U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

January 1, 1983 - December 31, 1983

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

I. Administrative Changes

Dr. Charles W. Naeser replaced Mr. Carl M. Bunker as a member of the Reactor Operations Committee.

II. Operating Experience

The prime function of the Geological Survey TRIGA Reactor (GSTR) for the year 1983 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 Government agencies and educational institutions.

A listing of irradiations performed during the year 1983 is given below:

Organization	Samples (1983)
Geologic Division (Denver)	10,269
Geologic Division (Reston)	2,044
Colorado State University	376
Rockwell International	90
Oregon State University	84
University of Georgia	21
University of Maine	6
University of New York	6
Louisiana State University	2
Brigham Young University	1
	12,896

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

A. Thermal power calibrations at 50 KW were performed in January and July.

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B. Control rods were inspected and calibrated in January.

C. One Class II experiment was approved during 1983.

D. 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.

E. Tours of the reactor facility were provided to 22 groups during the year. The major groups visiting the facility were affiliated with:

Geological Survey of South Africa
Green Mountain High School
Colorado Division of Wildlife
Colorado School of Mines
Colorado State University
University of Colorado
Boy Scouts of America
Highland High School
Food and Drug Administration
Rockwell International
Boulder Valley Schools

During the year, 222 visitors were admitted to the reactor facility.

III. Tabulation of Energy Generated

Month	Megawatt Hours	Time Reactor Was Critical	Number of Pulses
January 1983	79.668	98 hours 57 minutes	0
February 1983	80.958	87 hours 25 minutes	0
March 1983	87.524	93 hours 37 minutes	0
April 1983	116.383	119 hours 58 minutes	0
May 1983	81.245	91 hours 56 minutes	0
June 1983	75.332	83 hours 54 minutes	0
July 1983	82.851	91 hours 13 minutes	0
August 1983	65.035	71 hours 32 minutes	0
September 1983	40.918	43 hours 41 minutes	0
October 1983	83.912	89 hours 24 minutes	0
November 1983	99.611	104 hours 47 minutes	0
December 1983	86.424	95 hours 06 minutes	0
	979.861	1071 hours 30 minutes	0

IV. Unscheduled Shutdowns

Emergency Shutdowns - number and reason

1.	Magnet Power - bulb burned out on Safety rod Cont/ON button	Serial #292
2.	External Power Scram - power failure	Serial #293
3.	External Power Scram - power dip	Serial #294
4.	External Power Scram - power dip	Serial #295
5.	External Power Scram - power dip	Serial #296
6.	External Power Scram - power dip	Serial #297
7.	External Power Scram - power dip	Serial #298
8.	External Power Scram - power dip	Serial #299
9.	External Power Scram - power dip	Serial #300
10.	Percent Power Scram - noise spike	Serial #304

Unscheduled Shutdowns

1.	Manual scram - "Sample failed to leave reactor" signal. Rabbit broken. All parts recovered.	Serial #291
2.	Manual scram - Water in tank well area. Removed excess water.	Serial #301
3.	Manual scram - Percent power reading low. Cleaned and dried connectors.	Serial #302
4.	Manual scram - Pneumatic system computer system failure.	Serial #303
5.	Manual scram - Rotary specimen rack stopped rotating. Cleaned and lubricated main shaft bearing.	Serial #305

V. Major Maintenance Operations

1. Replaced Roots blower on Ar-41 monitoring system.
2. The demineralizer resin was changed once during the year.
3. Replaced motor on demineralizer pump.

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	Argon-41 (curies)	License (R-113) Allowable (curies)	Tritium (HTO) (curies)	10 CFR 20 Allowable (curies)
January 1983	0.72	5.8	7.8×10^{-5}	0.25
February 1983	0.95	5.8	8.2×10^{-5}	0.25
March 1983	1.10	5.8	9.9×10^{-5}	0.25
April 1983	0.90	5.8	9.7×10^{-5}	0.25
May 1983	0.75	5.8	8.7×10^{-5}	0.25
June 1983	0.93	5.8	12.8×10^{-5}	0.25
July 1983	0.60	5.8	6.5×10^{-5}	0.25
August 1983	0.61	5.8	11.2×10^{-5}	0.25
September 1983	0.69	5.8	8.7×10^{-5}	0.25
October 1983	0.93	5.8	11.5×10^{-5}	0.25
November 1983	1.08	5.8	14.0×10^{-5}	0.25
December 1983	0.69	5.8	11.6×10^{-5}	0.25
Total	9.95	70.0	1.20×10^{-3}	3.00
% of allowable	14.2%		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 1983.

C. Fifteen (15) drums (55-gallons each) of radioactive waste were shipped to the waste burial site at Richland, Washington in 1983.

The total amount of radioactive waste released from the reactor facility during 1983 is estimated to be approximately 3.0 mCi.

(Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin - used resin with small quantitites of rinse water is solidified with Portland cement 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 1983.

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 3.0×10^{8} μCi/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 Gamma Products G4020 Low Level 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 Gamma Products G4020 Low Level 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 have been less than 0.5 level mr/hr at our maximum power level. The maximum count level for a wipe (beta + gamma/100 cm^2) was 3644 pCi on a work table top.

4. Personnel, X and gamma, beta and neutron film badges are assigned to all permanent occupants of the Nuclear Science Building. $CaSO_4$:Dy dosimeters have been used at four outdoor environmental stations. Reactor facilty visitors are issued L-49 self-reading dosimeters.

These monitoring results are categorized below:

	Rem - 1983		
	Gamma	Beta	Neutron
Reactor Staff			
Whole Body			
Highest	0.045	0 000	0.00
Mean	0.022	0.000	0.00
Hands			
Highest	0.380	0.000	0.00
Mean	0.145	0.000	0.00
Reactor Experimenters			
Whole Body			
Highest	0.065	0.000	0.00
Mean	0.030	0.000	0.00
Hands			
Highest	0.100	0.000	0.00
Mean	0.050	0.000	0.00
Reactor Visitors			

All readings were less than 1.0 mrem.

Environmental Stations

	Rem 1983
Exhaust Stack	0.0691
West	0.0034
Southwest	None measured
Southeast	None measured

IX. Environmental Monitoring

Pursuant to reactor operating procedures, soil and water samples are collected every second year. Samples were not collected in 1983.