

August 24, 2006

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.50-05/2006-201

Dear Dr. Pell:

This refers to the inspection conducted on April 3 - 7, 2006, at the Pennsylvania State University Breazeale Research Reactor. 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 noncompliance of NRC requirements or safety concerns 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 document 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 Dan Hughes at NRC headquarters at 301-415-1631.

Sincerely,

**/RA/**

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

Docket No. 50-05  
License No. R-2

Enclosure: NRC Inspection Report No. 50-05/2006-201  
cc w/enclosure: See next page

Pennsylvania State University  
cc:

Mr. Eric J. Boeldt, Manager of  
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The Pennsylvania State University  
304 Old Main  
University Park, PA 16802-1504

Dr. C. Frederick Sears, Director  
The Pennsylvania State University  
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University Park, PA 16802-1504

Mr. William P. Dornsife, 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

Docket No: 50-005

License No: R-2

Report No: 50-05/2006-201

Licensee: Pennsylvania State University

Facility: Breazeale Research Reactor

Location: University Park, Pennsylvania

Dates: April 3 - 7, 2006

Inspector: Thomas F. Dragoun

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

## EXECUTIVE SUMMARY

The focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II non-power research reactor operation including: procedures, requalification program, surveillance and limiting conditions for operation, experiments, health physics program, and oversight by the Safeguards Committee.

The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

### Procedures

- The procedural control and implementation program satisfied Technical Specification requirements.

### Requalification Training

- Operator requalification was conducted as required by the Requalification Program.

### Surveillance and Limiting Conditions for Operations

- The records review indicated that the surveillance program was conducted in accordance with Technical Specification requirements.

### Experiments

- Experiments were conducted within the constraints established by the Technical Specifications.

### Health Physics

- The Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

### Committees, Audits, and Reviews

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

## Report Details

### Summary of Plant Status

The Director provided a detailed tour of the facility for the benefit of the incoming NRC inspector. The reactor was started and shutdown several times for experiments, training, and service work. The inspector observed the 8 o'clock daily coordination meeting for all staff.

#### 1. PROCEDURES

##### a. Inspection Scope (Inspection Procedure (IP) 69001)

The inspector reviewed the following to determine if procedures were maintained as required by Technical Specification 6.3 "Operating Procedures", NRC requirements in Title 10 of the Code of Federal Regulations, and licensee administrative requirements:

- Use of "Change Record for Procedures" checklist to review changes made to following procedures:
  - AOP-3, "Loss of Cobalt-60 Pool Water" Revision 3 reviewed on August 20, 2003
  - CCP-9, "Transient Rod Drive and Air Supply" Revision 4 reviewed on January 16, 2006
  - SOP-2, "Daily Checkout Procedure" Revision 17 reviewed on January 24, 2006
- Procedures conducted for compliance with Technical Specifications as follows:
  - CCP-1 "Control Rod Speed and Scram Time Checks" Revision 5 dated December 10, 2004 satisfies requirements in TS Sections 4.2.2, 3.13, 3.21, 3.22, and 3.26.
  - CCP-8 "Calibration of Air Monitors" Revision 8 dated February 13, 2006 satisfies TS section 3.6.1 and 4.6.1.
  - CCP-18 "Review of Procedures" Revision 4 dated October 17, 2005 satisfies the administration requirement for a biennial review of procedures.
- Observed a reactor startup using procedure SOP-1, "Reactor Operating Procedure" Revision 13
- Procedures AP-1 Revision 2, AP-6 Revision 3, and AP-8 Revision 5 were compared to verify that the benefits from a consistent format was also applied to non-technical procedures

##### b. Observations and Findings

The inspector noted that all procedures at the facility have the same format and content and provide comprehensive guidance. These factors contribute to proper implementation by the staff. Procedures were readily available when requested by the inspector. The inspector was often able to find procedures and

other documentation unassisted due to the highly structured filling system. All procedures required by the TS were available.

c. Conclusions

The procedural control and implementation program satisfied Technical Specification requirements.

2. REQUALIFICATION TRAINING

a. Inspection Scope (IP 69001)

The inspector reviewed selected records to determine if the Requalification Program approved by the NRC on July 9, 1997, and requirements in 10 CFR 55.59 were implemented. The review included:

- operator license status
- operator training records
- operator physical examination records
- operator examination records
- operator active duty status

b. Observations and Findings

There were no changes to this program since the last NRC inspection. The inspector reviewed the records of the physical exams, annual evaluations, biennial written exams, and reactivity manipulations for four of the operators. All were up-to-date with the requirements of the program.

c. Conclusions

Operator requalification was conducted as required by the Requalification Program.

3. SURVEILLANCE

a. Inspection Scope (IP 69001)

The inspector reviewed the following regarding conduct of surveillance on safety systems as specified by TS 4.0:

- Procedure CCP-1, "Control Rod Speed and Scram Time Checks" Revision 5
- Procedure SOP-2, "Daily Checkout Procedure" Revision 11, effective January 19, 2004
- Procedure CCP-7, "Wide Range Channel Electronic Checks" Revision 2
- Procedure CCP-14, "Power Range Channel Electronic Checks" Revision 2

- Procedure CCP-9, "Transient Rod Drive and Air Supply" Revision 4

b. Observations and Findings

The data records were well maintained and showed that surveillance requirements specified in TS were completed on schedule and in accordance with licensee procedures. All the recorded results were within the TS and procedurally prescribed parameters.

c. Conclusions

The records review indicated that the surveillance program was conducted in accordance with Technical Specification requirements.

4. EXPERIMENTS

a. Inspection Scope (IP 69001)

The inspector reviewed the following to confirm that experiments were conducted in accordance with TS 3.7, "Limitations of Experiments" and TS 6.4, "Review and Approval of Experiments":

- Procedure SOP 9, "Pneumatic Transfer System Operation" Revision 3, dated October 7, 2005
- Procedure SOP 5, "Experiment Evaluation and Authorization" Revision 4
- Procedure SOP-7, "Qualification of Reactor Pool Reactor Operating Positions" Revision 4
- Memorandum from the Radiation Safety Officer and the Associate Director for Operations dated October 17, 2005 authorizing certain personnel to use of the rabbit system

b. Observations and Findings

The inspector observed the experimental samples placed in-core and the process for relocating the reactor core for certain experiments. These activities were conducted in accordance with the applicable procedure. Operation of the pneumatic transfer system (rabbit system) was described in detail by the licensee.

c. Conclusions

Experiments were conducted within the constraints established by the TS.

5. HEALTH PHYSICS

The inspector reviewed the following to verify compliance with 10 CFR Part 20 and TS Section 6 requirements and procedural requirements:

- Administrative Procedure AP-18, "Radiation Protection Program" Revision 2, effective January 13, 2004
- Annual Operating Report for Fiscal Year 2004 - 2005 dated December 15, 2005
- NRC Materials License Number 37 - 00185 - 04, Docket 030 - 00952, expires September 30, 2008
- Policy "Rules and Procedures for the use of Radioactive Material at the Pennsylvania State University," Spring 2001
- Radiation survey maps, "Radioactive Material Survey" for all levels in the reactor building required to be completed weekly. Data for 2006
- Quarterly radiation surveys. Data for 2004 and 2005
- Personnel exposure records for 2005
- Control of solid, liquid, and gaseous radioactive waste
- Organization and staffing of the radiation protection function of the Environmental Health and Safety program

b. Observations and Findings

The reactor radiation protection program had not changed since the last inspection and remains a subset of the campus program with oversight provided by the University Isotopes Committee (UIC). The program was documented and its status was reviewed annually by the RSO as required by 10 CFR 20.1101.

Training of new radiation workers and experimenters was a multi-step process. The initial training consisted of a self-paced computerized program available on the Universities web site. The next step includes a practical demonstration of the protective devices and techniques. A 40-question exam covering the general radiation protection concepts was administered and successful candidates were referred to the reactor staff or Principal Investigator for the detailed training associated with the particular apparatus. The content of this training satisfied the requirements in 10 CFR 19.12.

Caution signs and postings were as required by 10 CFR 20, Subpart J. Routine radiological surveys were completed on a weekly, monthly, and quarterly basis in accordance with program requirements. Equipment used for these activities were maintained, calibrated and used acceptably. The survey reports were particularly well detailed and provided a thorough record and description of the radiological status of the area, including the condition of posted warning signs, presence of radwaste, condition of survey meters stationed in the area, and abnormal radiation levels.

Personnel dosimetry records indicated doses were well below NRC limits and, with one exception, were below the licensee's administrative limit of 10% of the NRC limit (500 mrem per year). The RSO stated that efforts to reduce the individuals dose are continuing.

The calculation of the concentration of radioactivity in liquid waste are completed by the RSO. If the liquid was determined to meet the criteria for discharge to the

sewer, the RSO notifies the reactor staff. The liquid may be discharged to the sewer or processed through an evaporator.

c. Conclusions

The radiation protection program acceptably satisfied NRC requirements.

6. COMMITTEES, AUDITS, AND REVIEWS

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2 were completed:

- Reactor Safeguards Committee (RSC) composition.
- Committee meeting minutes for January 17, 2006; April 12, October 11, and January 18, 2005

b. Observations and Findings

The meeting minutes showed that the safeguards committee met as required by the TS with a quorum present. The committee composition was as specified in the TS. Five members were from the science and engineering fields and one member was a health physicist. The issues and oversight provided by the committee were in accordance with the review function with effective follow up of decisions.

c. Conclusions

Audits were conducted by the RSC according to the requirements specified in the TS.

7. EXIT INTERVIEW

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on April 7, 2006. The licensee acknowledged the findings presented.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

E. Boeldt, Manager, Radiation Protection  
M. Bryan, Research Engineer  
L. Burton, Dean of Engineering  
M. Claver, Director, Environmental Health and Safety  
T. Flinchbaugh, Associate Director for Operations  
M. Linsley, EHS Program Manager  
T. Litzinger, Chair, Safeguards Committee  
M. Morlang, Reactor Engineer/Supervisor RSEC  
E. Pell, Vice President for Research and Dean of the Graduate School  
F. Sears, Director, Radiation Science & Engineering Center

## **INSPECTION PROCEDURES USED**

IP 69001            CLASS II NON-POWER REACTORS

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

OPENED:            None

CLOSED:            None

## **LIST OF ACRONYMS USED**

CFR	Code of Federal Regulations
IP	Inspection Procedure
NRC	Nuclear Regulatory Commission
RP	Radiation Protection
RSC	Penn State Reactor Safeguards Committee
RSO	Radiation Safety Officer
TS	Technical Specifications