

August 6, 2008

Dr. Eva J. Pell
Vice President for Research &
Dean of the Graduate School
The Pennsylvania State University
304 Old Main
University Park, PA 16802-1504

SUBJECT: NRC INSPECTION REPORT NO. 50-5/2008-201

Dear Dr. Pell:

This letter refers to the inspection conducted on July 22 to 25, 2008, at your Penn State Breazeale Reactor. 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 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 Nuclear Regulatory Commission (NRC) requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," 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 Agencywide Document Access 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 Marcus Voth at 301-415-1210.

Sincerely,

/RA/

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

Docket No. 50-5
License No. R-2

Enclosure: As stated
cc w/ enclosure: See next page

Pennsylvania State University

Docket No. 50-5

cc:

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Dr. Kenan Unlu, Director
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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: 50-5

License No: R-2

Report No: 50-5/2008-201

Licensee: The Pennsylvania State University

Facility: Penn State Breazeale Reactor

Location: University Park, Pennsylvania

Dates: July 22 to 25, 2008

Inspector: Marcus H. Voth, Lead
John J. Donohue
Gregory M. Schoenebeck

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

EXECUTIVE SUMMARY

The Pennsylvania State University
Penn State Breazeale Reactor Facility
NRC Inspection Report No. 50-5/2008-201

The primary focus of this routine, announced operations inspection was the onsite review of selected aspects of the licensee's Class II research reactor facility safety programs including organization and staffing; operations logs and records; requalification training; surveillance and limiting conditions for operation; experiments; emergency planning; maintenance logs and records; fuel handling logs and records; and transportation since the last NRC inspection of these areas. 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 was in compliance with organizational and staffing requirements for operation of the reactor facility.

Operations Logs and Records

- The licensee's operations record keeping program conformed to Technical Specification requirements.

Requalification Training

- Operator requalification was conducted as required by the Requalification Program. The lecture series was found to consist of a breadth of relevant topics.

Surveillance and Limiting Conditions for Operation

- Operations were found to be in compliance with the limiting conditions for operation and surveillances requirements as stated in the Technical Specifications.

Experiments

- The licensee reviewed and implemented experiments in accordance with their Technical Specifications and procedures.

Emergency Planning

- The records reviewed by the inspectors indicated that the PSBR Emergency Preparedness Plan, oversight, and training were being implemented as required.

Maintenance Logs and Records

- The licensee maintained records documenting principal maintenance activities in compliance with Technical Specification requirements.

Fuel Handling Logs and Records

- The licensee documented the fuel manipulations, performed inspections of the fuel and control rods, and verified reactor safety in accordance with Technical Specification requirements.

Transportation

- Radioactive material shipments by the licensee were conducted in accordance with applicable procedures and regulatory requirements.

REPORT DETAILS

Summary of Facility Status

The Pennsylvania State University (PSU) operates the one megawatt Penn State Breazeale Reactor (PSBR) as a major facility in its Radiation Science and Engineering Center (RSEC). The PSBR continued to be operated in support of graduate and undergraduate research, laboratory instruction, and a variety of radiation services. During the inspection, the reactor was operating approximately ten hours per day, performing multiple startups each day in support of user needs.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure (IP) 69001-02.01)

The inspectors reviewed the following to verify that the requirements of 10 CFR Part 55 and Section 6.0, Administrative Controls, of the Technical Specifications (TS) were being met:

- Radiation Science & Engineering Center 52nd Annual Progress Report, December 2007
- Reactor Control Logbook # 81, March 12, 2007 to September 5, 2007
- Reactor Control Logbook # 82, September 6, 2007 to February 1, 2008
- Reactor Control Logbook # 83, February 4, 2008 to July 14, 2008

b. Observations and Findings

The inspector reviewed the TS requirements and discussed the organizational structure for the PSBR with the Reactor Director. The inspector reviewed the minimum shift staffing requirements for reactor operations.

c. Conclusions

The licensee was in compliance with organizational and staffing requirements for operation of the reactor facility.

2. Operations Logs and Records

a. Inspection Scope (IP 69001-02.02)

The inspectors reviewed selected parts of the following reactor operations records to verify that the requirements of TS Section 6.7, Records, were being met:

- Reactor Control Logbook # 81, March 12, 2007 to September 5, 2007
- Reactor Control Logbook # 82, September 6, 2007 to February 1, 2008
- Reactor Control Logbook # 83, February 4, 2008 to July 14, 2008
- Procedure SOP-1, Reactor Operating Procedure, Rev. 15, March 2, 2007
- Procedure SOP-2, Daily Checkout Procedure, Rev. 19

b. Observations and Findings

Section VI.A.5.C of SOP-1, Conduct of Operations – Reactor Logbook Entries, provided reactor operators with criteria for making logbook entries. The inspectors found entries to be consistent with the procedural requirements; namely, such matters as pre-start checks, reactor startups, personnel on duty, experiments being performed, maintenance, surveillance, and core configurations.

c. Conclusions

The licensee's operations record keeping program conformed to Technical Specification requirements.

3. Requalification Training

a. Inspection Scope (IP 69001-02.04)

The inspectors reviewed the following to verify that the requirements of 10 CFR 50.55, Operators' Licenses, were being met:

- Procedure AP-3, Operator and Senior Operator Requalification, Rev. 2, October 17, 2005
- PSBR Operator Requalification File, 2006-2007
- PSBR Operator Training file, 2006-2007
- Operator Requalification files for two operators (randomly selected)

b. Observations and Findings

The inspectors found the licensee's requalification plan to include the regulatory requirements such as the two-year program; written, oral, and operating examinations; lectures; and procedure review. The written examination was determined to be of equivalent difficulty as those administered by the NRC; scores ranged from 89 to 99 percent. Files of two operators were reviewed in depth, one for a long-term operator and the second for a relatively new operator.

Records reviewed indicated perfect attendance at all training lectures, despite provisions for make-up of missed sessions. Topics included refresher subject material, lessons learned from incidents at other facilities, pre-job briefings, revised security requirements, and CPR training.

c. Conclusions

Operator requalification was conducted as required by the Requalification Program. The lecture series was found to consist of a breadth of relevant topics.

4. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001-02.05)

The inspectors reviewed the following to verify compliance with TS Section 3.0, Limiting Conditions for Operation, and to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0, Surveillance Requirements:

- Check and Calibration Procedure (CCP) Manual
- CCP-2, Reactor Thermal Power Calibration, completed August 23, 2007
- CCP-3, Pool Temperature Channel Calibration, completed May 22, 2007
- CCP Status Matrix
- SOP-2, Daily Checkout Procedure, Rev. 19
- SOP-4, Radiation, Evacuation and Alarm Checks, Rev. 10

b. Observations and Findings

The inspectors selected a sample of the TS limiting conditions for operation (LCOs) to verify implementation. In all cases the licensee demonstrated a method of compliance built into standard operating procedures (SOPs) and/or CCP which documented completion in reactor logbooks or on procedure data sheets. Records were well maintained and easily retrieved.

Surveillances less frequent than monthly were tracked on the CCP Status Matrix. Monthly surveillances were tracked as a subset using procedure SOP-4. Daily surveillances were recorded in the daily checkout procedure.

Two surveillance procedures were reviewed in depth for their technical approach, the reactor power and the pool temperature channel calibrations. The inspectors also observed preparations for testing of the emergency exhaust system filter efficiency.

c. Conclusions

Operations were found to be in compliance with the limiting conditions for operation and surveillances requirements as stated in the Technical Specifications.

5. Experiments

a. Inspection Scope (IP 69001-02.06)

The inspectors reviewed the following to verify that the requirements of TS Sections 3.7, Limitations on Experiments, and 6.4, Review and Approval of Experiments, were being met:

- Safety Review Committee Meeting Minutes from 2007 and 2008
- SOP-5, Experiment Evaluation and Authorization, Rev.4
- PSBR Experiment Evaluation and Authorization Forms for 2007 and 2008
- Reactor Control Logbook # 81, March 12, 2007 to September 5, 2007
- Reactor Control Logbook # 82, September 6, 2007 to February 1, 2008

b. Observations and Findings

The inspectors reviewed numerous experiment evaluation and authorization submittals. The objective of the review process by the PSBR staff was to ensure that the experiment:

- was in accordance with As Low As Reasonably Achievable (ALARA) practices,
- did not cause physical damage to the reactor facility, and
- did not violate TS limits on core parameters.

The inspectors observed several experiment manipulations and found that operations were consistent with implementing procedures.

Although there were no experiments among those reviewed that involved deviation from the previously reviewed experiment types, the licensee was cognizant and had review plans in place which met the requirements of 10 CFR 50.59 governing new or modified experiments.

c. Conclusions

The licensee reviewed and implemented experiments in accordance with their Technical Specifications and procedures.

6. Emergency Planning

a. Inspection Scope (IP 69001-02.10)

To verify compliance with 10 CFR 50.34, Appendix E, and TS 6.3.u, the inspectors reviewed the following documents and selective records:

- Penn State Breazeale Reactor Emergency Preparedness Plan (EPP), Rev. 4, September 21, 2000
- EP-1, Evacuation (EPP Implementation), Rev. 13, July 24, 2008
- CCP-22, Emergency Drill and Preparedness, Rev. 2, July 18, 2005
- CCP-28, Annual Review of PSBR Emergency Preparedness Plan, Rev. 2, April 2004
- File of minutes from critiques of exercises and evacuation drills conducted in 2007 and 2008.
- Training records for emergency on-site response personnel

b. Observation and Findings

The inspectors reviewed the current EPP which had not changed since the previous inspection. Four controlled copies the EPP procedures were readily available to users as required. Training and Emergency Plan review with the reactor staff, emergency exercises/drills, and critiques of the exercises/drills were conducted annually. The exercises/drills included testing of the communication link as required.

The inspectors verified that lists containing key emergency personnel notification information were readily available in the control room and the emergency support center.

c. Conclusions

The records reviewed by the inspectors indicated that the PSBR Emergency Preparedness Plan, oversight, and training were being implemented as required.

7. Maintenance Logs and Records

a. Inspection Scope (IP 69001-02.11)

The inspectors reviewed the following to verify compliance with the record-keeping requirements for preventive and corrective maintenance of electronic and reactor equipment pursuant to TS Sections 6.7.1.c and 6.7.1.g:

- Reactor Control Logbook # 81, March 12, 2007 to September 5, 2007
- Reactor Control Logbook # 82, September 6, 2007 to February 1, 2008
- Reactor Control Logbook # 83, February 4, 2008 to July 14, 2008
- Electronic Maintenance Log, March 2003 to present
- Software Change Log for the AECL Console Installation, August 13, 1991 to present
- AP-4, Identification, Evaluation and Documentation of Safety System Failures, Abnormal Events, and Operational Events, Rev. 3, May 18, 2004
- AP-13, Maintenance/Repair, Rev. 4, September 6, 2004
- File of Open RSEC Condition Reporting Forms, 2008-017 through 2008-029

b. Observations and Findings

The inspectors reviewed selected portions of logbooks governing the interval of time since the previous inspection. Maintenance was logged in one of three places referenced above depending on whether it affected reactor console software, electronics, or other auxiliary equipment. Maintenance that was not related to software or electronics was logged in the reactor control logbooks. Major maintenance activities were found documented in a level of detail commensurate with the safety significance of the activity.

The licensee maintained a file of condition report forms, a system which allowed any staff member to document in writing observed or suspected problems for management attention. The inspectors found that matters reported were being given timely review and resolution.

c. Conclusions

The licensee maintained records documenting principal maintenance activities in compliance with Technical Specification requirements.

8. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001-02.12)

The inspectors reviewed the following to verify that requirements of TS Sections 3.1, Reactor Core Parameters, 4.1.3, TRIGA Fuel Elements, and 6.3.b, Operating

Procedures (Core loading, unloading, and fuel movement within the reactor) were being met:

- SOP-3, Core Loading and Fuel Handling
- CCP-1, Control Rod Speed and Scram Time Checks
- CCP-11, Core Reactivity Evaluation
- CCP-16, Inspection of Fuel Elements
- CCP-17, Control Rod Inspection
- Core 53 Master
- Safety Review Committee Meeting Minutes, November 16, 2007
- Reactor Control Logbook # 81, March 12, 2007 to September 5, 2007
- Reactor Control Logbook # 82, September 6, 2007 to February 1, 2008

b. Observations and Find

The inspectors reviewed an appreciable number of fuel handling records which included the reactor pool leak repair and reactor core 53 configuration. The records filed in the Core 53 Master Procedure binder indicated that TS safety limits were not exceeded.

The records also indicated that under procedural control the licensee moved spent fuel to storage racks in the reactor pool, recording fuel element serial numbers, storage rack locations, and time of fuel movement. Inspections of the fuel and control rods were performed using written operating procedures which implemented TS requirements.

c. Conclusions

The licensee documented the fuel manipulations, performed inspections of the fuel and control rods, and verified reactor safety in accordance with Technical Specification requirements.

9. Transportation

a. Inspection Scope (IP 86740)

To verify compliance with 10 CFR Part 71 and 49 CFR Parts 100-185 and procedural compliance for transporting or shipping licensed radioactive material, the inspectors reviewed the following:

- Selected records of various types of radioactive material shipments
- Radiation Protection Procedure RP-Shipping-10, Radioactive Receipt and Shipping Procedure, January 2007
- Completed RP-Shipping-10, Appendix B Forms, Shipment Checklist for a Limited Quantity of Radioactive from January 2008 to present
- Completed RP-Shipping-10, Appendix C Forms, Type A Quantities Only, dated from January 2008 to present
- Completed RP-Shipping-11, Low Level Specific Activity Waste Pickup, dated from January 2008 to present

b. Observations and Findings

Through records reviewed and discussions with licensee personnel, the inspectors determined that the licensee had shipped various packages of radioactive material since the previous inspection. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. All radioactive material records reviewed by the inspectors had been completed in accordance with the Department of Transportation (DOT) and NRC regulations.

The inspectors verified that the licensee maintained copies of shipment recipients' licenses to possess radioactive material as required and that the licensees were verified prior to shipment. The training of staff members responsible for shipping material was also reviewed. The inspectors verified that the shippers' training met NRC and DOT requirements.

c. Conclusions

Radioactive material shipments by the licensee were conducted in accordance with applicable procedures and regulatory requirements.

10. Exit Interview

The inspection scope and results were summarized on July 25, 2008, with members of licensee management. The inspectors described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

A. Atchley, Associate Dean of Engineering
E. Boeldt, Manager, Radiation Protection
M. Bryan, Research Engineer
M. Claver, Director, Environmental Health and Safety
C. Davison, Research and Education Specialist
B. Heidrich, Senior Research Assistant
M. Morlang, Research Engineer
E. Pell, Vice President for Research and Dean of the Graduate School
D. Sathianathan, Penn State Reactor Safeguards Committee, Chairman
M. Trump, Associate Director for Operations
K. Unlu, Director, Radiation Science & Engineering Center

INSPECTION PROCEDURES USED

IP 69001 Class II Research and Test Reactors
IP 86740 Transportation

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened None
Closed None
Discussed None

PARTIAL LIST OF ACRONYMS USED

ADAMS Agencywide Document Access Management System
ALARA As Low As Reasonably Achievable
CCP Checks and Calibrations Procedures
CFR Code of Federal Regulations
DOT Department of Transportation
EPP Emergency Preparedness Plan
IP Inspection Procedure
LCO Limiting Conditions for Operation
NRC Nuclear Regulatory Commission
PARS Publicly Available Records
PSBR Penn State Breazeale Reactor
PSU Penn State University
Rev. Revision
RSEC Radiation Science and Engineering Center
SOP Standard Operating Procedure
TS Technical Specifications