

May 29, 2015

Dr. Ayman I. Hawari, Director
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
P. O. Box 7909
Raleigh, NC 27695-7909

SUBJECT: NORTH CAROLINA STATE UNIVERSITY – U.S. NUCLEAR REGULATORY
COMMISSION ROUTINE INSPECTION REPORT NO. 50-297/2015-201

Dear Dr. Hawari:

The U.S. Nuclear Regulatory Commission (NRC) conducted an inspection on April 27-30, 2015, at North Carolina State University (Inspection Report No. 50-297/2015-201). 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 enclosed 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 concerns or non-compliance of requirements 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, and requests for withholding" 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 component of NRC's document system (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

A. Hawari

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Should you have any questions concerning this inspection, please contact Mr. Johnny H. Eads at 301-415-0136 or by electronic mail at Johnny.Eads@nrc.gov.

Sincerely,

/RA/

Kevin Hsueh, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

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

Enclosure:
NRC Inspection Report No. 50-297/2015-201

cc: See next page

A. Hawari

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DATE	5/25/2015	5/29/2015

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North Carolina State University

Docket No.: 50-297

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

Docket No: 50-297

License No: R-120

Report No: 50-297/2015-201

Licensee: North Carolina State University

Facility: PULSTAR Nuclear Reactor Facility

Location: Raleigh, NC

Dates: April 27-30, 2015

Inspector: Johnny Eads

Approved by: Kevin Hsueh, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

ENCLOSURE

EXECUTIVE SUMMARY

North Carolina State University
PULSTAR Reactor Facility
NRC Inspection Report No. 50-297/2015-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the North Carolina State University Class II research reactor facility safety programs including procedures; requalification training; surveillance and limiting conditions for operation; design changes; committees, audits, and reviews; emergency planning; maintenance logs and records; and fuel handling logs and records. The licensee's programs were acceptably directed toward the protection of public health and safety, and were in compliance with U.S. Nuclear Regulatory Commission (NRC) requirements.

Procedures

- Facility procedural review, revision, and implementation satisfied Technical Specifications requirements.

Requalification Training

- Operator requalification was conducted as required by the Requalification Program and Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55.

Surveillance and Limiting Conditions for Operation

- LCO and surveillances required by Technical Specifications were being properly implemented.

Design Changes

- Changes at the facility were acceptably reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls.

Committees, Audits, and Reviews

- The Radiation Safety Committee and Reactor Safety and Audit Committee provided the oversight required by the Technical Specifications.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan and implementing procedures.

Maintenance Logs and Records

- Maintenance was performed, and logs and records maintained consistent with Technical Specifications and licensee procedure requirements.

Fuel Handling Logs and Records

- Fuel handling logs or activities satisfied the Technical Specifications requirements and facility procedural requirements.

REPORT DETAILS

Summary of Facility Status

The North Carolina State University (NCSU, the licensee) Nuclear Reactor Program (NRP) PULSTAR 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 operated in support of ongoing work and research.

1. Procedures

a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed the following to ensure that the requirements of technical specification (TS) Section 6.4, Operating Procedures (OP), were being met:

- NRP-OP-301, Reactor Fuel Handling, Rev. 1, dated October 15, 2012
- Special Procedure (SP) 2.6, Operator Requalification Program, Rev. 6, dated January 19, 1995
- PULSTAR Emergency Procedures (EP), specifically procedures:
EP-1, Emergency Plan Activation, Response, and Actions, Rev. 18, dated September 28, 2011
EP-4, Emergency Classification, dated October 13, 2008
- PULSTAR Nuclear Reactor Emergency Plan, dated September 19, 2008

b. Observations and Findings

The inspector observed that the licensee maintained written procedures covering the areas specified in TS Section 6.4. A systematic approach was being used to update and reissue procedures. New procedures and major changes were reviewed and approved by the Reactor Safety and Audit Committee (RSAC) and the Radiation Safety Committee (RSC) in accordance with a written procedure on document control. Minor changes did not require committee approval but were reviewed by the committees; the reviews and approvals were documented in the minutes of the respective committee meetings.

c. Conclusion

The licensee was maintaining and implementing written procedures in accordance with TS requirements.

2. **Requalification Training**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify that the requirements of 10 CFR Part 55, Operators' Licenses, and the licensee's Operator Requalification Program were being met:

- Requalification Written Examination administered during the 2013-2014 requalification cycle.
- Special Procedure 2.6, PULSTAR Operator Requalification Program, dated January 19, 1995
- Individual requalification training records, 2013 - 2014

b. Observations and Findings

The licensee's reactor operator staff consisted of four NRC licensed Senior Reactor Operators (SROs), all held by full time staff members, and three Reactor Operators (ROs).

The licensee's requalification program included the regulatory requirement for an annual operating test and a biennial written examination. The inspector verified that both examinations were administered at the specified frequency and that the level of difficulty was comparable to that of NRC-administered examinations.

The inspector reviewed the content of the written and oral examinations used for the 2013-2014 requalification cycle and found them adequate. The inspector selected records for four licensed SROs, and reviewed their training and medical records in detail. The inspector reviewed documentation indicating that all operators had performed the required number of reactor manipulations at the frequency specified in the requalification program.

c. Conclusion

Operator requalification was conducted as required by the Requalification Program and NRC regulations.

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

a. Inspection Scope (IP 69001)

The inspector reviewed the following to determine if the LCO specified in TS Section 3.0 was being effectively implemented and if the periodic surveillance tests on safety systems were being performed in accordance with TS Section 4.0:

- Procedure SP-2.5, PULSTAR Reactor Surveillance, Rev. 1, dated February 1, 1989

- PULSTAR Surveillance and Maintenance File
- PULSTAR Surveillance Master Schedule
- NCSU PULSTAR Reactor Logbooks #10 and #11 covering the period April 26, 2014, to present

b. Observations and Findings

Surveillances were completed on schedule and in accordance with licensee procedures. The protocols and techniques were effective in verifying the performance of the safety equipment. All the recorded results were within the TS and procedurally prescribed parameters. The records and logs were complete and were being maintained as required. Checks and calibrations were completed as required by TS.

c. Conclusion

The limiting conditions for operation and surveillances required by TS were being properly implemented.

4. Design Changes

a. Inspection Scope (IP 69001)

In order to verify that any modifications to the facility were consistent with 10 CFR 50.59, the inspector reviewed selected aspects of:

- SP 2.1, Review and Approval of Documents, dated September 15, 2008
- PULSTAR Annual Operating Report for 2014, dated March 26, 2015

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that no changes requiring prior NRC approval had been initiated and/or completed at the facility since the last NRC inspection.

The inspector review records for Change #774, "Reactor Power Recorder," Change #769, "Emergency Pool Fill," and Change #773, "NRP-OP-101, Reactor Startup and Shutdown, Rev. 9."

The licensee completed the 10 CFR 50.59 screenings and evaluation as required.

c. Conclusion

Records indicated that changes at the facility were acceptably reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls.

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 being completed:

- RSC Membership, dated August 3, 2014
- RSAC Membership, dated August 3, 2014
- RSAC Minutes of meetings held October 20, 2014, December 3, 2014, and February 6, 2015
- RSC Minutes of meetings held January 28, 2015
- 2014 RSAC Audit Summary draft to be issued May 2015

b. Observations and Findings

The composition of the RSC and RSAC were as specified in the TS. A review of records indicated that both committees met at the prescribed frequency and provided the oversight and reviews of the reactor programs as required by the TS.

c. Conclusion

The TSC and RSAC provided the oversight required by the TS.

6. Emergency Planning

a. Inspection Scope (IP 69001)

The inspector reviewed the emergency preparedness program and its implementation through the following:

- PULSTAR Nuclear Reactor Emergency Plan, Rev. 9, dated September 19, 2008
- Emergency Procedure 1, Emergency Plan Activation, Response and Actions, Rev. 18, dated September 28, 2011
- Emergency Procedure 2, Off-Site Notification, Rev. 19, dated December 1, 2014
- Emergency Procedure 4, Emergency Classification, Rev. 6, dated October 13, 2008
- Emergency Procedure 6, Training, Rev. 6, dated July 19, 2006
- Emergency Procedure 7, Drills, Rev. 6, dated March 22, 2001
- Emergency Procedure 9, Emergency Locker Inventory, Rev 6, dated February 25, 2009
- Training Records of Emergency Support Groups
- PULSTAR Nuclear Reactor Drill Summary and Critique, for the drill conducted August 8, 2014

- Letters of agreement with support agencies issued in 2014 and 2015.
- Emergency Locker Inventory, dated February 11, 2015

b. Observations and Findings

The inspector reviewed the licensee's emergency preparedness program as defined in the above-referenced emergency plan and implementing procedures. The inspector also reviewed documentation related to an annual drill conducted August 8, 2014, the critique of the drill and lessons learned.

The inspector found that letters of agreement with support agencies were available and current.

EP 6, Training, specifies that training for support agency personnel be offered every two years. Training records indicated that it was offered annually on multiple days to accommodate shift workers' schedules.

EP 9, Emergency Locker Inventory, specified the inventory for emergency supply cabinets at various locations, calling for a quarterly inventory of each locker and also an inventory after each use. The inspector reviewed records of completed inventories and verified that the inventories were performed on the designated frequency, that the specified items were in the cabinets and that the radios were operable.

c. Conclusion

The emergency preparedness program was conducted in accordance with the Emergency Plan and implementing procedures.

7. Maintenance Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following selected maintenance and reactor operations records to ensure that the requirements of TS Sections 6.8 "Retention of Records" were being met:

- PULSTAR Maintenance Log and History Report
- PULSTAR Reactor Logbook, Logbooks #10 and #11 covering the period April 26, 2014 to present

b. Observations and Findings

The inspector reviewed the maintenance records related to scheduled and unscheduled preventive and corrective maintenance activities that had occurred during the inspection period. The inspector reviewed maintenance records and interviewed personnel regarding maintenance completed on the Secondary Check Valve not closing smoothly resulting in reactor scrams.

Routine and preventive maintenance was controlled and documented in the appropriate logs. These documents indicated that all maintenance activities were in accordance with the requirements in licensee administrative controls. The inspector verified that all maintenance was conducted in accordance with the requirements of TS Section 4.0, and system operational checks were performed before returning them to service.

c. Conclusion

Maintenance was performed, and logs and records maintained consistent with TS and licensee procedure requirements.

8. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following records to verify implementation of the requirements of TS Section 4.1:

- Procedure NRP-OP-301, Reactor Fuel Handling, Rev. 1, dated October 15, 2012, Appendix A, Confirmations of Fuel Movement and Appendix B, Fuel Movements Schedule during the period July 2013 to June 2014
- Core Map Records of Fuel Element Locations

b. Observations and Findings

The inspector found the procedures used for fuel handling provide for the safe handling of fuel elements. The data sheets and the Core Map Records adequately documented the location of fuel elements at all times.

c. Conclusion

Fuel movements were performed safely in accordance with TS requirements and licensee procedural requirements.

9. Exit Interview

The inspector presented the inspection results to licensee management at the conclusion of the inspection on April 30, 2015. The inspector described the

areas inspected and discussed in detail the inspection observations. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

A. Cook	Manager, Nuclear Reactor Program and Reactor Operations Manager
A. Hawari	Director, Nuclear Reactor Program
K. Kincaid	Chief of Reactor Maintenance
G. Wicks	Reactor Health Physicist

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
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ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

PARTIAL LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access and Management System
EP	Emergency Procedure
IP	Inspection Procedure
LCO	Limiting conditions for operation
NCSU	North Carolina State University
NRC	U.S. Nuclear Regulatory Commission
NRF	Nuclear Reactor Facility
NRP	Nuclear Reactor Program
OP	Operating Procedure
PARS	Publicly Available Records
Rev.	Revision
RO	Reactor Operator
RSAC	Reactor Safety and Auditing Committee
RSC	Radiation Safety Committee
SP	Special Procedure
SRO	Senior Reactor Operator
TS	Technical Specifications