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Docket No. 50-116

Ref. 10 CFR 50.71 (a)

July 20, 1993

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 UTR-10 reactor. The period covered by this report is from July 1, 1992 to June 30, 1993.

Sincerely,

John T. Adams

John T. Adams
Reactor Manager

Enclosure
cc: American Nuclear Insurers
D. B. Bullen, Facility Director
R. A. Jacobson, Chm., Radiation Safety Committee
T. H. Okiishi, Chm., Mechanical Engineering Department
E. E. Sobottka, Dir., Environmental Health and Safety Department
T. L. Zimmerman, Chm., Reactor Use Committee
U. S. NRC, Region III

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Annual Operations Report
Iowa State University's
UTR-10 Reactor

Docket No. 50-116

July 1, 1992 to June 30, 1993

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 laboratory courses were taught during this reporting period which provided hands on laboratory experience for students in the graduate nuclear program. The reactor was also used to support undergraduate students who are working towards an undergraduate degree in Engineering Operations with the Nuclear Operations option.

During the period July 1, 1992 to June 30, 1993, a total of 154.31 kw-hrs of energy production and 173.13 hours of operation were recorded. Last year's numbers were 0.06 kw-hrs and 214 hours. The HEU core accumulated 7324 kw-hrs 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 kilowatt-hours are 154.37 kw-hrs and the cumulative hours of operation are 387.13 hours. The total energy produced during the life of the facility (both HEU and LEU cores) is 7478.37 kw-hrs with a cumulative operation time of 9061.13 hours. A percentage breakdown by operational categories for the years 91-92 and 92-93 are shown below.

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

Year	Research	Teaching Undergrad.	Teaching Graduate	Maintenance	Operator Training	Service
Energy %						
91-92	0.0	0.0	0.0	86.1	13.9	0.0
92-93	92.7	<0.1	<0.1	3.0	4.3	0.0
Time %						
91-92	0.0	1.9	4.1	89.1	4.9	0.0
92-93	20.6	0.9	16.0	23.6	38.9	0.0

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

There were no unscheduled shutdowns during this reporting period.

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

On September 16, 1992 precritical checks were aborted due to the failure of the "percent power" trip on the right hand wide range channel. The problem was traced to the reset switch. A new switch was drawn from spares and installed. The "percent power" trip on the right hand wide range channel was tested and found to operate properly.

On October 29, 1992 the switch which controls the power to the reactor control console was depressed in preparation for a reactor startup. The switch failed to provide power to the console. Investigation revealed that the switch had failed. A new switch was ordered, installed, and tested.

On November 13, 1992 while performing a normal reactor shutdown, the shim-safety control rod stuck in a position 33% out of the core. The shim safety rod inserted on its own approximately 20 minutes following the shutdown. The NRC was notified that day of the event. On November 16, 1992 a representative from NRC, Region III arrived onsite to assess the event. Special procedures were required to gain entry to the core because insufficient space existed in the fuel storage pits to accommodate all the fuel in the core. Procedures were developed, reviewed, and approved which allowed entry into the core region without the removal of all fuel. On December 1, 1992 personnel entered the core and inspected all components associated with the shim-safety control rod. The cause for the failure was traced to the inner pillow block bearing. It was noticed while rotating the inner pillow block bearing that an increase in resistance existed which corresponded to the 30% out position of the control rod. A new bearing was ordered and installed. Control rod response times were measured and found to be satisfactory.

A review of the operational history of the UTR-10 safety type control rods conducted by the Reactor Manager and the NRC Inspector revealed two other occurrences of safety type control rod failure during the life of the facility. With this information, it was decided to replace the inner pillow block bearing on all the safety type control rods. The replacement of these bearings has been scheduled for July of 1993.

A need for a long term solution to the bearing problem was also indicated by the multiple failures of these bearings over the life of the facility. An analysis of the time between failures was conducted. The results of the analysis showed that the minimum time between observed bearing failures was 8 years. With this information, the reactor staff is writing a new procedure which will require the replacement of the inner pillow block bearings on a

5 year interval. This procedure is expected to be completed and approved no later than July of 1993.

On June 14, 1993 while performing the Core Outlet Temperature Calibration Procedure, improper operation of the process instrumentation test switch was observed. Investigation revealed that two of the 5 sections of the switch had failed. A supplier for a new switch was located and a new functionally equivalent switch was ordered. The replacement switch will be installed as soon as it arrives. Expected arrival is late July or early August. Temporary connection were made on a spare section of the switch to allow for the testing of Reactor High Level Scram function.

Throughout the reporting period, monitoring of the incore cladding samples has continued. Two of the three samples in the core have continued to darken. The remaining sample has evenly darkened and does not appear to be changing. Also, fission product analysis using the high purity germanium detector (HPGe) continued on a weekly basis until May 12, 1993 when the analysis frequency was changed by the Reactor Use Committee. Now, analyses are performed after each critical operation of the reactor. The cause of the darkening has still not been determined, but Gerard Hofman, a senior metallurgist from Argonne National Lab (East), has provided and continues to provide assistance in determining and correcting the cause. A sample of the cladding samples in the core will be provided to Dr. Hofman in July for further analysis.

4. Major changes in the reactor facility, 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 no major changes in facility, procedures, tests, or experiments.

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 estimate 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. Summary of 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 exposure 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% of that allowed or recommended.