences in the classification scheme of events as listed in SOP No. 6 and the Emergency Plan.

9. Emergency Preparedness

a. Inspection Scope (IP 69001)

To ascertain whether the licensee was acceptably implementing the various aspects of their emergency preparedness program, the inspectors reviewed selected aspects of:

- emergency drills and exercises for the past two years
- Administrative Requirements Schedule Log (A.4) sheets
- training records for licensee staff and support personnel
- emergency response facilities, supplies, equipment, and instrumentation
- offsite support as documented in the Letter of Agreement with the hospital
- WSU Nuclear Radiation Center Short Form Emergency Procedure, latest Rev. dated May 25, 2005
- WSU Nuclear Radiation Center SOP No. 6, "Standard Procedure in the Event of an Emergency Situation," dated December 4, 2003
- WSU Nuclear Radiation Center SOP No. 29, "Standard Procedure for Security and Emergency Plan Training for Nuclear Radiation Center, Radiation Safety Office, and Campus Police Personnel," dated May 17, 2005

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the facility, entitled "Emergency Preparedness Plan for the Nuclear Radiation Center, Washington State University," was the same as the version most recently approved by the NRC and was dated June 19, 1994. The E-Plan was audited and reviewed biennially as required. Implementing procedures were reviewed and revised as needed to effectively implement the E-Plan. Emergency facilities, instrumentation, and equipment were being maintained and controlled, and supplies were being inventoried as required in the E-Plan. The inspectors and a licensee representative conducted an inventory of one of the emergency kits in the facility to verify its contents were as stipulated in the E-Plan.

The Inspectors determined through records review and through interviews with licensee personnel that emergency responders were knowledgeable of the proper actions to take in case of an emergency. The agreement with the Pullman Regional Hospital had been updated and maintained as necessary. Communications capabilities were acceptable with these support groups. Off-site support for the facility was verified to be acceptable and in accordance with the E-Plan. The alarm system had been tested weekly and monthly as stipulated in the E-Plan.

In addition, the inspectors determined that the emergency drills were being conducted as required by the E-Plan. The most recent drill, which had been conducted December 12, 2006, required the response of the facility emergency organization and simulated response from off-site support organizations. Critiques were written following the drills to document any strengths and weaknesses identified and to develop possible solutions to any problems noted.

The inspector also toured the Pullman Regional Hospital with licensee and hospital representatives on August 29, 2007. It was noted that a room and equipment had

been set aside for use during a radiological emergency. During the tour the inspector asked about the hospital staff response capabilities in case of an event at the Nuclear Radiation Center. The hospital representative stated that the hospital staff had the training and equipment needed to provide the appropriate support needed in a radiological emergency. There appeared to be a good working relationship between the licensee and hospital staff personnel.

c. Conclusions

The emergency response program was conducted in accordance with the requirements stipulated in the Emergency Preparedness Plan.

10. Transportation of Radioactive Materials

a. Inspection Scope (TI 2201/001)

To ascertain whether the licensee had shipped specific quantities of radioactive material and whether they were complying with NRC Order EA-05-007, the inspectors reviewed selected aspects of:

- WSU radioactive material transportation program
- NRC Order EA-05-007, "Imposing Additional Security Measures on the Transportation of Radioactive Material Quantities of Concern," dated July 19, 2005
- NRC Letter to the licensee, EA-07-082, dated May 23, 2007
- WSU Letters written and submitted to the NRC in response to NRC Order EA-05-007 and NRC Letter EA-07-082

b. Observations and Findings

NRC Order EA-05-007 stipulated that facilities that shipped radioactive material of specific quantities or in amounts greater than the specified quantities were required to comply with the requirements listed in the order. NRC Letter EA-07-082 requested information on the licensee's intent to ship radioactive material of those specified quantities and information on the actions to be taken to safeguard the material. The licensee responded to both the Order and the Letter by letters to the Commission dated August 5, 2005 and June 22, 2007, respectively. In the first letter the licensee indicated that, as of that date, no material of the specified quantities had been shipped. However, the licensee indicated that they consented to the Order and would comply with the Order in the event that they shipped material of that type. In the second letter the licensee stated that they had not shipped material of the specified quantities but that they would likely do so in the future. They reiterated the fact that they would comply with and take the appropriate actions required in NRC Order EA-05-007.

c. Conclusions

The licensee had not shipped any radioactive material of the type listed in NRC Order EA-05-007 but verified that they would comply with the Order if that quantity of material was shipped in the future.

11. Exit Interview

The inspection scope and results were summarized on August 30, 2007, with members of licensee management. The inspectors described the areas inspected and discussed in detail the inspection findings. The licensee did not identify as proprietary any of the materials reviewed by the inspectors although some of the material was designated as Safeguards Information. No dissenting comments were received from the licensee and no safeguards information is contained in this report.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

E. Corwin	Reactor Supervisor
M. Malloy	Reactor Technician and Reactor Operator (License Pending)
K. Marley	Engineering Technician and Reactor Operator
D. Wall	Director, Nuclear Radiation Center

Other Personnel

R. Caggiano	Medical Doctor and Director of Emergency Services, Pullman Regional Hospital
J. Elliston	Chair, Reactor Safeguards Committee

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
TI 2201/001	Inspection of Additional Security Measures for Radioactive Material Quantities of Concern

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-027/2007-201-01	URI	Follow-up on the submittal of a change to the NRC to clarify the Requalification Program.
50-027/2007-201-02	URI	Follow-up on corrective actions to be taken in response to failure to follow procedure for reactor power calibration following fuel movement associated with the transient pulse rod inspections.
50-027/2007-201-03	IFI	Follow-up on the licensee's actions to correct apparent inconsistencies between SOP No. 6 and the Emergency Plan.

Closed

50-027/2005-201-01	URI	Review the actions taken by the licensee to perform a test pulse as soon as the NLW-1000 is configured to prevent rod withdrawal when in the pulse mode.
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PARTIAL LIST OF ACRONYMS USED

ADAMS	Agencywide Documents and Management System
CFR	Code of Federal Regulations
E-Plan	Emergency Plan

FD	Fire Department
IP	Inspection Procedure
LCO	Limiting Conditions for Operation
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
Rev.	Revision
RO	Reactor Operator
RSC	Reactor Safeguards Committee
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TS	Technical Specifications
URI	Unresolved Item
WSU	Washington State University