U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No.: 50-57/92-02

Docket No.: 50-57

License No.: R-77

Licensee: State University of New York at Buffalo
Rotary Road, South Campus
Buffalo, New York

Facility Name: Buffalo Material Research Center

Inspection At: Buffalo, New York

Inspection Conducted: June 15-18,1992

Inspectors: Thomas Dragoun — 7/21/92
Thomas Dragoun, Project Scientist, Effluents Radiation Protection Section (ERPS), Facilities Radiological Safety and Safeguards Branch (FRSSB) — date

Stephen W Holmes — 7/24/92
Stephen Holmes, Radiation Specialist, ERPS, FRSSB — date

T Dragoun for — 7/21/92
Alexander Adams, Senior Project Manager, NRR, Non-Power Reactor, Decommissioning, and Environmental Projects Directorate — date

Approved By: John J Hayes Jr. for — 7/22/92
Robert J. Bores, Chief, ERPS, FRSSB, Division of Radiation Safety and Safeguards — date

Areas Reviewed: Status of previously identified items, health physics staffing, calibration of HP equipment, radiation surveys, surveillances, recordkeeping, requalification of reactor operators, review of equipment modifications, fuel loading and initial criticality.

Results: Within the scope of this review, no safety concerns or violations were observed. The reactor was reloaded and restarted in a safe manner. The staff displayed good teamwork in resolving unanticipated problems.

DETAILS

1.0 Persons Contacted

*L. Henry, Director
*M. Adams, Operations Manager
*J. Slawson, Senior Health Physicist
M. Pierro, Radiation Safety Officer
*N. Hutchinson, Health Physicist
*L. Dandrea, Health Physicist
*R. Jones, Shift Supervisor
*R. Kerns, Shift Supervisor
*M. Herbst, Reactor Operator Trainee
*D. Vasbinder, Analytical Services Manager

* Attended the exit interview on June 18, 1992. Other personnel were contacted or interviewed during the inspection.

2.0 Status of Previously Identified Items

2.1 (Closed) Followup Item (50-57/92-01-01) Conduct containment leak test. The licensee had not performed containment leak tests during the time the reactor fuel was in storage in the hot cell. The licensee stated that a leak test would be performed before fuel was loaded on to the grid plate. The test was performed on June 12-13, 1992 with a result of 3.26 ft^3/min (cfm) which is within the TS limit of 7.0 cfm. The inspector reviewed the data and confirmed the licensee's calculations. This item is closed.

2.2 (Closed) Violation (50-57/92-01-02) Failure to conduct surveillance on fuel storage tank water at the required frequencies. The inspector reviewed the Surveillance Check Sheets for the hot cell fuel storage tank and confirmed that this surveillance is now performed at the required interval. Licensee corrective action described in a letter dated March 27, 1992 is complete and satisfactory. This violation is closed.

2.3 (Closed) Followup Item (50-57/92-01-03) The Surveillance Check Sheet for the hot cell fuel storage tank had a space available for supervisor sign-off that was not utilized. The inspector observed that the Surveillance Check Sheets are now receiving reactor supervisor review. This item is closed.

3.0 Radiation Protection Program

3.1 Staffing

Technical Specification 6.1.1 states that the Buffalo Materials Research Center (BMRC) Health Physics Department is responsible for routine radiological safety activities. The inspector reviewed the current staffing of this department with respect to the anticipated

needs as the facility returns to normal operations. Present staff consists of five persons, a senior Health Physicist (HP), one full and one part-time HP, a student, and the analytical services manager (HP). The four permanent staff were interviewed and, though their experience was limited to BMRC, the inspector found them competent and consistently knowledgeable in regards to the BMRC health physics program. The inspector discussed with the facility director advantages to his program of providing outside training or rotational work at other facilities for the new health physics staff that replaced the experienced staff that left during the long outage. The director stated that various training options are being considered. Discussions were held with the Radiation Safety Officer (RSO), who is not part of the BMRC staff, regarding the need for additional management oversight during reactor restart. The RSO stated that he tours the facility monthly and will increase the number of visits during the restart. The inspector concluded that HP staffing was appropriate.

3.2 Calibration of Portable Survey Equipment and Counting Room Equipment

The inspector reviewed the use, stockage, and calibration of the portable survey equipment. The inspector also reviewed calibration, quality control, and test source certification records for portable radiation monitoring instruments and counting room instruments. The health physics technicians and the analytical service manager were interviewed. The inspector determined that sufficient amounts and appropriate types of portable survey equipment were available to the health physics staff. Generally, the calibration of the portable survey and health physics counting lab equipment was done properly and in compliance with license procedures. Written procedures were consistent with American National Standards Institute (ANSI) recommendations. The inspector noted the following areas for improvement.

Some instrument checks using an electronic pulser were outside the ANSI recommendations of 20% and 80% of each range. The license stated that a recently acquired variable pulser will resolve this problem. Some of the calculated dose rates at fixed locations from the test source were in error. The licensee stated that all dose rates were recently recalculated and the corrected values will be used.

No formal operability checks of the gas flow proportional counter are being done nor are quality control (QC) acceptance limits posted. The license stated that the QC and daily check presently being done would be proceduralized and the QC use limits posted.

3.3 Radiation Surveys, Analyses, Signs, and Postings

The licensee is required by 10 CFR 20.201 and 20.203 to perform routine surveys to evaluate the radiation hazards present and to properly post such areas with the required signs. The inspector toured the reactor controlled areas, observed the refueling operation, interviewed various staff members, and examined procedures and records of routine radiation surveys, and reactor pool water analyses. The warning signs and postings properly reflected the radiological condition in the facility. Procedures were good. However, some routine operations, such as survey and release of material from the reactor area, were not proceduralized. The licensee stated that the need for additional procedures would be reviewed. The inspector determined that the routine survey and analyses programs and postings were adequate.

4.0 Surveillances

TS Section 4 requires the performance of periodic surveillances to insure that reactor safety equipment performance is within the limits specified in the license and the facility Safety Analysis Report. Surveillances that were not required while the reactor was disassembled, or were waived by the NRC, need to be performed during the start-up process when the applicable systems are returned to operation. The inspector reviewed the licensee's program for the conduct of these surveillances and observed that surveillances applicable to the critical experiment stage of the start-up process were completed. The licensee's plans to complete the remaining surveillances were considered by the inspector to be adequate.

The inspector noted that on May 21, 1992, the conductivity of the tank water was measured at 7.5 micromhos/cm (limit is less than 5.0 micromhos/cm). The tank was flushed with water from the makeup demineralizer which caused the conductivity of the tank to read off scale high (greater than 25 micromhos/cm). It was discovered that the conductivity meter on the makeup demineralizer outlet had failed in such a way that the licensee believed that the makeup water was within specifications when it was not. The licensee regenerated the demin resin and flushed the reactor tank with in-specification water. By May 26, 1992, conductivity of the tank was back within specifications. Although licensee corrective action was prompt and effective, there was no management review to determine if this event was reportable to the NRC. The inspector noted that this particular event was not reportable under 10 CFR 50.72, however, the licensee stated that they will improve screening of abnormal occurrences in the future.

5.0 Logs and Recordkeeping

The inspector reviewed the reactor console log book and the maintenance log for the period January 24, 1992 to June 18, 1992. The entries in the logs appeared appropriate

for the status of the facility. The following observation was noted.

On March 25, 1992 the facility emergency generator was tested. This test included the proper functioning of the equipment on the emergency circuit. As part of this test, the dampers that seal the containment air ducts were closed to confirm that the reactor containment could be maintained at a negative pressure during an emergency. The dampers were closed using a manual push button in the control room. At the conclusion of this test, the dampers are normally opened from the control room before the emergency generator is turned off.

During the test of March 25, the recovery sequence was changed in that the power was switched from the emergency generator to normal power with the dampers still closed. Upon return to normal power, the dampers unexpectedly opened. This response of the system appears to have safety significance since operator action to manually shut the dampers during an emergency could be reversed by a power transient. The licensee stated that this system response will be investigated to determine if it is within the envelope specified by the Safety Analysis Report. This matter is unresolved and will be reviewed in a future inspection (50-57/92-02-01).

6.0 Requalification of Reactor Operators

Due to the extended shutdown of the reactor, the NRC had approved an alternate operator requalification program that included special provisions for the restart of the reactor. The inspector reviewed the licensee's implementation of the requirements of this plan.

A review of records and personnel interviews indicated that all seven of the current operators successfully completed the classroom training, written and oral examinations. Exam results were analyzed by the director and additional training was given to the group or individuals in areas found to be weak. Lecture outlines and exam questions demonstrated good technical depth. Two Senior Reactor Operators, who received special training at the North Carolina State University Reactor, and the facility director performed the fuel loading and controlled the initial criticality of the reactor. Within the scope of this review, no deviations from the NRC approved plan were observed.

7.0 Review of Modifications

10 CFR 50.59 allows the licensee to make changes to the facility without NRC approval unless the change involves a change in the technical specifications or an unreviewed safety question. During the installation of the new reactor tank liner, several modifications were made. The inspector reviewed the licensee's analysis of the following changes:

-installation of a "carburetor plate" under the lower core lattice plate.
-replacement of the NIM power supply and readout modules for the start-up channel (fission chamber).
-installation of a filtered air exhaust line for the reactor pool area.
*-installation of an I beam core support.
*-elimination of the dry chamber nosepiece, PNC rabbit tube, and beam tubes.
*-rerouting of the emergency pool flooding line.
*-installation of a tell-tale drain for the new liner.
*-use of Hatch mounts for pool fuel racks.
*-new core support and lower tank penetrations.
*-new thermal column nosepiece.

*Indicates changes reviewed and approved by the Nuclear Safety Committee (NSC). Other changes were reviewed and approved by the facility director.

Within the scope of this review, the safety review of changes appeared to be complete. The inspector noted that there was difficulty obtaining a quorum for some of the NSC meetings. This matter will be reviewed in a future inspection.

8.0 Fuel Loading and Initial Criticality

The inspector observed the critical experiment that lead to reactor start-up. The licensee initially loaded 12 fuel elements on the grid plate. Neutron counts were taken with the control rods at 30%, 50%, and 100% withdrawn and an inverse multiplication curve was plotted to predict the number of fuel elements required to reach criticality. Fuel elements were added one element at a time and the measurements were repeated. At 17 elements loaded, measurements were also taken with the rods at 70% withdrawn. The inspector independently plotted the licensee's data and predicted criticality at 28 elements. This matched the licensee's prediction and the reactor obtained criticality with 28 elements on the grid plate. The licensee then loaded the core to 33 elements. Because this was a high burn-up core that the licensee had used before, the licensee was confident that shutdown margin and excess reactivity were within specifications. Shutdown margin and excess reactivity will be confirmed after the control rods are calibrated. The control rods are new. As part of the reactor start-up, the inspector observed the completion of the control room portion of Operating Procedure 2, Reactor Pre-Operational Checklist.

The reactor was normally shut down by mechanically driving the rods to the bottom rather than allowing the rods to fall (scram). During a shutdown, rod #4 jammed, snapping the mounts on the drive motor. The drive was removed and disassembled. The control blade and blade shroud were inspected and no damage or scratches were found.

The licensee assumed that the hydraulic shock absorber, which slows the rod during the last 10% of travel on a scram, had jammed since the rod could not self-align as it would during a scram. Internal surfaces were polished and the drive reassembled and realigned with the core. The rod was stroked several times and drop times were measured and found to be in specification. Core loading was resumed. Subsequently, rod #2 displayed similar behavior. Since no problems were observed if the rods were scrammed, the licensee changed the procedure to require a scram after each of the final fuel elements were loaded. The inspector noted that there were adequate numbers of health physics and other staff personnel available to deal with the unanticipated equipment problems. Good communication and teamwork were demonstrated. The licensee stated that additional evaluation of the drive mechanisms would be done with the full core in place and at elevated pool temperatures. The NRC would be informed of the results. This matter will be reviewed in a future inspection (50-57/92-02-02).

The licensee advised the inspector that an antimony-beryllium startup source would be used. Since the reactor had not been operated for two years to "recharge" the source, the inspector requested the licensee to demonstrate that the source was producing a reliable indication on the source range nuclear instrumentation. This test was unsuccessful and the licensee installed a plutonium-beryllium source that was acceptable.

Within the scope of this review, the inspector determined that the reactor was reloaded in a safe manner.

9.0 Exit Interview

The inspector met with the licensee representatives indicated in Section 1.0 on June 3, 1992 and summarized the scope and findings of this inspection.