



United States Department of the Interior

U. S. GEOLOGICAL SURVEY
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Denver, Colorado 80225

IN REPLY REFER TO:

January 15, 2002

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, 2001 - DECEMBER 31, 2001

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

I. **Personnel Changes**: One full-time employee (Senior Reactor Operator) retired in August and was rehired as a part-time contractor in October.

II. **Operating Experience**

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 2001. 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	1304
Geologic Division - Geochronology	958
Non-USGS affiliated	<u>842</u>
Total	3,104

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

B. One new Class II experiment (foil irradiation) 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 270.

E. One fuel movement was performed during the year for the purpose of performing the biennial control rod inspection.

III. Tabulation of Energy Generated

	<u>MWH operated</u>	<u>Critical hours</u>	<u>Pulses</u>
<u>Jan</u>	41.611	45.583	0
<u>Feb</u>	55.707	57.083	0
<u>Mar</u>	94.442	96.733	4
<u>Apr</u>	56.684	57.983	0
<u>May</u>	142.921	148.067	0
<u>June</u>	60.218	64.917	4
<u>July</u>	26.937	36.717	3
<u>Aug</u>	92.868	95.150	0
<u>Sept</u>	39.901	40.733	0
<u>Oct</u>	43.163	45.450	0
<u>Nov</u>	39.167	40.133	0
<u>Dec</u>	26.323	27.200	1
<u>Totals</u>	719.942	755.750	12

IV. Unscheduled Shutdowns

<u>Number</u>	<u>Date</u>	<u>Cause</u>	
971	1/18	DIS064 scanner timeout scram.	
972	2/14	DIS064 scanner timeout scram.	
973	2/21	DIS064 scanner timeout scram.	
974	3/7	DIS064 scanner timeout scram.	
975	4/4	DIS064 scanner timeout scram.	
976	4/11	NPP1000 high power scram due to AC power transient.	
977	4/11	NPP1000 high power scram due to AC power transient.	
978	4/11	NPP1000 high power scram due to AC power transient.	
979	5/4	CSC watchdog scram due to computer lockup.	
980	5/24	DIS064 scanner timeout scram.	
981	5/29	NPP1000 high power scram due to AC power transient.	
982	6/8	NP1000 high power scram due to square wave operation with too short of a period.	
983	8/2	CSC watchdog scram due to computer lockup.	
984	9/27	NPP1000 high power scram – cause not determined.	
985	11/8	NPP1000 high power scram – cause not determined.	
986	12/7	DIS064 scanner timeout scram.	
987	12/7	NPP1000 high power scram due to AC power transient.	

V. Major Maintenance Operations

The primary coolant ion exchange resin was replaced in January. The transient rod air solenoid valve was replaced in January. The control console high-resolution

monitor was replaced in June, and the console acknowledge (push-button) switch was replaced in December.

VI. Summary of 10 CFR 50.59 changes

The chart recorder on the control console was changed from a pen and paper recorder to a paperless recorder. This change was performed on 12/18/01. The new recorder provides more information to the operator and reduced maintenance. 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	0.334	5.833	0.068	124
February	0.379	5.833	0.144	124
March	0.464	5.833	0.068	124
April	0.342	5.833	0.142	124
May	0.596	5.833	0.142	124
June	1.723	5.833	0.148	124
July	0.165	5.833	0.067	124
August	0.282	5.833	0.125	124
September	0.343	5.833	0.072	124
October	0.102	5.833	0.119	124
November	0.078	5.833	0.068	124
December	0.060	5.833	0.102	124
Total	4.868	70.00	1.266	1488
% of Allowable	6.95%	-----	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 AccuLabs Inc.

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

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} $\mu\text{Ci/ml}$ 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 were 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 (12/1/00 – 11/30/01)

Name	Deep Dose Equivalent	Shallow Dose Equivalent	
	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
Aakhus-Witt A.	0.025	0.025	0.068
DeBey, T	0.017	0.017	0.082
Helfer, P	0.035	0.035	0.240
Liles, D	0.047	0.047	0.109
Perryman, R	0.030	0.020	0.266

Note: December's personnel dosimetry results are not available at this time.

Reactor visitors and occasional experimenters wore pocket dosimeters that resulted in no individual reading that was greater than one (1) mrem.

Table 3. Environmental Dose Results

Location	Dose Jan-Mar (RAD)	Dose Apr-June (RAD)	Dose July-Sept. (RAD)	Dose Oct.- Dec. (RAD)	Total (RAD)
Exhaust Stack	0.0074	0.0108	0.0018	0.0192	0.0392
Cooling Tower Fence	0.000	0.0000	0.0000	0.0000	0.0
West Vehicle Gate	0.0122	0.0076	0.0045	0.0184	0.0427
West Room 151 Gate	0.0066	0.0059	0.0036	0.0121	0.0282
Southwest Light Pole	0.0033	0.0027	0.0008	0.0042	0.011
Control (background)	0.0237	0.0197	0.0143	0.0227	0.0804
Southeast Light Pole	0.0000	0.0000	0.0000	0.0000	0.0

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

X. 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.