January 26, 2000

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

A020

U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 1999 - DECEMBER 31, 1999

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

I. Personnel Changes : None

II. Operating Experience

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 1999. 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	5810
Geologic Division - Geochronology	1476
Geologic Division – U/Th DN	434
Non-USGS affiliated	891
Total	8,611

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

B. One new Class I experiment (fission track experiment) was approved during this period.

C. During the report period, 173 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. Six fuel movements were performed during the year for the purposes of maintenance, inspections, increasing core reactivity, and performing experiments.

III. Tabulation of Energy Generated

Month	MW Hours	Critical Time	Pulses
January	48.719	51 hours 13 minutes	0
February	72.822	73 hours 17 minutes	0
March	74.367	76 hours 00 minutes	0
April	71.116	72 hours 23 minutes	0
May	65.083	66 hours 8 minutes	0
June	69.017	70 hours 50 minutes	0
July	71.417	73 hours 53 minutes	0
August	76.083	77 hours 24 minutes	0
September	79.980	81 hours 47 minutes	0
October	66.432	67 hours 26 minutes	0
November	59.332	63 hours 40 minutes	0
December	65.184	66 hours 30 minutes	0
Totals	819.552 MWh	840 hours 31 minutes	0

IV. Unscheduled Shutdowns

Number	Date	Cause
877	1/7	CSC Watchdog scram due to computer lockup.
878	1/20	CSC Watchdog scram due to computer lockup.
879	2/3	Manual scram due to building evacuation alarm.
880	2/4	CSC watchdog scram due to computer lockup.
881	2/10	CSC watchdog scram due to computer lockup.
882	2/11	Manual scram due to reactor room underpressure alarm.
883	2/17	CSC watchdog scram due to computer lockup.
884	2/23	CSC watchdog scram due to computer lockup.
885	2/26	CSC watchdog scram due to computer lockup.
886	2/26	CSC watchdog scram due to computer lockup.
887	2/26	CSC watchdog scram due to computer lockup.
888	3/4	CSC watchdog scram due to computer lockup.
889	3/11	NPP hi power scram due to signal spike.
890	3/17	CSC watchdog scram due to computer lockup.
891	3/24	CSC watchdog scram due to computer lockup.
892	3/24	CSC watchdog scram due to computer lockup.
893	3/30	CSC watchdog scram due to computer lockup.
894	3/30	CSC watchdog scram due to computer lockup.
895	4/1	CSC watchdog scram due to computer lockup.
896	4/1	CSC watchdog scram due to computer lockup.
897	4/21	CSC watchdog scram due to computer lockup.
898	4/22	CSC watchdog scram due to computer lockup.
899	4/22	CSC watchdog scram due to computer lockup.
900	5/6	CSC watchdog scram due to computer lockup.
901	5/20	CSC watchdog scram due to computer lockup.

902	5/20	CSC watchdog scram due to computer lockup.
903	6/9	CSC watchdog scram due to computer lockup.
904	6/10	CSC watchdog scram due to computer lockup.
905	6/17	CSC watchdog scram due to computer lockup.
906	6/24	CSC watchdog scram due to computer lockup.
907	6/24	CSC watchdog scram due to computer lockup.
908	6/25	CSC watchdog scram due to computer lockup.
909	6/30	CSC watchdog scram due to computer lockup.
910	7/7	CSC watchdog scram due to computer lockup.
911	7/7	CSC watchdog scram due to computer lockup.
912	7/8	CSC watchdog scram due to computer lockup.
913	7/8	CSC watchdog scram due to computer lockup.
914	7/21	CSC watchdog scram due to computer lockup.
915	7/29	CSC watchdog scram due to computer lockup.
916	8/11	CSC watchdog scram due to computer lockup.
917	8/11	CSC watchdog scram due to computer lockup.
918	8/11	CSC watchdog scram due to computer lockup.
919	8/18	CSC watchdog scram due to computer lockup.
920	8/25	CSC watchdog scram due to computer lockup.
921	8/26	CSC watchdog scram due to computer lockup.
922	9/22	CSC watchdog scram due to computer lockup.
923	9/22	CSC watchdog scram due to computer lockup.
924	9/22	CSC watchdog scram due to computer lockup.
925	9/23	NPP1000 hi power scram due to signal spike.
926	9/23	NPP1000 hi power scram due to signal spike.
927	9/23	NPP1000 hi power scram due to signal spike.
928	9/24	CSC watchdog scram due to computer lockup.
929	9/24	CSC watchdog scram due to computer lockup.
930	9/27	CSC watchdog scram due to computer lockup.
931	9/29	Database timeout scram due to computer lockup.
932	10/8	CSC watchdog scram due to computer lockup.
933	10/28	CSC watchdog scram due to computer lockup.
934	11/5	CSC watchdog scram due to computer lockup.
935	11/5	CSC watchdog scram due to computer lockup.
936	11/17	CSC watchdog scram due to computer lockup.
937	11/18	CSC watchdog scram due to computer lockup.
938	11/23	CSC watchdog scram due to computer lockup.
939	12/8	CSC watchdog scram due to computer lockup.
940	12/9	CSC watchdog scram due to computer lockup.
941	12/9	CSC watchdog scram due to computer lockup.
942	12/22	CSC watchdog scram due to computer lockup.
943	12/29	CSC watchdog scram due to computer lockup.
944	12/29	CSC watchdog scram due to computer lockup.
945	12/29	CSC watchdog scram due to computer lockup.
946	12/30	CSC watchdog scram due to computer lockup.

V. Major Maintenance Operations

The primary coolant ion exchange resin was replaced in April. The electronics drawer for the continuous air monitor was replaced in May. The secondary cooling pump and motor were replaced in October.

VI. Summary of 10 CFR 50.59 changes

There were two 50.59 changes at the facility during this report period. The first was the replacement of the electronics drawer of the continuous air monitor. The second was the replacement of the secondary cooling pump and motor. Both changes were evaluated by the Reactor Operations Committee 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	0.391	5.833	0.173	124
February	0.462	5.833	0.146	124
March	0.398	5.833	0.168	124
April	0.517	5.833	0.128	124
May	0.418	5.833	0.155	124
June	0.386	5.833	0.151	124
July	0.419	5.833	0.162	124
August	0.457	5.833	0.153	124
September	0.360	5.833	0.093	124
October	0.686	5.833	0.209	124
November	0.443	5.833	0.091	124
December	0.273	5.833	0.218	124
Total	5.21	70.00	1.847	1488
% of Allowable	7.44%	————	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 State 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 a 55-gallon drum.

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) samples the air in the reactor bay. An equilibrium concentration of about 1×10^{-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 NIST, and wipes are counted on a Gamma Products G5000 low level counting system. Four contaminated areas were noted during routine wipe surveys. The highest had a beta activity of 281 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 badges for X-rays, gamma, beta and neutron radiations are assigned to all permanent occupants of the Nuclear Science Building. LiF TLD dosimeters are 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 (1/1/99 – 11/30/99)

	Deep Dose Equivalent	Shallow Dose Equivalent	
Name	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
Debey, T	0.000	0.000	0.000
Helfer, P	0.000	0.000	0.000
Liles, D	0.010	0.010	0.160
Perryman, R	0.000	0.000	0.080

Note: December's results not yet available.

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	0.0131	0.0169	0.0141	0.0135	0.0576
Cooling Tower Fence	0.0040	0.0010	0.0002	0.0126	0.0178
West Vehicle Gate	0.0087	0.0049	0.0032	0.0081	0.0249
West Room 151 Gate	0.0120	0.0106	0.0105	0.0180	0.0511
Southwest Light Pole	0.0039	0.0027	0.0000	0.0032	0.0098
Control (background)	0.0184	0.0206	0.0197	0.0219	0.0806
Southeast Light Pole	0.0047	0.0013	0.0000	0.0056	0.0116

Note: Above totals (except Control) 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.