

April 2, 2004

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 ANNOUNCED INSPECTION REPORT NO. 50-05/2004-202

Dear Dr. Pell:

This letter refers to the inspection conducted on February 23 - 27, 2004, 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 2.790 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 Thomas Dragoun in King of Prussia, PA at 610-337-5373.

Sincerely,

***/RA by Marvin Mendonca Acting for/***

Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report No. 50-005/2004-202  
cc w/enclosure: See next page

Pennsylvania State University

Docket No. 50-5

cc:

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

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

Mr. William P. Dornsife, Director  
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Department of Environmental Protection  
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Harrisburg, PA 17105-8469

Test, Research, and Training  
Reactor Newsletter  
University of Florida  
202 Nuclear Sciences Center  
Gainesville, FL 32611

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Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket No. 50-05  
License No. R-2  
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cc w/enclosure: See next page

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**ACCESSION NO.: ML040910200**

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U. S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-005

License No: R-2

Report No: 50-005/2004-202

Licensee: Pennsylvania State University

Facility: Breazeale Research Reactor

Location: University Park, Pennsylvania

Dates: February 23 - 27, 2004

Inspector: Thomas F. Dragoun

Approved by: Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of selected aspects of the organizational structure and functions, operations, radiation protection program, surveillances, committees, audits and reviews, and material control and accountability since the last NRC inspection of this program.

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

### ORGANIZATIONAL STRUCTURE AND FUNCTIONS

The organizational structure and functions were consistent with Technical Specification requirements.

### OPERATIONS

The repeated occurrences of similar reportable events were given management attention and corrective actions have been planned.

### RADIATION PROTECTION

The radiation protection program acceptably satisfied NRC requirements. Shipment of radioactive material complied with DOT regulations.

### SURVEILLANCE

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

### COMMITTEES, AUDITS, AND REVIEWS

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

### MATERIAL CONTROL AND ACCOUNTABILITY

Special Nuclear Materials were acceptably controlled and inventoried.

## Report Details

### Summary of Plant Status

A nuclear engineering class measuring control rod worth, shipments of Argon-41, and final stage proposals for installation of experimental beam tubes were observed during this inspection. The reactor was started and shut down several times for experiments, training, and service work.

#### 1. ORGANIZATIONAL STRUCTURE AND FUNCTIONS

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

The inspector reviewed selected aspects of:

- organization and staffing
- qualifications
- management responsibilities
- administrative controls

##### b. Observations and Findings

The organizational structure and staffing at the facility was as required by the Technical Specifications (TS). The staffing level and supervisory personnel remained unchanged since the last inspection. Succession planning was underway in anticipation of possible staff retirements. The total number of licensed reactor operators remained the same with losses of student operators through graduations replaced by new trainees. Support of the operations schedule was acceptable with current staff providing the personnel required by TS 6.1.3. However, increased utilization of the reactor was anticipated if proposals for new experiments and installation of new beam ports are approved and funded.

Review of records verified that management responsibilities were administered as required by Technical Specifications and applicable procedures.

##### c. Conclusions

The organizational structure and functions were consistent with Technical Specification requirements.

#### 2. OPERATIONS

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

The inspector reviewed selected aspects of:

- Licensee letter dated February 20, 1998, "Reportable Occurrence - TS 6.1.3.a(1)." Operator not present in control room for 5 seconds while the reactor was critical.

- Licensee letter dated March 30, 2000, "Reportable Occurrence: Violation of Tech Spec 6.1.3.a.1." Console key was not in off position and removed while the reactor was shut down but no operator at the console for 3 minutes.
- Licensee letter dated June 7, 2001, "Reportable Occurrence: Violation of Tech Spec 6.1.3.a.1." Console key not removed while control room unoccupied for 75 seconds.
- Licensee letter dated January 6, 2004, "Reportable Occurrence: Violation of Tech Spec 6.1.3.a.1." Console key not removed after performance of routine surveillance with the reactor shutdown.
- Licensee initial corrective actions
- Actions to prevent recurrence

b. Observations and Findings

The inspector discussed with the Director the corrective actions to be taken for the latest failure by the reactor operators to remove the control console key when required by the TS. There have been four instances of similar reportable events since 1998. The Director stated that the failure of previous corrective action to prevent recurrence was acknowledged. Management decided to install an electronic sensor in the control room to detect the console key. This equipment was similar to the anti-theft systems used by retail stores.

c. Conclusions

The repeated occurrences of similar reportable events were given management attention and corrective actions have been planned.

3. RADIATION PROTECTION

a. Inspection Scope (IP 69001)

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 reviews of the radiation protection program using the procedure AP -18 checklist. Reports dated December 18, 2003, December 9, 2002, and December 11, 2001.
- 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 21 surveys completed between September 2003 and February 2004.
- RPO Procedure "RP-Shipping-10: Radioactive Material Receipt and Shipping Procedure" updated January 27, 2003. Appendix C, "Type A Quantities Only" updated January 27, 2003. Data for a shipment of Argon-41 on February 25, 2004.
- Self certification and testing of shipping packaging called "TTSEAR -1" completed by Tru-Tec Services, Inc.
- Completed licensee form "Sanitary Sewer Release Form" dated June 30, 2003.

- Quattro Pro computer file, "HP04/intranet/waste/liqspike1.wb3."
- Personnel exposure records for the current and previous years.
- Calibration and maintenance of portable survey instruments.
- 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

Environmental Health and Safety - Radiation Protection Office consists of 5 Health Physicists (HP) and a part time secretary. The personnel from this group with responsibility for elements of the reactor program (e.g., radioactive material shipments) appear to be qualified by training and experience to perform the assignment. 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. The reactor staff, usually the Manager of Operations and Training, also conducts an annual review of radiation protection activities in accordance with reactor procedures AP-16, 17, and 18. No significant deficiencies were reported by these reviews. The Manager of Radiation Protection indicated that as a permanent member of the Reactor Safeguards Committee he ensured the incorporation of radiation protection requirements in the various reactor operations procedures and programs.

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 below the licensee's administrative limit of 10% of the NRC limit.

The inspector observed the production of, and two shipments of, radioactive Argon-41 in special packaging. The certification of the packaging, labeling of the package, placarding on the truck, required DOT hazmat training of licensee personnel and truck driver, radiation surveys, and shipping documents were determined to be in compliance with DOT regulations.

The calculation and controls of one liquid waste discharge to the sewer and data for gaseous emission for the two previous years were reviewed and determined to be below the NRC release limits.



c. Conclusions

The radiation protection program acceptably satisfied NRC requirements. Shipment of radioactive material complied with DOT regulations.

4. 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 4, effective April 11, 2002. Data for September 29, August 25, and August 11, 2003.
- Procedure SOP-2, "Daily Checkout Procedure" revision 11, effective January 19, 2004. Data for entire year 2003.

b. Observations and Findings

The data records were well maintained and showed that surveillance requirements specified in TS Sections 4.2.2 and 4.2.3 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.

5. 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 13, 2004; October 14, July 15, April 8, and January 28, 2003; October 22, 2002.

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. 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.

6. MATERIAL CONTROL AND ACCOUNTABILITY

a. Inspection Scope (IP 85102)

The inspector reviewed:

- Draft report "Retrieval of Uranium from Pennsylvania State University" by GEM Technologies, undated, mailed on December 4, 2003 to the licensee.
- NRC Bulletin 2003-04: Rebaselining of Data in the Nuclear Materials Management and Safeguards System, dated October 8, 2003.
- Material Balance Reports (DOE/NRC Form-742 and 742c) and Material Transaction Reports (DOE/NRC Form-741) for the reporting period March 30 to October 1, 2003.

b. Observations and Findings

For many years the licensee stored DOE-owned, unirradiated, low enriched Pathfinder reactor fuel on campus. A DOE contractor returned the fuel to DOE. The procedures for packaging and shipment of the fuel were developed and implemented by the contractor General Engineering and Management Technologies, Inc. (GEM) employed by DOE Sandia Office. The licensee stated that involvement of University staff was minimal. However, the 208 fuel elements had been transferred to the licensee's Reporting Identification Symbol (RIS) code in October 1965. On completion of the last of 10 shipments on November 18, 2003, the licensee filed a DOE/NRC Form-741 transaction report for the reporting period October 1 to December 23, 2003. This non-standard reporting period was in response to earlier direction from NMMSS to migrate the reporting cycle from biannual to annual reporting.

In response to irregularities in the NMMSS records, found during an audit by the DOE Inspector General, NRC licensees possessing SNM were requested to submit a one-time report of holdings to "baseline" the data. The licensee fully complied with this request in a timely manner.

Prior to the recent major changes, records indicated that all nuclear material was accurately accounted for. All Material Balance Reports (DOE/NRC Form-742 and 742c) submitted by the licensee for these periods acceptably satisfied the requirements specified in 10 CFR 70.53.

c. Conclusions

Special Nuclear Materials were acceptably controlled and inventoried.

7. EXIT INTERVIEW

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on February 27, 2004. The licensee acknowledged the findings presented.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

E. Boeldt, Manager, Radiation Protection  
L. Burton, Dean of Engineering  
M. Claver, Director, Environmental Health and Safety  
T. Flinchbaugh, Manager, Operations and Training RSEC  
M. Morlang, Reactor Engineer/Supervisor RSEC  
F. Sears, Director, Radiation Science & Engineering Center

## **INSPECTION PROCEDURES USED**

IP 69001      CLASS II NON-POWER REACTORS  
IP 85102      MATERIAL CONTROL AND ACCOUNTING

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

OPENED:      None  
CLOSED:      None

## **LIST OF ACRONYMS USED**

CFR              Code of Federal Regulations  
DOE              Department of Energy  
NMMSS          Nuclear Materials Management and Safeguards System  
NRC              Nuclear Regulatory Commission  
RIS              Reporting Identification Symbol  
RP                Radiation Protection  
RSC              Penn State Reactor Safeguards Committee  
RSO              Radiation Safety Officer  
SNM              Special Nuclear Material  
TS                Technical Specifications