

June 10, 2009

Mr. Jere Jenkins, Director
Purdue University Radiation Laboratory
School of Nuclear Engineering
400 Central Drive
West Lafayette, IN 47904-2017

SUBJECT: PURDUE UNIVERSITY - NRC ROUTINE INSPECTION REPORT NO.
50-182/2009-201

Dear Mr. Jenkins:

The U.S. Nuclear Regulatory Commission (NRC) conducted an inspection on May 18-22, 2009, at your Purdue University Reactor (Inspection Report No. 50-182/2009-201). The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concern or noncompliance of requirements was identified. No response to this letter is required.

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J. Jenkins

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Should you have any questions concerning this inspection, please contact Jack Donohue at 301-415-3163 or electronic mail at Jack.Donohue@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-182

License No. R-87

Enclosure:
As stated

cc w/ encl: See next page

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

Docket No: 50-182

License No: R-87

Report No: 50-182/2009-201

Licensee: Purdue University

Facility: Purdue University Reactor

Location: West Lafayette, IN

Dates: May 18 - 22, 2009

Inspector: Jack Donohue

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

EXECUTIVE SUMMARY

Purdue University
Purdue University Reactor
NRC Inspection Report No. 50-182/2009-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Purdue University's (the licensee's) Class II research reactor facility safety programs including organization and staffing; operations logs and records; procedures; requalification training; surveillance and limiting conditions for operation; experiments; design changes; committees, audits and reviews; emergency planning; maintenance logs and records; fuel handling logs and records. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organization and Staffing

- The licensee's organization and staffing was in compliance with the requirements specified in the Technical Specifications.

Operations Logs and Records

- Within the scope of this review, the licensee's operations record keeping program conformed to Technical Specification requirements.

Procedures

- The inspector found that appropriate procedures were in effect, new procedures were being prepared as needed, and dated procedures were being updated as necessary.

Requalification Training

- Current operator requalification was conducted as required by the Requalification Program.

Surveillance and Limiting Conditions for Operation

- Surveillance was observed to be performed in accordance with requirements as stated in the Technical Specifications.

Experiments

- No new experiments were requested but procedures existed to review them pursuant to Technical Specification requirements should one be requested.

Design Changes

- No new changes, tests, or experiments subject to 10 CFR Part 50.59 reporting were performed.

Committees, Audits and Reviews

- The Committee on Reactor Operations provided the oversight required by the Technical Specifications.

Emergency Planning

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

Maintenance Logs and Records

- The licensee maintained records documenting principal maintenance activities.

Fuel Handling Logs and Records

- Fuel handling and inspection activities were completed and documented as required by Technical Specification and facility procedures.

REPORT DETAILS

Summary of Facility Status

The Purdue University Reactor (PUR-1), a one kilowatt (kw) research reactor continued to be operated in support of graduate and undergraduate education and laboratory instruction. During the inspection, the reactor was not operated.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure (IP) 69001 and IP 92701)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Section 6.1 of the licensee's Technical Specifications (TS), Amendment No. 12 to Facility Operating License No. R-87, dated August 9, 2007, was being met:

- organizational structure
- staffing requirements
- "Report on Reactor Operations for the Period January 1, 2008, to December 31, 2008," E. Merritt, March 2009
- Reactor Logbook No. 47, November 28, 2007 to July 7, 2008
- Reactor Logbook No. 48, July 15, 2008 to December 11, 2008
- Reactor Logbook No. 49, December 11, 2008 to present
- File of completed Pre-start Checklists including those for 2008 and 2009
- Committee on Reactor Operations (CORO) Meeting Minutes, December 15, 2008
- TS for Purdue University Reactor-1 (PUR-1) Amendment 12, dated August 9, 2007

b. Observations and Findings

Through discussions with licensee representatives, the inspector determined that the management structure at the facility had not changed since the previous NRC inspection. The reactor staff consisted of three individuals, all of whom maintained NRC Senior Reactor Operator (SRO) licenses. Staffing of the reactor shifts, including designated on-call individuals, met TS requirements as documented in the reactor logbook and pre-start checklists. The licensee stated that an updated Organization PUR-1 was prepared as part of the relicensing application process.

c. Conclusions

The licensee's organization and staffing was in compliance with the requirements specified in the TS.

2. Operations Logs and Records

b. Inspection Scope (IP 69001)

The inspector reviewed selected parts of the following reactor operations records to verify that the requirements of TS Section 6.5, Operating Records, were being met:

- Purdue University Reactor (PUR or PUR-1) Procedures Manual
- PUR-1 Procedure 91-1, Reactor Startup, Operation and Shutdown, dated June 1991
- "Report on Reactor Operations for the Period January 1, 2008, to December 31, 2008," E. Merritt, March 2009
- Reactor Logbook No. 47, November 28, 2007 to July 7, 2008
- Reactor Logbook No. 48, July 15, 2008 to December 11, 2008
- Reactor Logbook No. 49, December 11, 2008 to present
- File of completed Pre-start Checklists including those for 2008 and 2009
- File of completed Shutdown Checklists including those for 2008 and 2009

b. Observations and Findings

The PUR procedures specified a records system that was commensurate with TS requirements. Procedures called for most operational data to be recorded in the reactor logbooks, startup checklists, and shutdown checklists. Data recorded indicated that the reactor was operated within the envelope of safety parameters established in the reactor license and Technical Specifications.

The inspector reviewed monthly reactor water sample results and other annual maintenance requirements that were documented in accordance with TS requirements, noting that proper procedures were followed and logbook entries were made.

c. Conclusions

Within the scope of this review, the licensee's operations record keeping program conformed to TS requirements.

3. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the requirements of TS Section 6.3, Operating Procedures, were being met:

- PUR Procedures Manual
- PUR 91-1, Reactor Startup, Operation and Shutdown, dated June 1991
- PUR 07-01, Partial or complete disassembly and reassembly of the PUR-1 core, dated September 7, 2007
- PUR-1 03-01-EP, Emergency Procedure, dated March 25, 2003
- PUR-1 M-5A, Calibration of Radiation Area Monitors (RAM) model GA-6, dated April 25, 2001

b. Observations and Findings

The inspector reviewed the licensee's written procedures and revisions to procedures. Significant work continues to consolidate documents. Procedures appeared thorough and of the appropriate level of detail. The Procedures Manual included lists of "Approved Procedures", "Maintenance Procedures" and "Emergency Procedures", all of which were reviewed and approved by the Committee for Reactor Operations (CORO). The inspector noted that the Procedures Manual contained a Table of Contents which listed most procedures by name and number and recently include the current revision number and the effective date. Also, some approved procedures were not listed in the Table of Contents. The licensee stated that the Table of Contents was not intended to include all documents in the Procedure Manual but agreed that it could be a source of confusion or error. The licensee stated that a clarification to include all procedures in the Table of Contents but not necessarily included in the Procedures Manual could eliminate some confusion.

c. Conclusions

The inspector found that appropriate procedures were in effect, new procedures were being prepared as needed, and dated procedures were being updated as necessary and in accordance with TS requirements.

4. Requalification Training

a. Inspection Scope (IP 69001 and IP 92701)

The inspector reviewed the following to verify that the requirements of 10 CFR Part 55 were being met:

- Operator Requalification Program for the PUR-1 Reactor Facility, 1988

- 10 CFR Part 55.53, Operators' Licenses, Conditions of Licenses
- PUR-1 Instructor Lecture/Experiment Schedule, July 15, 2008 through December 9, 2008 and April 13, 2009 through May 12, 2009
- J. Jenkins, PUR-1 Operation Training for PUR-1 dated May 12, 2009
- E. Merritt Operator's Requalification Program Performance Evaluation Form, April 9, 2009
- ANSI/ANS 15.4, Certification of Medical Examinations, dated April 8, 2009, July 31, 2008 and October 16, 2007

b. Observations and Findings

The inspector reviewed the records for licensed operators and noted that they were maintained as required by the Requalification Program.

The inspector determined that the licensee conducted its requalification program consistent with the Office of Nuclear Reactor Regulations (NRR) approved Requalification Program. It was determined that PUR-1 staff did this through:

- Discussing and reviewing changes in the facility, procedures, and license.
- Reviewing and simulating abnormal and emergency procedures.
- The assurance that operators maintained an active duty status in accordance with 10 CFR 55.53(e).
- The conduct of formal training, e.g., lectures and seminars

The licensee stated that an updated Operator Requalification Program was prepared as part of the facility relicensing application process.

c. Conclusions

Current operator requalification was conducted as required by the Requalification Program and in accordance with TS requirements.

5. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001 and IP 92701)

The inspector reviewed the following to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0, Surveillance Requirements:

- Surveillance Manual
- CORO Audit Report, April 1, 2009
- File of completed Pre-start Checklists including those for 2008 and 2009

b. Observations and Findings

Surveillance requirements were primarily done as part of the pre-start checkout; surveillance such as control rod drop time tests and water chemistry tests were documented with individual procedures or in the Surveillance Manual. The protocols and techniques randomly selected for inspection were considered to be effective in verifying acceptable performance of the safety equipment. Checks and calibrations were completed as required by TS.

TS 6.2.6.a required that the CORO perform an annual audit of facility operation the Technical Specification and applicable license conditions. A thorough audit report indicated completion of the audit requirement for the year 2008.

c. Conclusions

Surveillance was observed to be performed in accordance with requirements as stated in the Technical Specifications.

6. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with TS Section 3.5, Limitations on Experiments:

- Requested Irradiations Forms

b. Observations and Findings

The inspector reviewed the irradiations requests (Form B) and through discussion with staff members determined that no new types of experiments were reviewed or approved during the past two years. Procedures were observed to be in effect to require an evaluation of new experiments for conformance to TS requirements at such time as an experiment of a new type is requested.

c. Conclusions

No new experiments were requested. Procedures existed to review them pursuant to TS requirements should one be requested.

7. Design Changes

a. Inspection Scope (IP 69001)

The inspector reviewed the following materials to verify compliance with regulatory requirements:

- “Report on Reactor Operations for the Period January 1, 2008, to December 31, 2008,” E. Merritt, March 2009

b. Observations and Findings

The licensee reported that since the previous inspection there were no changes made which constituted a change reportable under 10 CFR 50.59.

c. Conclusions

No new changes, tests, or experiments subject to 10 CFR Part 50.59 reporting were performed.

8. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001 and IP 92701)

The inspector reviewed the following to verify compliance with the requirements of TS Section 6.2, Review and Audit:

- CORO Meeting Minutes, January 18, 2008
- CORO Meeting Minutes, June 11, 2008
- CORO Meeting Minutes, October 16, 2008
- CORO Meeting Minutes, December 15, 2008
- CORO Meeting Agenda, 17 April, 2009 , Not yet approved
- Reactor License Audit, Technical Specification Section, License No, R-87 Section 6.2.6.a, dated April 1, 2009
- 2008 Audit of Radiation Safety Program Content and Implementation, Completed April 1, 2009

b. Observations and Findings

The composition of the Committee on Reactor Operations (CORO) was verified to be in accordance with TS Section 6.2.2. A quorum as defined in TS Section 6.2.4 was present at each of the six meetings reviewed. Meetings were held at the required frequency as specified in TS Section 6.2.3.

The reviewed the Audit of Radiation Safety Program Content and Implementation dated April 1, 2009 and has determined that Limiting Conditions for Operations, Surveillance Requirements, Design Features and Administrative Controls were reported satisfactory.

Through reviewing CORO minutes of meetings from the recent past the inspector verified that the committee was performing the review responsibilities defined in TS Section 6.2.5.

The inspector verified the Emergency Plan was reviewed by the Reactor Supervisor and the Security Plan was reviewed by the Laboratory Director since the last Inspection.

c. Conclusions

The Committee on Reactor Operations provided the oversight required by the TS.

9. Emergency Planning

a. Inspection Scope (IP 69001)

The inspector reviewed the implementation of selected portions of the emergency preparedness program including:

- Emergency Plan for the Purdue University Reactor, March 20, 2000
- Radiation Emergency Procedures, approved March 25, 2003
- University of Purdue Campus Fire Station Training Records
- Purdue Reactor Emergency Drill, dated December 18, 2008
- Emergency Response Team Radiation Scenario Exercise After Action Report

b. Observations and Findings

The inspector visited the campus police and fire department facilities to ascertain emergency preparedness. Both facilities provided a description of response activities and capabilities. Regarding the fire response personnel, the on-duty staff provided an adequate discussion of radiological equipment use and proficiency. Through the review of training records at the fire station and further discussion regarding emergency response actions, the inspector found that there is sufficient interaction with REM (Radiological and Environmental Management) to coordinate efforts in an event involving the release of radiological material. Through discussions with PUFDF Chief on the Annual Purdue Reactor Emergency Drill (2008), REM will be notified by PUFDF during the incident response as an action resulting from the drill critique.

The current PUR-1 facility emergency plan and implementing procedures were current and readily available, although the facility stated that it will be modified to account for the low enriched uranium core. Facility staff indicated that the new version has been submitted as part of the relicensing application process.

The inspector determined that the licensee conducts training for emergency response personnel as required. Exercises and drills required by the emergency plan were conducted on December 18, 2008 to reinforce training and were deemed adequate. Lessons learned appear to be adequately addressed in the after action report and corrected by the respective party having a deficiency.

c. Conclusions

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

10. Maintenance Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following selected maintenance logs and records to verify compliance with the requirements of TS Section 6.5.1.a:

- Maintenance Logbook
- Reactor Logbook No. 47, November 28, 2007 to July 7, 2008
- Reactor Logbook No. 48, July 15, 2008 to December 11, 2008
- Reactor Logbook No. 49, December 11, 2008 to present

b. Observations and Findings

The inspector reviewed selected portions of the reactor and maintenance logbooks governing the interval of time since the previous inspection. Major maintenance activities were found documented with detail commensurate with the safety significance of the activity.

c. Conclusions

The licensee maintained records documenting principal maintenance activities and in accordance with TS requirements.

11. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with requirements of Technical Specification Section 6.5.2.d:

- Purdue University Reactor Procedures Manual
- PUR-1 Standard Operating Procedure 07-04, Loading of New Fuel Assemblies, reviewed by CORO July 16, 2007
- Safety Analysis Report for the Conversion of the Purdue University Research Reactor from HEU to LEU Fuel, July 2006
- Reactor Logbook No. 47, November 28, 2007 to July 7, 2008
- Reactor Logbook No. 48, July 15, 2008 to December 11, 2008
- Reactor Logbook No. 49, December 11, 2008 to present
- "Report on Reactor Operations for the Period January 1, 2008, to December 31, 2008," E. Merritt, March 2009

b. Observations and Findings:

Procedures for refueling, fuel movement, and TS required fuel inspections and surveillances were reviewed and approved as required and were available to control operations. New procedures were prepared as needed. The inspector determined through the reactor operator logs that annual fuel inspection was performed on March 17, 2009 using an underwater camera (INUKTUN Crystal Camera). Fuel movement, log keeping, and data recording were being done as directed by procedures. Log entries clearly identified that a licensed reactor operator was present for all fuel inspections.

c. Conclusions

Fuel handling and inspection activities were completed and documented as required by TS and facility procedures.

12. Exit Meeting Summary

The inspector reviewed the inspection results with members or the licensee management at the conclusion of the inspection on May 22, 2009. The licensee acknowledged the findings presented 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

V. F. Bralts, Interim Head of Nuclear Engineering
J. K. Cox, Police Chief
M. J. R. Handy, Assistant Radiation Safety Officer
J. H. Jenkins, Director of Radiation Laboratories
E. C. Merritt, Reactor Supervisor
K. M. Ply, Fire Chief
B. S. Revis, SRO
M. J. Rosenbarger, Detective Sergeant
J. F. Schweitzer, Director/Radiation Safety Officer

Other Personnel

None

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 92701	Follow-up

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

PARTIAL LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
ADAMS	Agencywide Document Access Management System
CFR	Code of Federal Regulations
CORO	Committee on Reactor Operations
HEU	Highly Enriched Uranium
IFI	Follow-up Item
IP	Inspection Procedure
LEU	Low Enriched Uranium
LD	Laboratory Director
No.	Number
NRC	Nuclear Regulatory Commission
NRF	Nuclear Reactor Facility
NRR	(Office of) Nuclear Reactor Regulation
PARS	Publicly Available Records
PUR	Purdue University Reactor
PUR-1	Purdue University Reactor 1
RAM	Radiation Area Monitor
REM	Radiological and Environmental Management
Rev.	Revision
RO	Reactor Operator
RS	Reactor Supervisor
RSM	Radiation Safety Manual
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications
URI	Unresolved Item