



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

December 2, 2019

Dr. Lei Raymond Cao, Director
Nuclear Reactor Laboratory
Ohio State University
1298 Kinnear Rd
Columbus, OH 43212

SUBJECT: OHIO STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION
SAFETY INSPECTION REPORT NO. 05000150/2019-201

Dear Dr. Cao:

From October 21-24, 2019, the U.S. Nuclear Regulatory Commission (NRC) conducted an announced safety inspection at the Ohio State University Nuclear Reactor Laboratory 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 noncompliance 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 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 Mr. William Schuster at (301) 415-1590, or by electronic mail at William.Schuster@nrc.gov.

Sincerely,

/RA/

Anthony J. Mendiola, 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. 50-150
License No. R-75

Enclosure:
As stated

cc: See next page

Ohio State University

Docket No. 50-150

cc:

Chief
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Bureau of Environmental Health
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Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
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University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

SUBJECT: OHIO STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION
SAFETY INSPECTION REPORT NO. 05000150/2019-201
DATE: DECEMBER 2, 2019

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

Docket No.: 50-150

License No.: R-75

Report No.: 05000150/2019-201

Licensee: Ohio State University

Facility: Nuclear Reactor Laboratory

Location: Columbus, Ohio

Dates: October 21-24, 2019

Inspector: William Schuster

Approved by: Anthony J. Mendiola, 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

Ohio State University
Nuclear Reactor Laboratory
Inspection Report No. 05000150/2019-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Ohio State University (the licensee) research reactor facility program, including: (1) organization and staffing; (2) operations logs and records; (3) requalification training; (4) surveillance and limiting conditions for operation (LCO); (5) emergency planning; (6) maintenance logs and records, and (7) fuel handling logs and records. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with U.S. Nuclear Regulatory Commission (NRC) requirements.

Organization and Staffing

- Organization and staffing were in compliance with the technical specification (TS) requirements.

Operations Logs and Records

- Operations logs and records were maintained consistent with applicable TS and procedural requirements.

Requalification Training

- Operator requalification was conducted and completed in accordance with the NRC-approved program.

Surveillance and Limiting Conditions for Operation

- Surveillances were conducted and LCO were maintained in accordance with TS requirements.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan (E-Plan).

Maintenance Logs and Records

- Principal maintenance activities were documented in accordance with TS requirements.

Fuel Handling Logs and Records

- Fuel movements and inspections were conducted in accordance with TS and procedural requirements.

REPORT DETAILS

Summary of Facility Status

The Ohio State University (OSU) 500 kilowatt open pool-type research reactor continued to be operated in support of undergraduate instruction, laboratory experiments, and various types of irradiation projects. During this inspection, the OSU research reactor (OSURR) was shutdown for control rod maintenance activities.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001, Section 02.01)

To verify compliance with the licensee's TS requirements for organization, the inspector reviewed selected aspects of the licensee's program, including:

- Appendix A to Renewed Facility Operating License No. R-75, "Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150," dated June 2008
- Select entries, OSURR Operations Logbook, from 2017-2019 (page 8089-8412)

b. Observations and Findings

The inspector determined that the organizational structure at the OSURR facility had not changed since the previous inspection and was consistent with TS Figure 6.1. The inspector also noted that the facility staffing of operators has been constant – three senior reactor operators (SROs) and zero reactor operators. The inspector reviewed OSURR Operations Logbook entries and determined that: 1) minimum staffing when the reactor was not secured satisfied TS 6.1.3(1); and, 2) an SRO was present at the facility, when required by TS 6.1.3. The inspector also verified that a list of facility personnel is posted in the control room, as required by TS 6.1.3(2).

c. Conclusion

The licensee's organization and staffing were in compliance with the TS requirements.

2. Operations Logs and Records

a. Inspection Scope (IP 69001, Section 02.02)

To verify compliance with the licensee's TS requirements for logs and records, the inspector reviewed selected aspects of the licensee's program, including:

- Appendix A to Renewed Facility Operating License No. R-75, "Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150," dated June 2008
- Administrative Procedures (AP)-11, "Record Keeping"
- Select entries, OSURR Operations Logbook, from 2017-2019 (page 8089-8412)

b. Observations and Findings

Based on document review, the inspector determined that logs and records are maintained in accordance with the licensee's administrative procedures. Records also showed that the required operational conditions and parameters were appropriately documented and established retention timeframes met or exceeded regulatory requirements, in accordance with TS 6.7.

c. Conclusion

Operations logs and records were maintained consistent with applicable TS and procedural requirements.

3. **Requalification Training**

a. Inspection Scope (IP 69001, Section 02.04)

To verify compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' Licenses," and the licensee's NRC-approved operator requalification program, the inspector reviewed selected aspects of the licensee's program, including:

- AP-09, "RO/SRO Requalification," Revision 9, dated February 15, 2018
- AP-10, Attachment A, "OSURR Console Operating Experience," for 2017-2018
- Various internal memoranda, "Operator Requalification," for 2017-2018
- OSURR Operator Requalification Operational Examination Records for 2017-2018
- OSURR Operator Requalification Written Examination Records for 2017-2018
- OSURR Console Operating Experience Records for 2017-2018
- Select records, completed NRC Form 396, "Certification of Medical Examination by Facility Licensee," for 2016-2019
- Select entries, OSURR Operations Logbook, from 2017-2019 (page 8089-8412)

b. Observations and Findings

The inspector reviewed the requalification records for the three licensed SROs at the facility. All three licensed SROs received license renewals in 2018 and 2019. The inspector determined that all SROs have performed the functions of a senior operator each calendar quarter, completed a requalification program, and completed a biennial medical examination, as required by 10 CFR 55.53, "Condition of licenses." At the time of this inspection, requalification program activities for 2019 were still in progress and scheduled to be completed in December. Requalification program schedule, lectures, on-the-job training, evaluation, and records were generally consistent with the requirements in 10 CFR 55.59, "Requalification." Lectures covered topics required by 10 CFR 55.59(c)(2). Licensed SROs conducted manipulations required by 10 CFR 55.59(c)(3)(i). Licensed SROs passed comprehensive written examinations and operating tests as directed by the NRC-approved program outlined in AP-09.

c. Conclusion

Operator requalification was conducted and completed in accordance with the NRC-approved program.

4. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001, Section 02.05)

To verify compliance with the licensee's TS requirements for surveillances and LCOs, the inspector reviewed selected aspects of the licensee's program, including:

- Appendix A to Renewed Facility Operating License No. R-75, "Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150," dated June 2008
- "Annual Report for The Ohio State University Research Reactor, License R-75, Docket 50-150," for 2018 and 2019
- Select entries, OSURR Operations Logbook, from 2017-2019 (page 8089-8412)
- Pre-Startup / Post-Shutdown Checkout Form for the past 2 years
- Select procedures, Instrumentation Use & Maintenance
- Select procedures, Operations and Maintenance (OM)
- Core Reactivity Data Calculations for the past 2 years
- Surveillance Item data sheets for the past 2 years
- Surveillance records for the past 2 years

b. Observations and Findings

The licensee used surveillance data sheets readily visible and available to all operators to ensure the annual, semiannual, quarterly, monthly, and weekly administrative and TS required items were completed in periodicity. The inspector reviewed a random sample of the periodic surveillances performed and determined that they were completed in the specified time frame and in accordance with procedures. Specifically, the inspector reviewed parameters associated with TS-required LCOs. Excess reactivity, minimum shutdown margin, and control rod reactivity worth were measured annually and following core configuration changes, as required by TS 4.1.1 and TS 4.2.1(1). Control rod scram and drive times were measured annually and following maintenance, as required by TS 4.2.1(2). Reactor power level channel calibrations were performed annually, as required by TS.4.2.2(3). Scram channels were tested annually, as required by TS 4.2.2(7). Primary coolant water power of hydrogen [pH] and conductivity was measured weekly, as required by TS 4.3.1. The inspector verified that all measured or recorded results for surveillances and LCO were within the required parameters.

c. Conclusion

Surveillances were conducted and LCO were maintained in accordance with TS requirements.

5. Emergency Planning

a. Inspection Scope (IP 69001, Section 02.10)

To verify compliance with Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, "Domestic Licensing of

Production and Utilization Facilities,” and the licensee’s E-Plan, the inspector reviewed selected aspects of the licensee’s program, including:

- Appendix A to Renewed Facility Operating License No. R-75, “Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150,” dated June 2008
- “Emergency Preparedness Plan,” dated April 2019
- Select Emergency Procedures (EP)
- Building Emergency Action Plan, dated January 2019
- “The Ohio State University Wexner Medical Center Radiological Emergency Management Plan,” dated June 2019
- “Emergency Plan Review,” for 2017-2018
- “Emergency Plan Training Topics,” for 2017-2018
- EP-04, Attachment A, “OSU-NRL Emergency Equipment Inventory Checklist,” for 2017-2019
- OSURR Emergency Drill Notes and Recommendations, for 2017-2018

b. Observations and Findings

The inspector reviewed the E-Plan in use at the facility. The inspector verified that the latest update in April 2019, was made in accordance with the requirements of 10 CFR 50.54(q), “Emergency plans.” In the transmittal letter, the licensee stated the changes did not reduce the effectiveness of the E-Plan. The inspector notes that the E-Plan, as revised, continues to meet the requirements in Appendix E to 10 CFR Part 50. The inspector confirmed that the E-Plan was being reviewed annually, as required. Implementing procedures were reviewed and revised as needed to effectively implement the E-Plan. Through records review, the inspector determined that emergency preparedness and response training for reactor staff was completed and documented. Emergency equipment (meters, supplies, communications, security, and alarms) was being maintained and inventoried annually, as required. The inspector reviewed documentation of the drills conducted in 2017 and 2018. Emergency drills had been conducted annually, as required. The scenarios written for the drills and critiques held were well documented.

Additionally, the inspector, accompanied by the Associate Director, Radiation Safety Officer and Medical Health Physicist, visited the OSU Wexner Medical Center. The inspector toured the hospital spaces described in the E-Plan. Discussions included: ambulance response; decontamination room, activities, and equipment; and, hospital equipment, drills, and response. Based on observations and discussions, the inspector noted that hospital was prepared to respond in the event of a radiological emergency involving the research reactor.

c. Conclusion

The emergency preparedness program was conducted in accordance with the E-Plan.

6. Maintenance Logs and Records

a. Inspection Scope (IP 69001, Section 02.11)

To verify compliance with the licensee's TS requirements related to maintenance, the inspector reviewed selected aspects of the licensee's program, including:

- Appendix A to Renewed Facility Operating License No. R-75, "Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150," dated June 2008
- "Annual Report for The Ohio State University Research Reactor, License R-75, Docket 50-150," for 2018 and 2019
- Select entries, OSURR Operations Logbook, from 2018-2019 (page 8184-8382)
- Maintenance Logbook IV

b. Observations and Findings

The inspector reviewed the records regarding scheduled and unscheduled preventive and corrective maintenance activities for the past 2 years. The inspector noted that the maintenance logbooks contained thorough documentation of these activities. After completion of maintenance activities, systems were retested to ensure that the affected systems functioned properly before returning them to service. The inspector also verified that maintenance records were being retained for at least 5 years, as required by TS 6.7.1(2).

c. Conclusion

Principal maintenance activities were documented in accordance with TS requirements.

7. Fuel Handling

a. Inspection Scope (IP 69001, Section 02.12)

To verify compliance with the licensee's TS requirements related to fuel handling and storage, the inspector reviewed selected aspects of the licensee's program, including:

- Appendix A to Renewed Facility Operating License No. R-75, "Technical Specifications and Bases for The Ohio State University Pool-Type Nuclear Reactor, Columbus, Ohio, Docket No. 50-150," dated June 2008
- OM-07, "Fuel Element Inspections," Revision 8, dated November 11, 2016
- AP-05, "[Special Nuclear Material (SNM)] Inventory"
- Completed AP-05, Attachment A, "Fission Chamber Record Sheet," from 2018-2019
- Completed AP-05, Attachment B, "Fuel Element Inventory Form," from 2018-2019
- Fuel Element Inspection Record
- Maintenance Logbook IV, page 25
- Reactivity Data for OSURR LEU Core #6 and #7
- OSURR Modification Request #86, "Partial fuel element swap"
- Select entries, OSURR Operations Logbook, from 2017-2019 (page 8089-8412)

b. Observations and Findings

The inspector reviewed the fuel handling process used by the licensee and verified that the fuel was moved according to established procedures. The inspector reviewed records for fuel movements conducted for core changes and inspection of the fuel elements and control rods. Changes to core configurations had reactivity changes assessed, measured, and documented, as required. Fuel element positions were tracked on a core map in the control room. Fuel element movements were recorded in the OSURR Operations Logbook. The inspector confirmed that inspections were carried out on fuel elements as required by TS 4.1.2. As discussed in the Surveillance section of this report, the inspector reviewed records that showed primary coolant water chemistry was routinely sampled, as required by TS 4.3.1, to ensure that water was maintained to minimize corrosion.

c. Conclusion

Fuel movements and inspections were conducted in accordance with TS and procedural requirements.

8. Exit Interview

The inspection scope and results were summarized on October 24, 2019, with members of licensee management and staff. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

A. Kauffman	Associate Director, Nuclear Reactor Laboratory and SRO
K. Herminghuysen	Research Associate and SRO
S. White	Research Associate and SRO

Other Personnel

R. Batdorf	Assistant Radiation Safety Officer
G. Hinkle	Health Physicist, Medical
D. Konate	Radiation Safety Officer
J. Maitland	Nurse Manager, Emergency Services

INSPECTION PROCEDURES USED

IP 69001	Class II Non-Power Reactors
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ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

AP	Administrative Procedure
E-Plan	Emergency Plan
EP	Emergency Procedure
IP	Inspection Procedure
LCO	Limiting Conditions for Operation
NRC	U.S. Nuclear Regulatory Commission
OM	Operations and Maintenance Procedure
OSU	The Ohio State University
OSURR	The Ohio State University Research Reactor
SRO	Senior Reactor Operator
TS	Technical Specification