U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-156/90001(DRP)

Docket No. 50-156 License No. R-74

Licensee: University Of Wisconsin

Facility Name: TRIGA Research Reactor

Inspection At: Nuclear Reactor Laboratory, Madison, Wisconsin

Inspection Conducted: March 28-30, 1990

Telephone Exit: April 10, 1990

Inspector: A. Dunlop, Jr. Andrew Dunlop Jr MAY 03 1990
Date

Approved By: R. C. Knop, Chief
Reactor Projects Branch 3 5/3/90
Date

Inspection Summary

Inspection on March 28-30, 1990 (Report No. 50-156/90001(DRP)
Areas Inspected: Routine, unannounced inspection to review actions on: organization, logs, and records; review and audit functions; requalification training; procedures; surveillance; experiments; fuel handling activities; emergency planning; radiation controls; radwaste management (40750); transportation activities (86740); periodic and special reports (90713); and licensee event reports (92700).
Results: Of the 13 areas inspected, one violation was identified in the report concerning the failure to classify the low reactor pool level as an Unusual Event per the Emergency Plan (paragraph 3). Although the event itself did not have safety significance due to system design, the emergency plan required the event to be classified as an Unusual Event and the NRC to be notified.

The licensee's overall program is good. Some of the positive attributes are as follows:

1. Quality of procedures.
2. Reactor Safety Committee involvement.
3. Surveillance/Maintenance tracking system.
4. Resolution to the reactor pool liner crack.

DETAILS

1. Persons Contacted

University of Wisconsin

*S. M. Matusewic, Reactor Supervisor
*W. F. Vogelsang, Chairman, Reactor Safety Committee
#R. Cashwell, Reactor Director

Additional station technical, operational, and administrative personnel were contacted by the inspector during the course of the inspection.

*Denotes those attending the exit meeting on March 30, 1990.
#Denotes those attending the telephone exit meeting on April 10, 1990.

2. General (40750)

This inspection, which began on March 28, 1990, was conducted to examine the research reactor program at the University of Wisconsin. The facility was toured shortly after arrival. The general housekeeping of the facility remains good. The reactor was operated approximately 16 hours a week. Operations were primarily for student laboratory classes, irradiation of samples, experiments, and ensuring the fuel elements remain self-protecting.

The inspector witnessed the performance of a pre-startup checklist, reactor startup, insertion and removal of samples, and control rod worth determination by a student laboratory class.

No violations or deviations were identified.

3. Organization, Logs, and Records (40750)

The facility organization was reviewed and verified to be consistent with the Technical Specifications and Safety Analysis Report (SAR). The minimum staffing requirements were verified to be met during reactor operation, and fuel handling or refueling operations.

The reactor logs and records were reviewed to verify that:

a. Records were available for inspection.

b. Required entries were made.

c. Significant problems or incidents were documented.

d. The facility was being maintained properly.

The Nuclear Reactor Laboratory staff consists of a Reactor Director (senior reactor operator (SRO)), Reactor Supervisor (SRO), and five reactor operators (ROs). The Reactor Safety Committee (RSC) Chairman is also a qualified SRO. The staff performs its own radiation and

contamination surveys. The university Health Physics Department performs monthly audits of the reactor's health physics program. Since the last inspection, S. Englehardt and P. Probert have replaced R. Radtke and E. Falk on the RSC as a result of the latter retirements from the university.

The inspector reviewed selected reactor operator logs for 1988 through March 1990 and did not identify any concerns. The licensee records were well maintained.

The inspector noted that on January 29, 1989, the campus Police and Security received a pool level alarm from the Nuclear Reactor Laboratory. The Reactor Supervisor was called in to investigate the alarm. Prior to entering the laboratory, as per procedure, radiation levels were checked to ensure they were normal. The Reactor Supervisor determined that the cause of the low level alarm was a failed shaft seal on the demineralizer pump. Approximately 275 gallons (pool level decreased 5 inches) of pool water leaked into the pit where it was contained. The pool level was restored to normal and the demineralizer system was isolated to stop the leak.

The failed seal was replaced and the demineralizer system was returned to service by February 1, 1989. Due to the design of the demineralizer system, which takes a suction from near the pool surface, the pool would not have drained to a level of concern even if the leak had not been isolated.

The inspector reviewed UWNR 155, "Abnormal Operating Procedure," which states for a pool level alarm, due to low level, the licensee should investigate for possible leaks and review UWNR 151, "Leak Resulting in Draining of Reactor Pool" and UWNR 006, "Emergency Plan". The licensee followed UWNR 151 and isolated the leak, restored the pool level, and subsequently repaired the failed seal. It appears, however, that the Emergency Plan was not followed in its entirety. The plan lists in Table 2 as one of the possible events, a loss of reactor pool water (without fuel damage). The Emergency Action Level for this event is a pool level alarm from low level due to a leak. The January 29 event appears to meet these conditions. The Standard Emergency Classification for this is an Unusual Event. The licensee did not classify the event as such, nor notify the NRC as required.

In discussions with the licensee, it was noted that the Technical Specification for the pool level alarm should be about 1 foot below the normal level of the pool. The pool level alarm is actually set at about 5 inches below normal, which is conservative. Since the event did not pose a significant problem, the licensee concluded that they should not declare an Unusual Event. The licensee stated that the Emergency Plan was written to take into account worse case accident, which was not the case in this event. Nevertheless, the event did meet the condition as described in the Emergency Plan and as such, this is an apparent violation for failure to follow the Emergency Plan in not declaring an Unusual Event (156/90001-01).

One violation was identified concerning the failure to declare an Unusual Event.

4. Reviews and Audits (40750)

The licensee's review and audit program records were examined by the inspector to verify that:

a. Reviews of facility changes, operating and maintenance procedures, design changes, and unreviewed experiments were performed by the reactor safety committee as required by Technical Specifications or SAR.

b. The reactor safety committee and/or subcommittee were composed of qualified members and that quorum requirements and frequency of meetings had been met.

c. Required safety audits had been conducted in accordance with Technical Specification requirements and that identified problems were resolved.

The RSC met on a semiannual basis as required by Technical Specifications. The inspector reviewed the RSC meeting minutes for 1988 through 1989. The meeting minutes were of good quality and provided a clear record of review and approval of reactor activities. From 1988 to present, there have not been any design changes to the facility, nor new experiments requiring approval of the RSC for 10 CFR 50.59 applicability. The RSC approved changes to procedures; reviewed audit checklists and reports; and addressed other items of interest such as the repair to the reactor pool liner, low reactor pool level alarm due to a failed shaft seal on the demineralizer pump, and organization changes.

No violations or deviations were identified.

5. Requalification Training (40750)

The inspector reviewed procedures, logs, and training records; and interviewed personnel to verify that the requalification training program was being carried out in conformance with the facility's approved plan and NRC regulations. UWNR 004, "Operator Proficiency Maintenance Program," states the requirements for ensuring an operator maintains their license. These include training lectures, performing required number of reactivity manipulations, passing written examinations, medical qualifications, remedial training if required, and record requirements. The inspector verified that operators completed the requirements for 1988 and 1989.

No violations or deviations were identified.

6. Procedures (40750)

The inspector reviewed the licensee's procedures to determine if procedures were issued, reviewed, changed or updated, and approved in accordance with Technical Specifications and SAR requirements. This review also verified:

a. That procedure content was adequate to safely operate, refuel, and maintain the facility.

b. That responsibilities were clearly defined.

c. That required checklists and forms were used.

The licensee maintains a large number of procedures on a word processing system that are reviewed on a yearly basis and revised as required. Operators are instructed to inform an SRO of any procedural problem or question in order to obtain an adequate resolution. The content of selected procedures were found to be of good quality with sufficient detail to perform each task as required. The quality of the procedures is a positive attribute of the licensee's program.

The inspector accompanied the operator on the daily pre-startup checklist and reviewed selected completed daily and monthly checklists, including health physics surveys. No concerns were identified.

No violations or deviations were identified.

7. Surveillance (40750)

The inspector reviewed procedures, surveillance test schedules, and test records and discussed the surveillance and preventive maintenance program with responsible personnel to verify:

a. That procedures were available and adequate to perform tests.

b. That test were completed within the required time schedule.

c. Test records were available.

UWNR 100, "Surveillance Activities," lists weekly, monthly, semiannual, and annual surveillance activities that need to be accomplished. The inspector reviewed selected checklists for 1988 and 1989 and verified surveillances were being completed within the required time schedule. The checklist also identified preventive maintenance activities and the month they are required to be complete; no discrepancies were noted. Selected surveillance procedures were reviewed and determined to be adequate to verify the Technical Specification requirements.

No violations or deviations were identified.

8. Experiments (40750)

The inspector verified by reviewing experiment records and other reactor logs that:

a. Experiments were conducted using approved procedures and under approved reactor conditions.

b. New experiments or changes in experiments were properly reviewed and approved.

c. The experiments did not involve unreviewed safety questions, i.e., 10 CFR 50.59.

d. Experiments involving potential hazards or reactivity changes were identified in procedures.

e. Reactivity limits were not or could not have been exceeded during an experiment.

UWNR 030, "Experiment Review Questions," requires experimenters to submit to the Reactor Director a description of the experiment including materials involved, reactivity effects, and safety analysis. The Reactor Director will perform a safety evaluation and classify the experiment as routine, modified routine, or special to determine what level of approval is needed. Two new experiments were identified in 1988-89 and were classified as modified routine since similar experiments had been done in the past. As such, the experiments were approved by the Reactor Director. These experiments were: Neutron Radiography Facility and Beta Energy Capture. The descriptions and evaluations associated with these experiments were of good quality.

No violations or deviations were identified.

9. Fuel Handling (40750)

The facility fuel handling program was reviewed by the inspector. The review included the verification of approved procedures for fuel handling and their technical adequacy in the areas of radiation protection, criticality safety, Technical Specification, and security plan requirements. The inspector determined by records review and discussions with personnel that fuel handling operations were carried out in conformance to procedures.

No violations or deviations were identified.

10. Emergency Planning (40750)

The inspector reviewed records and interviewed personnel to determine that the approved emergency plan was being carried out by verifying:

a. That procedures were in place and required records were being kept.

b. That required drills were conducted and evaluated.

c. That required training had been conducted.

The licensee conducted semiannual emergency drills and one of these includes a practice building evacuation. The drill ensured necessary equipment was available, operators were knowledgeable in emergency procedures, and the adequacy of evacuating the building and surrounding area. Operators were trained and examined on emergency procedures yearly as part of the operator requalification program.

No violations or deviations were identified.

11. Radiation Control (40750)

The inspector reviewed the radiation protection activities since the last inspection. Records were reviewed, personnel were interviewed, and observations were made to verify that radiation controls were being carried out in accordance with license and NRC regulations. The areas covered were:

a. Posting and labeling of restricted areas and radioactive materials.

b. Control of irradiated samples.

c. Calibration of radiation detection instruments.

d. Required periodic dose rate and contamination surveys.

e. Exposure records of personnel.

f. Posted areas of facility.

g. Personnel training.

A review of personnel dosimetry records for 1987-88 and 1988-89 indicated no problems. The maximum annual whole body exposure was 20 mrem and the highest extremity exposure was 710 mrem.

Dose rate and contamination surveys had been conducted as required with no problems noted. Areas were properly posted. Instruments were properly calibrated.

No violations or deviations were identified.

12. Radwaste Management (40750)

a. Gaseous Radwaste

According to the licensee's calculations, the average concentration of argon-41 released in fiscal year 1987-88 was 0.109E-6 microcuries per milliliter, which corresponds to approximately 0.45 percent of MPC calculated in the SAR. In 1988-89, the average concentration was 0.94E-7 microcuries per milliliter or 0.39 percent of MPC.

The inspector noted that the data provided in Table 3 of the Annual Reports for 1987-88 and 1988-89 were in error with respect to average concentration of argon-41 in the 1987-88 report and average concentration of MPC for both reports. The errors were in adding the monthly averages and in transcribing numbers. The data listed in the reports were higher than the actual amounts and as such, within the allowable. The Reactor Director stated that a revision will be submitted to correct the reports.

b. Liquid Wastes

Potentially contaminated water is collected and stored in a 2000 gallon holdup tank where it is sampled prior to release to the sanitary sewer. In 1987-88, 359 microcuries were released at an average concentration of 3.5E-5 microcuries per milliliter, and in 1988-89, 1121 microcuries were released at an average concentration of 1.2E-4 microcuries per milliliter, well below the limits of 10 CFR 20.303 without considering dilution from the sanitary sewer.

c. Solid Waste

The licensee had transferred 9.5 cubic feet of solid waste containing 334 microcuries to the UW Radiation Safety Department on March 30, 1989, which was later shipped to Hanford, Washington on April 3, 1989. The transfer and shipment were carried out under the licensee's byproduct license and were not reviewed during the inspection.

No violations or deviations were identified.

13. Transportation Activities (86740)

The inspector reviewed the licensee's shipping program for compliance with the requirements in Department of Transportation (DOT) and NRC regulations, 49 CFR Parts 172 & 173 and 10 CFR Part 71, respectively.

Byproduct material is transferred from the byproduct and reactor licenses only to customers who have a valid NRC or Agreement State license that authorizes the type and quantity of material. UWNR 130, "Request for Isotope Production," requires the Health Physics Department to verify that personnel requesting samples are authorized to possess them. The inspector reviewed selected request forms and verified that proper approval was granted.

No violations or deviations were identified.

14. Review of Periodic and Special Reports (90713)

The inspector reviewed the following annual reports for timeliness of submittal and adequacy of information submitted:

Annual Operating Report for Fiscal Year 1987-1988
Annual Operating Report for Fiscal Year 1988-1989

The reports were submitted in a timely manner and contained the information required by Technical Specifications. The inspector noted that the problem with the demineralizer, discussed in section 3 of this report, should have been included in the 1988-1989 report. Errors with the gaseous activities data from Table 3 were discussed in section 12.a of this report.

No violations or deviations were identified.

15. License Event Reports (92700)

Through direct observation, discussions with licensee personnel, and review of records, the following event reports were reviewed to determine that reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with Technical Specifications.

(Closed) LER 86-02: On August 28, 1986, the licensee discovered a small leak from the lower thermal column liner. The licensee notified the NRC per telcon the same day. During the annual maintenance shutdown in December 1987, the core was unloaded to the storage pit in the reactor pool floor. Radiation surveys within the pool indicated low dose rates to allow an operator with scuba diving experience to inspect the liner. No crack indications were noted in the liner. The reactor was refueled and returned to service. The leak rate which had decreased during the shutdown, increased with the return of warm weather, although not to a significant level.

In May 1988, the RSC approved a plan to repair the leak. Fuel, the regulating blade, and neutron sources were transferred into the storage pit and covered with a shielded cover in June 1988. Pool water was incrementally drained into the 2000 gallon waste water holdup tank and a 27 foot diameter above ground swimming pool erected on the floor of the reactor laboratory. As water was lowered in 4-5 foot increments, the liner was tested for leakage by applying 2-2.5 psi air pressure between the concrete pool walls and the pool liner. A single crack in the pool liner was identified in the form of an arc (0.5 inches long) about 9/32 of an inch above the top west corner of the thermal column.

Water level in the pool was established at about 6 inches below the crack in order to minimize the dose rate (20-100 mrem/hour) during repairs. Holes 1/4 inch in diameter were drilled at each end of the crack and the cracked region was ground out. MIG welding was used to fill the ground out area and to overlay that weld with three additional welds. Another air pressure test indicated that the leak was sealed.

The pool was refilled and the reactor refueled to facilitate reactor operations that resumed on June 30, 1988. No further indications of leakage have been noted since the repair.

The licensee's corrective actions in determining the location of the leak, repairing the crack and subsequent retesting were well documented. The procedures were approved by the RSC prior to commencing the work.

No violations or deviations were identified.

16. Exit Interview (30703)

The inspector met with licensee and contractor representatives denoted in Paragraph 1 during and at the conclusion of the inspection on March 30, 1990. A subsequent telephone exit was conducted on April 10, 1990, with the Reactor Director. The inspector summarized the scope and results of the inspection and discussed the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.

The licensee, however, stated that the issue identified in Section 3 of this report was not a violation. The reasoning is that the Emergency Plan is based on worst case scenarios while this event did not have any safety significance. The inspector reviewed the issue with emergency preparedness personnel in Region III and the Office of Nuclear Regulation. The conclusion based on those actions was that the Emergency Plan, as written, was not properly followed and as such, the violation is valid.