



Rensselaer

DEPARTMENT OF MECHANICAL,
AEROSPACE, AND NUCLEAR ENGINEERING

March 31, 2005

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

U.S. Department of Energy
NE-30
John Gutteridge
1000 Independence Avenue, SW
Washington, DC 20585

Re: Operations Report for the Rensselaer Polytechnic Institute (RPI) Reactor Critical Facility (RCF)

NRC License CX-22
Docket Number 50-225

To Whom It May Concern:

This document constitutes the calendar year 2004 Operations Report of the RPI RCF to the USNRC, USDOE, and to Rensselaer management.

The Reactor Critical Facility (RCF) operated successfully during calendar year 2004. The RCF was used for one laboratory course and two introductory courses in the Nuclear Engineering and Engineering Physics curricula. Eighteen credits of PhD thesis work were conducted at the facility. Two graduate students and the facility staff performed experiments and work toward submittal of a critical benchmark to the international benchmark project. The facility staff trained two new Senior Reactor Operators who passed an NRC licensing exam in May 2004.

Work proceeded on critical experiments with the 0.640 pitch lattice plates. Critical measurements were performed with 332-pin and 333-pin configurations. Some subcritical measurements were conducted with fewer pins. The SPERT(F1) fuel is 4.81 w/o enriched high density UO₂ pellet fuel clad in stainless steel, so it is similar to power plant reactor fuel.

The RCF is now the only facility in the U.S. carrying out reactor physics critical experiments in support of the power reactor function. These experiments are similar to power reactor startup measurements.

A PhD thesis experiment was completed to measure the penetration of fission gammas through fuel pin lattices without water; the application is to above-ground cask storage of spent fuel and to fuel handling devices.

Work continues on upgrading the reactor instruments, circuits, readouts, and facilities. A new rod position system was installed and replaces the original synchro transmitter-receiver system. A related Technical Specification change, approved by the Nuclear Regulatory Commission, eliminated the interlock associated with the 400 Hz motor-generator set that provided power to the synchros. The new system senses rod motion through an optical encoder mechanically coupled to the control rod. Position is determined by detecting the pulse train from the encoder in a digital counter. Position is displayed in inches withdrawn to the nearest 0.01 inch. A written test procedure was used to verify correct operation of all affected controls and indications.

A NRC inspection was performed in January 2004. NRC findings and the RPI response have been reported in other correspondence.

Funds were provided under the USDOE URI Program to complete additional upgrades. The funds are targeted for a replacement set of startup instrumentation (2 channels), control rod drive clutches, spare detectors and other instrumentation. The grant is a five year continuing program and a continuation request has been submitted.

Training and proficiency requirements for all licensed operators have been reviewed and are current.

The Technical Specifications, App. A to USNRC License CX-22, require reporting the following operational items:

1. Changes to facility design: The rod position system was replaced as explained above.
2. Significant maintenance, repairs or other work performed on RCF systems:
 - a. The control panel layout was revised to accommodate the new rod position indicating devices and to consolidate other test controls.
3. Changes in operating procedures which relate to the safety of RCF operations: None
4. Surveillance checks, tests, and calibrations were conducted and logged as required. The results were satisfactory. On November 18, 2004 an emergency preparedness drill was conducted at the RCF.

5. Changes, tests or experiments requiring authorization from the USNRC under 10CFR50.59 a or b: None
6. Glenn Winters and Jonathan Stephens have been Director and Operations Supervisor respectively through this period. Dr. Don Steiner was replaced as NSRB Chairman by Dr. Michael Podowski from the Nuclear Engineering faculty. Dr. Steiner remains as a member of the NSRB.
7. Calculated integrated thermal power: Approximately 5×10^{-3} kwhr for all of 2004, far less than the Technical Specification 3.1.10 limit of 200 kwhr/yr.
8. There were no unplanned scrams in the report interval.
9. Maintenance operations were carried out and logged with satisfactory results.
10. There were no discharges of radioactive effluents.
11. Environmental monitors (exclusion area and site boundary) recorded exposures less than 40 mrem per year above background.
12. Facility personnel exposures were all less than 50 mRem for the report period.

Sincerely,



Glenn Winters, Director
RPI Reactor Critical Facility

cc: Michael Podowski, Chairman, RPI NSRB
Jonathan Stephens, RCF Operations Supervisor, RPI
J. A. Tichy, Chair, Department of MANE, RPI
Peter Caracappa, RPI Radiation Safety Officer
Will Fahey, Acting Director, Environmental Health and Safety, RPI