

U. S. Geological Survey TRIGA Reactor

ANNUAL REPORT

January 1, 1982 - December 31, 1982

NRC License No. R-113 - Docket No. 50-274

I. Administrative Changes

- A. Dr. Hugh T. Millard, Jr. replaced Mr. Albert P. Marranzino as Reactor Administrator.
- B. Dr. David McKown replaced Dr. Millard as a member of the Reactor Operation's Committee.

II. Operating Experience

The prime function of the Geological Survey TRIGA Reactor (GSTR) for the year 1982 continued to be the provision of neutrons for the various research programs being conducted by the U.S. Geological Survey. Irradiations were also performed for other Governmental agencies and educational institutions.

A listing of all irradiations performed during the year 1982 is listed below.

<u>Organization</u>	<u>Samples (1982)</u>
Geologic Division (Denver)	18,656
Geologic Division (Reston)	226
Geologic Division (Menlo Park)	52
University of Georgia	49
Oregon State University	28
University of Utah	4
University of British Columbia	2
Colorado School of Mines	1
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	19,018

DESIGNATED ORIGINAL

Certified By Roland Storey 2/4/83

The operation of the reactor has been normal. The specific's of operations relating to performance characteristics are:

- A. Thermal power calibration at 50 KW was performed in January and June, 1982.
- B. Control rods were calibrated in January.
- C. Four (4) standard fuel elements were added to the core in January.
- D. No Class II experiments were approved during 1982.
- E. During the report period 191 daily checklists and 12 monthly checklists were completed in compliance with Technical Specifications requirements for surveillance of the reactor facility.
- F. Tours of the reactor facility were provided to 16 groups during the year. The major groups visiting the facility were affiliated with:

St. Mary's High School
Highland High School
Bennett High School
University of Wyoming
Rockwell International
University of Missouri
University of Colorado
Geological Survey of Japan

During the year, 171 visitors were admitted to the reactor facility.

III. Tabulation of Energy Generated

<u>Month</u>	<u>Mewawatt Hours</u>	<u>Time Reactor Was Critical</u>	<u>Number of Pulses</u>
January 1982	68.812	88 hours 20 minutes	0
February 1982	88.655	94 hours 56 minutes	0
March 1982	86.858	95 hours 34 minutes	0
April 1982	66.759	72 hours 20 minutes	0
May 1982	85.516	102 hours 40 minutes	0
June 1982	93.874	127 hours 12 minutes	0
July 1982	112.391	125 hours 33 minutes	0
August 1982	74.371	87 hours 52 minutes	0
September 1982	76.441	87 hours 44 minutes	0
October 1982	96.933	105 hours 18 minutes	0
November 1982	85.668	100 hours 38 minutes	0
December 1982	73.189	78 hours 55 minutes	0
	<u>1009.467</u>	<u>1167 hours 03 minutes</u>	<u>0</u>

IV. Unscheduled Shutdowns

Emergency Shutdowns - number and reason

1. Linear power scram - physical shock to console Serial #287
2. Primary power scram - power failure Serial #288
3. Percent power scram - physical shock to console Serial #289

Unscheduled Shutdowns

1. Manual Scram - Sample failed to leave Reactor signal. Sample was out of reactor. Loss of power to photocell Serial #284
2. Manual Scram - Sample jammed in sample changer block Serial #285
3. Manual Scram - Sample stuck in transit signal. Sample returned O.K. Software error Serial #286
4. Manual Scram - Sample stuck in transit signal. Sample returned O.K. Bent tube on sample changer. Serial #290

V. Major Maintenance Operations

A. Water Systems

1. The demineralizer resin was changed once during the year.
2. Replaced make-up valve on the secondary water system.

B. Control Rods

1. Replaced seals, "O" rings, and "Down" microswitch and bracket on Transient Rod.

VI. Summary of 10 CFR 50.59 Changes

No changes were made under 10 CFR 50.59.

VII. Radioactivity Releases

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

Month	License (R-113)			10 CFR 20 Allowable (curies)
	Argon-41 (curies)	Allowable (curies)	Tritium (HTO) (curies)	
January 1982	0.70	5.8	8.6×10^{-5}	0.25
February 1982	0.53	5.8	13.9×10^{-5}	0.25
March 1982	0.54	5.8	11.3×10^{-5}	0.25
April 1982	0.58	5.8	7.8×10^{-5}	0.25
May 1982	0.91	5.8	7.0×10^{-5}	0.25
June 1982	0.96	5.8	7.3×10^{-5}	0.25
July 1982	0.70	5.8	9.9×10^{-5}	0.25
August 1982	0.47	5.8	10.6×10^{-5}	0.25
September 1982	0.54	5.8	17.7×10^{-5}	0.25
October 1982	0.89	5.8	10.3×10^{-5}	0.25
November 1982	0.72	5.8	8.0×10^{-5}	0.25
December 1982	0.86	5.8	6.9×10^{-5}	0.25
Total	8.40	70.0	1.19×10^{-3}	3.00
% of allowable	12%		0.04%	

(Note #1: The argon activities reported are integrated values obtained from the facility's gaseous stack monitor. Calculated values have been substituted for measured values in the few instances when the monitoring system was down for maintenance or repair).

(Note #2: The tritium concentrations are estimates based on the amount of water lost by evaporation from the reactor times the concentration of tritium as HTO).

B. There were no radioactive liquid effluents released from the reactor facility during the year 1982.

C. No radioactive waste was shipped offsite during 1982.

The total amount of radioactive waste released from the reactor facility during 1982 is estimated to be approximately 4.0 mCi.

(Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin - used resin with small quantities of rinse water is solidified with an oil dry compound prior to release 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 1982.

1. Eighteen area monitors (17 gammas, 1 neutron) located throughout the Nuclear Science Building. To provide a background signal, a small check source is attached to the scintillation detector. High alarm set points range from 2 mr/hr to 50 mr/hr. High level alarms have been infrequent and are documented in appropriate Log Books.

2. One Continuous Air Monitor (CAM) sampling the air in the reactor bay. An equilibrium concentration of $3.0 \times 10^8 \mu\text{Ci/cc}$ present for two minutes will result in an increase of ~900 cpm above background. There are two alarm set points. A low-level alarm is set at 3,000 cpm, and the high-level alarm is set at 10,000 cpm.

Reactor bay air is sampled during all reactor operations. The fixed particulate air filter is changed and counted daily on a Beckman Low Beta II counting system. The charcoal filter, fitted behind the air filter, is changed and counted weekly. In all instances, final sample calculations show less than MPC (10 CFR Part 20, Appendix B, Table II) concentrations for all isotopes in question in the reactor bay.

3. Contamination wipe surveys and radiation surveys with portable survey instruments are performed at least once each month. All portable instruments are calibrated with a certified 3-curie Cs-137 source and wipes are counted on a Beckman Low Beta II counting system.

Wipe surveys have shown the reactor area remains free of tactile contamination except for intermittent low level activity on work table tops and the sample storage caves. Instrument surveys indicate no fixed areas of contamination and radiation leaking at outside wall surfaces and have been less than 0.5 mr/hr at our maximum power level. The maximum count level for a wipe (beta + gamma/100 cm²) was 2830 pCi on the floor near the large sample storage cave.

4. Personnel, X and gamma, beta and neutron film badges are assigned to all permanent occupants of the Nuclear Science Building. CaSO₄:Dy dosimeters have been used at four outdoor environmental stations. Reactor facility visitors are issued L-49 self-reading dosimeters.

These monitoring results are categorized below:

		Rem - 1982*		
	<u>Gamma</u>	<u>Beta</u>	<u>Neutron</u>	
<u>Reactor Staff</u>				
<u>Whole Body</u>				
Highest	0.040	0.000	0.00	
Mean	0.015	0.000	0.00	
<u>Hands</u>				
Highest	0.200	0.000	0.00	
Mean	0.050	0.000	0.00	
<u>Reactor Experimenters</u>				
<u>Whole Body</u>				
Highest	0.015	0.000	0.00	
Mean	0.009	0.000	0.00	
<u>Hands</u>				
Highest	0.180	0.000	0.00	
Mean	0.047	0.000	0.00	

Reactor Visitors

All readings were less than 1.0 mrem.

Environmental Stations

	<u>Rem 1982</u>
Exhaust Stack	0.0158
West	0.0017
Southwest	0.0003
Southeast	0.0002

* Personnel monitoring results are for the the fourth quarter of 1981 and the first three quarters of 1982.

IX. Environmental Monitoring

Pursuant to reactor operating procedures, soil and water samples are collected every second year. Samples were collected in 1982.