U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 1990 - DECEMBER 31, 1990

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

I. Administrative Changes

Lorraine Filipek assumed the position of Reactor Administrator on 2/1/90, replacing Hugh Millard. David Smith assumed the position of Reactor Administrator on 7/7/90, replacing Lorraine Filipek.

II. Operating Experience

The Geological Survey TRIGA Reactor (GSTR) was in normal operations for the year 1990. Pulsing operations were performed for the first time in many years and preinstallation checks continued on the new control console.

A total of 262 irradiation requests were processed during the year, with the average request representing 49 samples and 8.0 full-power hours of reactor operation. A synopsis of irradiations performed during the 1990 year is given below, listed by the organization submitting the samples to the reactor staff:

Organization	Number of Samples
Geologic Division - BGC	10,919
Geologic Division - BIG	991
Geologic Division - CMR	646
Geologic Division - WMR	0
Geologic Division - BSP	9
Non-USGS users	213
Total	12,778

A. Thermal power calibrations at about 800 kW were performed in February and August, with only very minor adjustments required.

B. Four new Class I experiments and one new Class II experiment were approved during this period. The Class II experiment involved the installation of a vertical beam tube in the reactor tank to allow the irradiation of electronic components.

C. During the report period, 193 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 in 1990 for a total visitor count of approximately 200.

E. Nine standard fuel elements from the Michigan State reactor were installed in the core. One of the elements was placed in a void position in the G ring while the other eight were installed in place of original elements with high burnup. A total reactivity gain of about $.85 was achieved.

III. Tabulation of Energy Generated

Month	Megawatt Hours	Time Reactor Was Critical	Number of Pulses
January 1990	132.632	135 hours 10 minute	0
February 1990	99.223	103 hours 56 minutes	0
March 1990	75.568	79 hours 31 minutes	0
April 1990	97.655	104 hours 29 minutes	0
May 1990	120.269	121 hours 5 minutes	0
June 1990	105.080	107 hours 13 minutes	0
July 1990	108.020	110 hours 29 minutes	6
August 1990	122.043	126 hours 1 minutes	12
September 1990	87.369	92 hours 37 minutes	0
October 1990	76.917	79 hours 23 minute	0
November 1990	85.157	87 hours 31 minutes	0
December 1990	118.000	119 hours 15 minutes	0
Totals	1227.933	1265 hours 40 minutes	18

IV. Unscheduled Shutdowns

Serial No.	Date	Cause
438	2/20/90	Linear scram due to AC transient when moving T.R.
439	4/26/90	Linear scram due to AC transient from pool temp alarm
440	5/16/90	Linear scram due to AC transient when moving T.R.
441	7/3/90	Linear scram due to AC transient when moving T.R.
442	8/1/90	Linear scram due to physical shock to console
443	8/16/90	Linear scram due to physical shock to console
444	10/23/90	Linear scram due to physical shock to console

V. Major Maintenance Operations

Maintenance items in CY'90 were relatively minor. A new water conductivity system was installed as part of the new digital console. This conductivity system has a readout at the instrument in room 149 and on the new console status screen. In May, the cooling tower nozzles were once again removed, inspected, cleaned, and reinstalled. Rust particles were found to be clogging a number of the nozzles. After the maintenance, a hole was cut in the end of the cooling tower header pipe to allow flushing of the accumulated rust. A stub tube was attached to allow future flushing of the header pipe. This cleaning resulted in a significant decrease in cooling tower header pressure was noted. Overall performance of the cooling tower continues to be satisfactory. Ion exchange resin was replaced once during the year, in June.

VI. Summary of 10 CFR 50.59 changes

There were no 50.59 changes at the facility during this report period. The pending installation of a new control console will not be performed as a 50.59 change, but will be installed after receiving the appropriate approval and technical specifications changes from the Nuclear Regulatory Commission. The current schedule calls for the console to be installed in the spring of 1991.

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) (uCuries)	10 CFR 20 Allowable (Curies)
January 1990	1.12	5.8	126.3	0.25
February 1990	0.72	5.8	187.0	0.25
March 1990	0.80	5.8	205.9	0.25
April 1990	0.99	5.8	140.0	0.25
May 1990	1.18	5.8	193.0	0.25
June 1990	1.02	5.8	238.0	0.25
July 1990	1.14	5.8	174.0	0.25
August 1990	1.02	5.8	151.0	0.25
September 1990	0.64	5.8	132.0	0.25
October 1990	0.69	5.8	181.0	0.25
November 1990	0.92	5.8	144.0	0.25
December 1990	1.18	5.8	233.0	0.25
Total	11.42	70.0	2105.2 uCi	3.00
% of allowable	16.3%		0.1%	

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 multiplied by the concentration of tritium as HTO. Tritium sample analyses are being performed by Colorado State University.

B. About 132 liters of contaminated reactor water containing a total of 0.325 uCi of ^{60}Co were released into the Federal Center sewage system over a twelve month time period. This water was diluted by 3.4×10^{6} gallons of sewage water.

C. Four 55-gal. drums of low level solid waste and solidified resin were shipped for burial in Nevada in 1990.

The total amount of radioactive waste released from the reactor facility during 1990 is estimated to be approximately 9.0 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 1990.

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} uCi/ml present for two minutes will result in an increase of 400 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 11) 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 a 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.

Monthly wipe tests in the Reactor Bay indicated two areas of contamination in 1990. The first was located on a work table top and the second on the tool box table. The recorded activities were 19 and 24 pCi/100 cm^2 beta, respectively. Neither area was greater than two square feet. The roof hatch over the reactor bay continues to be roped off and posted as a radiation area (averaging 2.5 mR/hr) during routine 1 MW operations.

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.

Personnel monitoring results are categorized below:

	Rem-1990		
	Gamma	Beta	Neutron
Reactor Staff			
Whole Body Cumulative Dose for Calendar Year (thru 10-19-90)			
Highest	0.190	0.190	0.000
Hands Cumulative Shallow Dose for Calendar Year			
Highest	0.000	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	0.000	0.150	0.000

Reactor Visitors and Occasional Experimenters

No individual reading was greater than 6 mrem.

Environmental Stations

	Rem 1990
Exhaust Stack	0.1520
West	0.0048
Southwest	0.0000
Southeast	0.0000

IX. Environmental Monitoring

Pursuant to reactor procedures, soil and water samples are collected every second year. Environmental soil and water samples were collected in 1990.

Thirteen (13) off-site soil samples encompassing a 4 mile radius of the Denver Federal Center and thirteen (13) on site samples from a grid layout of the Federal Center grounds were taken. All soil samples were analyzed by Colorado State University (CSU) using the gamma spectroscopy method.

Six (6) water samples were collected from lakes, ponds and streams surrounding and within the Federal Center. These samples were analyzed by Barringer Labs for gross alpha and beta activity.

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.