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

April 24, 2019

Mr. Robert J. Agasie, Reactor Director
Nuclear Reactor Laboratory
University of Wisconsin - Madison
1513 University Avenue, Room 1215
Madison, WI 53706-1687

SUBJECT: UNIVERSITY OF WISCONSIN – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 50-156/2019-201

Dear Mr. Agasie:

From March 18 - 20, 2019, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the University of Wisconsin Nuclear Reactor Laboratory. The enclosed report documents the inspection results, which were discussed on March 21, 2019, with you, Corey Edwards, Reactor Supervisor, Dr. Douglass Henderson, Chair of the Engineering Physics Department, and Dr. Paul Wilson, Reactor Safety Committee member.

This 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 observed various activities in progress, interviewed personnel, and reviewed selected procedures and records. 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 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).

Should you have any questions concerning this inspection, please contact Craig Bassett at 240-535-1842 or by electronic mail at Craig.Bassett@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. 50-156
License No. R-74

Enclosure:
As stated

cc: See next page

cc:

Mayor of Madison
City Hall
210 Martin Luther King Jr. Boulevard
Room 403
Madison, Wisconsin 53703

Chairman, Public Service
Commission of Wisconsin
610 North Whitney Way
Madison, WI 53707-7854

Paul Schmidt, Manager
Radiation Protection Section
Division of Public Health
Wisconsin Dept of Health Services
P.O. Box 2659
Madison, WI 53701-2659

Test, Research and Training
Reactor Newsletter
Attention: Amber Johnson
Dept of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

Jason Timm, Assistant Director
& Radiation Safety Officer
University of Madison - Wisconsin
Department Environmental Health & Safety
Environmental Protection and Safety Bldg.
30 E. Campus Mall
Madison, WI 53715

SUBJECT: UNIVERSITY OF WISCONSIN – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 50-156/2019-201 DATE: APRIL 24, 2019

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

Docket No.:	50-156
License No.:	R-74
Report No.:	50-156/2019-201
Licensee:	University of Wisconsin
Facility:	Nuclear Reactor Laboratory
Location:	Madison, WI
Dates:	March 18-20, 2019
Inspector:	Craig Bassett
Approved by:	Anthony J. Mendiola, Chief Research and Test Reactors Oversight Branch Division of Licensing Projects Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Wisconsin - Madison
Nuclear Reactor Laboratory
NRC Report No. 50-156/2019-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the University of Wisconsin (the licensee's) Class II research and test reactor safety program including: (1) organization and staffing, (2) operations logs and records, (3) procedures, (4) requalification training, (5) surveillance and limiting conditions for operation (LCO), (6) experiments, (7) design changes, (8) committees, audits, and reviews, (9) emergency planning, (10) maintenance logs and records, and (11) fuel handling logs and records since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements. No violations or deviations were identified.

Organizational Structure and Staffing

- The organizational structure was consistent with technical specifications (TSs) requirement.
- Shift staffing met the requirements for duty, relief, and on-call personnel.

Operations Logs and Records

- Reactor operations were conducted in accordance with TSs requirements and applicable procedures.
- Current reactor operations were strictly limited to maintaining reactor operator (RO) qualifications.

Procedures

- Procedural review, revision, and control satisfied the requirements specified in Section 6.4 of the TSs.

Operator Requalification Program

- The operator requalification/training program was up-to-date and acceptably maintained.
- Medical examinations for facility operators were being completed biennially as required.

Surveillance and Limiting Conditions for Operation

- The program for tracking and completing surveillance checks and LCO verifications satisfied TS requirements and licensee administrative and procedural controls.

Experiments

- Conduct and control of experiments and irradiations met the requirements specified in TS Sections 3.8, 4.8, and 6.5, the applicable experiment and irradiation authorizations, and associated procedures.

Design Changes

- Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, “Changes, tests, and experiments,” design change process at the facility was being followed as required.

Committees, Audits, and Reviews

- The Reactor Safety Committee (RSC) was meeting at the required periodicity.

- The review and audit functions required by TSs Section 6.2 were being acceptably completed by the RSC.

Emergency Planning

- The Emergency Plan (EP) and Implementing Procedures were being reviewed annually as required and updated as needed.

- Emergency response facilities and equipment were being maintained as required.

- Emergency responders were knowledgeable of proper actions to take in case of an emergency.

- Off-site support was available and the various support organizations were staffed and well equipped.

- Semiannual drills were being conducted as required by the EP.

- Emergency preparedness training for staff personnel was being completed as required.

Maintenance Logs and Records

- Maintenance logs and records were being kept and maintenance activities were being conducted in accordance with procedural requirements.

Fuel Handling Logs and Records

- Reactor fuel movements and inspections were completed and documented in accordance with procedure.

- The fuel was being inspected as specified by TSs Sections 3.1.6 and 4.1 and the core was used and arranged as required in TSs Sections 3.1.4, 5.3, and 5.4.

REPORT DETAILS

Summary of Plant Status

The University of Wisconsin (UW) continued to operate their 1 megawatt TRIGA (Training, Research, Isotopes, General Atomics) conversion reactor as needed in support of laboratory and lecture courses, research in various areas including neutron irradiation, and the Reactor Sharing Program. During this inspection the reactor was operated several hours on Wednesday, at varying power levels, so that various ROs could maintain their qualifications.

1. Organization and Staffing

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

To verify that the organization, responsibility, and staffing requirements specified in Section 6.1 of the facility TSs (designated as Appendix A of the UW Nuclear Reactor renewed license, dated March 25, 2011) were being met, the inspector reviewed selected aspects of the following:

- Management responsibilities stipulated in the TSs
- Staffing requirements for operation of the reactor facility
- Organizational structure of the Nuclear Reactor Laboratory
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- UW Nuclear Reactor (UWNR) Procedure Number (No.) 001, "Standing Operating Instructions," Revision (Rev.) 17
- "The University of Wisconsin Nuclear Reactor Laboratory Fiscal Year 2016 – 2017 Annual Operating Report," for the period from July 2016 through June 2017, submitted to the NRC on July 17, 2017
- "The University of Wisconsin Nuclear Reactor Laboratory Fiscal Year 2017 – 2018 Annual Operating Report," for the period from July 2017 through June 2018, submitted to the NRC on July 16, 2018

b. Observations and Findings

Through discussions with licensee representatives, it was noted that management responsibilities and the organization at the UW Nuclear Reactor Laboratory had not changed since the previous NRC inspection of this material in June 2017 (Inspection Report No. 50-156/2017-201). The Reactor Director was responsible for all activities at the facility as stipulated in the TSs. The Reactor Supervisor retained direct control and overall responsibility for safe operation and maintenance of the reactor. The Reactor Director reported to the Chancellor of UW-Madison through the Chair of the Engineering Physics Department as required.

The licensee's current operational organization consisted of a Reactor Director, a Reactor Supervisor, and five ROs. In addition to their administrative duties, the Director and Supervisor were qualified senior reactor operators (SROs). This organization was consistent with that specified in the TSs.

A review of selected reactor Operating Log Sheets and the associated records for the past 2 years showed that the logs were being maintained as required. The logs and records confirmed that shift staffing met the requirements for duty, relief, and on-call personnel.

a. Conclusion

The licensee's organization and staffing met the requirements specified in the TSs and applicable procedures.

2. Operations Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to ensure that actions taken during routine operations were conducted in accordance with TS Sections 3 and 4, and that actions following abnormal occurrences, were in compliance with TS Sections 6.6 and 6.7, and with the procedures specified in TS Section 6.4:

- Letter from the UW Vice Chancellor for Finance and Administration to the Dean of the College of Engineering, dated September 5, 2018 (directing the immediate shutdown of reactor operations)
- UWNR Operators Turn-Over Log maintained on the computer in the Control Room
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- Selected audits completed by Radiation Safety Department staff personnel documented in monthly reports for 2018 and to date in 2019
- Various reviews completed by operations staff personnel documented in monthly reports for 2018 and to date in 2019
- Various UWNR Procedures including Procedure No. 001, "Standing Operating Instructions," Rev. 17; Procedure No. 110, "Daily Reactor Pre-Startup Checklist," Rev. 53; Procedure No. 111, "Reactor Startup Check Sheet," Rev. 47; Procedure No. 112, "Operating Log Sheet," Rev. 10; Procedure No. 114, "Reactor Shutdown Checklist," Rev. No 20; and, Procedure No. 115, "Scram," Rev. 6
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

(1) Routine Reactor Operations

The inspector observed various reactor operations during the inspection. These included reactor startup, steady state operation, and reactor shutdown. Operations were conducted in accordance with TS requirements and the applicable procedures in order that various operators at the facility could maintain their qualifications.

The inspector reviewed selected Daily Reactor Pre-Startup Check Lists, Reactor Startup Check Sheets, Operating Log Sheets, and Reactor

Shutdown Checklists from December 2017 through September 2018. The forms were color coded to facilitate location of the recorded data and to ensure proper usage of the forms. Through this review, the inspector determined that reactor operations were carried out following written procedures as required by the TSs. Any problems or abnormal events that occurred during operation, were documented in the operations log, reported, reviewed, and the problems resolved as required by TSs and the procedures. Scrams were identified on specific forms in the logs and records, reported as required, and their cause(s) resolved before operations were resumed under the authorization of a licensed SRO.

The inspector verified that the information that was required to be recorded by the TSs and various procedures was logged on the appropriate forms and cross referenced with other logs and/or forms. As previously noted, the data indicated that no TSs operational limits had been exceeded. The logs and records indicated that shift staffing was adequate and satisfied the requirements for duty and on-call personnel.

(2) Limited Operations Following the Voluntary Shutdown of the Reactor

Ever since 1986, the facility has experienced a recurring reactor pool leak. It was thought that the leak was likely a fatigue failure in the heat affected zone of the welds around the pool liner and the thermal column. The licensee noted that significant swings in pool water temperature resulted in the recurrence of this leak from the pool. Pool water temperature fluctuations have resulted from variations in environmental temperatures and frequency of reactor operations. In the past, in-house testing identified the location of cracks in various welds around the thermal column. These were subsequently repaired in-house following partial draining of the pool on two occasions. Besides the repairs, various actions have been taken to mitigate the leak. These actions have included the installation of a new cooling system in 2003 that was capable of maintaining the pool water temperature constant during reactor operations at full power. Other measures have included the addition of pool temperature alarms (for both high and low temperatures), reducing the operating time required to perform the required annual calorimetric measurements for reactor power, and electrically heating the pool during periods of inactivity.

Following the most recent leak in early 2018, the licensee used an underwater camera to conduct a visual inspection of the weld areas and the liner plate near the thermal column. A potential crack was located in this area. This suspected crack is approximately one-half inch in length and is similar in appearance to cracks found on previous occasions. When the Vice Chancellor for Finance and Administration learned of the latest pool leak, he issued a letter to the Dean of the College of Engineering directing the college to immediately and safely suspend experimental and teaching operations at the reactor. Because an operational reactor is required for the various operators to maintain their qualifications, it was decided to allow minimum operation of the reactor every quarter for this purpose. This is required so that the facility remains

within the licensing basis of the safety analysis report and so that any future corrective actions, which will likely require fuel to be moved in the core or removed from the core, can be accomplished.

In addition to prohibiting all but the minimally required reactor operations, the Vice Chancellor directed that the college identify the source(s) of the leak and devise a reliable and permanent solution. The Dean subsequently created a committee composed of the College of Engineering Associate Dean for Research (committee chair), the Assistant Director of Environmental Health and Safety (who is also the UW-Madison Radiation Safety Officer), the College of Engineering Director for Safety, and the UWNR Reactor Director. The committee has developed an action plan to resolve the pool leak problem. As of the date of the inspection, the action plan was awaiting approval. The Reactor Director was asked to provide the NRC with situation updates including the approved plan for remediating the pool leak and the schedule for its completion. The licensee was informed that the resolution of the pool leak issue will be an Inspector Follow-up Item (IFI) and will be reviewed during a subsequent NRC inspection (IFI 50-156/2019-201-01).

c. Conclusion

Reactor operations and other required actions were completed in accordance with TS requirements and applicable procedures. Current reactor operations were strictly limited to maintaining RO qualifications.

3. Procedures

a. Inspection Scope (IP 69001)

To determine whether facility procedures met the requirements outlined in TS Section 6.4, the inspector reviewed:

- Selected operating procedures and administrative logs
- Selected forms and checklists associated with current procedures
- Procedural reviews and updates as documented in RSC meeting minutes
- UWNR Procedure No. 005, “UWNR Administrative Guide,” Rev. 61
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

The inspector determined that the licensee had developed procedures for the operations, tasks, and conditions listed in Section 6.4 of the TSs. The inspector noted that procedure UWNR Procedure No. 001, “Standing Operating Instructions,” specified the role and use of procedures at the facility. The licensee’s procedures and checklists were found to be acceptable for the current facility status, staffing, and level of operations. The procedures were being audited and/or reviewed annually and were updated as needed.

Minor changes to procedures were allowed to be reviewed and approved by two SROs prior to implementation. These types of changes were subsequently

presented to the RSC for information and were reviewed by that committee. Major changes to the procedures were required to be reviewed and approved by the RSC prior to implementation. The inspector determined that substantive revisions to checklists and forms were routinely presented to the RSC for review and approval as required. The inspector verified that the latest revisions to selected procedures and forms had been through this review and approval process.

c. Conclusion

Facility procedures satisfied TS Section 6.4 requirements and procedure reviews were being completed annually.

4. Requalification Training

a. Inspection Scope (IP 69001)

To determine that operator requalification activities and training were conducted in accordance with the licensee's operator requalification plan and 10 CFR Part 55, "Operators' Licenses," and that medical requirements were met, the inspector reviewed:

- Active operators' license status
- Written examination records for 2017 and 2018
- Operator medical examination records from 2016 to the present
- The UWNR Operator Requalification Program outlined in UWNR Procedure No. 004, "University of Wisconsin Nuclear Reactor Operator Proficiency Maintenance Program," Rev. 4, RSC approval dated May 31, 2018
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- Audits completed by operations staff personnel documented in monthly reports submitted to the RSC entitled "Monthly Operations Summary," for 2018 and to date in 2019
- Training Status Record forms for selected individuals for 2017 and 2018
- UWNR Operator Evaluation Check Sheet records for the past 3 years
- UWNR Operator Proficiency Maintenance Program - Class Record Sheets for the past 3 years
- UWNR Procedure No. 005, "UWNR Administrative Guide," Rev. 61
- Logs and records of reactivity manipulations documented on forms associated with UWNR Procedure No. 112, "Operating Log Sheet," Rev. 10
- The two most recent Annual Operating Reports issued by the facility
- American National Standards Institute/American Nuclear Society (ANSI/ANS) Standard 15.4-2007, "Standards for Selection and Training of Personnel for Research Reactors," Sections 4-6, dated August 17, 2007

b. Observations and Findings

As noted previously, there were two qualified SROs who were full-time university employees working at the facility as well as five part-time student ROs. All of the operators' licenses were verified to be current. It was noted that there were no

people in training to become qualified operators as of the date of the inspection but a class was scheduled to begin in the fall.

A review of facility logs and training records showed that training and lectures had been conducted in accordance with the licensee's requalification and training program. It was noted that annual written examinations had been given as stipulated and the results documented. Despite the limitations on reactor operations, a review of the records of reactor operations, reactivity manipulations, and other operations and supervisory activities, indicated that these required activities were being completed by each licensed operator as required. Records also indicated that quarterly performance evaluations were being completed as required. Records further documented participation by the operators in semi-annual emergency training and drills. The inspector noted that the licensee's training program appeared to be comprehensive and was well maintained and documented.

Through discussions with licensed operators and a review of records, the inspector also verified that each operator was receiving a biennial medical examination as required.

c. Conclusion

The requirements of the Operator Requalification Program were being met and the program was being acceptably implemented. Medical examinations for facility operators were being completed biennially as required.

5. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001)

To determine that surveillance and LCO activities and verifications were being completed as required by TS Sections 3 and 4, the inspector reviewed:

- Selected preventive maintenance records for 2018 and to date in 2019
- Open Pool Reactor Manual (OPRM) referenced in UWNR Procedure No. 100A
- Selected forms and records associated with various procedures UWNR including UWNR Procedure No. 100, "Surveillance Activities," Rev. 58 and Procedure No. 169, "Annual Maintenance Procedure," Rev. 17
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

The inspector determined that selected daily, weekly, monthly, semiannual, and annual checks, tests, and verifications for selected LCO and surveillance activities were completed as stipulated. The surveillance and LCO verifications reviewed were completed on schedule and in accordance with licensee procedures. All the recorded results were within the TSs and procedurally prescribed parameters. The records and logs reviewed appeared to be complete and were being maintained as required.

c. Conclusion

The program for surveillance and LCO verifications was being carried out in accordance with TSs requirements.

6. Experiments

a. Inspection Scope (IP 69001)

In order to verify that experiments were being conducted in accordance with approved procedural guidelines and reviewed and approved as specified in TS Sections 3.8, 4.8, and 6.5, the inspector reviewed:

- Control of irradiated items and potential hazards identification
- Records of recently proposed experiments and/or changes to approved experiments documented on forms entitled, “Experiment Review Questionnaire”
- Various UWNR Procedures including Procedure No. 002, “Experiment Standing Operating Instructions,” Rev. 12, and Procedure No. 030, “Experiment Review Questionnaire,” Rev. 9, and the associated forms and records

b. Observations and Findings

In accordance with the licensee’s TSs, experiments were classified as “routine,” “modified routine,” or “special.” It was noted that routine and modified routine experiments could be conducted at the discretion of the SRO responsible for reactor operation. These were typically conducted under the auspices of UWNR Procedure No. 002. Special experiments were required to be reviewed by the RSC and possibly were of such a nature that they could require review and approval by the NRC. It was noted that three routine experiments were currently in use at the facility.

It was noted that one new experiment and then a modification to that experiment had been initiated recently. The new experiment dealt with developing in-core neutron sensors to enhance reactor core modeling. The inspector reviewed the new experiment, as well as the modification, and verified that they had been reviewed and approved by the Reactor Director as required. Copies of the Experiment Review Questionnaires for the experiment and modification had been forwarded to the RSC for review. Appropriate safety evaluations had also been completed. The new experiment, and subsequently the modification, had been reviewed and approved by the RSC.

The conduct and results of the experiments and irradiations conducted at the facility were documented on the Operations Log Sheets. Sample irradiation results were documented on the irradiation request forms, UWNR Procedure No. 130, “Request for Isotope Production.” The inspector verified that experiments and irradiations were conducted in accordance with the appropriate procedure, and the material produced was controlled as required in the TSs and the applicable questionnaires or authorizations.

c. Conclusion

Conduct and control of experiments and irradiations met the requirements specified in the TS Sections 3.8, 4.8, and 6.5, the applicable experiment and irradiation authorizations, and associated procedures.

7. Design Changes

a. Inspection Scope (IP 69001)

In order to determine whether modifications to the facility were consistent with 10 CFR 50.59, the inspector reviewed:

- RSC meeting minutes from May 2017 through the present
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- Records of design changes and/or modifications to the facility documented on forms entitled, “UWNR Modification Checklist,” “Safety Screening,” and “Safety Evaluation”
- UWNR Procedure No. 005, “UWNR Administrative Guide,” Rev. 61
- UWNR Procedure No. 019, “Changes, Tests, and Experiments,” Rev. 4
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that no structures, systems, or components modifications or design changes had been initiated at the facility since the last NRC operations inspection. However, various procedure changes had been reviewed and approved.

The inspector verified that the licensee was following the established design change control program and that the required reviews and approvals of past changes had been completed by the RSC, if required, prior to implementation. It was noted that the design change procedure had been revised to help licensee personnel screen the change proposal and then determine whether or not a full safety evaluation was required. The procedure incorporated screening criteria for this purpose.

As noted in the previous section, the licensee determined that the new experiment that had been proposed met the criteria of 10 CFR 50.59(c)(2) paragraphs (i) through (viii) which would require a safety evaluation and/or NRC approval of the change. The inspector verified that an appropriate safety evaluation had been completed for the new experiment, as well as the modification thereof. The evaluations were reviewed and approved by the Reactor Director and the RSC as required. The proposed experiment did not require prior NRC approval.

c. Conclusion

The 10 CFR 50.59 process for reviewing and approving design changes at the facility was being followed as required and no recent changes required NRC approval.

8. Committees, Audits and Reviews

a. Inspection Scope (IP 69001)

In order to verify that reviews required by TS Section 6.2.3 had been completed by the RSC and that the audits stipulated in TS Section 6.2.4 had been conducted by the Radiation Safety office and the RSC, the inspector reviewed:

- The current RSC charter dated May 25, 2016
- RSC meeting minutes from May 2017 through the present
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- Audits completed by the Radiation Safety Office staff personnel documented in monthly reports submitted to the RSC entitled “Nuclear Reactor Audit and Report,” for 2018 and to date in 2019
- Audits completed by the operations staff personnel documented in monthly reports submitted to the RSC entitled “Monthly Operations Summary,” for 2018 and to date in 2019
- Audits of the facility Requalification Plan, the EP, and the Security Plan completed by personnel from various organizations, including the UW Safety Department and the UW Police Department
- UWNR Procedure No. 005, “UWNR Administrative Guide,” Rev. 61
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

The inspector reviewed the RSC’s meeting minutes from May 2017 to the present. These meeting minutes demonstrated that the RSC had met at the required frequency and that a quorum was present. The minutes also indicated that the RSC, or a designated subcommittee, was completing reviews of those items and documents required by the TSs. Through these reviews, the RSC was providing appropriate oversight and direction for reactor.

The inspector noted that various audits had been conducted at the facility in the areas of reactor operations, radiation protection, emergency preparedness, security, requalification of operators, and procedures. The inspector noted that the RSC reviewed these audits as required. The audits were structured so that the various aspects of the licensee's radiation protection and safety programs were reviewed on a monthly basis. Major facility documents and plans were reviewed annually, as were the facility procedures. The inspector noted that the audits and the resulting findings were adequately documented and that the licensee responded and took corrective actions for the findings as needed.

c. Conclusion

The RSC was meeting at the required periodicity. Review and audit functions required by TS Section 6.2 were acceptably completed by the RSC.

9. Emergency Planning

a. Inspection Scope (IP 69001)

To ensure that the licensee's emergency response program was being conducted in accordance with the facility EP, the inspector reviewed:

- Offsite support for the UWNR facility
- Records of emergency and evacuation drills
- Training records regarding emergency response for facility staff and offsite support personnel
- Various UWNR Procedures including Procedure No. 005, "UWNR Administrative Guide," Rev. 61, Procedure No. 150, "Reactor Accident, Fission Product Release, or Major Spill of Radioactive Materials," Rev. 22, Procedure No. 152, "Suspected Fission Product Leak," Rev. 15, and Procedure No. 157, "Fire; Radioactive Material Spills; Radioactive Dust, Fumes, and Gases; Personnel Injuries Involving Radioactivity; Personnel Overexposures," Rev. 13
- Emergency response requirements stipulated in ANSI/ANS 15.16 – 1982 (R1988), "Emergency Planning for Research Reactors"

b. Observations and Findings

The EP in use at the UWNR Laboratory was the facility procedure, UWNR Procedure No. 006, "University of Wisconsin Nuclear Reactor Emergency Plan," Rev. 7, RSC approval dated May 31, 2018. The EP was audited and reviewed annually as required. EP Implementing Procedures, UWNR Procedure Nos.150-154, 156 and 157, were also reviewed annually and revised as needed.

The inspector noted that the licensee representative maintained the specified materials in the Emergency Support Center at the facility. The inspector verified that the required supplies, instrumentation, and equipment were inventoried annually as required.

Through records review and interviews with licensee and support personnel, emergency responders were found to be knowledgeable of the proper actions to take in case of an emergency. Two agreements, one with an on-site support group (UW Engineering External Relations) and one with an off-site response organization (the UW Hospital and Clinics), were updated every 2 years and were being maintained as required. Other agreements were not needed with such entities as the fire department and police force because they were under statutory requirements to respond to the UWNR in case of an emergency. Communications capabilities with these support groups were tested periodically and were acceptable.

Emergency drills for operations personnel were conducted semiannually as required by the EP. One of the semiannual drills was required to include a practice evacuation of the facility. The other drill involved reviewing the emergency procedures, discussing what actions to take, and conducting walk-through training in various areas or on various pieces of equipment. The drills were conducted as required and the results of the drills were documented.

The inspector verified that training for reactor staff personnel in emergency response was conducted and documented through the Operator Requalification Program.

The inspector, accompanied by the UWNR Facility Director and the Reactor Supervisor, visited with two Environmental Monitoring Specialists who worked for the Radiation Protection Section of the Wisconsin Department of Health Services. They demonstrated the capabilities of a vehicle that specially equipped to provide support to monitoring teams in the field in the event of a radiological incident at a facility, especially a nuclear power plant. The inspector and licensee observed some the equipment they possessed for response to such emergencies. It was noted that the vehicle appeared to be well equipped to provide needed assistance. It was apparent that there was a good working relationship between the reactor staff and the State of Wisconsin personnel.

c. Conclusion

The inspector concluded that the emergency preparedness program was being conducted in accordance with the EP because: 1) the EP and Implementing Procedures were being reviewed annually as required and updated as needed; 2) emergency response facilities and equipment were being maintained as required; 3) emergency responders were knowledgeable of proper actions to take in case of an emergency; 4) off-site support was acceptable; 5) semiannual drills were being conducted as required by the EP; and 6) emergency preparedness training for staff personnel was being completed as required.

10. Maintenance Logs and Records

a. Inspection Scope (IP 69001)

To determine that maintenance activities were being conducted as required, the inspector reviewed:

- Selected preventive maintenance records for 2018 and to date in 2019
- OPRM referenced in UWNR Procedure No. 100A
- Selected forms and records associated with various UWNR procedures including Procedure No. 100, “Surveillance Activities,” Rev. 58 and Procedure No. 169, “Annual Maintenance Procedure,” Rev. 17
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

The inspector reviewed the maintenance that had been completed for 2018 and to date in 2019 as required by UWNR Procedure No. 100 and UWNR Procedure No. 169. The records indicated that various maintenance activities were conducted monthly and others annually as required. The majority of the annual maintenance was completed in June each year. Annual maintenance activities included fuel inspection; reflector, control blades, and transient rod inspection; fuel temperature monitor calibration; core inlet monitor calibration; and, reactor ventilation operation.

Preventive maintenance items were also tracked and conducted as scheduled and any problems found were addressed in accordance with the TSs, applicable procedures, the OPRM, or other equipment manuals. Maintenance activities ensured that equipment remained consistent with the safety analysis report and TS requirements. Unscheduled maintenance or repairs were reviewed to determine if they required 10 CFR 50.59 evaluations.

c. Conclusion

Maintenance logs and records were being maintained and maintenance activities were being conducted in accordance with procedural requirements.

11. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

In order to verify adherence to fuel handling, use, and inspection requirements specified in TS Sections 3.1.4, 3.1.6, 4.1, 5.3 and 5.4, the inspector reviewed:

- Core Status Boards located at the reactor pool top and in the Control Room and the associated fuel element/bundle map
- Operator Information Book which included core loading diagrams and standard fuel loading instructions
- Selected Operations Log Sheets, checklists, and associated forms and records for 2018 and to date in 2019
- Various UWNR Procedures including Procedure No. 142, “Procedure for Measuring Fuel Element Bow and Growth,” Rev. 16; Procedure No. 143, “Procedure for Fuel Handling and Core Arrangements,” Rev. 3 (including “Fuel Movement Log Sheet” forms); and Procedure No. 143A, “Core Loading Diagram,” Rev. 4
- The two most recent Annual Operating Reports issued by the facility

b. Observations and Findings

The inspector verified that the reactor fuel bundles in the core and in storage were being inspected annually as required by TSs. The results of the inspections were recorded as required and comments on the condition of each fuel bundle were noted appropriately. The procedures and the controls specified for these operations were acceptable.

The inspector determined that the licensee was maintaining the required records of the various fuel movements that had been completed using Fuel Movement Log Sheets. This information was routinely stored with the facility Operating Log Sheets. The inspector verified that the movements were conducted and recorded in compliance with procedure. The current core was designated as Core K21-R6.

c. Conclusion

Reactor fuel movements and inspections were completed and documented in accordance with procedure. The fuel was being inspected as specified by TS Sections 3.1.6 and 4.1, and the core was used and arranged as required in TS Sections 3.1.4, 5.3, and 5.4.

12. Exit Meeting Summary

The inspection scope and results were summarized on March 20, 2019, with licensee management and staff. The inspector discussed the findings for each area reviewed. The licensee acknowledged the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

R. Agasie	Reactor Director
C. Edwards	Reactor Supervisor
T. Montenegro	Reactor Operator
J. Quincy	Reactor Operator

Other Personnel

R. Busch	Environmental Monitoring Specialist, Radiation Protection Section, Department of Health Services, State of Wisconsin
D. Henderson	Chair of the Department of Engineering Physics, College of Engineering, University of Wisconsin-Madison
D. LeClear	Environmental Monitoring Specialist, Radiation Protection Section, Department of Health Services, State of Wisconsin
P. Wilson	Member, Reactor Safety Committee

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-156/2019-201-01	IFI	Follow-up on the licensee's actions to resolve the pool leak issue.

Closed

None

PARTIAL LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
ANSI/ANS	American National Standards Institute/American Nuclear Society
EP	Emergency Plan
IFI	Inspector Follow-up Item
IP	Inspection Procedure
LCO	Limiting Conditions for Operation
No.	Number
NRC	Nuclear Regulatory Commission
OPRM	Open Pool Reactor Manual
Rev.	Revision
RO	Reactor Operator
RSC	Reactor Safety Committee
SRO	Senior Reactor Operator
TS(s)	Technical Specifications
UW	University of Wisconsin
UWNR	University of Wisconsin Nuclear Reactor