United States Department of the Interior
GEOLOGICAL SURVEY
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IN REPLY REFER TO:

January 17, 2001

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

Dear NRC staff:

The attached annual report of the U.S. Geological Survey TRIGA non-power reactor facility is submitted in accordance with license conditions. The facility docket number is 50-274.

Sincerely,

Timothy M. DeBey
Reactor Supervisor

Enclosure

Copy to:
Al Adams, MS O-11-D-19

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U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 2000 - DECEMBER 31, 2000

NRC LICENSE NO. R-113 - DOCKET NO. 50-274

I. **Personnel Changes**: One part-time, student employee was added to the staff in June 2000.

II. Operating Experience

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 2000. No major facility changes were made during the year.

A synopsis of irradiations performed during the year is given below, listed by the organization submitting the samples to the reactor staff:

Organization	Number of Samples
Geologic Division – INAA	1492
Geologic Division - Geochronology	1621
Geologic Division – U/Th DN	343
Non-USGS affiliated	1178
Total	4,634

A. Thermal power calibrations were performed in February, May, and August, with minor adjustments required.

B. Two new Class I experiments (tracer isotope production) were approved during this period.

C. During the report period, 188 daily checklists and 12 monthly checklists were completed in compliance with technical specifications requirements for surveillance of the reactor facility.

D. Tours were provided to individuals and groups during the year for a total visitor count of approximately 260.

E. Eight fuel movements were performed during the year for the purposes of console upgrade and testing, and performing experiments.

III. Tabulation of Energy Generated

	MWH operated	Critical hours	Pulses
Jan	54.584	56.75	0
Feb	42.499	45.08	0
Mar	86.629	91.80	0
Apr	66.05	67.33	0
May	67.191	68.93	0
June	81.782	83.48	0
July	38.954	41.07	0
Aug	99.351	101.20	0
Sept	80.637	83.75	5
Oct	39.671	42.67	0
Nov	45.583	46.73	0
Dec	33.465	35.23	0
Totals	736.396	764.03	5

IV. Unscheduled Shutdowns

Number	Date	Cause
947	1/28	CSC watchdog scram due to computer lockup.
948	2/2	Manual scram due to failure of DN system blower.
949	3/6	CSC watchdog scram due to computer lockup.
950	3/7	CSC watchdog scram due to computer lockup.
951	3/7	CSC watchdog scram due to computer lockup.
952	3/13	CSC watchdog scram due to computer lockup.
953	3/30	CSC watchdog scram due to computer lockup.
954	3/31	CSC watchdog scram due to computer lockup.
955	4/7	CSC watchdog scram due to computer lockup.
956	4/12	CSC watchdog scram due to computer lockup.
957	4/12	CSC watchdog scram due to computer lockup.
958	4/19	CSC watchdog scram due to computer lockup.
959	5/3	CSC watchdog scram due to computer lockup.
960	5/3	CSC watchdog scram due to computer lockup.
961	5/16	CSC watchdog scram due to computer lockup.
962	5/17	CSC watchdog scram due to computer lockup.
963	9/12	DIS064 scanner timeout scram.
964	9/13	DIS064 scanner timeout scram.
965	9/15	DIS064 scanner timeout scram.
966	9/15	DIS064 scanner timeout scram.
967	9/27	DIS064 scanner timeout scram.
968	9/27	DIS064 scanner timeout scram.
969	9/29	DIS064 scanner timeout scram.
970	10/4	DIS064 scanner timeout scram.

V. Major Maintenance Operations

The primary coolant ion exchange resin was replaced in April. The secondary cooling pump was repaired (bottom collet replaced) in August.

VI. Summary of 10 CFR 50.59 changes

The control console was upgraded by General Atomics, including changing the base computers and upgrading the software. The upgrade effort began in March and was completed in mid-September. One clear benefit of the upgrade is a dramatic reduction in the frequency of unplanned scrams that were caused by console malfunction. The change was evaluated by the Reactor Operations Committee and determined to be authorized under 10 CFR 50.59 without prior NRC review and approval.

VII. Radioactivity Releases

A. Listed below are the total amounts of radioactive gaseous effluent released to the environment beyond the effective control of the reactor facility.

Table 1. Gaseous Effluents Released to the Environment

Month	**Argon-41** (curies)	**License Allowable** (Ci) (R-113)	Tritium (HTO) (mCi) *	**10CFR20 Allowable** (mCi)
January	0.187	5.833	0.104	124
February	0.203	5.833	0.195	124
March	0.319	5.833	0.182	124
April	0.271	5.833	0.200	124
May	0.208	5.833	0.204	124
June	0.216	5.833	0.091	124
July	0.170	5.833	0.109	124
August	0.406	5.833	0.213	124
September	0.338	5.833	0.086	124
October	0.205	5.833	0.150	124
November	0.232	5.833	0.079	124
December	0.155	5.833	0.158	124
Total	2.91	70.00	1.773	1488
% of Allowable	4.16%	----------	0.12%	----------

* **Note**: The tritium concentrations are estimates based on the amount of water lost by evaporation from the reactor multiplied by the concentration of tritium as HTO. Tritium sample analyses are being performed by Barringer Labs.

B. One 55-gallon drum of low-level radioactive solid waste was shipped for burial in Washington during the year.

Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin - used resin with small quantities of rinse water was de-watered by evaporation and placed in 55-gallon drums.

VIII. Radiation Monitoring

A. Our program to monitor and control radiation exposures included the four major elements below during the operating year.

1. Fifteen gamma-sensitive area monitors are located throughout the Nuclear Science Building. A remote readout panel is located in the reactor health physics office. High alarm set points range from 2 mR/hr to 50 mR/hr. High-level alarms are very infrequent and due to sample movements.

2. One Continuous Air Monitor (CAM) sampling the air in the reactor bay. An equilibrium concentration of about 1 x 10^{-8} μCi/ml present for two minutes will result in an increase of 400 cpm above background. There are two alarm setpoints. A low-level alarm is set at 3000 cpm and the high level alarm is set at 10000 cpm. Reactor bay air is sampled during all reactor operations. The fixed particulate air filter is changed each week and counted on a HPGE gamma spectrometer counting system. The charcoal filter, fitted behind the air filter, is also changed and counted weekly. In all instances, sample data were less than airborne concentration value (10 CFR Part 20, Appendix B, Table 2) for all particulate radioisotopes produced by the reactor.

3. Contamination wipe surveys and radiation surveys with portable survey instruments are performed at least once a month. All portable instruments are calibrated with a 3-Curie (initial activity) Cs-137 source traceable to NBS, and wipes are counted on a Gamma Products G5000 low level counting system. Six contaminated areas were noted during routine wipe surveys. The highest had a beta activity of 80 pCi/100 cm^2. Soap and water were used to remove the contamination. All other areas were less than 30 pCi/100 cm^2 beta and 15 pCi/100 cm^2 alpha. The roof area over the reactor tank is roped off and posted as a radiation area (averaging 2.5 mR/hr) during 1 MW operations.

4. Personnel, X and gamma, beta and neutron film badges are assigned to all permanent occupants of the Nuclear Science Building. LiF TLD dosimeters have been used at four outdoor environmental stations. Reactor facility visitors are issued self-reading dosimeters. Reactor staff personnel are issued albedo neutron badges.

Table 2. Personnel Monitoring Results (12/1/99 – 11/30/00)

	Deep Dose Equivalent	Shallow Dose Equivalent	
Name	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
Aakhus-Witt A. **	0.000	0.000	0.000
DeBey, T	0.000	0.000	0.000
Helfer, P	0.023	0.023	0.030
Liles, D	0.000	0.000	0.060
Perryman, R	0.000	0.000	0.000

December's results not available.
** monitoring period (6/6/00 – 11/30/00).

Reactor Visitors and Occasional Experimenters
No individual reading was greater than four (4) mrem.

Table 3. Environmental Dose Results

Location	**Dose Jan-Mar** (REM)	**Dose Apr-June** (REM)	**Dose July-Sept.** (REM)	**Dose Oct.- Dec.** (REM)	**Total** (REM)
Exhaust Stack	0.0335	0.0294	0.0289	0.0056	0.0974
Cooling Tower Fence	0.0124	0.0059	0.0035	0.000	0.0218
West Vehicle Gate	0.0304	0.0100	0.0024	0.0095	0.0523
West Room 151 Gate	0.0265	0.0146	0.0140	0.0091	0.0642
Southwest Light Pole	0.0095	0.0054	0.0095 **	0.0037	0.0281
Control (background)	0.0218	0.0222	0.0203	0.0252	0.0895
Southeast Light Pole	0.0090	0.0017	0.0008	0.0000	0.0115

Note: Above totals have the background subtracted (see control).
** estimate due to TLD being lost (assigned highest dose received per quarter).

X. Environmental Releases

There have been no uncontrolled radioactivity releases from the reactor to the present date. Thus, the data on file from past years to the present are considered to be background information.