

July 14, 2011

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 ANNOUNCED INSPECTION REPORT
NO. 50-182/2011-201

Dear Mr. Jenkins:

The U.S. Nuclear Regulatory Commission (NRC) conducted an inspection on May 13-16, 2011, at your Purdue University Reactor (Inspection Report No. 50-182/2011-201). 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.

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

Should you have any questions concerning this inspection, please contact Mike Morlang at 301-415-4092 or electronic mail at Gary.Morlang@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-182
License No. R-87

Enclosure:
As stated

cc w/ encl: See next page

Purdue University

Docket No. 50-182

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: 50-182

License No: R-87

Report No: 50-182/2011-201

Licensee: Purdue University

Facility: Purdue University Reactor

Location: West Lafayette, IN

Dates: May 13 - 16, 2011

Inspector: Mike Morlang

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

EXECUTIVE SUMMARY

Purdue University
Purdue University Reactor
NRC Inspection Report No. 50-182/2011-201

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; procedures; requalification training; experiments; design changes; 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 U.S. Nuclear Regulatory Commission (NRC) requirements.

Organization and Staffing

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

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.

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 Title 10 of the *Code of Federal Regulations* Section 50.59 reporting were performed.

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's (the licensee, PUR-1), a one kilowatt (kW) research reactor had been shutdown since February 2011 due to nuclear instrumentation problems. 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
- Reactor Logbook No. 51, November 12, 2009 to June 11, 2010
- Reactor Logbook No. 52, June 11, 2010 to October 27, 2010
- Reactor Logbook No. 53, October 27, 2010 to present
- File of completed Pre-start Checklists including those for 2009 and 2010
- Committee on Reactor Operations (CORO) Meeting Minutes
- 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 U.S. Nuclear Regulatory Commission (NRC) inspection however there were changes in the staff. The reactor staff consisted of one full time Senior Reactor Operator (SRO), the Reactor Director. Of the two other previous SRO's, one had left the facility permanently and the electronics technician had retired and been rehired on a part time basis (100 hrs/6 months). The lack of a full time electronics technician had slowed the recovery from maintenance shutdown which began on February 8, 2011. Staffing of the reactor shifts, including designated on-call individuals, met TS requirements as documented in the reactor logbook and pre-start checklists.

c. Conclusion

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

2. 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-1 Procedures Manual
- PUR-1 91-1, Reactor Startup, Operation and Shutdown, dated June 1991
- PUR-1 07-01, Partial or complete disassembly and reassembly of the PUR-1 core, dated September 7, 2007
- PUR-1 M-1, Procedure for checking meter contact switches, dated June 29, 1995
- PUR-1 M-2, Procedure for checking the Source Missing Interlock, dated June 8, 1995
- PUR-1 M-3, Procedure for determining magnet current settings and checking the fast scrams, dated June 29, 1995
- PUR-1 M-4, Procedure for measuring Shim-safety rod drop times, dated July 28, 1995
- 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. 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 on Reactor Operations (CORO). The procedures noted in the previous inspection that had pen and ink changes and had not been reviewed by the CORO had been totally rewritten and had been revised through three review cycles. The procedures were to be reviewed at the next CORO meeting. The licensee was informed that failure to have the pen and ink procedure changes reviewed by the CORO was identified as an Unresolved Item¹ (URI) pending corrective actions and implementation of controls to prevent recurrence. This issue will remain open and be reviewed during a future inspection (URI-50-182/2010-201-01).

c. Conclusion

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.

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.

3. **Requalification Training**

a. Inspection Scope (IP 69001 and IP 92701)

The inspector reviewed the following to verify that the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55 were being met:

- Operator Requalification Program for the PUR-1 Reactor Facility, 1988
- 10 CFR Section 55.53, Operators' Licenses, Conditions of Licenses
- PUR-1 Instructor Lecture/Experiment Schedule, April 13, 2009 through July 9, 2010
- PUR-1 Operation Training for PUR-1 dated July 9, 2010
- Operator's Requalification Program Performance Evaluation Form, April 9, 2009
- American National Standards Institute/American Nuclear Society Section 15.4, Certification of Medical Examinations, dated April 8, 2009
- Senior Reactor Operator Requalification Written Exam dated June 2010

b. Observations and Findings

The inspector reviewed the records for the licensed SRO and noted that they were maintained as required by the Requalification Program. With only two SRO's at the facility, one will be in requalification each year and the other will be conducting written and operating exams. Rotation of positions will be required until a new licensed operator is hired and obtains an operator license.

The inspector determined that the licensee conducted its requalification program through discussing and reviewing changes in the facility, procedures, and license, reviewing and simulating abnormal and emergency procedures, and the conduct of formal training.

c. Conclusions

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

4. **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
- CORO Minutes for 2010
- TS Section 4.5

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. Conclusion

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

5. 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, 2009, to December 31, 2009, March 2010
- Requested Irradiations Forms

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. Conclusion

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

6. 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 PUR-1, dated March 20, 2000
- Radiation Emergency Procedures, approved March 25, 2003
- University of Purdue Campus Fire Station Training Records

- Purdue Reactor Emergency Drill, dated October 12, 2010
- Emergency Response Team Radiation Scenario Exercise After Action Report , dated October 12, 2010

b. Observations and Findings

The inspector visited the campus fire department facilities to ascertain emergency preparedness. The facility 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 records provided by the Radiological and Environmental Management Office the inspector verified all personnel including back shifts had received training.

The current PUR-1 facility emergency plan and implementing procedures were current and readily available.

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 October 10, 2010 to reinforce training and were deemed adequate. The drill involved three hospitals, six ambulances, Purdue Emergency Medical Services personnel, the University Police Department and University Fire Department. Lessons learned appear to be adequately addressed in the after action report and corrected by the respective party having a deficiency.

c. Conclusion

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

7. 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 from October 28, 2009 to present
- Reactor Logbook No. 51, November 12, 2009 to June 11, 2010
- Reactor Logbook No. 52, June 11, 2010 to October 27, 2010
- Reactor Logbook No. 53, October 27, 2010 to present
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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. The inspector noted corresponding entries in the reactor and maintenance logs allowing detail tracking of events.

c. Conclusion

The licensee maintained records documenting all maintenance activities as required by TS.

8. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

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

- PUR-1 Procedures Manual
- PUR-1 Standard Operating Procedure 07-04, Initial Fuel Assembly Loading Procedure, reviewed by CORO August 31, 2007
- Reactor Logbook No. 51, November 12, 2009 to June 11, 2010
- Reactor Logbook No. 52, June 11, 2010 to October 27, 2010
- Reactor Logbook No. 53, October 27, 2010 to present
- Report on Reactor Operations for the Period January 1, 2009, to December 31, 2009, dated March 2010
- PUR-1 Standard Operating Procedure 07-05 Core Loading Procedure, reviewed by CORO September 7, 2007
- PUR-1 Standard Operating Procedure 07-01 Partial or Complete Disassembly and Reassembly of the Core, reviewed by CORO September 1, 2007

b. Observations and Findings:

Procedures for refueling, fuel movement, and TS required fuel inspections and surveillances were reviewed and approved as required. The inspector determined through the reactor operator logs that annual fuel inspection was performed on March 15, 2010 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 senior reactor operator was present for all fuel inspections.

c. Conclusion

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

9. Exit Meeting Summary

The inspector reviewed the inspection results with members or the licensee management at the conclusion of the inspection on May 16, 2011. 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

A. Hassanein Phd	Head of Nuclear Engineering
J. H. Jenkins	Director of Radiation Laboratories
E. C. Merritt	Reactor Supervisor
K. M. Ply	Fire Chief
J. F. Schweitzer	Director/Radiation Safety Officer
C. Echterling	Radiation Safety Office
M. J. R. Handy	Assistant 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

Discussed

50-182/2010-201-01	URI	Failure to have pen and ink temporary changes to procedures reviewed by the CORO.
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PARTIAL LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access Management System
CORO	Committee on Reactor Operations
IP	Inspection Procedure
No.	Number
NRC	U.S. Nuclear Regulatory Commission
PUR-1	Purdue University Reactor 1
Rev.	Revision
SRO	Senior Reactor Operator
TS	Technical Specifications
URI	Unresolved Item