U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 1985 - DECEMBER 31, 1985

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

I. Administrative Changes

No administrative changes.

II. Operating Experience

The prime function of the Geological Survey TRIGA Reactor (GSTR) for the year 1985 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 1985 is given below:

Organization	Samples (1985)
Geologic Division (Denver)	9055
Geologic Division (Reston)	1882
Geologic Division (Menlo Park)	137
University of Georgia	28
Rensselear Polytechnic Institute	22
Brigham Young University	6
Colorado College	26
University of Utah	1
Oregon State University	28
University of Maine	6
Louisiana State University	2
University of Southern California	1
Colorado School of Mines	2
Colorado Division of Wildlife	393
Total	11,589

The operation of the reactor has been normal. The primary activities are listed below.

A. Thermal power calibrations at 50KW were performed in January, March, May, July, August, September, and November.

B. Fuel element measurements were made in January.

C. The rotary specimen rack was replaced with a new unit modified to permit samples to be unloaded pneumatically. (See Section VI)

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D. No Class II experiments were approved during 1985.

E. During the report period, 200 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 groups during the year. Some of the major groups visiting the facility were affiliated with:

Colorado School of Mines
Colorado College
Western State College
Bennett High School
Republic of China (Uranium Research Institute)
Department of Labor
Case Western Reserve University
Colorado State University
Highlands High School
University of Colorado
Denver area High Schools (Public and Private)

Approximately 300 visitors were admitted to the facility during the year.

III. Tabulation of Energy Generated

Month	Megawatt Hours	Time Reactor Was Critical	Number of Pulses
January 1985	65.706	97 hours 07 minutes	0
February 1985	58.230	69 hours 45 minutes	0
March 1985	79.107	98 hours 05 minutes	0
April 1985	108.543	118 hours 15 minutes	0
May 1985	95.569	106 hours 32 minutes	0
June 1985	66.128	81 hours 06 minutes	0
July 1985	108.808	120 hours 46 minutes	0
August 1985	73.674	93 hours 22 minutes	0
September 1985	98.237	104 hours 40 minutes	0
October 1985	95.946	102 hours 23 minutes	0
November 1985	57.168	67 hours 08 minutes	0
December 1985	94.668	100 hours 21 minutes	0
	1001.784	1159 hours 30 minutes	0

IV. Unscheduled Shutdowns

1.	Period Scram - while connecting scope to console	Serial #330
2.	Linear Scram - noise spike	Serial #331
3.	Manual Scram - lost area monitor power and underpressure in reactor room	Serial #332
4.	Mnaual Scram - underpressure less than 0.1" water	Serial #333
5.	Linear Scram - physical shock to console	Serial #334
6.	Linear Scram - noise spike	Serial #335
7.	Linear Scram - noise spike	Serial #336
8.	Linear Scram - noise spike	Serial #337
9.	Linear Scram - noise spike	Serial #338
10.	Linear Scram - noise spike	Serial #339
11.	Linear Scram - while adjusting linear chamber	Serial #340
12.	Manual Scram - "Rabbit failed to leave reactor" signal - pneumatic system	Serial #341
13.	Linear Scram - operator error	Serial #342
14.	Manual Scram - lost program on CTD for pneumatic system	Serial #343
15.	Manual Scram - lost program on CTD	Serial #344
16.	Manual Scram - lost program on CTD	Serial #345
17.	Linear Scram - noise spike	Serial #346
18.	Linear Scram - noise spike	Serial #347
19.	Linear Scram - noise spike	Serial #348
20.	Linear Scram - noise spike	Serial #349
21.	Loss of building power	Serial #350
22.	Loss of building power	Serial #351
23.	Period Scram - noise on log channel	Serial #352
24.	Manual Scram - "Rabbit failed to leave reactor" signal - pneumatic system	Serial #353

25. Loss of building power — Serial #354

26. Linear Scram - physical shock to chamber — Serial #355

27. Manual Scram - "Rabbit failed to leave reactor" signal - penumatic system — Serial #356

28. Manual Scram - lost program on CTD — Serial #357

V. Major Maintenance Operations

1. A new motor was installed on main exhaust system in reactor room.

2. The demineralizer resing was changed once during the year.

3. Installed new CIC in linear channel.

VI. Summary of 10 CFR 50.59 Changes

The existing rotary specimen rack (lazy susan) was replaced in November. The new unit was modified to allow the samples to be unloaded pneumatically. The new unit was designed and manufactured by GA Technologies, Inc. The major modifications consisted of 1.) adding an air supply line to the drive side of the housing, and 2.) adding a second load tube, offset three positions from the standard load tube. The second load tube was added to permit the use of the sample container that is used in our pneumatic system. The container is smaller than the conventional TRIGA tube. Procedures for the removal and installation of the lazy susans were furnished by GA Technologies.

The replacement of the rack was reviewed by the Reactor Operations Committee in its meeting of February 27-28, 1984. The Committee found that the operations of the modified rack will not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the Safety Analysis Report, and it will not create the possibility for an accident or malfunction of a different type than previously evaluated in the Safety Analysis Report. The margin of safety as defined in the basis for any technical specification is not reduced.

The Committee concluded the change did not involve an unreviewed safety question and would constitute a 10 CFR 50.59 change.

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 1985	0.53	5.8	12.5×10^{-5}	0.25
February 1985	0.35	5.8	13.2×10^{-5}	0.25
March 1985	0.68	5.8	7.1×10^{-5}	0.25
April 1985	0.90	5.8	14.4×10^{-5}	0.25
May 1985	0.97	5.8	21.5×10^{-5}	0.25
June 1985	0.60	5.8	13.4×10^{-5}	0.25
July 1985	0.95	5.8	19.2×10^{-5}	0.25
August 1985	1.06	5.8	11.6×10^{-5}	0.25
September 1985	0.93	5.8	7.3×10^{-5}	0.25
October 1985	1.32	5.8	8.1×10^{-5}	0.25
November 1985	1.34	5.8	9.3×10^{-5}	0.25
December 1985	1.30	5.8	14.7×10^{-5}	0.25
Total	10.93	70.0	1.52×10^{-3}	3.00
% of allowable	22.4%		0.05%	

(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. No radioactive liquid effluents were released from the reactor facility during the year 1985.

C. No radioactive waste was shipped for burial during 1985.

The total amount of radioactive waste released from the reactor facility during 1985 is estimated to be approximately 11.0 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 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 1985.

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} present for two minutes will result in an increase of 500 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 mr/hr at our maximum power level. The maximum count for a wipe (beta + gamma/100 cm^2) was 1130 pCi on a storage cave. No alpha contamination was detected.

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 facility visitors are issued L-49 self-reading dosimeters.

These monitoring results are categorized below:

	Rem - 1985		
	Gamma	Beta	Neutron
Reactor Staff			
Whole Body Cumulative Dose for Calendar Year			
Highest	0.030	0.000	0.000
Hands Cumulative Dose for Calendar Year			
Highest	1.360	0.000	0.000
Reactor Experimenters			
Whole Body Cumulative Dose for Calendar Year			
Highest	0.000	0.000	0.000
Hands Cumulative Dose for Calendar Year			
Highest	0.060	0.000	0.000

Reactor Visitors

All readings were less than 1.0 mrem.

Environmental Stations

	Rem 1985
Exhaust Stack	0.0930
West	0.0014
Southwest	0.0000
Southeast	0.0000

IX. Environmental Monitoring

Pursuant to reactor operating procedures, soil and water samples are collected every second year. No samples were collected in 1985.

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IN REPLY REFER TO:

January 24, 1986

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

Administrator
Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
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The enclosed annual report of the U. S. Geological Survey TRIGA reactor, including a description of 50.59 changes, is submitted in accordance with 10 CFR 50.59(b).

Sincerely,

Donald H Rusling

DONALD RUSLING
Reactor Supervisor

Enclosure

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