December 19, 1995

Dr. John A. Bernard
Director of Reactor Operations
Nuclear Reactor Laboratory
Massachusetts Institute of Technology
138 Albany Street
Cambridge, Massachusetts 02139

SUBJECT: RESPONSE TO MIT COMMENTS ON NRC DRAFT DOCUMENTS

Dear Dr. Bernard:

By electronic mail dated November 20, 1995, Thomas Newton, Jr. of your staff provided comments on Chapters 4, 7, 9, and 13 of the draft "Format and Content for Applications for the Licensing of Non-Power Reactors." Thank you for taking the time and effort to review our draft documents. The enclosure 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 Manager
Office of Nuclear Reactor Regulation

Docket No. 50-20

Enclosure:
As stated

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

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Massachusetts Institute of Technology

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City Hall
Cambridge, Massachusetts 02139

Assistant Secretary for Policy
Executive Office of Energy Resources
100 Cambridge Street, Room 1500
Boston, Massachusetts 02202

Department of Environmental
Quality Engineering
100 Cambridge Street
Boston, Massachusetts 02108

NRC response to MIT 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 this statement could be misleading in that reactor operation would or could be continued until repairs are made. You suggested that perhaps instead of "safely operated," the sentence could read "placed in a safe condition," or words to that effect.

NRC response - Some types of encapsulated moderators and reflectors (e.g., encapsulated graphite reflectors) have had encapsulation failure without affecting the ability to continue to operate the reactor safely. However your point is well taken that in some reactor designs the reactor should be placed in a safe condition if moderator or reflector encapsulation failure occurs. This section of the format and content will be amended as follows:

> 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 4.5, Nuclear Design, page 4-8, and section 4.6, Thermal-Hydraulic Design, page 4-11. You commented that another area in which guidance would be appreciated is in the area of analyses and the NRC acceptance criteria of the use of specific codes.

NRC response - Many different computer codes exist for the design and analysis of nuclear reactors. However, many of these codes were developed for use with power reactor designs and operating conditions and their use with non-power reactors may require careful consideration by the licensee. Because this is a constantly changing field, we believe that referring to specific codes for use in non-power reactors may not allow the use of the fullest array of design and analysis tools. The documents do not specifically discuss the use of computer codes. The following will be added to section 4.5 of the format and content:

> A detailed description of the analytical methods used in the nuclear design should be provided. Computer codes that are used should be described in detail as to the name and type of code, how it is used, and its validity based on experiments or confirmed predictions of operating non-power reactors. Code descriptions should include methods of obtaining parameters such as cross sections. Estimates of the accuracy of the analytical methods should be included.

The following will be added to section 4.6 of the format and content:

> A detailed description of the analytical methods used in the thermal-hydraulic design should be provided. Computer codes that are used should be described in detail as to the name and type of code, how it is used, and its validity based on experiments or confirmed predictions of operating non-power reactors. Estimates of the accuracy of the analytical methods should be included.

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

Comment - Format and content section 7.4, Reactor Protection System, page 7-11. The fourth dash on the page discusses start-up channels having a minimum neutron count rate interlock as a specific design feature. You commented that some facilities which use photoneutrons as the startup source do not require an interlock.

NRC response - Comment accepted. The wording of the section will be changed as follows:

> A start-up channel measuring neutrons at subcritical with a minimum count rate interlock to ensure operation and to prevent control or safety rod withdrawal unless the neutron count rate is at least some predetermined minimum such as 2 counts per second. This interlock may not be needed in reactor designs that use photoneutrons for start-up. The applicant should justify not needing the interlock in this case.

NRC response to MIT comment - Chapter 9, Auxiliary Systems

Comment - Format and content section 9.6, Byproduct, Source, and Special Nuclear Material Possession and Use, page 9-5. The document discusses requirements for possession, for up to 30 days, of byproduct material transferred to the reactor license from another NRC or State license for irradiation in the reactor. You commented that you were unaware of specific NRC requirements of a time limit on byproduct material possession under the reactor license prior to irradiation. You ask whether this also applies to material created under the reactor license and later transferred to another license (such as in-core specimens which are cyclically irradiated or repeat NAA samples)?

NRC response - Most non-power reactor licenses do not have a provision in the byproduct clause of their Part 50 license to receive, possess and use byproduct material transferred from other licenses. The byproduct clause of the license normally applies to only byproduct material produced in the non-power reactor. The MIT license is unusual in that paragraph 2.B.(3), which has been in place for many years, allows possession, use and transfer of byproduct material made in reactors other than MIT.

To address this issue, the staff developed a position that allows for amendment of the reactor license to allow receipt of byproduct material which is to be irradiated in the reactor within 31 days of receipt. The time limit exists to prevent the reactor license from being used as a substitute for a materials license. The answer to your question is that material that comes from another license (even if originally produced in the reactor) is considered outside material and falls under the 31 day limit.

NRC response to MIT comments - Chapter 13, Accident Analysis

Comment - Format and Content section 13.1, Accident Analysis and Determination of Consequences, page 13-3. You commented that another area in which guidance would be appreciated is in the area of analyses and the NRC acceptance criteria of the use of specific codes.

NRC response - Many different computer codes exist for the design and analysis of nuclear reactors. However, many of these codes were developed for use with power reactor designs and operating conditions and their use with non-power reactors may require careful consideration by the licensee. Because this is a constantly changing field, we believe that referring to specific codes for use in non-power reactors may not allow the use of the fullest array of design and analysis tools. The documents do not specifically discuss the use of computer codes. The following will be added to section 13.1(5) of the format and content:

> Computer codes that are used should be described in detail as to the name and type of code, how it is used, and its validity based on experiments or confirmed predictions of operating non-power reactors. Estimates of the accuracy of the analytical methods should be included.