Docket No. 50-170 February 12, 1991

Colonel George W. Irving, III, BSC, USAF
Director
Armed Forces Radiobiology Research Institute
Bethesda, Maryland 20814-5145

Dear Colonel Irving:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION

We are continuing our review of your application for amendment of Facility Operating License No. R-84 for the Armed Forces Radiobiology Research Institute (AFRRI) TRIGA Research Reactor which was submitted on April 30, 1990, as supplemented on December 17, 1990. During our review of your application, questions have arisen for which we require additional information and clarification. Please provide responses to the enclosed Request for Additional Information within 60 days of the date of this letter. Following receipt of the additional information we will continue our evaluation of your application. If you have any questions regarding this review, please contact me at (301) 492-1127.

This requirement affects nine or fewer respondents and, therefore, is not subject to Office Management and Budget review under P. L. 96-511.

Sincerely,

Alexander Adams, Jr., Project Manager
Non-Power Reactors, Decommissioning and
Environmental Project Directorate
Division of Advanced Reactors
and Special Projects
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
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Armed Forces Radiobiology Research Institute

Docket No. 50-170

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

County Executive
Montgomery County Government
Rockville, Maryland 20850

Reactor Facility Director
Armed Forces Radiobiology Research Institute
National Naval Medical Center
Bethesda, Maryland 20814

REQUEST FOR ADDITIONAL INFORMATION

ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE

DOCKET NO. 50-170

This request refers to your response, dated December 17, 1990.

1. Your discussion of Shutdown Margin is still not adequate. Recall that the definition of Shutdown Margin in ANSI/ANS 15.1 requires a minimum negative reactivity with the control rod of most worth in its most extracted position. In the AFRRI reactor, that presumably means the three FFCR rods fully inserted and the Transient rod (because it can be automatically scrammed) in its most reactive position possible.

   When we reviewed the probable net worths of your projected FFCR rods, your Technical Specifications and your discussions of Shutdown Margin and of Excess Reactivity, we observed the following:

   a. You placed undue emphasis on loading fuel up to your current limit on excess reactivity.

   b. You placed insufficient emphasis on your licensed limit on Shutdown Margin.

   c. It seems possible you could load the core in such a way that you would violate your Technical Specification on Shutdown Margin.

   Therefore, please address our question No. 1 of November 14, 1990 as follows:

   a. Give and discuss the Shutdown Margin you will achieve at initial core loading with the new FFCRs.

   b. Give explicitly the projected reactivity worths of all three of these rods, and of your Transient rod.

   c. Give the technical bases for these numerical values.

   d. Show that your projected Shutdown Margin, as defined in ANSI/ANS 15.1 is within your Technical Specification limit.

   e. Discuss any implications on your projected operational excess reactivity.

   f. Base your discussions as much as possible on measurements in the AFRRI reactor, or other very similar reactor.

      (Please note, your definition of Shutdown margin in Procedure No. VII does not seem to be consistent with ANSI/ANS 15.1).

2. The maximum steady state fuel temperatures derived by equation number 11 (response to question No. 3, of November 14, 1990) seems to be acceptably close to a value we have obtained. However, for the record, we do not agree with your final version of equation number 11 in your December 17, 1990 response. Please review the use of this equation.

3. We are unable to evaluate your treatment of the peak temperature in a FFCR following a pulse, for the following reasons:

   a. It seems inappropriate to invoke a hypothetical core so different from your projected core.

   b. Your rendering of the Fuchs-Nordheim formulation left out a factor of 2, and addresses only the average temperature rise in the fuel.

   c. The numerical value you used for the temperature coefficient of reactivity is not consistent with the value used recently for other TRIGAs with stainless steel clad fuel.

Please reconsider this issue, as requested in our question 3b, November 14, 1990. Provide a technologically sound method, with appropriate peak-to-average ratios for neutron flux or power densities, and give a reasonable maximum temperature expected in a FFCR due to a maximum authorized pulse. Justify your method and results, and justify that the core parameters you use apply to the current AFRRI core containing the projected FFCRs. This analysis should be consistent with, and perhaps be based on measurements of fuel temperatures in the AFRRI reactor.

Compare your maximum projected temperature with all relevant limits in your Technical Specifications, and address any potential inconsistencies.