

U. S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-225/84-03

Docket No. 50-225

License No. CX-22 Priority -- Category G

Licensee: Rensselaer Polytechnic Institute  
Department of Nuclear Engineering and Science  
Troy, New York 12181

Facility Name: RPI Critical Experiments Facility

Inspection At: Schenectady and Troy, New York

Inspection Conducted: November 28-29, 1984

Inspector: Theodore A. Rebelowski  
T. A. Rebelowski, Senior Resident Engineer,  
Millstone Unit III

1/17/85  
date signed

Approved by: E. McCabe  
E. McCabe, Chief, Reactor Projects,  
Section 3B, DPRP

1/24/85  
date signed

Inspection Summary: Inspection on November 28-29, 1984 (Report No. 50-225/84-03)

Areas Inspected: Routine, unannounced inspection by a senior resident inspector (14 hrs.) of licensee action on previous inspection findings, facility operations, organization, logs and records, surveillance activities, reviews of procedures and experiments.

Results: No violations or unacceptable conditions were identified.

8502080459 850131  
PDR ADOCK 05000225  
G PDR

## DETAILS

### 1. Persons Contacted

Dr. R. T. Lahey, Chairman, Department of Nuclear Engineering and Science  
Dr. D. R. Harris, Facility Director  
Dr. F. E. Wicks, Operations Supervisor  
Mr. F. J. Mastriana, Assistant to Director, Office of Radiation and Nuclear Safety

### 2. Licensee Action on Previous Inspection Findings

(Closed) Inspector Follow Item (80-02-01): Review of startup checklists to assure completion. Discussions with the licensee indicated that checklists are reviewed by the Facility Supervisor prior to each startup. A review by the inspector of startup checklists for June 1983 to November 1984 found no unreviewed checklists and that the checklists were completed. This item is closed.

(Closed) Unresolved Item (80-02-02): Insure that scram surveillances are complete for each reactor startup. Startup checklists specify a check of rod scrams prior to startup and were completed. In addition, semi-annual and annual scram times were reviewed and found acceptable. This item is closed.

(Closed) Unresolved Item (80-02-04): Issue core reconfiguration report. The licensee has issued two such reports and a related NUREG-1023 safety evaluation report which was used as background for the issuance of a 20 year amendment to the licensee on December 8, 1984. This item is closed.

(Closed) Circulars 77-14 and 80-14 (77-CI-14 and 80-CI-14): The licensee concluded there was no problem with separation of systems in regard to cross contamination. Sample checks by the inspector during the facility tour confirmed this. These items are closed.

(Closed) Unresolved item (80-01-01): The area of a representative air sample was questioned during NRC Inspection 81-03. An inspection tour of the reactor included observations in the reactor room and verified location of the air sampling hose directly above the reactor tank. The system was traced, verifying proper connection to air samplers. This item is closed.

### 3. Operation Review

A review of a number of operational elements was conducted as indicated.

#### a. Maintenance Review

From June 1983 to November 1984 the following maintenance was performed.

-- Air monitor - new belts - the inspector noted this and verified the placement of the air sampling inlet above the reactor tank.

- Repair of Control Rod 4 - would not withdraw - stuck at 1", disassembled and retested. Rod drop test satisfactory.
- Installed and tested new solenoid interrupter circuits.

No deficiencies were identified.

b. Surveillance

A review was conducted of the Semi-Annual (6/28/84) and Annual Surveillance (1/30/84) checklists. Areas addressed included Nuclear Instrumentation, Trip Point Setting, Rod Drop Times, Interlock and Scram Tests, and Auxiliary Systems Test.

No deficiencies were identified.

c. Radiation Surveillance Review

1. Area Swipes

The inspector reviewed the radiation surveys performed on 1/25, 2/29, 3/28, 5/14, 8/22, 11/27 in 1984 and 6/30 and 9/29 in 1983. Surveys included 11 areas of the reactor floor and 6 control room areas and walls.

2. Environment Monitoring

The inspector reviewed environmental (TLD) readouts for eight areas, Badges 09701 to 09707 and 0930. All badges had no identified radiation effects. In addition, the sub-critical area monitor for the west wall had no abnormal readings.

No deficiencies were identified.

4. Emergency Plans

The licensee submitted proposed Emergency Plan CX-22 in September 1984 in response to a July 1984 request from the Standardization and Special Review Projects Branch, NRR. The interim plan is under review by NRR. An emergency drill was performed on April 9, 1984 and involved a simulated fire in the facility. Fire patrols, the local hospital, New York State, and the NRC were notified.

The inspector had no further questions at this time pending NRR approval of Emergency Plan.

5. Operational Reactor Physics and Engineering

The licensee offers an intensive course for electric utility engineers consisting of lectures and the performance of ten experiments on a critical reactor. These include fuel loading with associated sub-critical multiplica-

tion and prediction of criticality, control rod worth including bank and single rod, differential and integral rod worth, rod drop measurements, reactivity versus temperature, reactivity versus boron, reactivity versus void, spatial flux shape and power calibration, and cross section measurement. The instructions involve the use of a newly revised Manual of Experiments.

The experiments are discussed in the 1964 Hazards Summary and the 1984 Safety Evaluation Report. Differences in arrangement of calculations and procedural steps have been reviewed by the Nuclear Safety Review Board but are not identified in the Minutes of Board Meeting. The inspector requested formal documentation of the board's review.

This item will be reviewed during a subsequent inspection (IFI 84-03-01).

#### 6. Nuclear Safety Review board (NSRB)

The inspector reviewed the July 13, 1984 minutes of the NSRB session which reviewed fire protection alarms, entry alarms, control room panel cleanliness and improvements on control rod solenoids.

IE Notice 83-66 Supplement 1, Fatality at Argentine Nuclear Facility, was NSRB reviewed and summarized as follows.

1. The RPI core cannot go prompt critical with the current (student core) fuel loading configuration.
2. The students are adequately informed of the dangers that exist and an SRO must oversee all fuel loading operations.
3. NSRB must approve in advance all other core configurations.

The NSRB, upon approval of the NRC and DOE, did transfer some uranium to an approved vault to insure a reduced inventory at the Critical Facility.

Other than as noted in Detail 5, preceding, the inspector had no questions on the NSRB meeting minutes.

#### 7. Tour of Facility

A facility tour was conducted on arrival and at the conclusion of the inspection. Various previously identified concerns were reviewed and found acceptable.

Revision is needed in the piping diagrams that indicate licensee makeup water is passed through a demineralizer and various check valves to the storage tank. The demineralizer was removed several years ago, and the piping diagram, Figure 5 of the Hazards Summary Report, presently does not reflect this change. The licensee committed to review these and other drawings used for students to ensure they reflect system conditions (IFI 84-03-02).

Area monitors were observed and documentation of internal and extremity doses were reviewed in reports 09750 thru 09753. No deficiencies were identified.

8. Management Exit Interview

The inspector met with the licensee representatives at the conclusion of the inspection on November 29, 1984. The inspector summarized the purpose and scope of the inspection and discussed the two inspector follow items. The licensee acknowledged the findings.

References Used During Inspection

The references below were used during the site visit.

1. Reconfiguration of the Rensselaer Polytechnic Institute - Critical Facility to Lower Critical Mass - Nuclear Technology, Volume 60, February 1983, Peter K. Nelson and Donald R. Harris.
2. Operational Reactor Physics and Engineering for Utility Engineers - Dr. Frank Wicks' paper presented at the International Nuclear Power Plant Thermal Hydraulics and Operations Topical Meeting, Chinese Nuclear Energy Society - October 22-24, 1984.
3. Design Basis Transient Analysis for Low Power Research - Reactors; D. Harris, O. Jones, F. Wicks, C. Chuang, F. Rodrigues-Vera, and A. B. Harisi(?).
4. Hazard Summary Report, Schenectady Critical Facility, August 1964.
5. IE Information Notice, 83-66, Supplement 1.