

Armed Forces Radiobiology Research Institute
AFRRI TRIGA Reactor Facility

1 January 2021 - 31 December 2021

To satisfy the requirements of
U.S. Nuclear Regulatory Commission License No. R-84 (Docket No. 50-170),
Technical Specification 6.6.a.

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2021 ANNUAL REPORT

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INTRODUCTION

The Armed Forces Radiobiology Research Institute (AFRRI) reactor facility was unavailable for normal operations the entire year undergoing installation, testing, and NRC acceptance of a new instrumentation and control system. The General Atomics contractors completed all installation work in May 2018 and the reactor remains unavailable pending NRC review of a license amendment request for the console upgrade that was submitted to the NRC in revised form in February 2021. Subsequent to that submittal, telephone conversations and a NRC site visit in September resolved questions and the NRC staff is continuing the formal review. There were no unscheduled shutdowns during 2021.

The 2021 annual reactor audit required by the reactor technical specifications was conducted in early January 2022 by Ms. Candace Davison from the Pennsylvania State University reactor facility due to COVID-19 travel and meeting restrictions. During the audit she verbally indicated that she had not found any major discrepancies in reactor operations, maintenance, or documentation. This delay until January was in compliance with the frequency requirements of the reactor Technical Specifications.

A comprehensive NRC inspection of reactor facility operations was conducted by Mr. Phil O'Bryan from July 12-14, 2021. That inspection resulted in one Level IV non-cited violation. The unexpected retirement of Mr. Walter Tomlinson in April 2021 left AFRRI with no licensed operators on staff, in violation of the reactor technical specifications. Mr. O'Bryan recognized that AFRRI was actively working with the NRC to identify a path forward for the licensing of new operators. The licensing of four candidates as listed in the General Information section should occur in April or May 2022.

Several changes to the Reactor Physical Security Plan that did not decrease the effectiveness of the plan were implemented on July 16, 2021 and the NRC was notified on September 7, 2021.

There were two RRFSC membership changes during the year. There were three reactor staff arrivals and one staff departure during the year.

The remainder of this report is written in the format designated in the Technical Specifications for the AFRRI TRIGA Reactor Facility. Items not specifically required are presented in the General Information section. The following sections correspond to the required items listed in Section 6.6.a. of the Technical Specifications.

GENERAL INFORMATION

Key AFRRI personnel (as of 31 December 2021) are as follows:

1. AFRRI Director – Mohammad Naeem, COL, MC, USA

Radiation Sciences Department (RSD) Head – Omololu Makinde, LTC, USA

Radiation Safety Officer – Jeffrey Sumlin

2. Reactor Facility Director (RFD) – Andrew Cook (Interim)(effective 24 April)

4. Reactor operations personnel:

Reactor Operations Supervisor – Vacant

Training Coordinators – Harry H. Spence and Mathieu Brener

Maintenance Specialist – MSG Benjamin Knibbe, USA

Records Administration Specialist – Harry H. Spence

NOTE: Mr. Spence formerly held an SRO license at the AFRRI reactor and retired in June 2013. He returned as an unlicensed part-time staff member in February 2016.

5. Other Reactor Operators:

None

6. Operator candidates:

Benjamin Knibbe, Andrew Cook, Addison Guynn, Mathieu Brener, Timothy Ayers, Justin Payer

7. Newly licensed operators:

None

8. Additions to staff during 2021:

Addison Guynn, Mathieu Brener, Timothy Ayers, Justin Payer

9. Departures during 2021:

Walter Tomlinson (SRO)(effective 24 April)

10. There were two change to the Reactor and Radiation Facilities Safety Committee (RRFSC) during 2021. LTC Jeffrey Brown replaced CAPT Jerry Sanders as Chair on 17 September and Andrew Cook replaced Walter Tomlinson as Reactor Facility Director on 18 May.

In accordance with the requirements set forth in Section 6.2.1.1. of the Technical Specifications for the AFRRI TRIGA Reactor Facility, the RRFSC consisted of the following members as of 31 December 2021.

Regular members are:

Radiation Safety Officer – Jeffrey Sumlin

Reactor Facility Director – Andrew Cook (Interim)

Reactor Operations Specialist – Leo Bobek

Health Physics Specialist – Joe Pawlovich

Radiation Sciences Department Head – LTC Omololu Makinde, USA

RRFSC Chair and Director's Representative – LTC Jeffrey Brown, USA

Recorder - Harry H. Spence

Two meetings were held in 2021:

09 June

09 December

SECTION I

Changes in the Facility Design, Performance Characteristics, Administrative Procedures, Operational Procedures, Results of Surveillance Tests and Inspections

A summary of changes to the facility design, performance characteristics, administrative procedures, and operational procedures as well as the results of surveillance testing are provided in this section.

A. DESIGN CHANGES

There were no design changes to the reactor facility during 2021 that were reviewed and approved under provisions of 10 CFR 50.59. The NRC review of the license amendment request (LAR) for the console upgrade remains ongoing.

B. PERFORMANCE CHARACTERISTICS

There were no changes to the performance characteristics of the core during 2021. Sufficient fuel elements have been withdrawn from the core to ensure that the reactor cannot become critical during the upgrade pending approval of the license amendment request.

C. ADMINISTRATIVE PROCEDURES

There was one change to the Administrative Procedures during 2021:

09 June – The Weekly Operational Instrument Checklist and Logbook Entry Checklist procedure were changed to require the documenting of all make-up water additions to the reactor pool. This change does not affect reactor operations or safety. The revised procedure was approved by the RFD and reviewed by the RRFSC.

D. OPERATIONAL PROCEDURES

There were no changes to the Operational Procedures during 2021.

E. RESULTS OF SURVEILLANCE TESTS AND INSPECTIONS

Maintenance and surveillance tasks during 2021 were accomplished as required during the year except those tasks involving the reactor instrumentation, control rod drives, or other related components which are deferred as allowed by the technical specifications. Tasks that have been deferred will be accomplished before the reactor is returned to normal operation.

There were no reactor malfunctions during 2021.

The 2021 annual reactor audit required by the reactor technical specifications was conducted in early January 2022 by Ms. Candace Davison from the Pennsylvania State University reactor facility due to COVID-19 travel and meeting restrictions. During the audit she verbally indicated that she had not found any major discrepancies in reactor operations, maintenance, or documentation. This delay until January was in compliance with the frequency requirements of the reactor Technical Specifications.

A routine NRC inspection of reactor facility operations was conducted by Mr. Phil O'Bryan from July 12-14, 2021. That inspection resulted in one Level IV non-cited violation. The unexpected retirement of Mr. Walter Tomlinson in April 2021 left AFRRRI with no licensed operators on staff, in violation of the reactor technical specifications. Mr. O'Bryan recognized that AFRRRI was actively working with the NRC to identify a path forward for the licensing of new operators. The licensing of four candidates as listed in the General Information section should occur in April or May 2022.

A routine NRC security inspection was conducted from July 12 – 14, 2021. Based on the results of the inspection, no security concerns or non-compliances with NRC requirements were identified.

SECTION II

Energy Generated by the Reactor Core and the Number of Pulses \$2.00 or Larger

Month	Kilowatt-Hours
JAN	0.0
FEB	0.0
MAR	0.0
APR	0.0
MAY	0.0
JUN	0.0
JUL	0.0
AUG	0.0
SEP	0.0
OCT	0.0
NOV	0.0
DEC	<u>0.0</u>
TOTAL	0.0

Total energy generated in 2021: 0.0 kWh

Total energy on fuel elements: 1,158,846.7 kWh

Total energy on FFCRs*: 426,049.0 kWh

Total pulses this year \geq \$2.00: 0

Total pulses on fuel elements \geq \$2.00: 4,219

Total pulses on FFCRs* \geq \$2.00: 107

Total pulses this year: 0

Total pulses on fuel elements: 12,201

Total pulses on FFCRs*: 2,436

*Fuel-followed control rods

SECTION III

Unscheduled Shutdowns

There were no unscheduled shutdowns during 2021.

SECTION IV

Safety-Related Corrective Maintenance

There were no reactor malfunctions or other safety-related corrective maintenance during 2021.

SECTION V

Facility and Procedure Changes as Described in the Final Safety Analysis Report (FSAR), Changes Made Pursuant to 10 CFR 50.59 and not Submitted for Commission Approval, and New Experiments or Tests Performed During the Year

A. FACILITY CHANGES AS DESCRIBED IN THE FSAR

There were no changes to the facility as described in the FSAR.

B. PROCEDURE CHANGES AS DESCRIBED IN THE FSAR

The one safety evaluation for changes not submitted to the NRC, pursuant to the provisions of 10 CFR 50.59 concerning water additions to the pool, described in Section I.C. above, is not described in the FSAR. This procedure revision is primarily administrative in nature concerning make-up water addition to the reactor pool. There is no increase in the likelihood of an accident or malfunction previously evaluated in the FSAR. There is also no possibility of an accident or malfunction of a different type than evaluated in the FSAR. None of the criteria of 10 CFR 50.59(c)(2) were met and no change to the Technical Specifications was required.

C. NEW EXPERIMENTS OR TESTS

No new experiments or tests were performed during the reporting period that were not encompassed by the FSAR.

SECTION VI

Summary of Radioactive Effluent Released

A. Liquid Waste: The reactor produced no liquid waste during 2021.

B. Gaseous Waste: There were no particulate discharges in 2021.

The total activity of Argon-41 discharged in 2021 was 0.00 curies. The estimated effluent concentration from the release of Argon-41 represents 0.0% of the constraint limit for unrestricted areas (10 CFR 20.1101(d) and Table 2, Appendix B, 10 CFR 20).

Quarterly:	Jan - Mar 2021	0.00 Ci
	Apr - Jun 2021	0.00 Ci
	Jul - Sep 2021	0.00 Ci
	Oct - Dec 2021	0.00 Ci

C. Solid Waste: All solid radioactive waste material is transferred to the AFRRRI byproduct license; none was disposed of under the R-84 reactor license.

SECTION VII

Environmental Radiological Surveys

All environmental sampling of soil and vegetation yielded radionuclide levels within the background range. The radionuclides that were detected were those expected from natural background and from long-term fallout from nuclear weapons testing.

The calculated annual dose, due to Argon-41 release to the environment for 2021, was 0.00 mRem at the location of maximum public exposure. The maximum exposure is calculated at a location 91 meters from the release point as described in the FSAR. Exposure to the general population at the boundary of the Naval Support Activity Bethesda is significantly less due to the diffusion of Argon-41 in the atmosphere. The constraint limit for exposure to the public established under 10 CFR 20.1101(d) is 10 millirem per year. The exposure dose was calculated using COMPLY code, level 2, which is the most conservative level of COMPLY. Emissions due to reactor operations were 0.00 millirem, or 0.0% of the 10 millirem constraint limit, for the entire year.

The reactor in-plant surveys, specified in Health Physics Procedure (HPP) 3-2, all resulted in readings that were less than the action levels specified in HPP 0-2.

SECTION VIII

Exposures Greater than 25% of 10 CFR 20 Limits

There were no doses to reactor staff personnel or reactor visitors greater than 25% of 10 CFR 20 occupational and public radiation dose limits.