U.S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-225

License No: CX-22

Report No: 98201

Licensee: Rensselaer Polytechnic Institute

Facility: L. David Walthousen Critical Experimental Facility

Location: Schenectady, New York

Dates: April 7-10, 1998

Inspector: Thomas F. Dragoun, Reactor Inspector

Approved by: Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management

EXECUTIVE SUMMARY

The licensee's programs were directed toward the protection of public health and safety and were found to be in compliance with NRC requirements. No significant safety concern or violation as identified.

Report Details

Summary of Plant Status

The reactor was operated for student tours, training of reactor operator candidates, and a radiation survey. Housekeeping was acceptable. The 400 cycle motor-generator set, city water supply piping, reactor water dump valve and downstream piping had been replaced. A Gamma-Metrics digital nuclear instrumentation unit was installed in the control console but not electrically connected.

O1 Organization and Staffing

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed:

- organizational changes, and
- staffing levels

b. Observations and Findings

The college president and dean of the engineering school were replaced during this inspection. No impact on facility operation was anticipated. Since the last inspection, the Operations Supervisor, a position normally filled by a student, graduated and was replaced. However, no replacement has been named for the incumbent who will graduate in May 1998. The Facility Director retired to become an "active" professor emeritus but remained fully involved with the critical facility. Eight students were in training to obtain an NRC senior reactor operator license.

Three SROs were available to support reactor operations. Records indicated that a Duty SRO and On-call SRO were designated whenever the reactor was not shutdown as required by T.S.6.1.3.

The facility license expires in approximately five years. The additional workload to support license renewal has not been assessed by the licensee.

c. Conclusions

The organization satisfied T.S. 6.1 requirements.

O2 Operation Logs and Records

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed:

- reactor startup and shutdown checklists,
- console operations log,
- surveillance records, and
- maintenance records.

b. Observations and Findings

Records, checklists, and logs were clear and detailed. A separate list was added to the back of the console log which gave the page number where surveillance data and unanticipated scrams were recorded. This list assisted the inspector in quickly locating data.

Surveillances were performed on schedule and results met the applicable acceptance criterion's requirements. No radioactive material was shipped and there were no reportable occurrences. Limiting conditions for operations were satisfied.

Two of the four area gamma radiation monitors were out of commission. The licensee used portable units in these areas as allowed by T.S. 3.3(d). The two remaining operable units included the criticality monitor. The Facility Director stated that two new area monitors (detector and console readout) were ordered to replace the defective equipment. Management was also considering replacing the remaining two channels in anticipation of future failures.

The air monitor for the reactor room was calibrated semiannually. Since this device monitors airborne particulate activity as specified in T.S. 4.3, use of a button source with known activity for calibration was appropriate. Inspector follow-up item 92-01-01 is closed.

c. Conclusions

Records were maintained as required by T.S. 6.6 and surveillances conducted as required by T.S. 4.0.

O3 Procedures

a. Inspection Scope (Inspection Procedure 40750)

The inspector reviewed:

- current procedures, and
- procedure implementation.

b. Observations and Findings

Written and approved procedures required by T.S. 6.2 were available. Some activities are documented as student experiments. The Operations Supervisor indicated that there was a need for additional procedures and improvement of existing procedures to ensure consistency of program implementation during the frequent turnover of operations personnel. This effort would be completed as time permitted.

Procedures were used *verbatim* during the training class for SRO candidates. Some students read each step allowed for the benefit of the class during the evolution. The startup checklist, reactor startup, power changes, and reactor shutdown were done in accordance with procedures. The two SROs providing the training also quizzed students during performance of the procedure.

c. Conclusions

Availability and use of procedures satisfied T.S. requirements.

R1 Radiation Protection

a. Scope (Inspection Procedure 40750)

The inspector reviewed:

- radiation protection policies and procedures,
- personnel, environmental, and area dose records,
- radiological signs and postings,
- instructions to personnel,
- control of effluent releases,
- a routine radiation survey, and
- instrument calibrations.

b. Observations and Findings

During inspection 96-01, the licensee stated that revised Radiation Safety Regulations and Procedures (Revision 4) would be provided for NRC review. This was done. A review determined that the program was clear, comprehensive, and satisfied requirements specified in 10 CFR 20.1101. Inspector follow-up item 96-01-02 is closed.

Personnel, environmental, and area doses were measured using commercially available 4 chip TLD badges. TLD processing was done in-house as allowed by 10 CFR 20 Subpart F because doses were less that 10% of the NRC limits and there were no high radiation areas. All doses were within these limits. However, the inspector noted that some TLDs used within the critical facility as full time area monitors indicated an average dose rate of several millirem per hour across the year. Also, the relative contributions of neutron and gamma radiations shifted significantly from the first half of the year to the second half. These levels did not coincide with the results of monthly routine radiation surveys. Furthermore, given the distance of the TLDs from the core and PuBe source, and limited reactor operation during the year, there was the possibility that high radiation areas existed under certain conditions. Advised of this concern, the licensee conducted a gamma and neutron survey with portable instruments on April 10, 1998. Reactor conditions during the survey included: core tank drained and filled, PuBe neutron source exposed and stowed, and the reactor at different power levels. Preliminary analysis of the survey data indicated that the TLD results were in error. The licensee's final resolution of this matter will be reviewed in a future inspection. (Inspector Follow-up Item 50-225/1998201-01).

In addition to the special radiation survey discussed above, the inspector accompanied the Assistant RSO during a routine survey of dose rates and contamination. Acceptable survey techniques were used, procedure was followed, and results were well organized and clearly recorded on survey maps. The surveyor was aware of expected levels and able to identify anomalies. Warning signs and postings were appropriate for the radiation levels measured during the surveys.

Annual refresher training was provided to radiation workers. Written exams and lecture outlines indicated that material presented satisfied requirements in 10 CFR 19.12.

Liquid waste was analyzed for beta and gamma emitters using generally accepted techniques. Laboratory analytical equipment was properly quality controlled and efficiency factors measured each time a sample was analyzed. Discharge records indicated that effluent concentrations were below NRC limits. Gaseous discharges were not monitored due to the low reactor power levels. However, the licensee indicated that the EPA COMPLY computer code will be used to demonstrate compliance with the NRC constraint criteria effective January 9, 1997. No solid radioactive waste was produced at the reactor.

Portable β/γ survey instruments and laboratory α/β proportional counters are calibrated semiannually by students as experiments. The procedures were updated in Spring 1998 and followed recommended practices. The neutron survey meter was calibrated by a vendor.

c. Conclusions

The radiation protection program has been maintained in accordance with regulatory requirements and licensee commitments.

S1 Material Control and Accounting

a. Inspection Scope (Inspection Procedure 85102)

The inspector reviewed:

- designated storage areas,
- shipment, receipt, and burn up records,
- annual inventory results, and
- reports.

b. Observations and Findings

Records indicated that all nuclear material shipped or received was accurately accounted for. The licensee had one receipt of SNM and made no shipments between September 30, 1993 and September 30, 1997.

Storage and accountability of SNM were accomplished through item control. All SNM was stored in designated areas which included the reactor core and security cabinet.

Physical inventories were conducted at least annually as required by 10 CFR 70.51(d). The licensee's last inventory was performed on September 26, 1997. The operations staff conducts a monthly piece count of fuel pins and fuel pellets at the facility and reports the results to the Facility Director. The following material was accounted for:

- one Plutonium Beryllium Source, number M-734

- 597 fuel pins containing 35,995 pellets with 434,480 total grams of enriched uranium with 20,855 grams U-235

All Material Balance Reports (DOE/NRC Form-742) submitted by the licensee for the period September 30, 1993, through September 30, 1997, satisfied the requirements specified in 10 CFR 70.53. Total uranium and uranium-235 depletion records were satisfactory.

c. Conclusions

No deficiencies were identified in the licensee's Material Control and Accounting program.

X1 Exit Meeting Summary (Inspection Procedure 30703)

The inspector presented the inspection results to members of licensee management on April 9, 1998. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

*W. Christenson, Assistant Radiation Safety Officer
*B. Craig, Operations Supervisor
*D. Harris, Director, Reactor Critical Facility
*D. Steiner, Chairman, Department of Environmental and Energy Engineering
G. Xu, Radiation Safety Officer and Director, Office of Radiation and Nuclear Safety
*Attended the Exit Interview on April 9, 1998

INSPECTION PROCEDURES USED

IP 40750:	CLASS II NON-POWER REACTORS
IP 85102	MATERIAL CONTROL AND ACCOUNTING - REACTORS

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-225/1998201-01	IFI	Resolve discrepancy between area TLD results and routine surveys

Closed

50-225/92-01-01	IFI	Review calibration procedure for continuous air monitor
50-225/96-01-02	IFI	Provide copy of RSRP manual to NRC

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
IFI	Inspector Follow-up Item
NRC	Nuclear Regulatory Commission
PuBe	Plutonium-Beryllium neutron source
RP	Radiation Protection
RSO	Radiation Safety Officer
SRO	Senior Reactor Operator
TLD	Thermoluminescent dosimeter
T.S.	Technical Specifications