



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-62/85-03 and 50-396/85-01

Licensee: University of Virginia
Charlottesville, VA 22901

Docket Nos.: 50-62 and 50-396

Facility Name: University of Virginia Reactor UVAR and Cavalier

Inspection Conducted: November 8, 1985

Inspectors: *D. J. Burke* 12/4/85
D. J. Burke, Senior Resident Inspector - Surry Date Signed
M. W. Branch 12/5/85
M. W. Branch, Senior Resident Inspector - Date Signed
North Anna
Approved by: *P. E. Fredrickson* 12/5/85
P. E. Fredrickson, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine, unannounced inspection entailed 33 inspector-hours onsite in the areas of plant operations and operating records, staff organizations and services including audit functions and training, research reactor procedures, surveillances, and refueling records, reactor experiments, and licensee action on previous items.

Results: In the areas inspected, no violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *T. G. Williamson, Chairman, Nuclear Engineering and Engineering Physics Department
- *R. U. Mulder, Director, Nuclear Reactor Facility
- J. P. Farrar, Reactor Supervisor
- *P. E. Benneche, Reactor Operations Supervisor
- B. Hosticka (SRO), and Other Reactor Operators

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on November 8, 1985, with those persons indicated in paragraph 1 above. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Plant Operations and Operating Records

- a. The inspectors examined the operating logs for 1984 and 1985 to verify that significant operations and maintenance activities were properly documented and reviewed. In addition, the inspectors observed the completion of various pre-startup checklists and tests on November 7, 1985, in accordance with SOP 4-1 prior to the UVAR reactor startup. Several Safety System and Measuring channels in TS Tables 3.1 and 3.2 were demonstrated to be operable by channel displays and initiation of SCRAM trips when setpoints were exceeded during the pre-startup checklist and testings. The inspectors also witnessed the closure of the personnel door and ventilation exhaust duct during the bridge radiation monitor alarm testing, to ensure confinement capability. The inspectors then observed the approach to criticality and power operation of the UVAR. At 9:55 a.m., the UVAR went critical; the control rod critical positions were 12.72 inches (Reg Rod approx. 11 inches), or one inch above the minimum critical rod positions, ensuring adequate shutdown margin on core configuration 15c.

Staffing of the facility during operations was also certified to be in accordance with Technical Specifications (TS) 6.1.3. Within the areas inspected, no violations were identified.

The inspectors did recommend that the labeling and identification of control room equipment be reviewed for improvement; the Rabbit radiation monitor picoammeter, for example, had no identification tags or setpoint marks, although the alarm setpoint (240 mr/hr underwater) was properly verified prior to use. Open Item (62/85-03-01), Label and identify control room equipment, including setpoints.

- b. During review of the latest Annual Report, dated January 24, 1985, the inspectors noted in the maintenance section that a leak occurred in the primary coolant system (pool) demineralizer piping on July 19, 1984; the piping was epoxyed and returned to service. On September 29, 1984, the leak reoccurred overnight and resulted in the loss of some 3,000 gallons (approx. one foot) of pool water into the demineralizer and heat exchanger room before the system was isolated. The piping between the pump and filter was replaced and no subsequent leakage has occurred. The low pool level automatic isolation was also reset to activate at two inches rather than one foot. During the inspection of the demineralizer piping, the inspectors noted that various materials were used in the demineralizer and recirculation piping (e.g., plastic, aluminum, and cast piping and elbows). The original specifications for both the system design and the system materials could not be located by the licensee. Although the system operates at low pressures (e.g., 15 to 20 psig), and is automatically isolated by low pool level, the inspectors requested that some analysis of the system piping be performed to verify its integrity under all operating conditions, and to specify piping materials if replacements become necessary. Open Item (62/85-03-02), Analyze demineralizer piping for material specifications.

The inspectors also noted that several nuclear instrumentation detectors and connectors were replaced or rebuilt during the year (e.g., power range channel 2 detector replaced three times), and recommended that an engineering review be performed to determine the cause of failures, and if appropriate, a cost benefit analysis be considered to reduce the failure rates with upgraded equipment or repairs. In addition, the UVAR reactor experienced some 60 unplanned shutdowns or reactor SCRAMS during 1984. Many were caused by instrument noise on power range channel 2, or NI or RM detector response to fuel movements. The inspectors recommended that the licensee review the shutdowns to determine if corrective actions can be taken on generic trip initiators. Open Item (62/85-03-03), SCRAM reduction program.

- c. The inspectors also noted that a few UVAR SCRAMS were missing from the Unplanned Shutdown list in Section 6 of the 1984 Annual Report (e.g., 7/18/84, 8/28/84, 10/20/84, 11/28/84 SCRAMS), although they were properly listed in the logbooks and on the Master list which is retyped into the Annual Report. The licensee is submitting a supplement to the Report for the missing emergency shutdowns and SCRAMS, as well as the corrective action taken to ensure compliance with TS 6.6.2(4). Open Item (62/85-03-04), Correct SCRAM listing in 1984 Annual Report.
- d. A routine tour and inspection was made on the Cavalier reactor also; no violations were identified.
- e. (Closed) Open Item (50-62/85-03-01), A licensee review of the SAR was completed prior to January 31, 1984, and resulted in the updating of the document. For example, the new curved plate fuel is now described in the SAR. This item is closed.

6. Procedures

The inspectors verified that the content and scope of the facility procedures were adequate to control safety-related operations, and that an effective procedural control system had been established. Significant expansions in the Emergency and Health Physics procedures have occurred over the past 18 months. The inspectors also verified that appropriate procedures were used by the operators and staff during testing and manipulation of the reactor controls. Specific inspector comments on procedures may be found in paragraphs 5.a and 7.

Within the areas inspected, no violations were identified.

7. Surveillance Testing

The inspectors examined the licensee's surveillance and testing programs to ensure procedural adequacy and to verify that periodic testing and calibrations are being conducted in accordance with the Technical Specifications surveillance requirements. The performance of various pre-startup checklists and tests were observed as described in paragraph 5.a of this report. In addition, the inspectors reviewed certain calibration and testing records completed over the past 18 months which included the following:

- a. Rod drop tests and visual inspections; the inspectors noted that control rod 3 magnet current was less than half the amperage through CRs 1 and 2, due to a new armature. However, the magnet release and rod drop times of all rods were within the TS requirements.
- b. Primary Coolant System Flow instrumentation.
- c. Emergency Core Spray System flow testing.
- d. Pool level instrumentation.

- e. Pool level/demineralizer system trip verification.
- f. Power Range #2 calibrations.
- g. Primary heat balance calculations and correlation checks with nuclear instrumentation.
- h. Primary coolant conductivity and pH.

Within the areas inspected, no violations were identified. The inspectors did recommend that the Radiation Monitoring Systems (RMS) calibration procedures (7.2), be expanded to include additional instructions and acceptance criteria; the procedure currently refers to the vendors manuals for calibration and maintenance of the detectors and channels (e.g., Bridge RMS). Open Item (62/85-03-05), Upgrade RMS calibration procedures.

8. Review and Audit Function

The inspectors reviewed the 1984 and 1985 Reactor Safety Committee (RSC) meeting minutes and verified the following:

- Qualification of personnel satisfied those specified in Technical Specifications (TS) and the Committee Charter
- A quorum was present and meeting frequencies satisfied TS requirements.

Although few design changes were made to the facility in the 1984-1985 time frame, one major modification was reviewed. The modification reviewed involved the installation of a pneumatic rabbit system for the delivery of experiments in and out of the UVAR reactor. The inspectors found that the Safety Evaluation as well as the RSC review of the modification was detailed and provided an excellent basis for determination of the safety implications of the modifications. The inspectors did note, however, that the checklist discussed in the Quality Assurance Program Description (QAPD) was not utilized for this modification. Although no formal commitment to utilize this checklist could be found, the inspectors did recommend that the checklist be used for review of modifications since it provides a sound basis for making the 10 CFR 50.59 safety determination.

The inspectors did identify one item of concern which involved the blanket approval given by the RSC on April 17, 1979, on core configuration changes; the operating staff has interpreted this approval to mean that core configuration changes may be made without prior committee approval. Specifically, the operating staff frequently makes core configuration changes without prior committee approval providing the change is similar to one previously used and providing that excess reactivity and shutdown margin are verified to be within TS limits. The committee is provided with an information copy of the core changes made as well as the excess reactivity

and shutdown margin measurements made after loading. The inspectors reviewed Section 5 of the UVAR TS and determined that freedom to safely change core configurations, providing excess reactivity and shutdown margin are within limits, is a design feature of the reactor. However, the inspectors requested that the RSC review this matter to determine if a pre-established safety envelope should be provided by the RSC to the operating staff to ensure that core configurations have been previously used or properly reviewed prior to operations. Open Item (62/85-03-06), Consideration of a safety envelope for various core configuration changes.

9. Experiments

During inspection of the 1984 and 1985 RSC meeting minutes, the inspectors reviewed several new non-routine experiments that had been approved. One such experiment dealt with the irradiation of gem stones for the purpose of improving their luster quality. The experiment was approved prior to accomplishment as required by TS and the accompanying safety analysis contained sufficient detail to make a hazard's determination. Additionally, the inspectors verified that experiments were evaluated as to whether they should be fixed to the core or movable and that reactivity limits had been established on movable experiments. The rabbit facility was also reviewed as discussed in paragraph 8.

No violations or deviations were identified.