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

This is the Annual Report covering the period July 1, 2001, through June 30, 2002, 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 $3.91, $3.11, and $2.42, respectively. The largest change in worth was 1.01% 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.

   Ninety-one standard fuel elements were measured for length and bend during the reporting period. Three instrumented fuel elements, one demountable fuel element and two fuel-followed control rods were checked for bend. One standard fuel element (long retired from service) was not checked. All fuel that was checked passed the requirements of the facility technical specifications and all were free from any surface damage. 45 pulses or reactivity insertions greater than $1.00 were performed since the previous fuel measurement.

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Maximum reactivity insertion rates of $0.17/sec, $0.10/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.

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 0.81 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 64 hours, producing 2452.0 kW-hours (0.102 MW-day) of thermal energy. The cumulative energy output since the facility was commissioned is 9.773 MW-days. During the reporting period 3 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 2212.

   The reactor was in operation 59 days during the reporting period, with 81 hours of operating time, as recorded by the console clock.

3. There were one inadvertent reactor scram during the reporting period on Janauary 18, 2002. The power level scram signal came from the Left Safety Channel. The scram occurred near the end of a long full power run. As a result of flux tilt during long runs the readings drift slightly. The slight drift along with the small power spike observed when a sample is inserted into the core using the pneumatic transfer device (rabbit) caused the scram.

4. Major maintenance included repair of the High Voltage Power Supply in the left cabinet of the console. Four 1 megohm resistors were replaced after faulty readings were found. Also, the circuit card for the Linear Recorder's Campbelling Circuit was replaced when faulty readings were observed during a start-up check. Minor maintenance items included servicing the C.A.M. air pump, changing filter cartridges in the water purification system, 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: 9/20/01, 12/6/01, 3/6/02, and 5/16/02.

   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 2000 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. These included procedural changes to ensure the NRL complies with the revised 10CFR50.59 requirements.

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 $\mu$Ci per kilowatt-hr of reactor operation. The pneumatic transfer system produces approximately 0.05 $\mu$Ci 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 2001 | 239.76 | 512.5 | 752.26 |
| August 2001 | 222.0 | 0.0 | 222.0 |
| September 2001 | 0.0 | 0.0 | 0.0 |
| October 2001 | 26.94 | 0.0 | 26.94 |
| November 2001 | 27.60 | 0.0 | 27.60 |
| December 2001 | 5.85 | 0.0 | 5.85 |
| January 2002 | 505.49 | 1035.55 | 1541.04 |
| February 2002 | 0.07 | 0.0 | 0.07 |
| March 2002 | 0.07 | 0.0 | 0.07 |
| April 2002 | 467.75 | 1828.75 | 2296.50 |
| May 2002 | 0.0 | 0.0 | 0.0 |
| June 2002 | 392.94 | 579.5 | 972.44 |

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 5.84 millicuries. There were no other gaseous effluents from the facility during the reporting period.

7. Five (5) 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.

   Forty-three (43) 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, 2001, through June 30, 2002, the average yearly total of the 3 TLDs located on the reactor building roof was 149.8 mrem and the average of the 10 other TLDs was 161.7 mrem, after subtraction of the average reading of two control TLDs, which were kept in a shielded container. These readings are slightly higher than those of years past and can be attributed to a new TLD vender. Thus, 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 lowest total annual exposure for the reporting period at the restricted area periphery was 50 mrem, while the highest was 109 mrem. Exposure to the public was less than 100 mrem/year. Surveys performed at the periphery of the restricted area with the reactor operating at full power showed the dose rate to be much less than 2 mrem/hour.

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

JGW:MG

cc: Events Assessment, Generic Communications and
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