THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF ENGINEERING
DEPARTMENT OF NUCLEAR ENGINEERING

August 5, 1980

Region V USNRC
Office of Inspection & Enforcement
1990 N. California Blvd.
Suite 202
Walnut Creek, CA 94596

RE: Annual Report for License R-52, Docket 50-113

Gentlemen:

This is the annual report covering the period July 1, 1979, through June 30, 1980, for the activities of the TRIGA Mark I reactor at the University of Arizona, Tucson, Arizona. This report is submitted in compliance of Section 6.7e of the Facility Technical Specifications and paragraph 50.59(b) of Title 10, Code of Federal Regulations.

1. During the reporting period, the reactor was operated for research and education. It was used for Reactor Operator training and for undergraduate and graduate Nuclear Engineering course experiments, including thermal power calibrations, approaches to critical, control rod calibrations, measurements of the dynamic response of the reactor to step and periodic changes in reactivity, and flux mapping. The reactor was also used for neutron activation analysis, fast neutron damage studies, neutron radiography, and production of short-lived radioisotopes for teaching and research.

Reactor upgrading and modifications during the reporting period included installation of a muffler on the three-way air valve that actuates motion of the transient rod.

Routine surveillance tests of the power channels, including recalibration, showed only minor changes in zero adjustment and full scale trip settings. The total reactivity worths of the reg, shim, and transient rods were measured to be $4.16, $3.08, and $2.11, respectively. The highest reduction in worth was 14% on the transient rod. In relocating the fuel elements within the core, fuel elements with greater burn-up were placed near the control rods, thus reducing their worths.

No fuel elements were measured for length or bend during the reporting period as use is below the surveillance requirements as set forth in the Facility Technical Specifications.

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The transient rod drive assembly was inspected twice during the reporting period. Both piston seals were in satisfactory condition and no wear or rust buildup was present in the air cylinder. Mechanical testing of the shock absorber showed an adequate amount of hydraulic fluid. Rod drop

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times, from full out to full insertion, were measured to be .36, .37, and .89 seconds for the shim, reg, and transient rods, respectively. The shim and reg rods showed no appreciable change from the last measurement. The transient rod drop time increased by .17 second. Addition of the muffler to the system accounts for .03 second increase while .14 is attributed to a recent application of light lubricant to the inside of the air cylinder. All three drop times were within the one second drop time required by the Facility Technical Specifications.

All three control rods were inspected during the reporting period. No evidence of wear or deterioration was observed.

2. The reactor was critical for a total of 299 hours, producing 12,163 kw-hours of energy (.507 Mw-days). The cumulative energy output since the facility was commissioned is 5.56 Mw-days. During the reporting period 128 pulses with input reactivity greater than $1.00 were performed. The total number of pulses greater than $1.00 from the time pulsing was initiated until June 30, 1980, is 708.

3. No inadvertant scrams occurred during the reporting period.

4. The only major maintenance item was the replacement of depleted resins in the water purification system. Minor maintenance included replacement of burned out light bulbs and replacement of filters in the water purification system. In addition, monthly, semi-annual, and annual preventive maintenance as required by the University of Arizona Reactor Laboratory monthly and annual checklists was performed as scheduled.

5. The Reactor Committee reviewed plans to adjust the control rod position indicators to read directly in hundredths of an inch, the full out position being equal to the number of inches the rod has been raised off its down limit of zero. No action was required by the committee because the upper limit reading is arbitrary.

The Committee reviewed and denied a proposal to double the sensitivity of power readings in the pulse mode. Approval was denied since modification of the nv-nvt circuit in the control console could possibly require a change in technical specifications.

The Committee approved a proposed experiment to measure the heat flux in every fuel location in the reactor core. All procedures required to perform the experiment have been previously approved by the Committee.

The Committee approved revision of UARR4 (Experiment Request Form) to address the required "safety analysis report" review which conforms to 10CFR50.59(a).

The Committee approved in principle plans to formalize NE 420 laboratory experiments into UARR procedures for determining the worth of a control rod and for calorimetric power calibration of the reactor. Since no time limit was imposed, it was requested by the Reactor Supervisor to postpone final approval until after the return from leave of Dr. George W. Nelson, Head of the Reactor Laboratory. Dr. Nelson is expected to return to the University in September 1980.

The Committee discussed proposed changes to Technical Specifications that were brought up in response to an NRC compliance inspection March 18-19, 1980. The first would permit certain reactor operations above 10 kw with the facility air exhaust fan off. Revision of the requirements for frequency of Reactor Committee meetings is also under consideration. A complete review of the Technical Specifications for additional changes is in progress.

The Committee approved an experiment for investigating the natural convection circulation in a pool type reactor cooling system. The Committee determined that the experiment did not constitute an unreviewed safety question as defined by 10CFR50.59(a) and no potential conflicts with the Facility Technical Specifications were identified.

6. No liquid waste was discharged during the reporting period. Twenty gallons of pool water and spent resins containing 1.52 µci Sb-124, 0.52 µci Cs-137, and 4.56 µci Co-60 were collected by the University Radiation Control Office for burial at the state-licensed facility. A total of 9.0 cubic feet of solid waste (floor sweepings, tissues, gloves, irradiated neutron activation samples and standards) containing 50 µci of mixed irradiation products were also collected. The material was buried at the University of Arizona Waste Burial Ground, maintained under AAEC license 10-24. These collections were made in August, September, October, and November of 1979 and January, March, and April of 1980. The radioactive waste attributable to nuclear reactor operations is less than one percent of the activity and volume of material buried at this site.

From an experiment performed April 23, 1979, an upper bounding estimate for the production of Argon-41 of 49.94 microcuries per 100 kw hours power generated has been made. To obtain a more accurate figure will require a change in the Facility Technical Specifications allowing us to operate the reactor at power levels above 10 kw with the exhaust fan off to acquire data for the release of radioactive gases to the environment. The reactor staff and committee are presently investigating changes in the Technical Specifications necessary to allow greater resolution in this estimate. A request for approvals to perform this experiment may be presented to the Commission in the near future. Based on the above figure, the calculated amounts of Argon-41 released for each month of the reporting period are presented below.

Month	Argon-41 Release (microcuries)
July 1979	978.15
August 1979	145.33
September 1979	1.98
October 1979	533.66
November 1979	422.20
December 1979	524.64
January 1980	320.88
February 1980	374.98
March 1980	272.68
April 1980	710.51
May 1980	692.55
June 1980	1095.50

The annual total Argon-41 released during the reporting period was 6.074 millicuries. This is less than one percent of the allowable Argon-41 release as per 10CFR20.

7. One hundred thirty-nine (139) persons were issued film badges in the Department of Nuclear Engineering on a bi-weekly schedule during this reporting period. These included Reactor Operators, faculty and staff members, and students. Eight persons received measurable doses of penetrating radiation. These include persons involved in Neutron Activation Analysis research and reactor operations and maintenance. Listed below is a summary of penetrating dose from film badges for these persons.

Individual No.	Type of Badge	Dose (mrem)
1	Finger	25
2	Finger	30
3	Finger	100
4	Finger	25
5	Finger	30
6	Finger	60
7	Whole Body	10
8	Finger	30

Three hundred seventy-nine (379) persons visited the Reactor Laboratory during the reporting period and were issued pocket dosimeters during their stay. No radiation exposure was received by any visitor, as measured by the pocket dosimeters.

8. Radiation surveys of the Reactor Lab, control room and experiment set-up room were conducted on June 29, July 31, August 31, October 1, October 17, November 16, and December 18 of 1979 and February 1, March 4, April 2, April 29, and June 4 of 1980 by members of the University of Arizona Radiation Control Office using direct measurement and wipe tests. The results show little detectable activity except where expected (i.e., irradiated samples in storage areas). Other radiation surveys were performed by members of the Reactor Laboratory staff when necessary. No radiation exposure which can be attributed to reactor operations has been detected outside of the Reactor Laboratory.

In writing this report, I have tried to be as brief as is reasonable and still satisfy the requirements of 10CFR50.59, the Facility Technical Specifications, and the needs of the Commission. If other or more detailed information is needed, please contact me at your earliest convenience.

Sincerely,

Robert L. Seale, Acting Head
Nuclear Reactor Laboratory

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