



# United States Department of the Interior

GEOLOGICAL SURVEY  
BOX 25046 M.S. 974  
DENVER FEDERAL CENTER  
DENVER, COLORADO 80225

IN REPLY REFER TO:

February 2, 1998

U.S. Nuclear Regulatory Commission  
ATTN: Director, DRSS, Region IV  
611 Ryan Plaza Dr. Suite 400  
Arlington TX 76011

Dear Director:

The attached annual report of the U.S. Geological Survey TRIGA 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: 200007

USNRC Headquarters, Al Adams

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U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 1997 - DECEMBER 31, 1997

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

**I. Personnel Changes**

The Reactor Supervisor position was filled on March 31 with a permanent, full time employee. The facility staff continues to be 4 full time employees (three reactor operators and one health physicist).

**II. Operating Experience**

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 1997. 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:

<u>Organization</u>	<u>Number of Samples</u>
Geologic Division - National Mapping	1555
Geologic Division - Mineral Resources	1673
Geologic Division - Volcanic Hazards	56
Non-USGS users	132
Total	<u>3,416</u>

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

B. No new Class I or Class II experiments were approved during this period.

C. During the report period, 108 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 110.

E. Ten fuel movements were performed during the year for the purposes of maintenance, increasing core reactivity, and performing experiments. In December, all fuel elements were measured and control rods were inspected and found to be within the tolerances specified in the Technical Specifications.

### III. Tabulation of Energy Generated

Month	Megawatt Hours	Time Reactor was Critical	Number of Pulses
January	56.232	59 hours 51 minutes	0
February	53.450	57 hours 25 minutes	0
March	48.301	50 hours 30 minutes	0
April	51.511	54 hours 42 minutes	0
May	38.000	39 hours 29 minutes	0
June	62.058	63 hours 25 minutes	0
July	34.266	39 hours 14 minutes	0
August	55.222	55 hours 46 minutes	0
September	30.953	32 hours 6 minutes	0
October	27.917	28 hours 28 minutes	0
November	39.752	40 hours 46 minutes	0
December	24.000	24 hours 17 minutes	0
Totals	521.662 MWh	542 hours 59 minutes	0

### IV. Unscheduled Shutdowns

Number	Date	Cause
736	1/7	CSC Watchdog scram due to computer lockup.
737	1/7	CSC watchdog scram due to computer lockup.
738	1/8	CSC watchdog scram due to computer lockup.
739	1/8	CSC watchdog scram due to computer lockup.
740	1/10	CSC watchdog scram due to computer lockup.
741	1/15	CSC watchdog scram due to computer lockup.
742	1/17	CSC watchdog scram due to computer lockup.
743	1/29	CSC watchdog scram due to computer lockup.
744	2/3	CSC watchdog scram due to computer lockup.
745	2/12	CSC watchdog scram due to computer lockup.
746	3/5	CSC watchdog scram due to computer lockup.
747	3/12	CSC watchdog scram due to computer lockup.
748	3/12	CSC watchdog scram due to computer lockup.
749	3/19	CSC watchdog scram due to computer lockup.
750	3/19	CSC watchdog scram due to computer lockup.
751	3/19	CSC watchdog scram due to computer lockup.
752	3/28	CSC watchdog scram due to computer lockup.
753	3/28	CSC watchdog scram due to computer lockup.
754	4/16	CSC watchdog scram due to computer lockup.

755	4/16	CSC watchdog scram due to computer lockup.
756	4/23	CSC watchdog scram due to computer lockup.
757	4/25	CSC watchdog scram due to computer lockup.
758	4/30	CSC watchdog scram due to computer lockup.
759	4/30	CSC watchdog scram due to computer lockup.
760	5/7	CSC watchdog scram due to computer lockup.
761	5/14	NP1000 hi power during rod adjustment.
762	5/14	CSC watchdog scram due to computer lockup.
763	5/14	NP1000 hi power due to channel fluctuation.
764	5/14	CSC watchdog scram due to computer lockup.
765	5/21	CSC watchdog scram due to computer lockup.
766	5/28	NP1000 hi power due to circuit noise.
767	5/28	CSC watchdog scram due to computer lockup.
768	6/6	CSC watchdog scram due to computer lockup.
769	6/6	CSC watchdog scram due to computer lockup.
770	6/9	CSC watchdog scram due to computer lockup.
771	6/11	CSC watchdog scram due to computer lockup.
772	6/18	CSC watchdog scram due to computer lockup.
773	6/18	CSC watchdog scram due to computer lockup.
774	6/20	CSC watchdog scram due to computer lockup.
775	6/25	CSC watchdog scram due to computer lockup.
776	6/25	CSC watchdog scram due to computer lockup.
777	7/9	CSC watchdog scram due to computer lockup.
778	7/16	CSC watchdog scram due to computer lockup.
779	7/30	CSC watchdog scram due to computer lockup.
780	8/8	CSC watchdog scram due to computer lockup.
781	8/11	CSC watchdog scram due to computer lockup.
782	8/13	CSC watchdog scram due to computer lockup.
783	8/21	CSC watchdog scram due to computer lockup.
784	8/27	CSC watchdog scram due to computer lockup.
785	9/10	CSC watchdog scram due to computer lockup.
786	9/12	CSC watchdog scram due to computer lockup.
787	9/24	CSC watchdog scram due to computer lockup.
788	10/8	CSC watchdog scram due to computer lockup.
789	10/29	CSC watchdog scram due to computer lockup.
790	11/5	CSC watchdog scram due to computer lockup.
791	11/7	CSC watchdog scram due to computer lockup.
792	11/12	NP1000 hi power; cause not determinable.
793	11/12	Momentary AC power outage.
794	11/12	Momentary AC power outage.
795	11/19	CSC watchdog scram due to computer lockup.
796	11/19	CSC watchdog scram due to computer lockup.
797	11/21	CSC watchdog scram due to computer lockup.
798	11/24	CSC watchdog scram due to computer lockup.
799	12/10	CSC watchdog scram due to computer lockup.

## V. Major Maintenance Operations

The primary coolant ion exchange resin was replaced once during the year, in March.

## VI. Summary of 10 CFR 50.59 changes

There were no 50.59 changes at the facility during this report period.

## VII. Radioactivity Releases

A. Listed below is 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	0.297	5.833	0.151	124
February	0.09	5.833	0.119	124
March	0.129	5.833	0.065	124
April	0.099	5.833	0.070	124
May	0.059	5.833	0.133	124
June	0.096	5.833	0.055	124
July	0.099	5.833	0.101	124
August	0.388	5.833	0.111	124
September	0.178	5.833	0.159	124
October	0.117	5.833	0.171	124
November	0.111	5.833	0.101	124
December	0.69	5.833	0.096	124
<b>Total</b>	2.353	70.00	1.332	1488
<b>% of Allowable</b>	3.36%	-----	0.09%	-----

\* **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. Two 55-gallon drums of low-level radioactive solid waste were 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  $1 \times 10^{-6}$   $\mu\text{Ci}/\text{ml}$  present for two minutes will result in an increase of 400 cpm above background. There are two alarms 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 G4020 low level counting system. One contaminated area was noted during routine wipe surveys with a beta activity of 66 pCi/100  $\text{cm}^2$ . Soap and water were used to remove this contamination. All other areas were less than 30 pCi/100  $\text{cm}^2$  beta and 15 pCi/100  $\text{cm}^2$  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

Name	Deep Dose Equivalent	Shallow Dose Equivalent	
	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
DeBey, T **	0.000	0.000	0.000
Helfer, P	0.020	0.020	0.120
Liles, D	0.090	0.090	0.230
Perryman, R	0.030	0.030	0.090

\*\* DeBey monitoring period 4/1/97 to 12/31/97.

Reactor Visitors and Occasional Experimenters

No individual reading was greater than eight (8) 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	0.0503	0.0660	0.0342	0.0597	0.2102
Cooling Tower Fence	0.0113	0.0168	0.0119	0.0214	0.0614
West Vehicle Gate	0.0209	0.0436	0.0305	0.0586	0.1536
West Room 151 Gate	0.0172	0.0473	0.0180	0.0376	0.1201
Southwest Light Pole	0.0029	0.0224	0.0064	0.0058	0.0375
Southeast Light Pole	0.0061	0.013	0.0046	0.0064	0.0301
Control (background)	0.0329	0.0335	0.0283	0.0285	0.1232

Note: Above totals have the background subtracted (see control).

**IX. Environmental Monitoring**

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.