

May 23, 2018

Dr. Kenan Unlu, Director  
The Pennsylvania State University  
Breazeale Nuclear Reactor  
Radiation Science and Engineering Center  
University Park, PA 16802-2301

SUBJECT: PENNSYLVANIA STATE UNIVERSITY - U.S. NUCLEAR REGULATORY  
COMMISSION SAFETY INSPECTION REPORT NO. 05000005/2018-201

Dear Dr. Unlu:

From May 9-11, 2018, the U.S. Nuclear Regulatory Commission (NRC) conducted an announced safety inspection at your Pennsylvania State University Breazeale Reactor facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

During the inspection, the NRC staff examined activities conducted under your license as they relate to public health and safety to ensure compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. Based on the results of this inspection, no findings of non-compliance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (Agencywide Documents and 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 Mr. William Schuster at 301 415-1590 or by electronic mail at [William.Schuster@nrc.gov](mailto:William.Schuster@nrc.gov).

Sincerely,

*/RA/*

Anthony J. Mendiola, Chief  
Research and Test Reactors Oversight Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Docket No. 50-005  
License No. R-2

Enclosure:  
As stated

cc: See next page

Pennsylvania State University

Docket No. 50-005

cc:

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SUBJECT: PENNSYLVANIA STATE UNIVERSITY - U.S. NUCLEAR REGULATORY  
COMMISSION SAFETY INSPECTION REPORT NO. 05000005/2018-201  
DATE: MAY 23, 2018

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<b>DATE</b>	5/22/18	5/22/18	5/23/18

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**OFFICE OF NUCLEAR REACTOR REGULATION**

Docket No: 50-005

License No: R-2

Report No: 05000005/2018-201

Licensee: The Pennsylvania State University

Facility: Penn State Breazeale Reactor

Location: University Park, Pennsylvania

Dates: May 9-11, 2018

Inspector: William Schuster

Approved by: Anthony J. Mendiola, Chief  
Research and Test Reactors Oversight Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Enclosure

## EXECUTIVE SUMMARY

The Pennsylvania State University  
Penn State Breazeale Reactor Facility  
NRC Inspection Report No. 05000005/2018-201

The primary focus of this routine, announced operations inspection was the on-site review of selected aspects of the Pennsylvania State University (the licensee) Class II research reactor facility safety program, including: (1) organization and staffing, (2) operations logs and records, (3) requalification training, (4) surveillance and limiting conditions for operation, (5) emergency planning, (6) maintenance logs and records, and (7) fuel handling logs and records since the last U.S. Nuclear Regulatory Commission (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 Penn State Breazeale Reactor (PSBR) organization and staffing was consistent with technical specification (TS) requirements.

### Operation Logs and Records

- No deficiencies were noted with logbook records, retention met or exceeded the retention requirements of the PSBR TS.

### Requalification and Training

- The requalification program was being conducted consistently with the TS and Administrative Procedure (AP)-3.

### Surveillance and Limiting Conditions for Operation

- Operations were found in compliance with the limiting conditions for operation and surveillances requirements as stated in the TS.

### Emergency Planning

- The records reviewed by the inspector 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 TS requirements.

### Fuel Handling Logs and Records

- The licensee conducted and documented fuel handling activities in accordance with TS requirements.

## REPORT DETAILS

### Summary of Facility Status

The Pennsylvania State University (the licensee) continues to operate the 1-megawatt PSBR in support of education, research, and service. During the inspection, reactor utilization was in support of the service category conducting experiment irradiations.

#### 1. Organization and Staffing

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

To ensure that the requirements of TS 6.1, "Organization," were being met, the inspector reviewed the following:

- Facility Operating License No. R-2, Docket No. 50-5, Amendment No. 38
- Appendix A to Facility Operating License No. R-2, Amendment No. 38
- Organization Chart, Radiation Science and Engineering Center
- Standard Operating Procedure (SOP)-1, "Reactor Operator Procedure"
- PSBR Annual Operating Report, fiscal year (FY) 2015-2016 and FY 2016-2017
- PSBR Logbooks 100, 102, 103

##### b. Observations and Findings

Since the previous NRC inspection (Inspection Report No. 50-5/2016-201), there have been personnel changes in the organization at the PSBR as specified by TS 6.1.1. A new Associate Director for Operations (Level 2) was selected and meets the requirements specified in the TS and American National Standards Institute/American National Standards-15.4-1988.

A list of facility personnel is posted in the control room in accordance with TS 6.1.3 b. NRC staff found the list to contain the names and contact information for management, operations, radiation safety, and other support personnel. The list was found to have current management and operational personnel listed.

The inspector reviewed PSBR Logbook entries and determined that staffing satisfied the requirements of TS 6.1.3.a.

##### c. Conclusion

The PSBR organization and staffing was consistent with TS requirements.

## 2. Operations Logs and Records

### a. Inspection Scope (IP 69001-02.02)

To ensure that the requirements of TS 6.7, "Records," were being met, the inspector reviewed the following:

- SOP-1, "Reactor Operating Procedure"
- AP-3, "Operator and Senior Operator Requalification"
- AP-4 Event Evaluation Log Sheet, "Identification, Evaluation and Documentation of Safety System Failures, Abnormal Events, and Operational Events"
- PSBR Logbooks 100, 102, 103

### b. Observations and Findings

Logbook entries were maintained in accordance with approved procedures and uniformity. By PSBR procedures, certain items were to be entered in the console logbook, such as requalification requirements, completed compliance checks, maintenance items, and core position. Compliance checks were observed to be stamped with retention in accordance with TS 6.7.

### c. Conclusion

No deficiencies were noted with logbook records, retention met or exceeded the retention requirements of the TS.

## 3. Requalification Training

### a. Inspection Scope (IP 69001-02.04)

To ensure that the requalification training requirements of TS 6.1.4, "Selection and Training of Personnel"; TS 6.2.4, "Audit"; TS 6.7.2, "Records to be Retained for at Least One Training Cycle"; and, Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53(h), were being met, the inspector reviewed the following:

- AP-3, "Operator and Senior Operator Requalification"
- AP-4, Event Evaluation Log Sheet, "Identification, Evaluation and Documentation of Safety System Failures, Abnormal Events, and Operational Events"
- Operation and Emergency Procedures Exam Results, 2016-2018
- Requalification Training Records and Presentations, 2016-2018
- Annual Key-on Hours and Manipulations spreadsheet
- Operator's License (Medical) Matrix
- PSBR Logbooks 100, 102, 103



b. Observations and Findings

The requalification plan is captured in AP-3 and contains annual on the job training, oral test, and operational test requirements. Training lectures were done throughout the year. Written, operations, emergency, and biennial medical exams were completed, as required.

c. Conclusion

The requalification program was being conducted consistently with the TSs and procedures.

**4. Surveillance and Limiting Conditions for Operation**

a. Inspection Scope (IP 69001-02.08)

To ensure that the requirements of TS 3.0, "Limiting Conditions for Operation" (LCO), and TS 4.0, "Surveillance Requirements," were being met, the inspector reviewed the following:

- SOP-4A, "Radiation, Evacuation, and Alarm Checks," and completed forms
- SOP-4B, "Safety Support Equipment," and completed forms
- Check and Calibration Procedure (CCP)-2, "Reactor Thermal Power Calibration"
- CCP-28, "Review of Emergency Preparedness Plan"
- CCP-34, "Console Preventative Maintenance"
- CCP-35, "Console Calibration/Maintenance"
- CCP status matrix
- PSBR Logbooks 100, 102, 103

b. Observations and Findings

The inspector selected a sample of the TS-required surveillances to verify implementation and determined that the frequency and outcome met TS requirements. The inspector selected a sample of non TS-required calibration/maintenance activities of the reactor console equipment and determined that they were being conducted in accordance with the licensee's procedural requirements using calibrated measurement and test equipment. The LCOs were maintained in accordance with the TS and licensee's procedural requirements.

c. Conclusion

Operations were found to be in compliance with the LCOs and surveillance requirements as stated in the TS.

## 5. Emergency Planning

### a. Inspection Scope (IP 69001-02.10)

To ensure that the emergency preparedness requirements of 10 CFR 50.34, Appendix E, and TS 6.3.u. were being met, the inspector reviewed the following:

- PSBR Emergency Preparedness Plan (EPP)
- Emergency Procedure (EP)-1, "EPP Implementation"
- EP-11, "Unauthorized Intrusion"
- CCP-20, "University Police Training"
- CCP-21, "Emergency Support Center Supplies Check"
- CCP-22, "Emergency Drill and Preparedness"
- CCP-28, "Review of Emergency Preparedness Plan"
- Memorandum of Understanding with University Police, including mutual aid agreements with other local area Police Departments
- Memorandum of Understanding with Alpha Fire Company
- Memorandum of Understanding with Mount Nittany Medical Center including Hospital Procedures
- Emergency Contact List
- Audit Reports, 2016 and 2017

### b. Observation and Findings

The inspector reviewed the current EPP, which had not changed since the previous inspection; revisions typically were reviewed and approved through the individual implementing procedures. The EPP and implementing procedures were current and readily available in several locations for use as required. The biennial audit (TS 6.2.4) was completed in two parts; half of the topics required to be audited were covered in 2016, with the remaining topics audited in 2017. The emergency planning topics were audited in 2017, as required by TS 6.2.4.d. The inspector reviewed the equipment check semi-annual surveillance for the emergency supply cabinets.

The inspector reviewed training records for reactor staff and University Police and verified training was being completed annually, as required. Six training sessions for police officers were held in the summer and fall of 2017. Two training sessions were held in the spring of 2017 for new police officers.

Additionally, the facility is required to perform an annual emergency drill in accordance with TS. Drills for 2016 and 2017 were conducted resulting in evacuations and off-site organizations. In addition, the facility considered actual events (e.g. medical emergency, inadvertent actuations of evacuation alarm) and incorporated lessons learned into emergency planning. All evacuation, when required, and responder actions were performed as expected.

c. Conclusion

The records reviewed by the inspector indicated that the PSBR EPP, oversight, and training were generally being implemented as required.

**6. Maintenance Logs and Records**

a. Inspection Scope (IP 69001-02.11)

To ensure that the maintenance requirements of TS 6.7.1.c., and 6.7.1.g. were being met, the inspector reviewed the following:

- AP-4 Event Evaluation Log Sheet, "Identification, Evaluation and Documentation of Safety System Failures, Abnormal Events, and Operational Events"
- Electronic Maintenance Log

b. Observations and Findings

The inspector reviewed a selection of maintenance logs. The inspector determined that the selected maintenance items reviewed had not been facility modifications of systems, as described in the safety analysis report, and that records were being retained for at least five years.

c. Conclusion

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

**7. Fuel Handling Logs and Records**

a. Inspection Scope (IP 69001-02.12)

To ensure that the requirements of TS 3.1.6 and TS 4.1.3, "TRIGA Fuel Elements," were being met, the inspector reviewed the following:

- CCP-5, "Fuel Temperature versus Power Curve"
- CCP-16, "Inspection of Fuel Elements"
- CCP-17, "Inspection of Control Rods and Rod Drives"
- SOP-3, "Core Loading and Fuel Handling"
- Current fuel element storage location map
- Current core configuration map
- PSBR Logbooks 100, 102, 103

b. Observations and Findings

The inspector reviewed the fuel movement and surveillance records and determined that two fuel inspections have occurred since this module was previously inspected. During the June 2016 fuel inspection, 108 elements and three fuel-followed control rod elements were inspected. During the March 2018

fuel inspection, 52 elements were inspected in accordance with TS 3.1.6 and TS 4.1.3. One fuel element was removed from service following the March 2018 fuel inspection due to failing the “Go No-Go” test in the General Atomics fuel element inspection stand. This fuel element was “snug to fit” during the 2014 and 2016 fuel inspections. Other fuel elements with similar enrichment, weight percent, and power history passed fuel inspection with no deficiencies noted.

The inspector reviewed core configuration changes and determined that three cores (Core 57, 57a, and 58) have been installed since this module was previously inspected. The inspector verified changes were documented and followed established procedures.

c. Conclusion

The licensee conducted and documented fuel handling activities in accordance with TS requirements.

**8. Exit Interview**

The inspector reviewed the inspection results with members of licensee management and the Vice President of Research at the conclusion of the inspection on May 11, 2018. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspectors during the inspection.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

A. Bascom, Senior Reactor Operator  
C. Davison, Research and Education Specialist  
J. Geuther, Associate Director for Operations  
N. Sharkey, Vice President for Research  
A. Tong, Development Engineer  
K. Unlu, Director

## **INSPECTION PROCEDURES USED**

IP 69001      Class II Research and Test Reactors

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

Opened      None

Closed      None

Discussed      None

## **PARTIAL LIST OF ACRONYMS USED**

10 CFR      Title 10 of the *Code of Federal Regulations*  
AP      Administrative Procedure  
CCP      Checks and Calibrations Procedures  
EP      Emergency Procedure  
EPP      Emergency Preparedness Plan  
FY      Fiscal Year  
IP      Inspection Procedure  
LCO      Limiting Conditions for Operation  
NRC      U.S. Nuclear Regulatory Commission  
PSBR      Penn State Breazeale Reactor  
SOP      Standard Operating Procedure  
TS      Technical Specification