



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 3, 2022

Dr. Ayman I. Hawari, Director
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
Campus Box 7909
2500 Stinson Drive
Raleigh, NC 27695-7909

SUBJECT: NORTH CAROLINA STATE UNIVERSITY – U.S. NUCLEAR REGULATORY
COMMISSION SAFETY INSPECTION REPORT NO. 05000297/2022201

Dear Dr. Hawari:

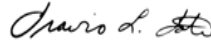
From April 18-21, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the North Carolina State University PULSTAR Reactor. The enclosed report presents the results of that inspection, which were discussed on April 20, 2022, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed various activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 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 the NRC's document system (Agencywide Documents Access and 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).

If you have any questions concerning this inspection, please contact Andrew Waugh at (301) 415-0230, or by electronic mail at Andrew.Waugh@nrc.gov.

Sincerely,



Signed by Tate, Travis
on 06/03/22

Travis L. Tate, Chief
Non-Power Production and Utilization Facility
Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-297
License No. R-120

Enclosure:
As stated

cc w/enclosure: See next page

North Carolina State University

Docket No. 50-297

cc:

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SUBJECT: NORTH CAROLINA STATE UNIVERSITY – U.S. NUCLEAR REGULATORY
COMMISSION SAFETY INSPECTION REPORT NO. 05000297/2022201
DATED: JUNE 3, 2022

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NAME	AWaugh	NParker	TTate
DATE	5/10/2022	5/10/2022	6/3/2022

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

Docket No.: 50-297

License No.: R-120

Report No: 05000297/2022201

Licensee: North Carolina State University

Facility: PULSTAR Nuclear Research Reactor

Location: Raleigh, NC

Dates: April 18-21, 2022

Inspector: Andrew Waugh

Approved by: Travis L. Tate, Chief
Non-Power Production and Utilization Facility
Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

North Carolina State University
PULSTAR Nuclear Research Reactor
Inspection Report No. 05000297/2022201

The primary focus of this routine announced inspection was the onsite review of selected aspects of the North Carolina State University's (NCSU, the licensee's) Class II research reactor facility program, including: (1) procedures; (2) experiments; (3) health physics (HP); (4) design changes; (5) committees, audits and review; and (6) transportation of radioactive materials. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Procedures

- The inspector determined that procedures were controlled, maintained current, implemented, and followed in compliance with technical specifications (TS) and license requirements.

Experiments

- The inspector determined that experiments were reviewed, approved, and conducted in accordance TS, procedural, and regulatory requirements.

Health Physics

- The inspector determined that the licensee's HP program was conducted in accordance with TS, procedural, and regulatory requirements.

Design Changes

- The inspector determined that design changes were conducted in accordance with TS, procedural, and regulatory requirements.

Committees, Audits and Reviews

- The inspector determined that the licensee's oversight programs were conducted in accordance with TS and procedural requirements.

Transportation Activities

- The inspector determined that the licensee's radioactive material transportation program was in accordance with regulatory and procedural requirements.

REPORT DETAILS

Summary of Facility Status

The NCSU 1,000 kilowatt PULSTAR nuclear research reactor continued to be operated in support of graduate and undergraduate research and laboratory instruction, service irradiations, reactor operator training, and periodic surveillance. During the inspection, the reactor was started up, operated, and shut down to support these ongoing activities.

1. Procedures

a. Inspection Scope (Inspection Procedure [IP] 69001, Section 02.03)

The inspector reviewed various procedures and observed their implementation. The inspector also reviewed the following regarding the licensee's procedures to ensure that the requirements of the licensee's administrative procedures and TS 6.4 were met:

- special procedure 2.1, "Review and Approval of Documentation," Revision 11
- operating procedure (OP) 101, "Reactor Startup and Shutdown," Revision 16
- OP 103, "Reactor Operation," Revision 6
- OP 105, "Response to SCRAMS, Alarms, and Abnormal Conditions," Revision 9
- PULSTAR surveillance procedure (PS) 2-3:S1, "Flow Measuring Channel Calibration," Revision 3
- PS 2-5:S1, "Pool Water Level Measuring Channel Calibration," Revision 5

b. Observations and Findings

The inspector observed that the licensee maintained written procedures covering the areas specified in TS 6.4. The inspector found that the procedures in use by the licensee were current, reviewed and approved as required by TS 6.4, able to be implemented as intended, and adhered to by reactor personnel.

c. Conclusion

The inspector determined that procedures were in compliance with TS and license requirements.

2. Experiments

a. Inspection Scope (IP 69001, Section 02.06)

The inspector reviewed the following to ensure that experiments were reviewed and conducted as required by TS 3.7, 3.8, and 6.5:

- OP 104, "Reactor Experiments," Revision 4
- select reactor utilization request forms
- qualified user lists for various experiments
- select training and qualification records
- select experiment log records from 2020-present

b. Observations and Findings

The inspector found that experiments were reviewed and approved as required by TS 6.2 and Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests and experiments." The inspector also found that experiments were conducted in accordance with the licensee's procedures and TS 3.7 and 3.8.

c. Conclusion

The inspector determined that experiments were reviewed, approved, and conducted in accordance TS, procedural, and regulatory requirements.

3. Health Physics

a. Inspection Scope (IP 69001, Section 02.07)

The inspector toured the facility, observed radiation surveys, and observed radiological signs and postings. The inspector also reviewed the following to ensure the licensee's HP program adheres to the requirements of 10 CFR Part 19, "Notices, Instructions, and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection against Radiation," and TS 3.5 and 4.4:

- PULSTAR annual operating reports for 2020 and 2021
- PULSTAR nuclear reactor radiation protection program annual self-assessments for 2020 and 2021
- personnel dosimetry records from 2020-present
- radiation safety training records 2020-present
- select weekly, monthly, and quarterly radiation surveys from 2020-present
- radiation work permits from 2020-present
- calibration records for various radiation monitoring equipment
- HP 1, "Radiation Protection Program," Revision 8
- HP 3, "Radiological Surveys," Revision 2
- HP 5, "Access Control and Training," Revision 0
- HP 10, "Calibration, Operation, and Maintenance of Radiation Survey and Chemistry Instruments," Revision 4
- PS 6-17-2:A1, "Process Radiation Monitoring Channel Calibration," Revision 6
- PS 6-19-1, "Thermo Radiation Monitor Calibration, Operation, and Maintenance," Revision 2

b. Observations and Findings

The inspector found that practices regarding the use of dosimetry, radiation monitoring equipment, placement of radiological postings, posting of notices, use of protective clothing, and the handling and storing of radioactive material or contaminated equipment was in accordance with regulations and the licensee's radiation protection program. The inspector found that the licensee met the regulatory requirements concerning radiological effluent releases and radiation survey, sampling, and monitoring. The inspector also found that training was conducted for radiation workers and as low as reasonably achievable principles were implemented as required by licensee procedures.

Violation (VIO) 50-120/2020-201-01 was opened during the previous safety inspection because, contrary to TS 6.7.4, the licensee failed to document the release of radioactivity in effluents released via their reactor pool leak to the NRC in any of the annual reports that they submitted since the leak started in 2015. During the current inspection, the inspector found that the licensee submitted updates to their annual reports from 2015 to 2019 which included the required information concerning the release of radioactivity via the reactor pool leak, and that subsequent annual reports also included this information. The inspector found the licensee corrected the issue and violation VIO 50-120/2020-201-01 is, therefore, closed with no further corrective action required.

c. Conclusion

The inspector determined that the licensee's HP program was conducted in accordance with TS, procedural, and regulatory requirements.

4. Design Changes

a. Inspection Scope (IP 69001, Section 02.08)

The inspector reviewed the following to ensure that modifications to the facility were made in accordance with the requirements of 10 CFR 50.59 and TS:

- PULSTAR annual operating reports for 2020 and 2021
- 10 CFR 50.59 screenings and evaluations from 2020-present
- Reactor Safety and Audit Committee (RSAC) meeting minutes from 2020-present
- SP 2.1, "Review and Approval of Documentation," Revision 11
- OP 101, "Reactor Startup and Shutdown," Revision 16

b. Observations and Findings

The inspector found that design changes were reviewed and approved as required by 10 CFR 50.59. The inspector also found that the performance of modified equipment and the procedures and drawings related to that equipment met regulatory, TS, and procedural requirements.

c. Conclusion

The inspector determined that design changes were conducted in accordance with TS, procedural, and regulatory requirements.

5. Committees, Audits and Reviews

a. Inspection Scope (IP 69001, Section 02.09)

The inspector reviewed the following to ensure that committees, audits, and reviews were conducted as required by the licensee's procedures and TS 6.2:

- RSAC membership appointments for 2020-present
- Radiation Safety Committee (RSC) membership appointments for 2020-present

- RSAC meeting minutes from 2020-present
- RSC meeting minutes from 2020-present
- RSAC audit summary for calendar year 2021
- RSAC audit summary for calendar year 2020

b. Observations and Findings

The inspector found that the licensee's RSC and RSAC met and provided reviews and audits as required by the licensee's procedures and TS. The inspector also found that problems identified from the licensee's required reviews were resolved in accordance with the licensee's procedures and TS.

c. Conclusion

The inspector determined that the licensee's oversight programs were conducted in accordance with TS and procedural requirements.

6. Transportation Activities

a. Inspection Scope (IP 86740)

The inspector reviewed the following to ensure the licensee's program for transporting radioactive materials met NRC and Department of Transportation (DOT) requirements:

- HP 6, "Transport of Radioactive and Hazardous Material," Revision 1
- various radioactive material shipment records from 2020-present

b. Observations and Findings

The inspector found that the licensee's procedures and records concerning the transportation of radioactive material were in accordance with NRC and DOT requirements.

c. Conclusion

The inspector determined that the licensee's radioactive material transportation program was in accordance with regulatory and procedural requirements.

7. Exit Interview

The inspection scope and results were summarized on April 21, 2022, with members of licensee management and staff. The inspector described the areas inspected and discussed the inspection results. The licensee acknowledged the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Lassell	Manager of Engineering and Operations
G. Wicks	Reactor Health Physicist
A. Hawari	Director, Nuclear Reactor Program
C. Fleming	Senior Research Scientist
A. Deak	Reactor Operator
K. Kincaid	Chief of Reactor Maintenance

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened:

None

Closed:

50-120/2020-201-01	VIO	The inspector determined that the licensee has documented the release of radioactivity via the reactor pool leak to the U.S. Nuclear Regulatory Commission in their annual reports as required by TS 6.7.4; therefore, this violation is closed out with no further action required.
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Discussed:

None