

January 29, 1996

Mr. Mark L. Moore
Armed Forces Radiobiology
Research Institute
Reactor Facility Director
8901 Wisconsin Avenue
Bethesda, Maryland 20889-5603

SUBJECT: RESPONSE TO AFRI COMMENTS ON NRC DRAFT DOCUMENTS

Dear Mr. Moore:

By letter dated November 28, 1995, you provided comments on Chapters 2, 3, 4, 7, 10, 13, and 18 of the draft "Format and Content for Applications for the Licensing of Non-Power Reactors" and "Standard Review Plan and Acceptance Criteria for Applications for the Licensing of Non-Power Reactors." Thank you for taking the time and effort to review our draft documents. The attachment to this letter is our analysis of your comments and changes made to the drafts as a result of your comments.

If you have any questions concerning our effort on these documents, please contact me at 301-415-1127.

Sincerely,

Original signed by:

Alexander Adams Jr., Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-170

Attachment: As stated

cc: w/attachments
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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

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Sincerely,

A handwritten signature in cursive script, appearing to read "Alexander Adams Jr.", written in dark ink.

Alexander Adams Jr., Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

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See next page

Armed Forces Radiobiology Research
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Docket No. 50-170

cc:

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NRC response to AFRI comments - Chapter 2, Site Characteristics

Comment - Format and content section 2.1.1.2, Boundary and Zone Area Maps, pages 2-2 and 2-3. The document states that maps should clearly show the location of emergency planning zones. You commented that analysis of postulated accidents for some types of research reactors show that consequences do not extend beyond the site boundary. EPZs are therefore not established for such reactors. You suggested that we change this paragraph to require only applicable boundaries and zones.

NRC response - We accept your comment. However, as discussed in our response to you for other chapters (e.g., Chapter 5), we have added wording to both the format and content and the standard review plan to make it clear that applicants need only consider the suggestions in these documents that are applicable to their situation. This is such a case. We will change this section to read:

location of emergency preparedness zones (EPZs), as applicable,

Comment - Format and content section 2.5, Geology, Seismology, and Geotechnical Engineering, page 2-5. The document states that the applicant should detail the seismic and geologic characteristics of the site and the region. You commented that this section requires a level of technical rigor and detail far beyond the capabilities of a research reactor staff. The potential consequences from most research reactor facilities do not warrant this level of detail. You suggested that we revise this section to require a level of technical detail and rigor commensurate with the potential hazards from research reactor operations.

NRC response - You are correct that the information needed by NRC in this area may be beyond the capabilities of the non-power reactor in-house staff and that outside expertise may be needed. The text already allows for different levels of detail in the information submitted:

In this section, the applicant should detail the seismic and geologic characteristics of the site and the region surrounding the site. The degree of detail and extent of the considerations should be commensurate with the potential consequences of seismological disturbance, both to the reactor facility and to the public.

We believe that the document is already sensitive to your concern and that changes to the text are not needed.

NRC response to AFRRRI comments - Chapter 3, Design of Structures, Systems, and Components

Comment - Format and content section 3.1, Design Criteria, page 3.1. The document states that the applicant should specify the design criteria for the facility structures, systems, and components. You commented that precise and detailed specifications for some structures, systems, and components may be impractical for SARs for facilities that are several decades old. You suggested that we change the wording to reflect the practical difficulty of precise and detailed design criteria for some parts of older facilities.

NRC response - The guidance document does not call for precise and detailed specifications, however we understand the difficulties your comment addresses. We would expect the level of detail presented in the SAR to be related to the safety significance of the component. For example, we would expect that an applicant would have greater detailed information on 20 year old reactor fuel than a 20 year old cooling tower. We believe guidance added to the document in response to comments you had concerning Chapter 5 gives applicants the flexibility to present the level of detail that they believe is justified. We will change the wording of this section to read:

In this section the applicant should specify the design criteria for the facility structures, systems, and components. The description of the actual design should be in the section or chapter that corresponds to the specific structure, system, or component. The design criteria should be both specific and general. The amount of detail given should be related to the safety function of the structure, system, or component. For example, general design criteria should include the following:

Comment - Review plan section 3.4.3, Seismic Damage, Review Procedures, page 3-6. The document states that the evaluation of seismic damage should be coordinated with the Chapter 13 accident analyses of seismic events or should be shown to be bound by other accidents considered in Chapter 13. You asked should the word "bound" be "bounded" and suggested we change the wording if appropriate.

NRC response - We will change the word as suggested.

NRC response to AFRI comments - Chapter 4, Reactor Description

Comment - Format and content section 4.2.3, Neutron Moderator and Reflector, page 4-4. The document discusses failure of encapsulated moderators or reflectors stating that the reactor should be able to safely operate until failed encapsulations are repaired or replaced. You commented that reactor shut down should be an option in addition to continued operation and suggested we insert the words "or shut down" between "operated" and "until".

NRC response - We agree with your comment. Based on a similar comment from another licensee we will make changes to this section that we believe also address your comment. The section will be changed to read:

In cases where moderators or reflectors are encapsulated to prevent contact with coolant, the effect of failure of the encapsulation should be analyzed. The reactor should be able to be safely operated until failed encapsulations are repaired or replaced. If reactor operations cannot be safely continued, the reactor should be placed and maintained in a safe condition until encapsulations are repaired or replaced.

Comment - Format and content section 4.2.5, Core Support Structure, page 4-6, and review plan section 4.2.5.2, Core Support Structure, Acceptance Criteria, page 4-12. The document states that for a movable core support, design information describing the motive power system, the system for ensuring position, and interlocks that prevent or control motion while the reactor is critical, while forced cooling is required, or when other activities that prohibit core support movement are to be conducted (e.g., experimental facility operations) should be provided. You commented that the TRIGA Mark-F is designed and licensed to permit operation of the reactor while the core support carriage is in motion. You suggested that we add the words "if such a system is required" between "critical" and "while" in the fifth subparagraph.

NRC response - We agree with your comment. However, we will add your suggested wording at the end of the section to make it apply to the entire statement. We will change section 4.2.5 of the format and content to read:

For a movable core support, design information describing the motive power system, the system for ensuring position, and interlocks that prevent or control motion while the reactor is critical, while forced cooling is required, or when other activities that prohibit core support movement are to be conducted, if such a system is required (e.g., experimental facility operations).

We will change section 4.2.5.2 of the review plan to read:

The design for a movable core contains features that ensure safe and reliable operation. This includes position tolerances to ensure safe and reliable reactor operation within all design limits including reactivity and cooling capability. The description includes the interlocks that keep the reactor core from moving while the reactor is critical or while forced cooling is required, if applicable. The design includes how the reactor is shut down if unwanted motion occurs.

Comment - Review plan section 4.2.3.2, Neutron Moderator and Reflector, Acceptance Criteria, page 4-7. The document states that non-nuclear design considerations ensure that the moderator and reflector can provide the necessary nuclear functions. You commented that the meaning of this sentence is unclear and suggested that we revise this sentence to clarify.

NRC response - An example of a non-nuclear design consideration would be the reflector encapsulation. We believe that this concept is clear to NRC reviewers but will add an example to the section to further clarify the section. The section will be changed to read:

The non-nuclear design bases such as reflector encapsulations are clearly presented, and the nuclear bases are briefly summarized. Non-nuclear design considerations ensure that the moderator and reflector can provide the necessary nuclear functions.

Comment - Review plan section 4.4.2, Biological Shield, Acceptance Criteria, page 4-16. The document states that shielding materials are based on demonstrated effectiveness at other non-power reactors of similar operating characteristics, and the calculational models and assumptions are justified by similar comparisons. You commented that this requirement appears to preclude the use of novel/unique shielding materials and suggested that we revise this section to provide acceptance criteria for materials not in use at other facilities.

NRC response - We agree with your comment. We will change the section to read:

Shielding materials are based on demonstrated effectiveness at other non-power reactors of similar operating characteristics, and the calculational models and assumptions are justified by similar comparisons. New shielding materials are justified by calculations, development testing and the biological shield test program during facility start up.

NRC response to AFRI comments - Chapter 7, Instrumentation and Control Systems

Comment - Format and content section 7.3, Reactor Control System, page 7-9 and review plan section 7.3.2, Reactor Control System, Acceptance Criteria, page 7-6. The document states that the reactor power indication of at least one channel will remain reliable for approximately one decade above the licensed power level. You commented that this requirement is unnecessarily burdensome, without providing significant benefit. Typical research reactors are physically incapable of reaching power levels ten times their licensed power level. Scaling instrumentation to read power levels this high will necessarily result in some loss of sensitivity at lower power levels where the measurement is really needed. It will be impossible to reliably calibrate instrumentation for accuracy at power levels ten times the licensed power level, except by crude electronic extrapolation. You suggested that we revise this section to require power indication "in the range of highest power licensed".

NRC response - You raise some interesting points in your comments. Many non-power reactors have log scale channels that should be able to meet this suggestion. Of course, how far above the licensed power level the instrumentation must respond is determined in the safety analysis. If the reactor is incapable of reaching a particular power level, we would not expect the instrumentation to be able to operate at those levels. For reactors with a power level safety limit, the instrumentation should be able to measure power to at least some point above the safety limit, to show if the safety limit is reached during events. For reactors where the power level is not a safety limit, the instrumentation should be able to read to a high enough level to determine if the event has occurred that is the reason for limiting power level in the reactor (e.g., some heat transfer level). We will change section 7.3 of the format and content to read:

The reactor power indication of at least one channel will remain reliable for some predetermined range above the licensed power level. For reactors with power level as a safety limit, the instrumentation should be able to indicate if the safety limit was exceeded. For other reactor types, at least one channel should be able to indicate if the power level was exceeded which is the basis for limiting licensed power level.

We will change this section 7.3.2 of the review plan to read:

At least one neutron flux measuring channel should give reliable readings to a predetermined power level. For reactors with power as a safety limit, the measurable power level should be above the safety limit. For reactors without power as a safety limit, the measurable power level should be high enough to show that the basis for limiting licensed power level is not exceeded.

Comment - Format and content section 7.6, Control Console and Display Instruments, page 7-14. The document states that if these systems digitally process control console information and present this information to the

reactor operator they need to go through the same review including verification and validation of software as a digital RCS or RPS. You commented that this requirement appears to apply to any information in the control room presented to the operator. It should only apply to information used for nuclear reactor control (e.g., a facility designed reactivity computer should not fall under this requirement). You suggested that we revise this section to limit its applicability only to information used for nuclear reactor control.

NRC response - We agree that there may be some digital information present in the control room that does not need to go through V&V. We can not comment on your example without knowing how the information is used by the operator. Any information presented to the operator that is used to make decisions about the status of the reactor or about what operational actions to take must be correct and should go through the V&V process. We will change this section to read:

The advancement of digital technology has simplified the ability to gather, analyze, manipulate and display large amounts of data. A number of licensees have considered the addition to their I&C system of internally developed operator information display systems and operating aids. If these systems digitally process control console information and present this information to the reactor operator to inform the operator of the status of the reactor or are used by the operator to make decisions about the operation of the reactor, they need to go through the same review including verification and validation of software as a digital RCS or RPS. It is acceptable to have these systems where they cannot be viewed by the reactor operator. The licensee should ensure that any interface between the information display system and the control console is isolated.

Comment - Format and content section 7.7, Radiation Monitoring Systems, page 7-14. You commented that it appears that one or several pages of the format and content document are missing.

NRC response - This appears to be an error that occurred in the duplication process for distribution. We will insure that the final document is complete.

NRC response to AFRRRI comments - Chapter 10, Experimental Facilities and Utilization

Comment - Review plan section 10.3.2, Experimental Facilities, Acceptance Criteria, page 10-6. The document states that for any large-volume irradiation facilities, such as an exposure room or dry chamber, an acceptable design must include provisions for automatically shutting down the reactor if the reactor or shielding are moved during operation. You commented that this requirement does not apply to the TRIGA Mark-F, which is designed for operation with the reactor support carriage in motion, or with shielding moving while the reactor is operating. You suggested that we revise this section to require this design feature only when applicable.

NRC response - We agree with you comment. This section will be changed to read:

For any large-volume irradiation facilities, such as an exposure room or dry chamber, an acceptable design must include provisions for (a) preventing reactor operation if personnel are in the irradiated volume, (b) controlling airborne radioactive materials, (c) maintaining acceptable biological shielding in occupied areas, (d) limiting effects on reactivity due to changes of experiments within the irradiated volume to values found acceptable, and (e) when applicable, automatically shutting down the reactor if the reactor or shielding are moved during operation.

NRC response to AFRI comments - Chapter 13, Accident Analysis

Comment - Format and comment section 13.3.1, MHA, page 13-5. The document states that the failure of one fuel pin in air is the MHA for a TRIGA reactor. You commented that TRIGA fuel is most often referred to as an "element" and suggested that we change "pin" to "element".

NRC response - We agree with your comment and will change the section to read as follows:

The fuel encapsulation bursts, releasing gaseous fission products to the pool or the air. (The failure of one fuel element in air is the MHA for a TRIGA reactor.)

NRC response to AFRI comments - Chapter 18, High-Enriched Uranium to Low-Enriched Uranium Conversions

Comment - Format and content page 18-2. You commented that page 18-2 of the format and content appears to be page 18-53 of the review plan.

NRC response - This appears to be an error that occurred in the duplication process for distribution. We will insure that the final document is complete.