U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report/License No.: 95-02/TR-5

Licensee: U. S. Department of Commerce
National Institute of Standards and Technology
Gaithersburg, Maryland 20899

Facility Name: National Bureau of Standards Reactor (NBSR)

Inspection At: Gaithersburg, Maryland

Inspection Conducted: July 17-21, 1995

Inspector: _____
Thomas Dragoun, Project Scientist

Approved by: _____
Robert Bores, Chief, Effluents Radiation Protection Section

Areas Inspected: Post-outage recovery of systems, reactor operator training regarding system changes, procedure updates, calibrations, engineering change closeouts, and long-range planning of future equipment improvements.

Results: The activities related to the restart of the reactor and preparations for resumption of power operations were being accomplished with good attention to safety. No safety concerns or violations of NRC requirements were observed.

DETAILS

1.0 INDIVIDUALS CONTACTED

*T. Raby, Chief, Reactor Operations
*J. Rowe, Chief, Reactor Radiation Division
J. Torrence, Deputy Chief, Reactor Operations

* Denotes those present at the exit meeting on July 21, 1995. The inspector also interviewed other licensee personnel.

2.0 PURPOSE OF INSPECTION

The purpose of this inspection was to review the post-outage recovery of systems, reactor operator training regarding system changes, procedure updates, calibrations, engineering change closeouts, and long-range planning of future equipment improvements.

3.0 OUTAGE RECOVERY

The major equipment outage that began in June 1994 was completed in July 1995. The significant hardware changes included replacement of all heat exchangers, extensive modification of the reactor refueling head, replacement of thermal shield piping, replacement of primary water valves with "fugitive emission" (zero leakage) valves, installation of custom radiation shields on reactor system components, replacement of the cold source and its cryogenics support system. The inspector reviewed the activities underway to recover from the outage and prepare the reactor systems for power operations.

The initial core load to achieve criticality occurred on July 18, 1995. The licensee had repositioned the nuclear instrumentation start-up detectors to more sensitive locations because photo-neutron flux was reduced due to radiological decay during the outage and replacement of the heavy water moderator with a new inventory. Records indicate that a reliable count rate was achieved for monitoring the initial core load. The inspector observed the alcohol cleaning, visual inspection, and loading of four new fuel elements into the core to achieve the excess reactivity needed for the first power run cycle. The changes that were made to the reactor refueling head during the outage appeared to have eliminated the problem of dropped fuel elements that has occurred in the past. The positioning of the fuel in the core proceeded safely and quickly. Communications, control, and recordkeeping by the shift supervisor in the control room were good. The fuel handling satisfied the requirements in Technical Specifications (TS) 3.7 and 3.8. The inspector also reviewed the records of the dimensional checks done on the fuel by NBSR engineers during visits to the fuel fabrication facility. Records of rework to correct out-of-specification fuel gaps were good. The licensee's program for quality assurance of the fuel was excellent.

The inspector toured the various equipment areas where modifications had been done. There was no extraneous material adrift in any area and all

outage tools were removed. The inspector discussed the operation of the new primary water heat exchangers with the senior reactor operator responsible for the system. This system contains heavy water. Since the heat exchangers are plate type with narrow water gaps, filters are installed on the cooling tower water lines. The filters must be properly maintained to ensure that the heat exchangers function properly during normal operation and cool the reactor during emergencies. The senior reactor operator was very familiar with the operation and maintenance of the system. The inspector observed the test run of the primary water pumps and the inspection of the system for leakage. Several valves and pipe sections had been replaced. No leaks were detected and the pump vibration was negligible. The licensee uses automotive spark plugs threaded into the bonnets of the larger valves to detect body-to-bonnet leaks by monitoring the resistance between the electrodes.

Within the scope of this review, no safety concerns were identified.

4.0 REACTOR OPERATOR TRAINING

The inspector reviewed the training program for the reactor operators designed to update the staff regarding equipment changes made during the outage. One of the senior reactor operators was designated as the Training Assistant (TA) with the responsibility to develop the program. The Deputy Chief of Reactor Operations retains responsibility for recordkeeping and oversight of the training. Training records reviewed by the inspector indicated that training in most of the equipment changes occurred in May 1995. The TA indicated that a repeat session, including the last minute equipment changes, will be conducted just prior to power operations. All needed training has been identified. No written tests will be administered, but oral quizzing by the shift supervisors will verify operator understanding of the changes. The licensee also created an extensive file of video tape and still photograph records of the changes to use during training. Considering that most of the changes were designed in-house, much of the work was performed by the reactor operators, and contractor work was done under reactor operator oversight, this training is adequate. The operators are also required to review of procedure and checklist changes. Records of these reviews are maintained in the control room. Within the scope of this review, the inspector determined that the licensee's update training program was good.

5.0 PROCEDURE UPDATES

The changes to procedures and checklists needed as a result of equipment changes have not been fully completed. TS 7.4 describes the required procedures and the methods for review and approval of the changes. The inspector discussed the process for making the changes with the senior reactor operator (SRO) responsible for the project. He stated that input is obtained from engineering personnel, hand-over-hand walkdown of systems by reactor operators, and from lessons learned from system flushes and hydrostatic testing. Rough draft procedures are placed in

the control room and marked up by staff. A list of valve changes was compiled and a valve numbering system was proposed. The SRO stated that all procedure changes would be completed prior to the scheduled reactor power operations in about one month. Licensee upper management stated that additional resources will be allocated to the procedure update project to ensure timely completion. This matter will be reviewed in a future inspection.

6.0 CALIBRATIONS

The inspector reviewed selected calibration records and interviewed the instrumentation supervisor (IS) regarding changes in calibration technique due to the equipment changes. The IS stated that none of the instrumentation channels specified in TS Section 3.0 were changed. Some non-TS changes were made, such as the addition of ultrasonic transducers to measure primary water flow rate. Records indicated that the required calibrations were completed at the specified frequencies. Within the scope of this review, no safety concerns were identified.

7.0 ENGINEERING CLOSEOUT

TS 7.2 requires that the Safety Evaluation Committee (SEC) review proposed changes to facility equipment. 10 CFR 50.59 allows the licensee to make changes provided there is no unreviewed safety question. The inspector reviewed the SEC minutes of meetings and verified that selected changes were reviewed and approved. The inspector noted that three members of the SEC recently changed. The inspector discussed the qualifications of the new members with the Director of Operations. They appeared to be qualified to serve on the committee.

Most of the facility equipment changes are processed as Engineering Change Notices (ECN). The inspector discussed ECN 409, 412, 418, and 422 with the Acting Manager of Engineering. The engineering and quality assurance appeared to be excellent. For example, the heat exchangers were custom made to eliminate the possibility of a leak of reactor coolant to the environment. NIST engineers witnessed the assembly and testing at the factory during key steps during the manufacturing of the heat exchangers. The primary-side piping was hydrostatically tested in place to 168 psi because the fishmouth joint between the 12-inch aluminum piping and the larger 18-inch header pipe could not be radiographed. Although not required, the ASME Boiler and Pressure Vessel Code and the American Welding Society quality assurance criteria were applied. As a result, a "U Stamp" certification was granted for the primary heat exchanger and piping assemblies.

The inspector noted that not all as-built drawings were updated. The licensee stated that this would be completed prior to the power operation of the reactor next month. In a few cases, the drawings remained the final item for closeout of the ECN package. Within the scope of this review, no safety concerns were identified and the licensee's engineering support for the outage appeared to be excellent.

8.0 FUTURE OUTAGE PLANS

The licensee stated that one of the senior shift supervisors was assigned the full-time responsibility for coordinating future equipment modifications. The inspector discussed with the coordinator the accomplishments of the current outage relative to the original goals. He stated that all objectives were met, except that only two of five planned fugitive emissions valves were installed in the primary system. The priority for future changes will be focused on reduced waste volume, reduced gaseous and liquid effluent releases, and high density spent fuel racking. Lessons learned from the current outage and ideas for future changes will be published in a "30-year plan". This is a good licensee initiative.

9.0 EXIT MEETING

The inspector met with the licensee representatives denoted in Section 1.0 of this report at the conclusion of the inspection on July 21, 1995. The inspector summarized the purpose, scope and findings of the inspection. The licensee acknowledged the inspection findings.