UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Nuclear, Plasma,
and Radiological Engineering

214 Nuclear Engineering Laboratory
103 South Goodwin Avenue
Urbana, IL 61801-2984

February 2, 2000
Docket No. 50-151

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Dear Sir,

SUBJECT: ANNUAL REPORT: Illinois Advanced TRIGA Reactor
License No. R-115 / Docket No. 50-151

The following is written to comply with the requirements of section 6.7.f of the Technical Specifications and the conditions of 10CFR50.59. The outline of the report follows the numbered sequence of section 6.7.f of the Technical Specifications.

Sincerely,

Richard L. Holm
Reactor Administrator

James F. Stubbins, Head
Department of Nuclear Engineering

c: Nuclear Reactor Committee
American Nuclear Insurers
File

A020

STATE OF ILLINOIS

COUNTY OF CHAMPAIGN

Richard L. Holm, being first duly sworn on oath, deposes and says that he has affixed his signature to the letter above in his official capacity as Reactor Administrator, University of Illinois Nuclear Reactor Laboratory; that in accordance with the provisions of Part 50, Chapter 1, Title 10 of the Code of Federal Regulations, he is attaching this affidavit; that the facts set forth in the within letter are true to his best information and belief.

Richard L. Holm
Reactor Administrator

Subscribed and sworn to before me, a Notary Public, in and for the County of Champaign, State of Illinois, this 16 day of February, A.D., 2000.

Notary Public of Illinois

8-19-2000
My Commission Expires

OFFICIAL SEAL
KATHLEEN M. DYSART
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 8-19-2000

ANNUAL REPORT
JANUARY 1, 1999-DECEMBER 31,1999
ILLINOIS ADVANCED TRIGA
FACILITY LICENSE R-115

I. SUMMARY

The reactor was in a shutdown SAFSTOR status for all of 1999. Monitoring of the facility is through the use of weekly, monthly and quarterly surveillance checklists performed by the Reactor Administrator and Reactor Health Physicist. Additional surveillances are performed at other intervals where appropriate. The checklists created for SAFSTOR have proven to be more than adequate to ensure that the facility is monitored safely.

During 1999 there were two individuals with a Senior Reactor Operator License, one of which is the reactor health physicist.

II. UNSCHEDULED REACTOR SHUTDOWNS

Not applicable.

III. MAJOR PREVENTIVE AND CORRECTIVE MAINTENANCE HAVING SAFETY SIGNIFICANCE

No major maintenance was performed having safety significance.

IV. CONDITIONS UNDER SECTION 50.59 OF 10CFR50

No 50.59 reviews were performed in 1999.

V. RELEASE OF RADIOACTIVE MATERIAL

A. Gaseous Effluents

1) ^{41}Ar

No longer produced: reactor shutdown, defueled, and in SAFSTOR condition.

2) ^{3}H

The estimated total release of ^{3}H to the Reactor Building atmosphere (and consequently out the Exhaust Stack) from the evaporation of water in the Primary Tank (PT) and the Bulk Shielding Tank (BST) was 177 μCi. This is based on the measure of the activity of ^{3}H in the PT or BST (whichever had the highest concentration of ^{3}H), multiplied by the total volume of makeup water additions since the tanks were last sampled for ^{3}H (yearly). This is calculated as follows: highest concentration of ^{3}H in the PT or BST (1.5 E^{-5} μCi/ml) multiplied by the evaporative loss volume (1.18 E^{7} ml) equals 177 μCi. The average concentration released via the Exhaust Stack was 1.2 E^{-10} μCi/ml calculated as follows: assume an average stack flow of 50 fpm[1] * 2 ft^2 = 100 ft^3/ min * 2.83 E^{4} ml/ft^3 = 2.83 E^{6} ml/min * 5.256 E^{5} min/yr = 1.5 E^{12} ml/yr. Then, 177 μCi (estimated total release) divided by 1.5 E^{12} ml (the total volume released) = 1.2 E^{-10} μCi/ml average concentration.

[1] Exhaust Stack Blower secured, flow reduced from 1200 fpm to 50 fpm.

3) Summary of Gaseous Effluents Released

A summary of all gaseous effluents for 1999 (Sections 1+2 above) is shown in the following table, which includes for each isotope: the total activity released; the average concentration; the 10 CFR 20, Appendix B, Table 2 limit; and the fraction of the limit released. The sum of the fractions for all isotopes released is listed at the end of the table.

Isotope	Total μCi	Ave Conc. (μCi/ml)	App. B Table 2 limit	Ave. Conc. / limit
^{41}Ar	None	None	$2.0\ E^{-6}$ *	0.000
^{3}H	177	$1.2\ E^{-10}$	$4.0\ E^{-6}$	0.003
			Sum of Fractions =	0.003 (< 1.0)

* Ar-41 concentration limit is specified by the Facility Technical Specifications.

B. Liquid Effluent

1) Waste Water discharged to the municipal sanitary sewer system

Waste Water is collected in the Reactor Building Retention Tank. When the Tank becomes full it is pumped over to a Holdup Tank. The water passes through a coarse and a fine filter assembly on route to the Holdup Tank where it is then sampled. The water is discharged from the Holdup Tank into the municipal sanitary sewer system when the soluble activity results are satisfactory and it is verified that no insoluble activity is present. If insoluble activity is detected before the discharge then the contents of the Holdup Tank can be recirculated through a 0.4 micron process filter until the insoluble activity has been removed and it is verified that no insoluble activity is present.

The average concentration of all soluble beta-gamma activity released in 1999 was $5.1\ E^{-8}$ μCi/ml. This is well below the 10 CFR 20, App. B, Table 3, "Releases to Sewers" limit of $9.0\ E^{-6}$ μCi/ml for the most restrictive isotope not known to be absent, ^{134}Cs. The average concentration of ^{3}H released concurrently with the above was $8.3\ E^{-5}$ μCi/ml. This is well below the 10 CFR 20 "release to sewer" limit of $1.0\ E^{-2}$ μCi/ml for ^{3}H.

VI. ENVIRONMENTAL SURVEYS

Continuous radiation monitoring utilizing Thermoluminescent Dosimeters (TLDs) supplied by a vendor (Landauer, Inc.) was conducted at the Site Boundary and in the Surrounding Environs. The Lower Limit of Detection (LLD) for these TLDs = 10 mRem/Quarter).

A. Site Boundary

The site boundary is established at the Reactor Building Walls with extensions at the fence around the Cooling Towers and the perimeter of the roof over the Mechanical Equipment Room. This is also defined as the boundary between the Restricted and Unrestricted Areas. The average annual dose at this perimeter was 107 mRem with a range of 40 mRem to 230 mRem. However, pursuant to 10 CFR 20.1302 (b) (1) an Annual Site Boundary Dose Calculation for Members of the Public, based on Occupancy Time, was performed. The highest calculated dose at the site boundary for 1999 was 0.6 mRem for the Year. These calculations are maintained and updated in the files of the Reactor Health Physicist.

B. Surrounding Environs

A background TLD was deployed ~100 meters from the Reactor Building. The total annual dose recorded on this monitor was 20 mRem.

VII. PERSONNEL RADIATION EXPOSURE AND SURVEYS WITHIN THE FACILITY

A. Personnel Exposure

1) Whole Body

Two part-time employees (SROs) who maintained an office in the building for 40 hours/week were assigned dosimetry at the facility and received a measurable Whole Body exposure (LLD = 10 mRem/month). The dosimetry was provided by Landauer, Inc. and ICN Dosimetry Service; both National Voluntary Laboratory Accreditation Program (NVLAP) accredited Dosimetry Vendors. The tables and explanations below outline the Whole Body exposure received by the 2 individuals.

Whole Body Exposure (mRem)	Number of Individuals
10 to 100	2
> 100 to 250	0
> 250	0
Total	2

ManRem Total: 0.084

Summary: The highest individual Whole Body Exposure was 74 mRem. This exposure was received by the Reactor Health Physicist as a result of handling radioisotopes or performing required Operations and Health Physics Surveillances.

2) Extremity Exposure

Two part-time employees (SROs) who maintained an office in the building for 40 hours/week were assigned dosimetry at the facility and received a measurable Extremity Exposure (LLD = 10 mRem/month).

ManRem Total: 0.329

Summary: The highest individual Extremity Exposure was 306 mRem. This exposure was received by the Reactor Health Physicist as a result of handling radioisotopes or performing required Operations and Health Physics Surveillances.

3) Skin Dose
There were no significant deviations between the Shallow Dose and Deep Dose reported by the vendors for any personnel.

4) Internal Exposure

There were no incidents or events that required investigation or assessment of internal exposure. Contamination levels are acceptably low and areas few (see B. below). There were no evolutions performed or events that occurred which caused, or could have caused, the presence of Airborne Radioactivity.

5) Visitor Exposures

All recorded exposures for Visitors were ≤ 1 mRem by Electronic Pocket Dosimeter (EPD).

B. Contamination Surveys

Smear surveys from various locations around the laboratory were taken Routinely: on a quarterly basis; and Specifically: to assess experimental devices, tools and equipment, potentially contaminated areas, or to evaluate adverse trends. The removable contamination was determined by counting the smears on an Eberline BC-4 or RM-14/HP-210T Beta Counter, and/or a SAC-4 Scintillation Alpha Counter.

The maximum gross Beta/Gamma Contamination is located in the only posted contamination area (where irradiated sample containers were formerly handled). There were no samples irradiated and handled during the year. In this area, the former sample preparation area (~5 ft^2), the average removable activity was 1,300 dpm/100 cm^2 with a high of 3K dpm/100 cm^2. The balance of the potentially contaminated area,

the reactor bridge (~11.5 ft^2), had average removable activity of ≤ 76 dpm/100 cm^2. Smears from other areas of the laboratory, within the restricted area; and the control room and other clean areas, outside the restricted area; were generally ≤ 76 dpm/100 cm^2 with a high of 289 dpm/100 cm^2 in the radwaste storage area. Total contaminated surface area = ~5 ft^2

Routine surveys for Alpha Contamination were all ≤ 12 dpm/100 cm^2.

VIII. NUCLEAR REACTOR COMMITTEE

Dr. David Miller (Illinois Power Company and Adjunct Assistant Professor of Nuclear Engineering) continued as Chairman of the Nuclear Reactor Committee for the 1999-2000 Academic Year. The following members remained on the Committee: Mr. Daniel Hang (Professor Emeritus of Nuclear Engineering), Dr. Brent Heuser (Assistant Professor of Nuclear Engineering), Dr. Erik Wiener (Assistant Professor of Nuclear Engineering), Mr. David Scherer (Campus Radiation Safety Officer), Mr. Rich Holm (Reactor Administrator), and Mr. Mark Kaczor (Reactor Health Physicist and ex-officio member until SAFSTOR Tech. Spec. changes effective, then voting member beginning at Meeting # 04-9899 held on May 13, 1999).

The committee held 3 meetings during the calendar year. Major topics reviewed were: a) Reactor Operations and Health Physics Surveillances; b) NRC Annual Report, Biennial E-Plan Review, and Operations and Health Physics Procedure Revisions; c) SAFSTOR changes to the Tech. Specs and License Amendments; and d) Reports on - Reactor Committee Audit of Operations and Annual Review of the Radiation Protection and ALARA Programs, the Emergency Plan Drill Critique, and Operations Quarterly Reports.