

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report/License No.: 95-03/TR-5

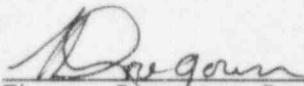
Licensee: U. S. Department of Commerce  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899

Facility Name: National Bureau of Standards Reactor (NBSR)

Inspection At: Gaithersburg, Maryland

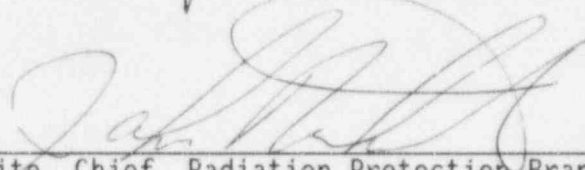
Inspection Conducted: September 25- October 5, 1995

Inspectors:

  
Thomas Dragoun, Project Scientist

  
Marvin Mendonca, Senior Program Manager (NRR)

Approved by:

  
John White, Chief, Radiation Protection Branch

**Areas Inspected:** Organization, logs, records, review and audit, design change functions, operator licenses, requalification and medical certification, procedures, reactor fuel movement, surveillance, experiments, effluent and environmental monitoring, emergency preparedness, radiological controls, and transportation activities.

**Results:** All programs included in this review were found to consistently exceed regulatory requirements. The ramp-up to full power operation at 20 megawatts was accomplished in a conservative and safe manner. No safety concerns or violations of NRC requirements were observed.

## DETAILS

### 1.0 INDIVIDUALS CONTACTED

#### 1.1 Licensee Personnel

- T. Hobbes, Leader, Health Physics Group
- H. Prask, Chairman, Safety Evaluation Committee
- L. Pevey, Chief, Occupational Health and Safety Division
- W. Rabbitt, Chief, Facilities Services Division
- \*T. Raby, Chief, Reactor Operations
- \*J. Rowe, Chief, Reactor Radiation Division
- L. Slaback, Supervisory Health Physicist
- J. Torrence, Deputy Chief, Reactor Operations

#### 1.2 Federal Nuclear and Radiation Safety Authority of Russia (GOSATOMNADZOR)

- M. Nikitina, Technical Translator
- A. Safronov, Deputy Head of Central Region
- V. Zlobin, Leading Specialist, First Department

#### 1.3 Ministry of Environmental Protection and Nuclear Safety- Ukraine

- T. Smiranova, Technical Translator
- B. Stolyarchuk, Senior Specialist, Nuclear Regulatory Administration
- A. Ved, Senior Specialist, Research and Development Centre for Nuclear Safety

\* Denotes licensee personnel present at the exit meeting on October 5, 1995. The inspectors also interviewed other licensee personnel.

### 2.0 PURPOSE OF INSPECTION

This inspection was conducted in accordance with joint agreements between Russia and the U.S., and the Ukraine and the U.S. It involved two Russian, two Ukrainian, and two U.S.N.R.C. inspectors, as well as, one Russian and one Ukrainian interpreter. The inspection consisted of safety reviews that followed the guidance contained in the NRC Inspection Procedures. The inspection successfully accomplished the activities specified in the joint agreements.

### 3.0 ENTRANCE INTERVIEW (Inspection Procedure 30703)

Inspectors began their on-site inspection efforts with an entrance interview. This meeting (1) informed the licensee of the areas for inspection, (2) solicited information concerning significant problems or changes since the last inspection, and (3) established the schedule of activities for inspection planning purposes. Also, a time at the end of the inspection for an exit meeting with licensee management to discuss the results of the inspection was scheduled. The licensee management indicated that the major equipment outage to upgrade the cold source and replace reactor system components, that began

in June 1994, was completed in July 1995. The licensee also identified that power ascension and testing activities were in progress and that the inspectors would be kept informed of the schedules to maximize observation of activities.

#### **4.0 INITIAL FACILITY TOUR (Manual Chapter 2545)**

A tour of the facility was conducted with licensee management (i.e., the chief nuclear engineer in charge of reactor operations and the supervisory health physicist). During the tour, facility conditions and ongoing activities were observed. The tour included the fuel storage pool and process equipment area. The process equipment area had been freshly painted and cleaned. New heat exchanger units were observed in the process room. The increased efficiency provided by the new heat exchangers required that flow be adjusted to maintain normal operating temperature.

The reactor was in power ascension testing and prepared for return to power operation. Reactor and health physics managers were well informed of ongoing activities and conditions. No violations or deviations were observed.

#### **5.0 ORGANIZATION, LOGS, AND RECORDS (Inspection Procedure 39745)**

The inspectors reviewed the organization with respect to requirements in Technical Specifications (TS) 7.1. There were no changes in personnel or organization structure since the last inspection. Reactor and health physics management positions were as required by TS and the manning of licensed operators on shift was verified by log review to acceptably meet the requirements. An adequate number of licensed operators was available to support resumption of continuous power operation. While only two licensed operators are required, most shifts were manned by three licensed operators.

Operator Logs were reviewed. Entries were clear and descriptive. Indicated problems or unusual entries were discussed with the operators on shift who were aware of the entries and able to explain the reason or resolution of the entries. Some control console displays were calibrated while others were conservatively set pending final calibration after the systems reached equilibrium at high power. The operators were fully cognizant of the status of each display.

Maintenance activities were evaluated for the top head plug repair activities. A videotape record of the work and related documents were examined. Management and Safety Evaluation Committee (SEC) review and approval was indicated on the documents. The licensee analysis determined that cathodic corrosion was the cause of the problem with the top head plug. The licensee's repair was designed to address this problem.

The inspectors also discussed the impact on safety of potential National Institute of Standards and Technology (NIST)-wide budget reductions on reactor activities with upper level licensee management. Management stated that job re-alignments would be controlled to minimize the impact on reactor programs and that safety would not be compromised.

## 6.0 REVIEW, AUDIT, AND DESIGN CHANGE FUNCTIONS (Inspection Procedures 40745)

The inspectors reviewed the Safety Evaluation Committee (SEC) and Safety Audit Committee (SAC) functions and membership to verify compliance with TS requirements.

SEC meeting minutes indicated that the committee was meeting with the required quorum and with the required frequency. The SEC minutes indicated that procedures and facility changes were reviewed as required. Additionally, the committee addressed facility problems, such as the scram relay failures that were caused by vibrations resulting from construction activity. The inspectors interviewed the Chairman of the SEC, who recently took over this function, and discussed the charter and function of the committee. From the minutes, it was noted that the SEC comprehensively identified and resolved problems. The SEC also recognized "commendable" work products by the licensee's staff.

SAC minutes indicated that the committee met in accordance with quorum and frequency requirements. The content of the SAC reviews were in accordance with TS requirements.

The inspectors reviewed selected design change documents (e.g., a new regulating rod control system and a new heat exchanger system) and the associated evaluations required by 10 CFR 50.59, and TS required management and committee reviews. The inspectors confirmed that testing was accomplished to verify system function after the change. Drawing and procedure changes were made as required. Within the scope of this review, no safety concerns were identified.

## 7.0 OPERATOR LICENSES, REQUALIFICATION AND MEDICAL CERTIFICATION (Inspection Procedure 41745)

Through a review of the operators logs the inspectors verified that qualifications were being maintained as required by the regulations [10CFR55.53(e)], that is, a minimum of four hours watchstanding per calendar quarter. By record review for selected operators, the inspectors verified that required training on facility equipment, procedure changes, and emergency response was being conducted to maintain license qualification in accordance with the requalification plan. The inspectors also verified that medical certifications were performed and verified as required by the requalification plan. Additionally, the inspectors reviewed the special practice given to the reactor operators prior to the start of the power ascension program. Within the scope of this review, no deficiencies were noted.

## 8.0 PROCEDURES (Inspection Procedure 42745)

The inspectors verified that the procedures required by TS were prepared and available in the control room for use by the operators as necessary. The inspectors noted that some procedures had been changed since the last inspection. Records indicated that these changes were reviewed and approved by the Safety Evaluation Committee. The inspectors verified that reactor operators were familiar with the changes.



The inspectors observed a reactor startup and reactor power ascension. These activities were conducted in accordance with the procedures and demonstrated good understanding and adherence to procedures. Additionally, before the startup, the licensee performed a startup checklist (which was not required, given the short duration of the shutdown). This was a good licensee initiative.

#### **9.0 REACTOR FUEL MOVEMENT (Inspection Procedure 60745)**

The inspectors reviewed the licensee fuel movement control process and records for the most recent off-loading and loading of fuel to the core. The inspectors verified that the fuel movement was preplanned and documented. Radiological and security controls at the fuel pool were observed to be consistent with regulatory requirements. Also the inspectors verified that checks and test for proper fuel position and latching were documented.

#### **10.0 SURVEILLANCE (Inspection Procedure 61745)**

The inspectors reviewed the licensee program for control and conduct of surveillance activities. Selected surveillance activities (e.g. control rod worth, withdrawal and insertion speeds, scram drop times, and measures to ensure that there was no mechanical binding of the control rods) were verified to have been performed in accordance with TS requirements and approved procedures.

#### **11.0 EXPERIMENTS (Inspection Procedure 69745)**

The inspectors examined the control program for experiments. The licensee controls in-core experiments through approved lists of experiments and experimenters. The inspectors verified that operators are provided with these lists in the control room and implemented the controls as required on selected experiments. The inspectors also verified that the control system ensures that the requirements of TS 4.0 (single and total experiment reactivity worth, precautions for irradiation of explosives or corrosives) are met. The inspectors discussed the advisability of indicating the estimated reactivity worth on each experiment request form, for experiments done under a blanket approval. This information would assist operators in tracking the worth of experiments installed in the core. Licensee management stated that reactivity worth is monitored and controlled by the operators as they observe the change in regulating rod (reg rod) position, hence the core reactivity change, during experiment insertions and record the reg rod position at 15 minute intervals in the log. The inspectors accepted this response since it considered facility specific conditions, equipment and personnel requirements; and indicated a timely, thorough analyses of the safety issue by the licensee.

Selected experiments and experimental changes were verified to include approval as required by management and the independent Safety Evaluation Committee.

A pneumatic in-core (rabbit) insertion was observed. The insertion was conducted in accordance with procedures (i.e., communications with the control room, observation of radiological conditions, remote monitoring of radiological conditions prior to entry into the room and during conduct of the rabbit insertions), and radiological precautions (use of gloves, remote handling, and shielding).

Control conditions for beam port experiments were also observed. A good practice, that was recently implemented from lessons learned from a beam port experiment fire at a Department of Energy test reactor, was the posting in front of experimental beam facilities of a list of authorized experimenters and location of electrical on-off switches for the facility. In addition, the required radiological posting was verified. The inspectors discussed radiological control requirements with a beam port experimenter and verified acceptable training and understanding of the hazards and controls for this location. Experimental programs were acceptably conducted and no violations or deviations were observed.

## **12.0 EFFLUENT AND ENVIRONMENTAL MONITORING (Inspection Procedure 80745)**

The inspectors reviewed the effluent and environmental monitoring records, dosimetry system, and verified that effluent releases since the last inspection were in accordance with licensee procedures, regulatory requirements, and the As Low As Reasonably Achievable (ALARA) principle.

## **13.0 EMERGENCY PREPAREDNESS (Inspection Procedure 82745)**

There were no changes to the emergency plan since the last inspection.

Previous drills and exercises were verified by record review to be conducted at the required frequency and detail. Additionally, through this verification, the inspectors determined that the licensee demonstrated the ability to respond to emergency conditions in the emergency planning zone as required by the emergency plan. The inspectors verified that the licensee has established emergency action levels for radiological conditions based on specific monitoring for gaseous releases.

The inspectors also examined the licensee's actual response to a recent unusual event, a bomb threat. Records indicated that declaration of emergency conditions was prompt, emergency organization mobilization was timely, and actions were in accordance with the emergency plan for the condition (e.g., secure the reactor, evacuate the reactor building, and search the facility). A critique was conducted by the licensee and the inspectors verified that this critique was comprehensive. This emergency will be credited as the emergency exercise for 1995.

The inspectors also interviewed the security, fire fighting and medical treatment personnel, and toured their facilities. These personnel were equipped, trained and qualified to perform functions as required by the emergency plan.

The inspectors also verified acceptable emergency call-outs lists, equipment, instrumentation, communications, alarms and supplies in accordance with the emergency plan. The licensee maintained more equipment and supplies than were required by the plan.

The only offsite emergency support needed for this facility is the Naval Medical Hospital, with whom the licensee is planning to conduct the next exercise. The inspectors toured the hospital facilities, interviewed the officer-in-charge, and verified that the facility can acceptably meet the emergency plan requirements.

#### 14.0 RADIOLOGICAL CONTROLS (Inspection Procedure 83743)

The radiological controls program was not changed since the last inspection.

The inspectors reviewed general radiological training which includes the use of a computerized training program. This program was user friendly, accurate and encouraged student learning.

The inspectors reviewed the staffing of the licensee health physics group. Currently, the health physics group is sufficiently staffed with qualified personnel to implement the radiological control program in accordance with management expectations and regulatory requirements. The inspectors discussed the impact on staffing of potential federal budgetary restraints and encouraged management to keep the inspectors informed of any changes in staffing.

The inspectors reviewed the licensee's shielding verification survey program for the return to high power reactor operations. A radiation survey of one cold neutron beam guide tube facility was observed. A good practice that was noted was the use of one individual to survey and another individual to take data. The inspectors also reviewed licensee analysis and corrective action proposals for addressing the elevated background radiation at the primary-to-secondary leak detector, caused by N-16 gamma streaming from a newly installed neutron guide tube. The licensee is considering additional shielding or movement of the leak detectors as an engineering approach to resolve this condition. The licensee's approach to this problem resolution appears appropriate. General area survey results, schedules, shielding efforts, or other measures were discussed and records demonstrated compliance with the provisions of the radiation controls program and the principle of ALARA.

Posting and labeling of contaminated and radiation areas were reviewed and observed to be in accordance with the radiological control program and regulatory requirements.

The inspectors reviewed the controls for high radiation areas around neutron beams. The licensee program is consistent with that discussed in an NRC letter on control of radiation beams issued on June 5, 1995.

The inspectors verified that the annual review of reactor radiation protection program was performed as required by 10CFR20.1101(c). The review considered regulatory changes and identified associated program changes that were

required. The review included all procedures and processes related to reactor health physics, and changes to the facility. The review found the radiation protection program in compliance. The inspectors concluded that the annual review was acceptably conducted.

The inspectors also reviewed storage and disposal of low level radioactive wastes and verified that these functions were in accordance with the radiological controls program.

#### **15.0 TRANSPORTATION ACTIVITIES (Inspection Procedure 86740)**

The inspectors observed the licensee packaging facility, forms and labels for transportation activities. The inspectors also reviewed records of transportation to verify proper surveys, packaging, labeling, and controls.

#### **16.0 EXIT INTERVIEW (Inspection Procedure 30703)**

The inspectors met with licensee management and first expressed appreciation for the excellent cooperation from the licensee staff during the inspection. Within the scope of this review, the inspectors concluded that all licensee programs associated with the reactor exceeded regulatory requirements and generally provided a considerable margin that ensures safe reactor operation.