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

This is the Annual Report covering the period July 1, 2004, through June 30, 2005, for the activities of the TRIGA Mark I Reactor at the University of Arizona, Tucson, Arizona. The report is submitted in compliance with 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 of operators at this facility. The reactor was used for graduate thesis research. The reactor was also used for neutron activation analysis for teaching and research.

   There were no reactor upgrading or modifications during the reporting period.

   Power channel calibration by the calorimetric method was performed during the reporting period. The total worth of the regulating, shim, and transient rods were measured to be \$4.08, \$3.19, and \$2.47, respectively. The largest change in worth was 2.20% of total worth on the Regulating rod, which is consistent with the small changes in rod worth due to rotational changes of position of individual fuel elements from fuel movement during approach to critical experiments and fuel inspection.

   Ten pulses or reactivity insertions greater than \$1.00 were performed since the previous fuel measurement.

   Maximum reactivity insertion rates of \$0.17/sec, \$0.11/sec, and \$0.16/sec were measured for the regulating, shim, and transient rods, respectively. All three insertion rates were less than the maximum rate allowed by the facility technical specifications.

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The transient rod drive assembly was inspected twice during the reporting period. Both piston seals were found to be in satisfactory condition and no wear or rust accumulation was present in the air cylinder.

Rod drop times from full out to full insertion were measured to be 0.38, 0.38, and 0.875 seconds for the regulating, shim, and transient rods, respectively. There was no appreciable change in the drop times of the control rods since the last rod drop measurements. All three drop times were less than the time required by the facility technical specifications. The regulating, shim and transient rods were visually inspected during the reporting period. All three control rods passed visual inspection.

The area radiation monitors, the pool activity monitor and the pool conductivity meter were calibrated during the reporting period.

2. The reactor was critical for a total of 38 hours, producing 596.5 kW-hours (0.025 MW-day) of thermal energy. The cumulative energy output since the facility was commissioned is 9.863 MW-days. During the reporting period 10 pulses with input reactivity greater than $1.00 were performed. The cumulative number of pulses greater than $1.00 since the time pulsing was initiated is 2235.

   The reactor was in operation 57 days during the reporting period, with 47 hours of operating time, as recorded by the console clock.

3. There was no inadvertent reactor scram during the reporting period.

4. Major maintenance included replacement of a High Voltage Power Supply, replacement of the PS202 Power Supply, repair of the writing arm for the linear pen on the chart recorder. It was also found that the Fast Irradiation Facility(FIr) developed a leak and flooded. The facility was removed and a pinhole was found in the aluminum access tube just above the flange connecting the irradaition facility. The access tube was cut above the hole and a new flange was installed and the FIr was returned to the core. Minor maintenance items included servicing the C.A.M. air pump, adding pool water lost by evaporation, replacing burned out light bulbs in the reactor pool, replacing burned out annunciator bulbs in the reactor control console, changing batteries in the low water level detector circuit and area monitors, and making periodic adjustments to the reactor control console circuitry.

5. The Reactor Committee met four times during the reporting period: 8/31/04, 12/9/04, 3/2/05, and 5/13/05.

At its meetings and in individual reviews by Committee members, the Committee reviewed operations and operational records of the facility as specified by the Committee charter. This included audit of preliminary check sheets, pulsing check sheets, approach to critical and termination check sheets, operations and maintenance log books, monthly and annual check sheets, irradiation records, and experiments performed with the reactor. The Committee reviewed the 2004 annual report to the NRC.

The Reactor Committee reviewed no 10CFR50.59 safety evaluations during the reporting period. However, the reactor committee did review several procedural and Physical Security Plan changes.

6. No liquid or solid waste was discharged from the facility during the reporting period.

Measurements of the Argon-41 concentration in the reactor pool water have demonstrated that the maximum rate of release of Argon-41 from reactor pool water is less than 0.74 μCi per kilowatt-hr of reactor operation. The pneumatic transfer system produces approximately 0.05 μCi of Argon-41 per kW-min of reactor operation, some of which is released when the system is operated. Presented below are the calculations of the maximum monthly releases of Argon-41 from the reactor pool surface, the pneumatic transfer system and the totals.

Month	Argon-41 (μCi) Pool Surface	Argon-41 (μCi) Pneumatic Transfer System	Argon-41 (μCi) Total
July 2004	58.02	0.0	58.02
August 2004	2.66	0.0	2.66
September 2004	0.0	0.0	0.0
October 2004	14.06	0.0	14.06
November 2004	2.74	0.0	2.74
December 2004	100.57	0.0	100.57
January 2005	49.88	0.0	49.88
February 2005	2.96	0.0	2.96
March 2005	0	0.0	0
April 2005	94.87	14	108.87
May 2005	5.03	0.0	5.03
June 2005	78.07	0.0	78.07

The daily calculations for Argon-41 release from the pneumatic transfer system did not include decay of the isotope prior to release and, therefore, give an over-estimate of Argon-41 release. The maximum total estimated Argon-41 release from the facility during the reporting period is 0.42 millicuries. There were no other gaseous effluents from the facility during the reporting period.

7. Six (6) persons were issued film badges on a monthly basis for all or part of the reporting period in the Nuclear Reactor Laboratory. The persons receiving badges included all reactor operators, faculty and staff members using the reactor laboratory, researchers, and all students in laboratory courses. No badged individuals were reported as having received exposures above background.

Sixty-eight (68) non-badged persons were admitted to the Reactor Laboratory in classes, tours, or on official business during the reporting period. All groups were issued pocket dosimeters. Pocket dosimeters issued to visitors indicated that no exposure was received.

8. Radiation surveys of the reactor room, control room, and experiment set-up room were conducted monthly during the reporting period by members of the University of Arizona Radiation Control Office(RCO) using direct measurement and wipe tests. The results show little detectable activity except where expected (i.e., irradiated samples in storage areas and internal wall surfaces of the irradiation facilities). 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 the reactor laboratory.

9. Environmental TLD monitors at 3 locations on the roof of the building housing the reactor and at 10 other roof locations on the University campus were replaced and read quarterly during the reporting period. For the 12 month period from July 1, 2004 through June 30, 2005 the total doserates, after subtraction of the average background reading for 10 of 13 TLDs were 0 mR/yr. One TLD in the Arizona Health Sciences Center, one TLD in the Art building and one in the Computer Center read 3.8 mR/yr, 0.8 mR/yr and 37.8 mR/yr respectively. These higher readings are attributed to building materials as reported by the Radiation Control Office. There is no evidence that radiation exposures in the vicinity of the reactor are higher than normal. Eight TLD monitors were placed at the periphery of the restricted area, and two TLD monitors were placed in an office area far removed from the restricted area to provide a baseline reference for building background. The TLDs on the periphery of the NRL ranged from 15 mR/yr to 119 mR/yr. The areas where monitor readings exceeded 100 mR/yr were surveyed using a calibrated ion chamber quarterly by the Radiation Control Office with the reactor operating at 100 kW. No radiation fields were detected that exceeded background levels (0.01 mR/hr).

   To meet the requirements of 10CFR20.1302, the sum of internal and external radiation dose to the public must not exceed 100 mrem/yr or 2.0 mR/hr. As stated above, with the reactor operating at 100 kW, no instrument reading exceeded 0.01 mR/hr. To estimate the radiation dose from internal and external radiation sources, the highest environmental monitor reading is summed with the Ar-41 estimated dose and multiplied by an occupancy factor of 0.25 (very conservative). The highest dose was 119 mR/yr and Comply Code estimated dose (0.2 mR/yr) are summed and multiplied by the occupancy factor (0.25) to estimate dose to the public of 28.6 mR/yr.

In writing this report, I have tried to be both complete and 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,

John G. Williams, Director
Nuclear Reactor Laboratory

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