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March 29, 2021

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Document Control Desk

Dear Ms. Cindy Montgomery,

Enclosed is the 2020 Annual Operating Report required by the technical specifications for the Armed Forces Radiobiology Research Institute (AFRRI) Facility Operating License No. R-84, Docket 50-170.

Should you need any further technical information, please contact Mr. Walter (Dale) Tomlinson at (301) 295-9247.

Mohammad Naeem, MD, FCCP, FACR
Colonel, Medical Corps, US Army
Director AFRRI

Enclosures:
As Stated

Armed Forces Radiobiology Research Institute
AFRRI TRIGA Reactor Facility

1 January 2020 - 31 December 2020

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

Prepared by
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Reactor Staff

Submitted by
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2020 ANNUAL REPORT

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2020 ANNUAL REPORT

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 on 10 November 2020 and further supplemented on 5 February 2021 and 11 February 2021. There were no unscheduled shutdowns during 2020.

The 2019 annual reactor audit required by the reactor technical specifications was conducted by Ms. Amber Johnson in December 2019. Ms. Johnson is an operator at the University of Maryland – College Park research reactor facility. During the audit she verbally indicated that she had not found any major discrepancies in reactor operations and those conclusions are reflected in her written report. Due to COVID-19 travel and meeting restrictions, the 2020 annual audit has been delayed until March 2021. This delay is in compliance with the frequency requirements of the reactor Technical Specifications.

As indicated in the 2019 annual report, an NRC reactive inspection concerning the fission chamber loss incident was conducted on 14 November 2019. The comprehensive search and radiological survey of the entire AFRRI building was completed on 21 January 2020, with the results reported to the NRC on 03 February 2020. On 03 March 2020, the NRC issued a Notice of Violation concerning the incident. AFRRI submitted a written response to that Notice on 30 March 2020 detailing the corrective actions that have been taken to minimize the possibility of a similar occurrence in the future. The corrective actions include the revision of the SNM accountability procedure as described in Section I.C. Finally, a comprehensive NRC inspection of reactor facility operations was conducted by Mr. Michael Takacs from 29 September 2020 to 01 October 2020. No violations were noted during that inspection.

There were three RRFSS membership changes during the year. There were no reactor operations staff arrivals and one reactor operations 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 2020) are as follows:

1. AFRRI Director – Mohammad Naeem, COL, MC, USA, replaced Danielle Wooten, CAPT, USN, July 16, 2020 refer to TS 6.6.b. Notification Letter – ML20213B723.

Radiation Sciences Department (RSD) Head – Omololu Makinde MAJ, USA, replaced Joshua Molgaard, MAJ, USA, June 15, 2020.

Radiation Safety Officer – Jeffrey Sumlin replaced Jeffrey Divis, LT, USN, September 14, 2020

2. Reactor Facility Director (RFD) – Walter D. Tomlinson (SRO)
3. Reactor Division Chief, RSD – Andrew Cook, October 13, 2020.
4. Reactor operations personnel:

Reactor Operations Supervisor – Walter D. Tomlinson (SRO)

Training Coordinator – Harry H. Spence

Maintenance Specialist – Walter D. Tomlinson (SRO)

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, MSG, USA
7. Newly licensed operators:
None
8. Additions to reactor operations staff during 2020:
None
9. Departures from reactor operations staff during 2020:
Sacha T. Moore, MSG, USA
10. There were three changes to the Reactor and Radiation Facilities Safety Committee (RRFSC) during 2020.

CAPT Jerry Sanders Jr. replaced CAPT Danielle Wooten as Chairperson on 24 January, Mr. Jeffrey Sumlin replaced LT Jeffrey Divis as Radiation Safety Officer on 24 July, and MAJ Omololu Makinde replaced MAJ Joshua Molgaard as Radiation Sciences Department Head on 24 July.

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 2020.

Regular members are:

Radiation Safety Officer – Jeffrey Sumlin

Reactor Facility Director – Walter D. Tomlinson

Reactor Operations Specialist – Leo Bobek

Health Physics Specialist – Joe Pawlovich

Radiation Sciences Department Head – MAJ Omololu Makinde, USA

RRFSC Chairperson and Director's Representative – CAPT Jerry Sanders Jr., USN

Recorder - Harry H. Spence

Two meetings were held in 2020:

22 September

08 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 2020 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 pending.

B. PERFORMANCE CHARACTERISTICS

There were no changes to the performance characteristics of the core during 2020. Sufficient fuel elements have been withdrawn from the core to ensure that the reactor cannot become critical during the upgrade pending approval of the Technical Specification changes and license amendment request.

C. ADMINISTRATIVE PROCEDURES

There was one change to the Administrative Procedures during 2020:

07 April – The Special Nuclear Material Accountability procedure was revised to incorporate changes to decrease the possibility of a loss-of-SNM incident in the future, including increasing inventory frequency and revisions to storage procedures (see Introduction section above). 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 2020.

E. RESULTS OF SURVEILLANCE TESTS AND INSPECTIONS

All maintenance and surveillance tasks during 2020 were accomplished as normally scheduled during the year except those tasks involving the reactor instrumentation, control rod drives, or other related components. All tasks deferred during the instrumentation upgrade will be accomplished before the reactor is returned to normal operation.

There were no reactor malfunctions during 2020.

The 2019 annual reactor audit required by the reactor technical specifications was conducted

by Ms. Amber Johnson in December 2019. Ms. Johnson is an operator at the University of Maryland – College Park research reactor facility. During the audit she verbally indicated that she had not found any major discrepancies in reactor operations and those conclusions are reflected in her written report. Due to COVID-19 travel and meeting restrictions, the 2020 annual audit has been delayed until March 2021. This delay is in compliance with the frequency requirements of the reactor Technical Specifications.

As indicated in the 2019 annual report, an NRC reactive inspection concerning the fission chamber loss incident was conducted on 14 November 2019. The comprehensive search and radiological survey of the entire AFRRI building was completed on 21 January 2020, with the results reported to the NRC on 03 February 2020. On 03 March 2020, the NRC issued a Notice of Violation concerning the incident. AFRRI submitted a written response to that Notice on 30 March 2020 detailing the corrective actions that have been taken to minimize the possibility of a similar occurrence in the future. The corrective actions include the revision of the SNM accountability procedure as described in Section I.C. Finally, a comprehensive NRC inspection of reactor facility operations was conducted by Mr. Michael Takacs from 29 September 2020 to 01 October 2020. No violations were noted during that inspection.

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 2020: 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 2020.

SECTION IV

Safety-Related Corrective Maintenance

There were no reactor malfunctions or other safety-related corrective maintenance during 2020.

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

There was one safety evaluation for changes not submitted to the NRC, pursuant to the provisions of 10 CFR 50.59 concerning the SNM accountability procedures described in Section 3.5 of the FSAR. (see Section I.C. above) This procedure revision was primarily administrative in nature changing references and inventory frequency. The frequency of, and procedures for, fuel movement were not changed and thus 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 2020.

B. Gaseous Waste: There were no particulate discharges in 2020.

The total activity of Argon-41 discharged in 2020 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 2020	0.00 Ci
	Apr - Jun 2020	0.00 Ci
	Jul - Sep 2020	0.00 Ci
	Oct - Dec 2020	0.00 Ci

C. Solid Waste: All solid radioactive waste material is transferred to the AFRRI 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 2020, 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.