



ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE  
8901 WISCONSIN AVENUE  
BETHESDA, MARYLAND 20889-5603



October 21, 2010

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

SUBJECT: ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE-REQUEST FOR  
ADDITIONAL INFORMATION REGARDING THE APPLICATION FOR LICENSE RENEWAL  
(TAC NO. ME1587)

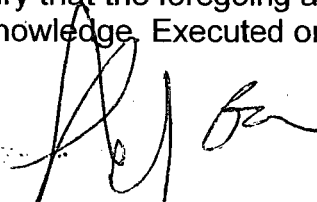
Sir:

By letter dated September 13, 2010, the Nuclear Regulatory Commission requested  
additional information regarding our application for license renewal.

Additional information is included below as requested.

If you need further information, please contact Mr. Stephen Miller at 301-295-1290 or  
millers@afri.usuhs.mil.

I declare under penalty of perjury that the foregoing and all enclosed information is true  
and correct to the best of my knowledge. Executed on October 21, 2010.

  
Mark Melanson  
COL, MS, USA  
Director

**OFFICE OF NUCLEAR REACTOR REGULATION**

**REQUEST FOR ADDITIONAL INFORMATION**

**LICENSE RENEWAL FOR ARMED FORCES RADIOLOGICAL RESEARCH INSTITUTE**

**LICENSE NO. R-84**

**DOCKET NO. 50-170**

The U. S. Nuclear Regulatory Commission (NRC) is continuing its review of your application for the renewal of Facility Operating License No. R-84 for the Armed Forces Radiobiology Research Institute (AFRRI) TRIGA reactor, dated June 24, 2004, and supplemented by letter dated March 4, 2010.

We require additional information and clarification on questions that have arisen during our review. Please provide responses to the following requests for additional information within 45 days of the date of this letter.

1. During a recent review of your June 24, 2004, letter applying to renew the operating license for the AFRRI TRIGA Reactor we have noted what we believe to be a typographical error referring to the reactor as a 1 MW(t) TRIGA reactor when this reactor is licensed at 1.1 MW(t) as per License Amendment No. 22 dated October 8, 1991. Please confirm your desire to renew your Facility Operating License R-84 for the current steady state limit of up to 1.1 MW(t).

The 1.0MW(t) cited in the 2004 license renewal application should have read 1.1MW(t).

2. Your June 24, 2004, license renewal application had attachments for the Reactor Emergency Plan, the Reactor Security Plan and the Reactor Operator Requalification Program. The Interim Staff Guidance (ISG) on Streamlined Review Process for License Renewal for Research Reactors dated October 28, 2009, does not require review of the Reactor Emergency Plan, the Reactor Physical Security Plan or the Reactor Operator Requalification Program if there are NRC-approved plans and programs in place and no significant changes to these approved documents are requested by licensee. Please confirm that these documents attached to your June 24, 2004, letter contain no significant changes that would require NRC review as part of the recent ISG on Streamlined Review Process for the AFRRI license renewal review.

The Reactor Emergency Plan, Reactor Physical Security Plan and Reactor Requalification Plan currently in place do not have need of significant changes. These documents do not require NRC review as part of the recent ISG on Streamlined Review Process for the AFRRI license renewal review.

3. The regulations in Title 10 of the Code of *Federal Regulations* (10 CFR) Section 20.1301(a)(1) state that the total effective dose equivalent to individual members of the

public likely to receive the highest dose from licensed operation may not exceed 0.1 rem (1 mSv) in a year.

- Section 3.4.1.2 of the 2004 SAR estimates that in a typical operation year the total argon 41 (Ar-41) release would be 20 curies (Ci). The estimated maximum integrated air radiation dose in an unrestricted area 91 meters from the release point due to the Ar-41 discharge was calculated to be 1.9 mrad using a safety factor of two (40 Ci total release).
- Operating data in 2009 indicates that the total energy generation was 65 MW-hrs with a total Ar-41 discharge of 49.9 Ci. Using the COMPLY code the calculated annual dose in the unrestricted area 91 meters from the release point was 1.6 mrem.
- Section 6.2.4 of the 2004 SAR estimates a total Ar-41 production rate at 5.1  $\mu\text{Ci}/\text{sec}$  in deriving an estimate of occupational radiation dose for facility workers, which would correspond to about 160 Ci of yearly discharge assuming continuous reactor operations.

- a. What is the annual dose to the maximum exposed member of the public from Ar-41 releases from the AFFRI research reactor facility?

The annual dose to the maximum exposed member of the public from Ar-41 releases from the AFFRI TRIGA will be less than 10 mrem per year in accordance with 10 CFR 20.1101(d).

In order to conservatively determine the annual Ar-41 activity which approaches the §20.1101(d) constraint limit, the COMPLY computer program (v. 1.6, provided by the EPA Office of Radiation and Indoor Air) was executed at Level 2, assuming an effluent release of  $313.5 \text{ Ci yr}^{-1}$  of Ar-41. A release of this magnitude results in a dose of 9.9 mrem to the maximally exposed member of the public. Thus, a 160 Ci release would result in a substantially lower projected dose. (See attachment)

- b. Where is this person located? If this dose is from immersion in the Ar-41 plume when it reaches ground level, confirm that a higher dose is not possible from radiation shine from the plume passing over a person closer to the facility than the point at which the plume reaches ground level or from a person exposed to direct radiation shine from the Ar-41 source before release from the AFFRI research reactor facility.

The maximally exposed member of the public is at the Zachary and Elizabeth Fisher House, located 91 meters from the AFFRI research reactor stack. This location represents the closest "full-time occupancy" or permanent residence position from the AFFRI stack. Other features located less than 91 meters from the AFFRI stack are roads, sidewalks, parking lots, parking garages, and the AFFRI front patio, none of which would be considered a permanent residence or be "full-time occupancy."

In order to calculate the theoretical dose to a person exposed to direct

radiation shine from Ar-41 source release from the AFRRRI research reactor facility, simulations were run utilizing MicroSkyshine ®. If we assume 24 continuous hours of operation at 1 MW with an Ar-41 production rate of 5.1 µCi/sec, we obtain a value of 0.44 Ci of Ar-41. If, for the sake of conservatism, 0.44 Ci is rounded to 0.5 Ci, and we presume a member of the public was ten feet from the AFRRRI building exterior, the dose rate from direct radiation shine would be approximately  $2.3 \times 10^{-2}$  mR/hr (0.00023 mSv/hr).

- c. Assume that the reactor is in continuous operation or propose a technical specification constraint if a shorter period of reactor operation is used as the basis of the source term. What is the annual dose at the closest permanent residence and what is the location of this residence? Please provide the details of your calculations. If a code such as COMPLY is used to determine doses, please provide a copy of the COMPLY code run and explain the code inputs used. Discuss how your calculated doses compare with the requirements of the regulations.

As previously discussed in 3 a. above, COMPLY was executed assuming an effluent release of 313.5 Ci yr<sup>-1</sup> of Argon 41. This theoretical 313.5 Ci release represents a factor of more than six times the amount of Ar-41 actually released by the AFRRRI research reactor during any year of the last decade. This theoretical release of 313.5 Ci of Ar-41 results in a dose of 9.9 mrem to the maximally exposed member of the public (a resident of Fisher House). Based on Section 6.2.4 of the 2004 SAR (total Ar-41 production rate), continuous operation of the AFRRRI TRIGA (24 X 7 X 365) results in the production/release of 160 Ci of Ar-41. Hence the theoretical 313.5 Ci of Ar-41, a value which is 1.96 times greater than 160 Ci, indicates that a Technical Specification limit is unnecessary, as the dose to a resident of Fisher House ( maximally exposed member of the public) would be less than 10 mrem per year in accordance with 10 CFR 20.1101(d).

COMPLY Level 2 parameters utilized were a release height of 13 meters, a building height of 10 meters, a building width of 80 meters, source and receptor not located on the same building, a source-to-receptor distance of 91 meters, and the default wind speed of 2.0 meters/second. Various aspects of the modeling, e.g., default wind speeds, were selected in accordance with NCRP Commentary 3 in order to insure conservatism (over-estimation) in the dose estimates.

AR41MAXI

COMPLY: V1.6.

10/ 7/2010 12:41

40 CFR Part 61  
National Emission Standards  
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH  
THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS  
FROM THE COMPLY CODE - V1.6.

Prepared by:

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Prepared for:

U.S. Environmental Protection Agency  
Office of Radiation and Indoor Air  
Washington, DC 20460

COMPLY: V1.6.

10/ 7/2010 12:41

Argon-41 Maximum Release for 10 CFR 20.1101(d) Compliance

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SCREENING LEVEL 2  
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AR41MAXI

DATA ENTERED:  
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Nuclide	Release Rate (curies/YEAR)
AR-41	3.135E+02

Release height 13 meters.

Building height 10 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 91 meters.

Building width 80 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:  
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Input parameters outside the "normal" range:

None.

RESULTS:  
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Effective dose equivalent: 9.9 mrem/yr.

\*\*\* Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

\*\*\*\*\* END OF COMPLIANCE REPORT \*\*\*\*\*

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