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VIA OVERNIGHT DELIVERY SERVICE

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ATTN: Ms. Marlayna Vaaler, Project Manager

Reactor Decommissioning Branch

Division of Decommissioning, Uranium Recovery & Waste Programs

Office of Nuclear Material Safety and Safeguards

U.S. Nuclear Regulatory Commission

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**Subject: Docket No. 50-89, Facility License R-38, and
Docket No. 50-163, Facility License R-67;
Submission of General Atomics TRIGA® Mark I and Mark F Annual
Reports for Calendar Year 2017 (3 Copies each)**

Dear Ms. Vaaler:

Enclosed are the annual reports required by the applicable Technical Specifications of General Atomics' (GA's) Mark I (License R-38) and Mark F (License R-67) TRIGA® research reactors. These reports cover operations for the calendar year 2017. The sections of these reports are numbered consistent with the items of information referred to in Section 7.6d of the Technical Specifications for the Mark I TRIGA® reactor and in 8.6d of the Technical Specifications for the Mark F TRIGA® reactor.

Should you need additional information concerning the above, please contact me at (858) 455-2823 or by email keith.asmussen@ga.com or Mr. John Greenwood at (858) 455-4526 or at john.greenwood@ga.com.

Very truly yours,

A handwritten signature in blue ink that reads "Keith E. Asmussen".

Keith E. Asmussen, Ph.D., Director
Licensing, Safety and Nuclear Compliance

Enclosures: 1) TRIGA® Mark I Reactor/Annual Report/Calendar Year 2017, dated March, 2018 (3 Copies)
2) TRIGA® Mark F Reactor/Annual Report/Calendar Year 2017, dated March, 2018 (3 Copies)

cc: Mr. Alexander Adams, Jr. (NRC)



TRIGA[®] Mark I Reactor

ANNUAL REPORT

CALENDAR YEAR 2017

Prepared to satisfy the requirements of
U.S. Nuclear Regulatory Commission
Facility License R-38
Docket No. 50-89

MARCH 2018



GENERAL ATOMICS TRIGA® REACTORS FACILITY
TRIGA® Mark I Reactor
ANNUAL REPORT
Calendar Year 2017

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1. INTRODUCTION

This report documents operation of the General Atomics (GA) TRIGA^{®1} Mark I Non-Power Reactor for the period January 1, 2017 through December 31, 2017. The TRIGA[®] Mark I Reactor, possessed by GA at its San Diego, California facilities as authorized under License No. R-38 (Amendment No. 36) granted by the U.S. Nuclear Regulatory Commission (Docket No. 50-89) was not operated during the reporting period.

This report is being prepared and submitted to satisfy the requirements of Section 7.6(d) of the R-38 Technical Specifications, as amended. This report is presented in six parts, consistent with the information required by the applicable Technical Specifications.

2. SUMMARY OF FACILITY ACTIVITIES

2.1 Decommissioning Activities

During Calendar Year (CY) 2017, the TRIGA Mark I Reactor was in Decommissioning Status. The major tasks accomplished during this reporting period were:

- Developed a Statement of Work (SOW) which generally entails the removal and packaging of radiologically contaminated or activated structural materials from portions of the bottom of the TRIGA[®] Mark F Reactor Pit in a controlled and safe manner so as to minimize the resulting volume of Low Level Waste (LLW); herein referred to as "excavation" of the reactor pit. This was written in conjunction with the SOW for excavation of the Mark F reactor pit. A letter dated 02/01/2017 from the NRC (Watson) to GA (Engstrom) provided approved isotope specific radiological release criteria which allowed development of the excavation plan.
- Acquired and analyzed ten (10) additional core samples from the Mark I pit walls and deck.
- Created a volumetric profile of activated portions of the Mark I reactor structure using data from these samples as well as additional core sample data from CY 2000.
- Estimated the volume of material which will require excavation in order to meet the criteria for NRC release to unrestricted use.
- Sampled soil to a depth of approximately 23 ft at a location just west of the Mark I pit. The soil was analyzed for the purpose of determining a method to stabilize the soil and concrete during the excavation process.

2.2 Facility Status

The Mark I reactor was in DECON status during CY 2017. Pit core samples have been extracted and analyzed as have soil samples adjacent to the pit.

2.3 Decommissioning Schedule

A SOW was written for structural analysis and excavation of the Mark I pit and submitted to the selected contractor to provide a bid to GA. A proposal was received which was coordinated with the Mark F reactor decommissioning effort in order to better utilize personnel, equipment and material. The proposal was evaluated and a Phase 1 contract issued in November 2017 which included an assessment of the structural integrity of the excavated pits as well as preparation of a Health & Safety Plan and ALARA Plan for the actual excavation to take place in Phase 2. Phase 2 of the SOW is expected to be awarded in early 2018 with completion of the excavation of the Mark I pit in late 2018.

¹ ® TRIGA is a registered trademark of General Atomics



2.4 Radioactive Material Shipments

During 2017 there were no radioactive shipments or transfers made from the Mark I facility.

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 TRIGA® Reactor Facility 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 I 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-38 facility during the CY2017 reporting period.

There were no Special Experiments submitted for the R-38 facility during CY2017.

5. RADIOACTIVE EFFLUENTS RELEASED TO THE ENVIRONS

During CY2017, no liquid radionuclide effluent was released into the GA main site sanitary sewer system. Table 5.1 lists data on the radiological gaseous and particulate effluent released via the TRIGA® Facility's exhaust stack to unrestricted areas. TM1 indicates the TRIGA® Mark I facility and TMF the TRIGA® Mark F facility. MFP indicates Mixed Fission Products. All airborne releases were well within the allowable State of California and NRC (10CFR20) limits.

Table 5.1: Gas and Particulate Effluents

January 1, 2017 through June 30, 2017						
Release Point (ID)	Effluent	Flow Rate (ft/min)	Stack Area (ft ²)	m ³ /min (3)	pCi/m ³ (4)	Total Ci Released (2)
TRIGA® Reactor Facility (building 21) (1)						
TM1	MFP	1055	1.46	43.59	0.015	1.71E-7
TMF	MFP	1139	1.5	48.40	0.015	1.90E-7
					TOTAL	3.61E-7
TMF	IODINES	1139	1.5	48.40	0.050	6.34E-7
July 1, 2017 through December 31, 2017						
Release Point (ID)	Effluent	Flow Rate (ft/min)	Stack Area (ft ²)	m ³ /min (3)	pCi/m ³ (4)	Total Ci Released (2)
TRIGA® Reactor Facility (building 21) (1)						
TM1	MFP	1178	1.46	48.67	0.012	1.53E-7
TMF	MFP	1196	1.5	50.77	0.012	1.60E-7
					TOTAL	3.13E-7
TMF	IODINE5	1196	1.5	50.77	0.050	6.65E-7

- (1) Measured - Airborne effluents from selected facilities are monitored. The samples are collected weekly and analyzed using low-level alpha/beta counting systems. The average concentration (pCi/m³) over the six month period is obtained for each release point (alpha and beta concentrations are added).
- (2) Ci Released = (182 operating days) (24 hr/day) (60 min/hr) (1e-6 uCi/pCi) (1e-6 Ci/uCi) (#m³/min) (average pCi/m³) Note: Operating days may be different based on dates the ventilation system is shut down.
- (3) Flow Rate X Stack Area (Note: 0.0283 m² = 1 ft²).
- (4) Values shown are either six-month Averages or are equal to the MDA for GA instrumentation.

6. ENVIRONMENTAL SURVEYS

During CY2017, the Environmental Monitoring Program (EMP) for the TRIGA® Reactor Facility remained essentially unchanged from the prior year. The applicable EMP includes the following monitoring equipment and actions:

- o Three (3) stack air samplers situated on the roof of the TRIGA® Reactor Facility and three (3) environmental air samplers situated at or adjacent to the GA site perimeter in accordance with the GA Special Nuclear Material License (SNM-696).
- o Daily liquid effluent monitoring from the GA Main Sewerage Outfall Pump House, for gross alpha and beta radioactivity concentrations.
- o External radiation monitoring of the TRIGA® Reactor Facility using sixteen (16) passive area dosimeters, as well as radiation meter surveys conducted periodically.
- o A Continuous Air Monitor (CAM), situated in the Mark F Control Room (21/108), continuously samples air from the Mark I reactor pit 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® Reactor Facility during CY 2017. Personnel who are listed on the TRIGA® Reactor Facility Work Authorization (WA #600-16 and as of June 26, 2017 WA #600-17) and specific Radiological Work Permits (RWPs) were monitored for radiation exposure. These individuals included 15 General Atomics Staff and 12 Non-General Atomics Staff employees.

7.1 General Atomics Staff Whole Body Exposures ²

Number of individuals monitored:	15
High Exposure:	0.002 REM
Low Exposure:	0.000 REM
Average Exposure:	< 0.001 REM

7.2 Non-General Atomics Staff Whole Body Exposures ³

Number of individuals monitored:	12
High Exposure:	0.004 REM

² 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.

³ Includes non-GA sub-contractor personnel who were granted periodic access to the TRIGA® Reactor 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

Low Exposure: 0.000 REM
Average Exposure: 0.001 REM

7.3 Routine Wipe Surveys of Mark I Reactor Facility

High Wipe:	53.0	dpm/100 cm ²
Low Wipe:	< 1	dpm/100 cm ²
Average Wipe:	2.4	dpm/100 cm ²

7.4 Routine Radiation Measurements of Mark I Reactor Facility

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



TRIGA[®] Mark F Reactor

ANNUAL REPORT

CALENDAR YEAR 2017

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

MARCH 2018

**GENERAL ATOMICS TRIGA REACTORS FACILITY
TRIGA® Mark F Reactor
ANNUAL REPORT
Calendar Year 2017**

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1. INTRODUCTION

This report documents operation of the General Atomics (GA) TRIGA^{®1} Mark F non-power reactor for the period January 1, 2017 through December 31, 2017. 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 six parts, consistent with the information required by the applicable Technical Specifications.

2. SUMMARY OF FACILITY ACTIVITIES

2.1 Decommissioning Status

During Calendar Year (CY) 2017, the TRIGA[®] Mark F Reactor was in a Decommissioning status. The major task accomplished during this reporting period was the development of a Statement of Work (SOW) which generally entails the removal and packaging of radiologically contaminated or activated structural materials from portions of the bottom of the TRIGA[®] Mark F Reactor Pit in a controlled and safe manner so as to minimize the resulting volume of Low Level Waste (LLW); herein referred to as "excavation" of the reactor pit. This was written in conjunction with the SOW for excavation of the Mark I reactor pit. A letter dated 02/01/2017 from the NRC (Watson) to GA (Engstrom) provided approved isotope specific radiological release criteria which allowed development of the excavation plan. This, in conjunction with analysis of extracted core samples from the reactor pit, resulted in an estimate of the volume of material which will require removal prior to meeting the criteria for NRC release to unrestricted use. The material to be removed will consist of steel plate, steel reinforced concrete and gunite.

2.2 Facility Status

The Mark F reactor was in DECON status during CY 2017. The reactor pit/canal has been remediated of hazardous contaminants and core samples extracted and analyzed.

2.3 Decommissioning Schedule

A SOW was written for structural analysis and excavation of the Mark F pit and submitted to the selected contractor to provide a bid to GA. A proposal was received which covered excavation of both the Mark I and Mark F reactor pits. The proposal was evaluated and a Phase 1 contract issued in November 2017 which included an assessment of the structural integrity of the excavated pits as well as preparation of a Health & Safety Plan and ALARA Plan for the actual excavation to take place in Phase 2. Phase 2 of the SOW is expected to be awarded in early 2018 with completion of the excavation of the Mark F pit in late 2018.

2.4 Radioactive Material Shipments

During 2017 there were no radioactive shipments or transfers made from the TRIGA[®] Mark F facility.

¹ @TRIGA is a registered trademark of General Atomics

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 CY2017 reporting period.

There were no Special Experiments submitted for the R-67 facility during CY2017.

5. RADIOACTIVE EFFLUENTS RELEASE TO THE ENVIRONS

During CY2017, no liquid radionuclide effluent was released into the GA main site sanitary sewer system. Table 5.1 lists data on the radiological gaseous and particulate effluent released via the TRIGA® Facility's exhaust stack to unrestricted areas. TM1 indicates the TRIGA® Mark I facility and TMF the TRIGA® Mark F facility. MFP indicates Mixed Fission Products. All airborne releases were well within the allowable State of California and NRC (10CFR20) limits.

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TRIGA® Reactor Facility (building 21) ⁽¹⁾						
TM1	MFP	1055	1.46	43.59	0.015	1.71E-7
TMF	MFP	1139	1.5	48.40	0.015	1.90E-7
					TOTAL	3.61E-7
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Release Point (ID)	Effluent	Flow Rate (ft/min)	Stack Area (ft ²)	m ³ /min ⁽³⁾	pCi/m ³ ⁽⁴⁾	Total Ci Released ⁽²⁾
TRIGA® Reactor Facility (building 21) ⁽¹⁾						
TM1	MFP	1178	1.46	48.67	0.012	1.53E-7
TMF	MFP	1196	1.5	50.77	0.012	1.60E-7
					TOTAL	3.13E-7
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- (1) Measured - Airborne effluents from selected facilities are monitored. The samples are collected weekly and analyzed using low-level alpha/beta counting systems. The average concentration (pCi/m³) over the six month period is obtained for each release point (alpha and beta concentrations are added).
- (2) Ci Released = (182 operating days) (24 hr/day) (60 min/hr) (1e-6 uCi/pCi) (1e-6 Ci/uCi) (#m³/min) (average pCi/m³) Note: Operating days may be different based on dates the ventilation system is shut down.
- (3) Flow Rate X Stack Area (Note: 0.0283 m³ = 1 ft³).
- (4) Values shown are either six-month Averages or are equal to the MDA for GA instrumentation.

6. ENVIRONMENTAL SURVEYS

During CY2017, 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:

- o Three (3) stack air samplers situated on the roof of the TRIGA[®] Reactor Facility and three (3) environmental air samplers situated at or adjacent to the GA site perimeter in accordance with the GA Special Nuclear Material License (SNM-696).
- o Daily liquid effluent monitoring from the GA Main Sewerage Outfall Pump House, for gross alpha and beta radioactivity concentrations.
- o External radiation monitoring of the TRIGA[®] Reactor Facility using sixteen (16) passive area dosimeters, as well as radiation meter surveys conducted periodically.
- o A Continuous Air Monitor (CAM), situated in the Mark F Control Room (21/108), continuously samples room air for airborne radioactivity when decommissioning activities are taking place. 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 20167. Personnel who are listed on the TRIGA[®] Reactors Facility Work Authorization (WA #600-16 and as of June 26, 2017 WA #600-17) and specific Radiological Work Permits (RWPs) were monitored for radiation exposure; these individuals included 15 General Atomics Staff and 12 Non-General Atomics Staff employees.

7.1 General Atomics Staff Whole Body Exposures ²

Number of individuals monitored:	15
High Exposure:	0.002 REM
Low Exposure:	0.000 REM
Average Exposure:	< 0.001 REM

² 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.

7.2 Non-General Atomics Staff Whole Body Exposures ³

Number of Individuals monitored:	12
High Exposure:	0.004 REM
Low Exposure:	0.000 REM
Average Exposure:	0.001 REM

7.3 Routine Wipe Surveys Of Mark F Reactor Facility

High Wipe:	43.8	dpm/100 cm ²
Low Wipe:	< 1	dpm/100 cm ²
Average Wipe:	8.3	dpm/100 cm ²

7.4 Routine Radiation Measurements Of Mark F Reactor Facility

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

³ 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.