

March 31, 2017

Cindy Montgomery
U.S. NRC
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

RE: Submission of 2016 Annual Report for PUR-1, Docket Number 50-182

Dear Ms. Montgomery:

Enclosed please find one copy of the Annual Report for the Purdue University Research Reactor, PUR-1, for the operating year 2016.

Should you have any questions or require further information, please contact me at 765.494.5764, or by e-mail at clive@purdue.edu.

I declare under penalty of perjury that the foregoing is true and correct. Executed on March 31, 2017.

Regards,



Clive Townsend
PUR-1, Reactor Supervisor

A020
NRR



REPORT ON REACTOR OPERATIONS

**For the Period
January 1, 2016 to December 31, 2016**

**PURDUE UNIVERSITY REACTOR-1 (PUR-1)
Facility Docket No. 50-182
PURDUE UNIVERSITY
West Lafayette, Indiana 47907**

March 2017

**Prepared by
Clive Townsend, Reactor Supervisor**

1. INTRODUCTION

This report is submitted to meet the requirements set forth in the technical specifications of the Purdue University Reactor (PUR-1) and 10 CFR 50.59 for the period January 1, 2016 to December 31, 2016.

During the reporting period of 2016, a total of 702 people visited the reactor facility. Those people included many different groups for the purpose of classroom instruction, pre-scheduled tours, and our reactor sharing program. This number is considerably down from previous years due to construction in the area.

2. PLANT DESIGN AND OPERATIONAL CHANGES

2.1 Facility Design Changes

The building began a refresh and update in the summer of 2016. This is the first update to the building since the original installation of the reactor in the early 1960s. Activities being done include completion of a previously unused storage area, accessibility improvements to come into compliance with the Americans with Disabilities Act (ADA). These improvements include the widening of doorways and installation of an elevator for greater access. Legacy duct work, conduit, and wiring is being removed for clarity, modernization and aesthetic purposes. The majority of this work was done in portions of the building not involving the reactor room.

The second major change to the PUR-1 involved a 20 year license renewal and 12 kWth power uprate. While this was approved in October 31, 2016, it was not fully implemented in 2016 and the facility continued to operate under the prior license until compliance could be met.

2.2 Performance Characteristics

The overall status of the PUR-1 facility was sustained satisfactorily during the reporting period. The facility maintained all required surveillances.

A visual inspection of a representative fuel assembly was conducted in May of this period and no abnormalities were noted. Monthly surveillances of process water showed no fission product contamination, thereby verifying fuel integrity.

2.3 Changes in Operating Procedures Concerning Safety of Facility Operations

No changes were made to Operating Procedures concerning safety of facility operations.

2.4 Results of Surveillance Tests and Inspections

2.4.1 Reactivity Limits

The reactivity worths of the control rods were determined. The measured values are:

Shim-safety #1: -2.63%

Shim-safety #2: -1.64%

The worth curves of the control rods were checked after the current loading and the excess reactivity was determined to be 0.41%, and the shutdown margin was determined to be 1.22% based on these values.

2.4.2 Reactor Safety Systems

On the week of July 10, the electronic calibration of all safety channels was completed.

Power calibration using gold foils was performed on December 9, 2016 during Run A2665. The gold foils indicated a power level very near the indicated power level. The calculated final power level error encompassed the indicated power level.

During the reporting period, the radiation area monitors and the continuous air monitor's PMs were maintained and checked for normal operation. The three area monitors and the CAM were each calibrated on January 22 and July 22.

The rod drop times were measured on August 3. The average rod drop times were 540 and 504 milliseconds for SS1 and SS2 respectively. These values are consistent with past measurements and are well within the specification limit of one second.

The air system isolation was tested on February 2 and July 28 and correct operation of the louvres was observed. The Condensate Valve was also inspected at this time.

2.4.3 Primary Coolant System

The weekly measurements of the pH of the primary coolant consistently gave readings between 4.6 and 4.8 during 2016.

During the weekly checks the conductivity of the primary coolant was measured and the values never exceeded 1.26 micromhos/cm. This

represents a resistivity of more than 793,600 ohm-cm, which exceeds the lower limit of 330,000 ohm-cm as given in the specifications.

The specification for coolant height above the core to be 13 feet was always either met or exceeded.

Monthly samples of the primary coolant were collected and analyzed by personnel from Radiological and Environmental Management for gross alpha and beta activity. No activity which would indicate failure of the fuel plates was identified in the samples.

2.4.4 Confinement

Readings between -0.04 and -0.13 inches of water were recorded weekly for the negative pressure in the reactor room. No operation or fuel handling was performed while the air pressure was below -0.05 inches of water. Following discovery of -0.04 inches of water, barriers to confinement were sealed to correct pressure.

2.4.5 Experiments

One sample of trinitite weighing 3 grams with trace amounts of uranium and plutonium was irradiated in 2016.

2.5 Changes, Tests and Experiments Requiring Commission Authorization

During 2016, there were two facility changes which was made under 10 CFR 50.59. This did not require prior authorization. These changes are detailed in internal memorandums dated September 19 and October 23.

2.6 Changes in Facility Staff

There were no changes in facility staff in 2016.

3. POWER GENERATION

Operation of the PUR-1 during 2016 consisted of 32 runs which generated 10.1 kWh of energy and covered an integrated running time of 69.2 hours. This gives an average power level of 146 Watts during operation.

4. UNSCHEDULED SHUTDOWNS

There were two unscheduled shutdown in 2017, a notable decrease in years prior. The first was due to a drop of SS1 following taking reactor power to 85%. At this level, magnet current has been suppressed such that the rod is weakly coupled to the drive and mechanical motion may result in rod drop. Second unscheduled shutdown initiated by operator due to saturated Fission Chamber signal causing rod withdrawal interlock.

5. MAINTENANCE

The HEPA filter for the room supply and exhaust air was checked upon during normal maintenance checks quarterly. Filters were replaced as needed.

6. RADIOACTIVE EFFLUENT RELEASES

No measurable amount of radioactive effluent was released to the environs beyond our effective control, as measured at or prior to the point of such release.

7. OCCUPATIONAL PERSONNEL RADIATION EXPOSURE

No radiation exposures greater than 25% of the appropriate limits of 10 CFR 20 were received during the reporting period.