IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Engineering
Department of Mechanical Engineering
Nuclear Engineering Program
104 Nuclear Engineering Lab
Ames, Iowa 50011-2230
515 294-5840

Docket No. 50-113

Ref: 10 CFR 50.71(a)

August 5, 1991

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

Dear Sir:

Enclosed with this letter is the Annual Operations Report for the Iowa State University research reactor. The period covered by this report is from July 1, 1990 to June 30, 1991.

Sincerely,

RAHendrickson

Richard A. Hendrickson
Reactor Manager

Enclosure

C: American Nuclear Insurers
R. A. Danofsky, Facility Director
R. A. Jacobson, Chm., Radiation Safety Comm.
T. H. Okiishi, Chm., Mechanical Engineering Dept.
E. E. Sobottka, Dir., Environmental Health & Safety Dept.
T. L. Zimmerman, Chm., Reactor Use Comm.
US NRC, Region III.

A020
1/1

ANNUAL OPERATIONS REPORT

for the

Iowa State University Research Reactor

Docket No. 50-116

July 1, 1990 -- June 30, 1991

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. Three different courses, required for all sophomores and juniors in the nuclear engineering curriculum, provided hands-on laboratory experience and sample irradiation services during during fall and spring semesters. A graduate-level course that used the reactor extensively at low power levels was offered in the fall, and during spring semester a group of seniors worked with scientists from the ISU Center for Nondestructive Evaluation (CNDE) at the thermal column facility.

The senior group used the thermal column facility to design, erect, and evaluate shielding for a thermal neutron beam and gamma ray detector used to examine prompt gamma emission from materials of interest at CNDE. The operating data for this project were categorized as undergraduate teaching or research, as appropriate. This project was responsible for the large increase in the 1990-91 energy production compared with recent experience.

During the period Jul 1, 1990 - Jun 30, 1991, a total of 227 kilowatt-hours of energy production and 222 hours of operation were recorded. Last year's numbers were 85 kWh and 198 hours. Since initial criticality in 1959, the cumulative kilowatt-hours are 7324 and the cumulative operations hours are 8674. A percentage breakdown by operations categories is shown below. (Minor errors were found in the categories of research and operator training in the 1989-91 report. Reported and corrected entries for 89-90 are shown.)

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

	Research	Teaching Grad	Teaching U-grad	Maintenance	Operator Training	Service
Energy (%)						
89-90 report	27.1	1.5	26.6	29.5	16.3	0.0
89-90 correct	32.6	1.5	26.6	28.5	10.8	0.0
90-91	47.0	0.1	44.5	8.3	0.1	0.0
Time (%)						
89-90 report	19.4	13.1	38.6	9.9	24.0	0.0
89-90 correct	20.7	13.2	33.6	9.9	22.6	0.0
90-91	17.7	10.8	29.1	29.3	13.1	0.0

The large share of time allocated to maintenance this past year is due to SRO supervision of de-fueling the reactor and disassembly of all the high-enrichment uranium (HEU) fuel elements in May 1991. All HEU was stored in bundles of plates in the fuel storage pits. The last day of operation using HEU fuel was on May 2, 1991.

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 (Oct 25, 1990) when the high-level moderator channel sensed a brief differential pressure increase because the reactor technician was attempting to draw a sample of primary coolant for monthly analysis. Although the level-measuring channel will trip when a pressure increase equivalent to 5" of water, or more, occurs while the coolant is at the operating level, an experienced technician can operate the sample valve without causing a scram. The reactor facility was secured and later restarted without incident.

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

After the fuel was removed from the reactor core in early May, a major effort was started to inspect, clean, replace, and repaint, as needed, components and experiment facilities. These projects were reviewed and

approved by the Reactor Use Committee. In all cases, health physics personnel performed radiation surveys, monitored areas and personnel, and gave approval for working in all radiation environments.

- The shield tank facility, an all-concrete tank 5' x 6' x 12.5', was drained, cleaned, and repainted with two coats of an epoxy; the tank was refilled with a fresh batch of demineralized water after the epoxy cure-time had expired. After more than thirty years of service, the old paint was beginning to show signs of failure, especially on the aluminum plate that is the interface between the tank and the graphite duct from the core region.
- All of the steel surfaces of the operating and shutdown shield closures and plugs, and the interior of the cavity above the core region were cleaned, prepared, and painted with an epoxy. The old rust-inhibitor paint was flaking leaving small areas bare, mostly due to wear and tear during movements of shield parts. Residue from wet-sanding these surfaces was monitored for radioactivity by health physics personnel.
- All in-core components of the control rods systems -- drive shafts, bearings, couplings, Boral plates and sheaths, and reel subassemblies -- were inspected, photographed, and found to be in excellent condition
- The steam flow controller for the dump tank heater was replaced with a new unit that should provide better temperature selection and control of the dump tank temperature. This new system should improve the stability of the heat source so that measurements of moderator temperature coefficient and thermal power output will be less influenced by systematic errors. Operational testing had not begun before the end of this reporting period.

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 was one major change to the facility when all HEU fuel elements were removed from the core, disassembled, and stored. The reactor was last operated with HEU fuel on May 2, 1991. Procedures for the transfer and disassembly were reviewed and approved by the Reactor Use Committee. The Committee concluded that no unreviewed safety questions were involved. Low-enrichment uranium fuel will be loaded for the initial startup program after July 1, 1991.

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 sufficient):

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.