USGS
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Department of the Interior
US Geological Survey
Box 25046 MS-974
Denver CO, 80225
January 23, 2012

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

Dear NRC staff,

The 2011 annual report is herein submitted for the U.S. Geological Survey TRIGA non-power reactor facility. This report is generated in compliance with our license conditions.

The facility docket number is 50-274.

Sincerely,

Tim DeBey

Timothy M. DeBey
Reactor Supervisor

Enclosure

Copy to:
Paulette Torres, MS OWFN 12 D20

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NRR

U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 2011 - DECEMBER 31, 2011

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

I. Personnel Changes:

None.

II. Operating Experience

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 2011. 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 Discipline – INAA	1094
Geologic Discipline - Geochronology	930
Non-USGS	2561
Total	4585

A. Thermal power calibrations were performed in January, July and December, with minor adjustments made to the instrumentation.

B. During the report period, 181 daily checklists and 12 monthly checklists were completed in compliance with technical specifications requirements for surveillance of the reactor facility.

C. Tours were provided to individuals and groups during the year for a total visitor count of approximately 380.

III. Tabulation of Energy Generated

	MWh operated	Critical hours	Pulses
Jan	**44.799**	37h 7m	0
Feb	**43.005**	46h 36m	1
Mar	**111.733**	114h 59m	0
Apr	**29.600**	31h 54m	0
May	**34.665**	36h 13m	0
June	**86.954**	91h 30m	1
July	**55.078**	59h 12m	0
Aug	**80.680**	83h 57m	0
Sept	**16.033**	17h 20m	0
Oct	**90.468**	93h 0m	0
Nov	**75.333**	77h 36m	0
Dec	**97.287**	108h 8m	0
Totals	765.635	797h 32m	2

IV. Unscheduled Shutdowns

Number	Date	Cause :
1076	02/10/11	NPP100 hi power due to testing auto controller
1077	02/11/11	CSC watchdog due to memory leak
1078	02/15/11	DAC watchdog due to memory leak
1079	03/07/11	CSC watchdog due to memory leak
1080	03/08/11	CSC watchdog due to CSC timing error
1081	03/09/11	CSC watchdog due to CSC timing error
1082	03/11/11	CSC watchdog due to CSC timing error
1083	03/14/11	CSC watchdog due to CSC timing error
1084	03/14/11	CSC watchdog due to CSC timing error
1085	03/14/11	CSC watchdog due to CSC timing error
1086	03/14/11	CSC watchdog due to CSC timing error
1087	03/14/11	CSC watchdog due to CSC timing error
1088	03/14/11	CSC watchdog due to CSC timing error
1089	03/15/11	CSC watchdog due to CSC timing error
1090	03/15/11	CSC watchdog due to CSC timing error
1091	03/16/11	CSC watchdog due to CSC timing error
1092	03/18/11	NPP1000 hi power from sample movement
1093	03/23/11	CSC watchdog due to CSC timing error
1094	03/24/11	CSC watchdog due to CSC timing error
1095	03/28/11	CSC watchdog due to CSC timing error
1096	06/03/11	NPP1000 percent high from moving CT sample
1097	06/15/11	CSC watchdog due to computer lock-up
1098	10/04/11	NPP1000 hi power due to auto controller excessive rod motion at full power

V. Significant Maintenance Operations

1/11 Replaced right foot (southern) GM detector in hand & foot monitor.
2/11 Accepted console upgrade.
4/11 Cut shaft off of farthest east cooling tower fan.
4/11 Removed farthest east cooling tower fan and blocked hole.
5/11 Installed new fan (without connecting electrically)
5/11 Replaced batteries in RAM's – Rm 153 E doorway; Rm 151 bench, middle of room, & east door; SW exit; SE Hallway; Rx bay extra
5/11 Completed installation of pressure sensors on TR air, primary water, and secondary water systems.
5/11 Connected new cooling tower fan electrically to system.
6/11 Replaced GM detector on hand & foot monitor, right hand.
7/11 Installed filters and pressure gauges on heat exchanger inlet and outlet.
8/11 Replaced resin in the ion exchange tank.
9/11 Replace AC distribution panel in SE reactor bay with all new internals.
9/11 Repaired poly tubing on bare pneumatic terminus, rabbit side.
10/11 Replaced Action Pak sockets for FT1 & FT2 Action Paks in DAC.

VI. Summary of 10 CFR 50.59 changes

There were two 50.59 changes that were evaluated, approved by the Reactor Operations Committee, and implemented in CY 2011. One was to install five pressure switches in four separate locations on mechanical systems in the reactor bay. These switches were wired through optoisolators into five spare inputs of the console data acquisition system, to monitor important pressure values of the reactor's mechanical equipment.

The second 50.59 change involved a change to the cooling tower fans. The farthest east of the original squirrel cage wheel sections had failed and was removed from the common shaft. This unit was also the farthest unit from the drive motor, at the end of the shaft. A replacement squirrel cage fan unit, with its own, separate shaft and drive motor was installed in the opening created by removing the original unit. The new fan unit has its own electrical switch and electrical overload protection installed.

Further upgrades of the control console that were approved in CY2010 were implemented during CY2011. The upgraded console was accepted for routine operation in February 2011.

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** (Ci)	**R-113 License Allowable** (Ci)	**Tritium (HTO** (mCi) *	**10CFR20 Allowable** (mCi)
January	0.782	5.833	0.01	124
February	0.275	5.833	0.14	124
March	1.082	5.833	0.13	124
April	0.144	5.833	0.00	124
May	0.264	5.833	0.00	124
June	0.708	5.833	0.11	124
July	0.487	5.833	0.00	124
August	0.684	5.833	0.12	124
September	0.787	5.833	0.00	124
October	0.933	5.833	0.00	124
November	0.575	5.833	0.11	124
December	0.770	5.833	0.12	124
Total	7.491	70.00	0.75	1488
% of Allowable	10.7%	----------	0.050%	----------

* **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 were performed by Test America Laboratories.

B. A solid low-level waste shipment of 7.4 cu.ft., part of which was reactor generated, was shipped this calendar year.

C. Throughout the year Na-24, Br-82, and Co-60 were observed on the CAM filter analyses. The conservative estimated releases for these isotopes are in Table 2.

Table 2. Releases of other isotopes in 2011

Isotope	µCi	µCi/ml	10 CFR 20 limits (µCi/ml)	% of limit
Na-24	9.16E-03	6.16E-16	7.00E-09	8.80E-06
Br-82	3.25E-01	2.18E-14	5.00E-09	4.37E-04
Co-60	3.29E-04	2.21E-17	2.00E-10	1.10E-05

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 1.5 x 10^{-8} μCi/ml present for two minutes will result in an increase of about 400 cpm above background. The alarm setpoints are a low-level alarm set at 3000 cpm and the high level alarm 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 values in 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. The highest removable contamination found was equal to 1224 pCi/100 cm^2 beta, on top of the white west table on the north side, in the reactor bay. This area was successfully decontaminated below MDA. The next highest removable contamination found was equal to 411 pCi/100 cm^2 beta, on top of the white west table on the south side, in the reactor bay. No areas were greater than 8.2 pCi/100 cm^2 alpha contamination.

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. LiF TLD dosimeters were used at four outdoor environmental stations. Reactor facility visitors are issued self-reading dosimeters. Reactor staff personnel are issued beta, gamma, albedo neutron badges.

Table 3. Personnel Monitoring Results (12/1/10 – 11/30/11)

Employee code	Whole Body (Rem) Deep Dose Equiv.	Whole Body (Rem) Shallow Dose Equiv.	Extremity (Rem)
E0888	0.221	0.222	0.725
E0607	0.162	0.166	0.644
E0707	0.198	0.210	0.806
E0908	0.111	0.111	0.363
E0611	0.0	0.0	0.0

Reactor visitors and occasional experimenters wore pocket dosimeters that resulted in no individual's reading that was greater than 3.7 mrem.

Table 4. Environmental Dose Results

Location	**Dose Jan-Mar** (RAD)	**Dose Apr-June** (RAD)	**Dose July-Sept.** (RAD)	**Dose Oct.- Dec.** (RAD)	**Total** (RAD)
Exhaust Stack	0.040	0.026	0.033	0.089	0.188
Cooling Tower Fence	0.007	0.000	0.001	0.017	0.025
West Vehicle Gate	0.021	0.013	0.019	0.043	0.096
West Room 151 Gate	0.053	0.036	0.056	0.084	0.229
Southwest Light Pole	0.000	0.000	0.001	0.022	0.023
Control (background)	0.047	0.041	0.035	NA	0.123
Southeast Light Pole	0.000	0.000	0.000	0.014	.014

Note: Above totals have the background subtracted (see control). Environmental TLDs were supplied and analyzed by Global Dosimetry Solutions.

X. Environmental Monitoring

There were several isotopes detected on the CAM filters throughout the year resulting in very small releases of Na-24, Co-60, and Br-82 through the normal air exhaust on the roof. The amounts released are shown in Table 2. Routine biennial environmental soil and water samples will be taken in the summer of 2012.