ANNUAL OPERATIONS REPORT

for the

Docket No. 50-116

July 1, 1991 -- June 30, 1992

This is a routine operations report to the Nuclear Regulatory Commission in accordance with the requirements of Section 6.6 of the Technical Specifications, Appendix A to Operating License R-59.

1. Summary of reactor operating experience including the energy produced by the reactor:

The reactor is operated in support of undergraduate and graduate teaching laboratories and graduate student research in the nuclear engineering program. Two courses were given during the spring semester which provided hands on laboratory experience for students in the undergraduate and graduate nuclear engineering programs. The use of the reactor was limited to experiments that could be performed as part of the required start-up testing program for the low enriched uranium core (LEU) or at power levels less than critical.

During the period July 1, 1991 - June 30, 1992, a total of 0.06 kilowatt-hours of energy production and 214 hours of operation were recorded. Last year's numbers were 227 kilowatt-hours and 222 hours. The HEU core accumulated a total of 7324 kilowatt-hours of energy production and a total of 8674 hours of operation from initial criticality in 1959 to its removal in May of 1991. Since the initial criticality of the LEU core in August of 1991, the cumulative operations hours are 214 and the cumulative kilowatt-hours are 0.06 kWh. The total energy produced during the facility's lifetime (both HEU and LEU cores) is 7324.06 kWh with a cumulative operation time of 8888 hours. A percentage breakdown by operations categories for the years 90-91 and 91-92 is shown below.

Table 1. Allocation of energy production and operations time, in percent.

	Research	Teaching Grad	Teaching U-Gr.	Maintenance	Operator Training	Service
Energy (%)						
90-91	47.0	0.1	44.5	8.3	0.1	0.0
91-92	0.0	0.0	0.0	86.1	13.9	0.0
Time (%)						
90-91	17.7	10.8	29.1	29.1	13.1	0.0
91-92	0.0	4.1	1.9	89.1	4.9	0.0

The large share of time allocated to maintenance this past year is due to SRO supervision of refueling the reactor and assembly of all the low enrichment uranium (LEU) fuel elements in July 1991 and the startup testing required with the new core. Initial criticality of LEU core was achieved on 8/14/91.

2. Unscheduled shutdowns including, where applicable, corrective action taken to preclude recurrence:

There was one unscheduled shutdown during the reporting period.

One automatic shutdown occurred on 8/21/91 when reactor power was raised to one watt with the start-up source still fully inserted in the core. The shutdown occurred while performing rod worth measurements and was attributed to operator error. Addition personnel were provided to assist with rod worth measurements which minimized future distractions to the reactor operator. The reactor was secured and later restarted without incident.

3. Major preventive and corrective maintenance operations having safety significance:

On 8/1/91 the first LEU fuel was assembled and inserted in the core. Fuel was added in increments in accordance with the approach to critical procedure until a critical mass was achieved on 8/14/91.

During the fuel load, a darker than expected discoloration was noticed on the aluminum fuel cladding. On 9/20/91 reactor operations were terminated until the cause of the discoloration was determined. Babcock and Wilcox (B&W), the fuel's manufacturer, was notified. Scanning electron microscope and X-ray diffraction analysis identified the cause of the discoloration as a compound called bayerite, a form of aluminum hydroxide. A detailed water analysis of the primary coolant was performed by

the university's Analytical Services Lab. All parameters analyzed were found to be normal. The entire volume of primary coolant was replaced with deionized water and the ion exchanger resin was changed out. Additional cladding surveillances have been implemented to monitor the fuel cladding and reactor operation was resumed on 12/18/91.

During an inspection of the fuel cladding by B&W a crack was noticed in the roll pin of the removed element. This prompted an inspection of each element's roll pin. All roll pins were found with visually obvious cracks. The NRC was informed. Testing demonstrated that the roll pins cracked within 60 hours of submersion in water when pressed into the fuel element's lifting cone. The tests were performed in primary coolant, deionized water, and tap water. All roll pins tested cracked. When the roll pins were inserted in water without being pressed into the lifting cone no cracks occurred. A replacement pin made from 303 stainless steel was proposed. The proposed roll pin was fabricated and tested. A procedure for replacement was written and approved. LEU roll pin replacement was completed on 12/13/91.

The primary coolant flow transmitter failed and was replaced with a new functionally equivalent flow transmitter. The flow indicator/controller was also replaced. The flow calibration procedure was re-written reflecting the differences between new and old equipment.

The process instrumentation power supply failed and was replaced with a functionally equivalent power supply.

These projects were reviewed and approved by the Reactor Use Committee. In cases where potential radiological hazards could exist, health physics personnel performed the necessary surveys, monitored areas and personnel, and gave approval for working in all radiation environments.

4. Major changes in the reactor facility and procedures, and new tests or experiments, or both, that are significantly different from those performed previously and are not described in the Safety Analysis Report, including conclusions that no unreviewed safety questions were involved:

There were two major changes made at the facility during the reporting period. Low enriched uranium fuel was added to the reactor. A new procedure was written for the approach to critical and the initial criticality. This procedure was reviewed and approved by the Reactor Use Committee. The Committee concluded that no unreviewed safety questions existed.

Also during this reporting period, cracks were found in the LEU fuel element's roll pins. A special procedure was written for the removal of the fuel from the core and the replacement of the roll pin. The procedure was reviewed by Babcock & Wilcox and reviewed and approved by the Reactor Use Committee. The Committee concluded that no unreviewed safety questions existed.

5. Summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the University as determined at or before the point of such release or discharge. (Included, to the extent practical, are estimates of individual radionuclides present in the effluent. If the estimated average release after dilution or diffusion is less than 25 percent of the concentration allowed or recommended, a statement to this effect is used):

Argon-41: The technical specification limits on release of this radionuclide to the environs are based on weekly (up to 100 kWh) and annual (up to 4760 kWh) energy production of the reactor. The operating records show that less than 25% of the concentration allowed was released to the environs.

Others: No measurable amounts of other radioactive effluents were released to the environs.

6. Summarized results of any environmental surveys performed outside the facility:

No environmental surveys outside the facility were required to be performed since the trigger level, based on surveys inside the facility, was not exceeded.

7. Summary of exposures received by facility personnel and visitors where such exposures are greater than 25 percent of that allowed or recommended:

No facility personnel or visitors had exposures greater than 25 percent of that allowed or recommended.