

**TRIGA<sup>®</sup> Mark F Reactor**

**ANNUAL REPORT**

**CALENDAR YEAR 2013**

Prepared to satisfy the requirements of  
U.S. Nuclear Regulatory Commission  
Facility License R-67  
Docket No. 50-163

**MARCH 2014**



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## **1 INTRODUCTION**

This report documents operation of the General Atomics (GA) TRIGA® Mark F non-power reactor for the period January 1, 2013 through December 31, 2013. The TRIGA Mark F Reactor, possessed by GA under License No. R-67 (Amendment No. 45) granted by the U.S. Nuclear Regulatory Commission (Docket No. 50-163), at its San Diego, California facilities, was not operated for the duration of the reporting period.

This report is being prepared and submitted to satisfy the requirements of Section 8.6(d) of the R-67 Technical Specifications, as amended. This report is presented in seven parts, consistent with the information required by the applicable Technical Specifications.

## **2 SUMMARY OF FACILITY ACTIVITIES**

### **2.1 Decommissioning Activities**

During Calendar Year (CY) 2013, the TRIGA Mark F Reactor continued to be in Decommissioning Status. The major tasks accomplished towards eventual decommissioning during this reporting period were as follows:

- final rinsing of the Mark F pit and removal of all loose Epocast (an epoxy-type paint lining the tank walls) from the pit,
- removal and dispositioning of all water handling and filtration equipment,
- removal of remaining fuel storage racks and misc. hardware from the the pit, and
- obtaining core samples from the gunite lined walls of the pit for the purpose of preliminary characterization.
- efforts are continuing to properly disposition the remaining Am-241/Be reactor startup neutron source. The source has been placed in an interim shielded container and transferred to a temporary storage location within the reactor building.

### **2.2 Facility Activities**

2.2.1 During January, 2013 qualified and trained personnel entered the Mark F pit to remove large loose particles of Epocast that had peeled off from the Mark F pit walls. Since analysis of this particulate and process knowledge indicated the potential for the presence of hazardous materials (cadmium and lead) in the Epocast, a full Respirator Qualification Process for access to the pit was put in place for confined space entries to the Mark F pit as a personnel protection measure.

2.2.2 Also during January, 2013, a confined space entry was made into the fuel storage areas of the Mark F pit (south canal), and the last of the fuel storage racks removed.

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- 2.2.3 During March 2013, a final rinsing of the pit with deionized water (DI) was conducted. All water was passed through particulate filters and ion exchange resin cylinders and temporarily stored in two (2) 1000 gallon tanks for analysis. Analysis of the water showed that the water was clean, and it was subsequently discharged to the City's sanitary drain system.
- 2.2.4 Also during March 2013, selected staff members received training in the use of Powered Air Purifying Respirators (PAPRs) to be used for all confined space entries into the Mark F pit.
- 2.2.5 On May 2, 2013, 19 samples of the Epocast and gunite were taken from the pit walls for analysis of hazardous and radioactive material content by core-drilling into selected locations.
- 2.2.6 On June 4, 2013, HTGR Historical Fuel materials, containing both LEU & HEU, were shipped from the TRIGA Reactors Facility (TRF) to Oak Ridge National Laboratory in two (2) DOT 7A Type A Drums.
- 2.2.7 During the decommissioning activities, sufficient solid, low-level waste (LLW) was generated to load five (5) Y-4 (Type IP-1) boxes. These boxes were all packaged, gamma scanned and sealed in accordance with established procedures. On July 10, 2013, these boxes were shipped, without incident, to the Nevada National Security Site for burial.
- 2.2.8 Results of the 19 coring samples taken from the Mark F pit indicated that hazardous metal contamination (Cd and Pb) is relatively localized, primarily on the bottom deck and the walls of the lower portion of the round portion of the Mark F pit. This hazardous metal contamination appears to be limited to only the Epocast paint layer and the first ¼ inch depth of the unprotected gunite material. There was little or no detected metal contamination in the upper portion of the pit and the fuel storage canal. The presence of Cd and Pb, as well as the localized nature of the contamination, is consistent with process knowledge from reactor operations and maintenance activities.
- 2.2.9 On October 30, 2013, USNRC inspectors visited GA to inspect the TRF D&D Project and schedule. No problems were noted. The USNRC also reviewed the D&D Schedule. The inspection is documented in NRC's Inspection report NRC IR Oct 2013 12-02-2013.
- 2.2.10 On November 6, 2013 additional sample corings were taken from the pit in an effort to further determine the efficacy of the intact Epocast coating in protecting the underlying gunite from radioactive and metal contamination. The samples were prepared and shipped for analysis by an outside laboratory on November 18, 2013.

2.2.11 Negotiations between the Waste Isolation Pilot Plant (WIPP) and Argonne National Laboratory (ANL) continued during the past year. A tentative agreement was reached on December 9, 2013, and, once a contract is in place, ANL will accept the Am-Be startup source – anticipated to occur during 2<sup>nd</sup> or 3<sup>rd</sup> quarter 2014.

### **2.3 Decommissioning Schedule**

A primary activity during 2014 is expected to be removal of the entire Epocast coating in the main pit and adjoining fuel storage canal in preparation of final characterization. To that end, a Request for Proposals will be issued early in 2014 for the removal of the Epocast, a vendor selected, and removal activities carried out. This will allow for further hazardous and radioactive characterization of the pit gunite, steel liner, biological shield, and soil.

### **2.4 Radioactive Material Shipments**

On June 4, 2013, two (2) DOT 7A Type A Drums with historical HTGR fuel samples, which were maintained by GA in secure storage in the TRF, were shipped from the GA site to ORNL.

Package 1 contained 2.65 Mbq (0.0715 mCi) of solid U-235.

Package 2 contained 1.42 Mbq (0.0384 mCi) of solid U-235.

On June 11, 2013, five (5) DOT Type IP-1 steel boxes were shipped from the GA site to the NNSS.

Package 1 contained 2.363 Mbq (0.06 mCi) of Solid Metal Oxides with radionuclides of Co-60, Cs-137, Fe-55, Ni-63, Sr-90, Th-232, U-235 and U-238.

Package 2 contained 38.65 Mbq (1.04 mCi) of Solid Metal Oxides with radionuclides of Co-60, Fe-55, Ni-63, U-235 and U-238.

Package 3 contained 57.98 Mbq (1.57 mCi) of Solid Metal Oxides with radionuclides of Co-60, Eu-152, Fe-55, Ni-63, U-235 and U-238.

Package 4 contained 51.49 Mbq (1.38 mCi) of Solid Metal Oxides with radionuclides of Co-60, Cs-137, Fe-55, Ni-63, Sr-90, Eu-152, Eu-154, U-235 and U-238.

Package 5 contained 117.90 Mbq (3.20 mCi) of Solid Metal Oxides with radionuclides of Co-60, Cs-137, Fe-55, Ni-63, Sr-90, Th-232, U-235 and U-238.

## **3 MAINTENANCE OPERATIONS**

All maintenance activities, performed during the reporting period, generally fall into three categories: (i) routine preventive maintenance, (ii) routine calibration activities, and (iii) activities associated with replacement of older components and systems due to age. All maintenance activities are recorded in the TRF Decommissioning Logbook. Facility Maintenance Checklists are completed on a regular schedule at weekly, quarterly, and annual frequencies. All maintenance operations performed on the TRIGA Mark F Reactor Facility were minor in nature. There were no major maintenance operations performed during the reporting period.

#### **4 10CFR50.59 FACILITY MODIFICATIONS AND SPECIAL EXPERIMENTS**

No applications for Facility Modification under the provisions of 10CFR50.59 were submitted for the R-67 facility during the CY2013 reporting period.

There were no Special Experiments submitted for the R-67 facility during CY2013.

#### **5 RADIOACTIVE EFFLUENTS RELEASED TO THE ENVIRONS**

During CY2013, 0.00 millicuries of Argon-41 were discharged from the TRIGA Mark F Reactor Facility ventilation stack to the atmosphere.

#### **6 ENVIRONMENTAL SURVEYS**

During CY2013, the Environmental Monitoring Program (EMP) for the TRF remained essentially unchanged from the prior year. The applicable EMP includes the following monitoring equipment and actions:

- Five (5) emergency air samplers, situated on the Facility roof and around the TRIGA Reactor Facility perimeter.
- Six (6) environmental air samplers, situated adjacent to, and near the GA site perimeter, in accordance with the GA Special Nuclear Material License (SNM-696).
- Daily liquid effluent monitoring from the GA Main Sewerage Outfall Pump House, for gross alpha and beta radioactivity concentrations.
- External radiation monitoring of the TRF using five (5) passive area dosimeters, as well as radiation meter surveys conducted periodically.
- A Continuous Air Monitor (CAM), situated in the Mark F Reactor Room (21/107), continuously samples room air for airborne radioactivity. CAM air filters are collected each week and analyzed for radioactivity.

#### **7 SUMMARY OF RADIATION EXPOSURES AND RADIOLOGICAL SURVEYS**

The following data summarizes measured personnel occupational radiation exposures and radiological surveys of the TRIGA Reactors Facility during CY 2013. Personnel who are listed on the TRIGA Reactors Facility Work Authorization (WA #3427 and, as of July 12, 2013, WA #600-13) and specific Radiological Work Permits (RWPs) were monitored for radiation exposure; these individuals included General Atomics Staff and Non-General Atomics Staff employees. The following exposures were primarily as a result of the cleaning and sampling of the Mark F pit, loading of LLW into Y-4 boxes, and subsequent shipment activities.

### 7.1 General Atomics Staff Whole Body Exposures <sup>1</sup>

Number of individuals monitored:	25
High Exposure:	0.014 Rem
Low Exposure:	0.000 Rem
Average Exposure:	<0.001 Rem

### 7.2 Non-General Atomics Staff Whole Body Exposures <sup>2</sup>

Number of individuals monitored:	10
High Exposure:	0.008 Rem
Low Exposure:	0.000 Rem
Average Exposure:	<0.001 Rem

### 7.3 Routine Wipe Surveys of Mark F Reactor Facility

High Wipe:	133.0	dpm/100 cm <sup>2</sup>
Low Wipe:	< 1.0	dpm/100 cm <sup>2</sup>
Average Wipe:	16.1	dpm/100 cm <sup>2</sup>

### 7.4 Routine Radiation Measurements of Mark F Reactor Facility

High Measurement:	10	mR/hr
Low Measurement:	< 0.2	mR/hr
Average Level:	< 0.2	mR/hr

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<sup>1</sup> Includes reactor facility staff and facility support staff authorized to work at the TRIGA Reactor Facility. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.

<sup>2</sup> Includes non-GA personnel who were granted periodic access to the facility for the performance of work. These personnel may also work routinely at other GA radiation facilities; therefore, this dose represents *cumulative* exposure at all GA facilities.