



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 10, 2021

Mr. Andrew Cook
Interim Reactor Facility Director
Armed Forces Radiobiology Research Institute
4555 South Palmer Road, Building 42
Bethesda, MD 20889-5648

SUBJECT: U.S. DEPARTMENT OF DEFENSE ARMED FORCES RADIOBIOLOGY
RESEARCH INSTITUTE – REGULATORY AUDIT RE: DIGITAL
INSTRUMENTATION & CONTROL SYSTEM UPGRADE
(EPID L-2020-NFA-0012)

Dear Mr. Cook:

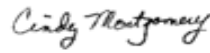
By letter dated November 10, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20318A339), as supplemented by letters dated February 5, 2021, and February 11, 2021, (ADAMS Accession Nos. ML21036A297 and ML21042B841, respectively) Armed Forces Radiobiology Research Institute applied for an amendment to Facility Operating License No. R-84 for the Armed Forces Radiobiology Research Institute TRIGA-Mark F tank-type nuclear reactor facility. The requested licensing action would replace and upgrade the instrumentation and control (I&C) systems for the reactor and would amend the technical specification related to the upgrade.

The U.S. Nuclear Regulatory Commission (NRC) staff will conduct an onsite and remote regulatory audit from September 13 to September 15, 2021, and continue the audit remotely (via teleconference) as necessary throughout the review period, in order to expedite the NRC staff review. The intent of the audit is to gain a better understanding of the application and all proposed changes to the facility. The audit will include review of documentation, observation of the facility, and discussions with facility personnel and management. In addition, the audit will identify information that will support the basis of the licensing decision and identify information that needs to be docketed. The enclosed audit plan provides additional details of the objective and scope of the audit. To facilitate an efficient audit, please provide ready access to working space, requested documentation and other materials, necessary personnel, and areas of the facility.

Following completion of the audit, the NRC staff will provide an audit summary. The summary will include a description of any information identified during the audit that will need to be docketed to supplement the application and information that is needed to allow the NRC staff to continue its review. You will have the opportunity to supplement the application to provide the additional information or the option to withdraw the application.

If you have any questions, please contact me at (301) 415-3398 or by electronic mail at cindy.montgomery@nrc.gov.

Sincerely,

A handwritten signature in cursive script that reads "Cindy Montgomery".

Signed by Montgomery, Cynthia
on 09/10/21

Cindy Montgomery, Project Manager
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No 50-170
License No. R-84

Enclosure:
As stated

Cc: See next page

Armed Forces Radiobiology Research Institute

Docket No 50-170

cc:

Director, Maryland Office of Planning
301 West Preston Street
Baltimore, MD 21201

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Colonel Mohammad Naeem, MD, FCCP,
FACR, Medical Corps, US Army
Director, Armed Forces Radiobiology
Research Institute
4301 Jones Bridge Road
Bethesda, MD 20814

Test, Research and Training
Reactor Newsletter
Attention: Amber Johnson
Dept of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

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RESEARCH INSTITUTE – REGULATORY AUDIT RE: DIGITAL
INSTRUMENTATION & CONTROL SYSTEM UPGRADE
(EPID L-2020-NFA-0012) DATED: SEPTEMBER 10, 2021

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ADAMS Accession No. ML21253A001**NRR-088**

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NAME	CMontgomery	JBorromeo, PBoyle for	CMontgomery
DATE	8/13/2021	9/10/2021	9/10/2021

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OFFICE OF NUCLEAR REACTOR REGULATION
REGULATORY AUDIT PLAN
REGARDING AMENDMENT TO
FACILITY OPERATING LICENSE NO. R-84
ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE
ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE TRIGA-MARK F TANK-TYPE
NUCLEAR REACTOR FACILITY
DOCKET NO 50-170

Background

By application dated November 10, 2020 (Reference 1) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20318A339), as supplemented by letters dated February 5, 2021 (Ref. 2), and February 11, 2021 (Ref. 3), (ADAMS Accession Nos. ML21036A297 and ML21042B841, respectively) Armed Forces Radiobiology Research Institute (the licensee or AFRRI) submitted an application for an amendment to Facility Operating License No. R-84 for the Armed Forces Radiobiology Research Institute Training, Research, Isotopes, General Atomics (TRIGA)-Mark F tank-type nuclear reactor facility. The requested licensing action would upgrade the instrumentation and control (I&C) systems for the AFRRI TRIGA reactor by replacing it with new analog or digital instrumentation and control (DI&C) systems. Additionally, the licensee requested editorial changes to its technical specifications (TSs).

The I&C systems for AFRRI consists of hybrid analog and digital system to monitor, protect, and control the reactor. The proposed I&C systems include a hardwired Reactor Protection System (RPS) with dedicated displays and controls so that safe operation and monitoring of the reactor is not affected if the digital systems become unavailable. Components of the I&C systems will be installed in the Data Acquisition Cabinet (DAC). The reactor will be operated from the Control System Console (CSC) located in the control room.

This regulatory audit is intended to assist NRC staff in confirming information submitted as part of the licensing amendment request.

Regulatory Bases for the Audit

The purpose of this audit is to support the NRC staff's review of the licensee's proposed I&C systems described in the Chapter 7, "Instrumentation and Control Systems," of the AFRRI proposed safety analysis report (SAR) in accordance with the applicable regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) and applicable guidance provided in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Part 1, "Format and Content," and Part 2, "Standard Review Plan and Acceptance Criteria," (ADAMS Accession Nos. ML042430055 and ML042430048, respectively).

Enclosure

Regulatory Audit Scope

As part of the audit, the NRC staff will review non-docketed procedures and records related to the design and development processes followed by General Atomics for both analog and digital instrumentation and control systems. In addition, during the audit, the NRC staff will interview key AFRRI personnel to discuss the acceptance process followed and proposed operation of the system. The NRC staff will be evaluating whether the results of these actions substantiate the description and assessments included in the proposed SAR for AFRRI.

Information Necessary for the Regulatory Audit

AFRRI should be prepared to have the following documentation and information available for the audit, as applicable:

- Quality Assurance Documentation
- Project Quality Assurance Plan
- Verification & Validation Plan
- Functional Requirements Specification
- Hardware Design Document
- Human Factors Documentation
- Logic Diagrams and Description
- Neutron Flux Detection System Documentation
- System Architecture Diagram
- Software Requirements Specification and Software Design Description documents
- Test Plan, Test Procedures, Test Results
- Factory Acceptance Testing Documentation
- Operating and Maintenance Procedures
- Reports documenting results of Verification & Validation
- Secure Development and Operational Environment Documentation

Team Assignments

The NRC staff performing this audit will be:

- Rossnyev Alvarado (Technical Reviewer)
- Joe Ashcraft (Technical Reviewer)
- Patrick Boyle (Technical Reviewer)
- Cindy Montgomery (Project Manager)

Logistics

The audit will take place at AFRRI in Bethesda, MD and via teleconference. The audit will start on the morning of September 13, 2021 continue through the afternoon on September 15, 2021 and will continue remotely (via teleconference) as necessary until the NRC staff have adequate understanding of the issues to be addressed to complete the review of the LAR.

Deliverables

At the completion of the regulatory audit, NRC staff will prepare a regulatory audit report, which will be issued after the audit has been completed.

Audit Questions:

The questions for discussion during the audit are primarily based on the open items list provided as an enclosure to this letter. At the conclusion of the audit, the staff will discuss necessary documents to be docketed and the potential requests for additional information (RAI) with the licensee. The goal of these discussions is that the licensee has a clear understanding of these potential requests.

Audit Schedule

September 13, 2021

8:00 a.m.	Entrance meeting, introductions, and project status
9:00 a.m.	Begin Audit
12:00 p.m.	Break for Lunch
1:00 p.m.	Resume Audit
5:00 p.m.	End for the day

September 14, 2021

8:00 a.m.	Meeting between NRC staff and AFRRRI to discuss logistics for the day
8:15 a.m.	Begin Audit
12:00 p.m.	Break for lunch
1:00 p.m.	Resume Audit
5:00 p.m.	End for the day

September 15, 2021

8:00 a.m.	Meeting with NRC staff and AFRRRI to discuss logistics for the day
8:15 a.m.	Resume Audit
12:00 p.m.	Break for Lunch
1:00 p.m.	Resume Audit
4:00 p.m.	Internal NRC staff meeting
4:30 p.m.	Exit Meeting – Summary of audit, general overview of observations, and discussion of open items and potential RAIs
5:00 p.m.	End for the Day

As needed

The NRC staff will continue audit interaction remotely (via teleconference) as needed.

References

1. "AFRRRI LAR for Digital I&C Upgrade" dated November 10, 2020 (ADAMS Accession Nos. ML20318A339, ML20318A340, ML20318A341, ML20318A342, ML20318A343, ML20318A344, ML20318A345, ML20318A346, ML20318A347, ML20318A348, and ML20318A349).
2. "Response to NRC 01/08/2021 Letter re License Amendment Request for Facility Operating

License No. R-84 for the AFRRRI TRIGA Reactor Docket No. 50-170,” dated February 5, 2021 (ADAMS Accession Nos. ML21036A297, ML21036A298, ML21036A299, ML21036A300, and ML21036A301).

3. “Transmittal of Proposed changes to the technical specifications in support of the license amendment request for the digital instrumentation and control upgrade for the AFRRRI TRIGA Reactor,” dated February 11, 2021 (ADAMS Accession Nos. ML21042B841 and ML21042B842).

Enclosure

Open items for regulatory audit

Open item(s)	Topic	Notes
4, 12	Power supply and distribution for I&C systems and components.	
9	Operation of interlocks in the rod withdrawal circuit logic and display in the Interlocks Pane.	
11	Operation and location of the Warning Pane.	
12	Operation of the power On/Off pushbutton in the Mode Control Panel in the control console.	
13, 14, 44, 45, 47, 72, 94	Operation of the magnet power key switch.	
14, 47, 48, 49, 62, 94	Review scram loop logic.	
15	Operation of the Acknowledge pushbutton.	
21	Operation and logic for the transient rod.	
22	Operation and logic of the control rods and Rod Control Panel.	
23, 27, 29, 30, 32, 33, 34, 37, 38, 40, 41, 44, 45, 47, 48, 49, 72	Interlocks signals and operation of FIS.	
30, 33	Panel, signals and logic in the control boxes and status panel in the experiment room.	
46	Operation of the lights in the FIS cabinet.	
51	Configuration and use of NLW-1000 signal trips.	
64, 73	Configuration and operation of the steady-state timer.	
65	Configuration when erroneous indications or out of range of a parameter is indicated in the control console.	
67, 68	Review procedures for calibration of nuclear instruments, including adjusting setpoints.	

Open item(s)	Topic	Notes
70	Configuration and operation of the Primary Coolant Conductivity.	
73, 75	Test of timers in the control console.	
74	Configuration, operation, and test of the two rotary test switches for the scrams and interlocks in the reactor control mode control pane.	
76	Operation of the pulse time scram.	
77	Identification and labeling of systems and components.	
80	Configuration management and control of the TRIGA basic program installed in the console system.	
81	Function in the CSC to gather data from the DAC and process I/O signals.	
82	Operation of the automatic bank rod and rods available.	
83	Observe operation modes (e.g., startup test mode, administrative mode, etc.) available in the CSC.	
86, 87, 89, 90, 91	Confirm the parameters shown in the control console displays and how the operator navigate through the different displays and panes.	
88	Use of and access to the printer included with the control console.	
92, 93	Configuration, operation and communication between DI/O drawer and the CSC.	
101	Configuration and use of the primary coolant conductivity.	
102	AFRRI Digital Upgrade Process.	