



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

June 12, 2018

Mr. Alberto Queirolo, Director
of Reactor Operations
Nuclear Reactor Laboratory
Research Reactor
Massachusetts Institute of Technology
138 Albany Street, MS NW12-116A
Cambridge, MA 02139

SUBJECT: MASSACHUSETTS INSTITUTE OF TECHNOLOGY NUCLEAR REACTOR -
ISSUANCE OF AMENDMENT NO. 41 TO RENEWED FACILITY OPERATING
LICENSE NO. R-37 REGARDING APPROVAL REQUIREMENTS FOR
EXPERIMENTS ACCORDING TO TECHNICAL SPECIFICATION 7.5.2.1
(EPID NO. L-2018-LLA-0021)

Dear Mr. Queirolo:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 41 to Renewed Facility Operating License No. R-37 for the Massachusetts Institute of Technology (MIT) Nuclear Reactor. The amendment consists of changes to the technical specifications (TSs) in response to MIT's application dated January 24, 2018, as supplemented on February 14, 2018.

The amendment revises the Approval Process requirement for the Experiment Review and Approval described in TS 7.5.2.1.

A copy of the NRC staff's safety evaluation is also enclosed. If you have any questions, please contact me at (301) 415-3936, or by electronic mail at Patrick.Boyle@nrc.gov.

Sincerely,

/RA Xiaosong Yin for/

Patrick G. Boyle, Project Manager
Research and Test Reactors Licensing Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket No. 50-20

Enclosures:

1. Amendment No. 41 to R-37
2. Safety Evaluation

cc: w/enclosure: See next page

cc:

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 (EPID NO. L 2018 LLA 0021) DATE: JUNE 12, 2018

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ADAMS Accession No. ML18059A102

*via email concurrence

NRR-058

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DATE	5/30/2018	6/12/2018	6/12/2018	

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

DOCKET NO. 50-20

MASSACHUSETTS INSTITUTE OF TECHNOLOGY RESEARCH REACTOR

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 41
Renewed License No. R-37

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Massachusetts Institute of Technology Research Reactor (the facility), Renewed Facility Operating License No. R-37 filed by the Massachusetts Institute of Technology (the licensee), dated January 24, 2018, as supplemented by letter dated February 14, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the Commission's regulations and all applicable requirements have been satisfied.
 - F. Prior notice of this amendment was not required by 10 CFR 2.105, "Notice of proposed action," and publication of notice for this amendment is not required by 10 CFR 2.106, "Notice of Issuance."

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in Attachment 2 to this license amendment, and paragraph 2.C.2 of Renewed Facility Operating License No. R-37 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised from Amendment 38 through Amendment No. 41, are hereby incorporated in the license. The Massachusetts Institute of Technology shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Alexander Adams, Jr., Chief
Research and Test Reactors Licensing Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Attachments:

1. Changes to Renewed Facility Operating License R-37
2. Changes to Appendix A, "Technical Specifications"

Date of Issuance: June 12, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 41

RENEWED FACILITY OPERATING LICENSE NO. R-37

DOCKET NO. 50-20

Replace the following page of the Renewed Facility Operating License No. R-37 with the revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove

3

Insert

3

3. Pursuant to the Act and 10 CFR Part 30, to receive, possess, and use:
 - a. a 150-curie antimony-beryllium sealed neutron source in connection with operation of the facility;
 - b. such byproduct material as may be produced by operation of the facility, which, except for byproduct material produced in non-fueled experiments, shall not be separated; and
 - c. byproduct materials activated in reactors other than the MIT reactor (for use in the reactor hot cells) that are in solid form and have atomic numbers 3 through 83. The total inventory of this byproduct material shall not exceed 100,000 curies at any one time. This material may be irradiated in the reactor.
- C. This renewed license shall be deemed to contain and is subject to the conditions specified in Parts 20, "Standards for Protection against Radiation," 30, 50, 51, 55, "Operators' Licenses," 70, and 73, "Physical Protection of Plants and Materials," of the Commission's regulations; is subject to all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified below:

Maximum Power Level

1. The licensee is authorized to operate the reactor at steady-state power levels not to exceed 6.0 megawatts (thermal).

Technical Specifications

2. The Technical Specifications contained in Appendix A, as revised from Amendments 38 through 41, are hereby incorporated in the license. The Massachusetts Institute of Technology shall operate the facility in accordance with the Technical Specifications.

Additional Conditions

3. The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security plan, including amendments and changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The approved physical security plan consists of a Massachusetts Institute of Technology Nuclear Reactor Laboratory document, withheld from public disclosure pursuant to 10 CFR 73.21, entitled, "Physical Security Plan for the M.I.T. Research Reactor Facility," dated July 22, 2013, as revised.

ATTACHMENT TO LICENSE AMENDMENT NO. 41

RENEWED FACILITY OPERATING LICENSE NO. R-37

DOCKET NO. 50-20

Replace the following pages of the Appendix A, "Technical Specifications," with the revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

7-14
7-15

Insert

7-14
7-15

7.5 Experiment Review and Approval

7.5.1 Review Process

Prior to performing any reactor experiment of a type not previously approved, the proposed experiment or irradiation series shall be evaluated in terms of its effect on reactor operation and the possibility and consequences of its failures, including, where significant, consideration of chemical reactions, physical integrity, design life, proper cooling, interaction with core components, and reactivity effects. This evaluation shall normally consist of the following:

- a) Preparation of an experiment description and safety evaluation by either the experimenter or individual(s) appointed by the Director of Reactor Operations.
- b) Preparation and approval of a written safety review as described in Specifications 7.4.1 and 7.4.2.
- c) Preparation of written procedures for the conduct of the experiment.

Item (a) above may be done as part of item (b) above at the discretion of the Director of Reactor Operations.

7.5.2 Approval Process

1. No reactor experiment of a type not previously approved shall be performed until the materials prepared in Specification 7.5.1 (a) and (b) have been reviewed and approved in writing by two licensed senior reactor operators, the Director of Reactor Operations, and the MITRSC. The materials prepared in Specification 7.5.1 (c) shall be reviewed and approved as required by Specification 7.4 (Procedures).
2. Substantive changes to previously reviewed experiments shall require the process described in Specifications 7.5.1 and 7.5.2.1. Minor changes that do

not significantly alter the experiment may be implemented upon the review and approval of a safety review by two senior reactor operators and the Director of Reactor Operations. The safety review shall, as a minimum, describe the change and evaluate its safety.

3. Previously approved experiments may be performed at the discretion of a licensed senior reactor operator without the necessity of any further review or approval.
4. All experiments shall conform to the General Experiment Criteria as given in Specification 6.1.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 41 TO

RENEWED FACILITY OPERATING LICENSE NO. R-37

MASSACHUSETTS INSTITUTE OF TECHNOLOGY REACTOR

DOCKET NO. 50-20

1.0 INTRODUCTION

By letter dated January 24, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18030A656), as supplemented on February 14, 2018 (ADAMS Accession No. ML18051A073), the Massachusetts Institute of Technology (MIT, the licensee), requested a license amendment to change the amended Facility Operating License No. R-37, including Appendix A, "Technical Specifications for the MIT Research Reactor (MITR-II)."

The requested amendment would change the technical specifications (TSs) by revising the experiment review and approval process. The scope of the review and approval of written procedures for the conduct of the experiments by the MIT reactor safeguards committee (MITRSC) would be changed. .

Specifically, the proposed changes would revise TS 7.5.2.1 to retain the requirement that materials prepared in TS 7.5.1.a) "Preparation of an experiment description and safety evaluation ..." and TS 7.5.1.b) "Preparation and approval of a written safety review ..." be reviewed and approved by the MITRSC. However, TS 7.5.2.1 would state that: "The materials prepared in Specification 7.5.1 (c) [written procedures for the conduct of the experiment] shall be reviewed and approved as required by Specification 7.4 (Procedures)."

TS 7.4 requires that the preparation of written procedures for the conduct of the experiment will be reviewed and approved by two senior reactor operators (SROs) and the Director of Reactor Operations (DRO) as required by TS 7.4.2 "Approval Process."

2.0 EVALUATION

2.1 Background

The MITR-II is utilized to perform experiments and irradiations. Prior to performing any reactor experiment of a type not previously approved, the proposed experiment or irradiation series is evaluated in terms of its effect on reactor operations in accordance with the TS requirements.

The licensee requests changes to the Renewed Facility Operating License No. R-37, TS 7.5.2.1, "Approval Process," removing the responsibility for approval of the written procedures for the conduct of experiments by the MITRSC. The MITRSC will continue to review and approve the preparation of an experiment description and safety evaluation, as well as the preparation and approval of a written safety review related to any reactor experiments of a type not previously approved. The changes to TS 7.5.2.1 will also require review and approval of written procedures for the conduct of the experiment to be performed in accordance with TS 7.4.

2.2 Regulatory Requirements

The NRC staff reviewed the licensee's amendment request, as supplemented, to ensure that there is reasonable assurance that the activities authorized by this amendment can be conducted without endangering the health and safety of the public and that such activities will be conducted in compliance with the Commission's regulations, and that the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public. The NRC staff considered the following statutory and regulatory requirements and guidance during its review of the proposed changes:

- The Atomic Energy Act of 1954, as amended, Section 182a, requires that each utilization facility operating license include TSs. The regulatory requirements related to the content of the TSs for nuclear reactors are in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36, "Technical specifications," which requires that TSs include the following categories: (1) safety limits and limiting safety system settings, (2) limiting conditions for operation, (3) surveillance requirements, (4) design features, and (5) administrative controls.
- The regulations in 10 CFR Part 20, "Standards for Protection against Radiation," establish standards for the protection against ionizing radiation resulting from activities conducted under licenses the NRC issues.
- The regulations in 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," in part, provide regulatory requirements for storage and use of byproduct material.
- The regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," provide regulatory requirements for licensing of non-power reactors.
- The regulations in 10 CFR 50.36(c)(5) "Administrative controls," provide regulatory requirements for the control of procedures to assure operation of the facility in a safe manner.
- The regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," provide regulatory requirements for the protection of the environment.
- NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," issued in February 1996, provides guidance for the format and content of non-power reactor licensing applications submitted to the NRC (ADAMS Accession No. ML042430055). NUREG-1537, Part 1, Appendix 14.1, "Format and Content of Technical Specifications for Non-Power Reactors," provides guidance on the format and content of non-power reactor TSs. Appendix 14.1, references American Nuclear Standards Institute/American Nuclear Society (ANSI/ANS)-15.1-2007, "The Development of Technical Specifications for Research Reactors."
- NUREG-1537, Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria," issued in February 1996, provides guidance to NRC staff on conducting licensing

application reviews for non-power reactor licensing applications (ADAMS Accession No. ML042430048). NUREG-1537, Part 2, Chapter 14, "Technical Specifications," provides guidance for the review acceptability of proposed TSs.

2.3 Staff Evaluation

2.3.1 TS 7.5.2.1, "Approval Process"

The current TS 7.5.2.1 states:

No reactor experiment of a type not previously approved shall be performed until the materials prepared in Specification 7.5.1 have been reviewed and approved in writing by two licensed senior reactor operators, the Director of Reactor Operations, and the MITRSC.

The proposed TS 7.5.2.1 states:

No reactor experiment of a type not previously approved shall be performed until the materials prepared in Specification 7.5.1 (a) and (b) have been reviewed and approved in writing by two licensed senior reactor operators, the Director of Reactor Operations, and the MITRSC. The materials prepared in Specification 7.5.1 (c) shall be reviewed and approved as required by Specification 7.4 (Procedures).

The proposed change would not alter the review and approval of the experiment description, safety evaluation, or safety review, which is currently required to be done by two SROs, the DRO, and the MITRSC. The proposed change would only impact the review of procedures for experiments. The MITRSC would continue to review new procedures and major revisions to procedures related to the conduct of experiments having safety significance. New procedures and major revisions to procedures related to the conduct of experiments not having safety significance would not be reviewed by the MITRSC but would be reviewed and approved by two SROs and the DRO. However if the review of an experiment procedure identifies a situation in which the criteria of 10 CFR 50.59(c)(1) are not met, then the proposal must be referred to the MITSC.

Specifically, the proposed change would modify the review and approval process for TS 7.5.1.c) "Preparation of written procedures for the conduct of experiments," by removing the MITRSC as a required reviewer and approver. However, the experiment procedures would continue to be reviewed and approved as required by TS 7.4, "Procedures." TS 7.4.2 states, in part, that "No new procedure or a change to an existing one shall be implemented until the material prepared in Specification 7.4.1 has been reviewed and approved by two licensed SROs and the Director of Reactor Operations." TS 7.4.2 also states, in part that "In the event that the review required by Specification 7.4.1 identifies a situation in which the criteria of 10 CFR 50.59(c)(1) are not met ... then the proposal must be referred to the MITRSC (and possibly to the NRC)." In addition, if an experiment procedure or a major revision to an experiment procedure has safety significance, then the experiment procedure shall be reviewed by the MITRSC as required by TS 7.2.2.1.b).

The licensee stated in its letter dated February 14, 2018, that the proposed revisions to TS 7.5.2.1 are consistent with the guidance in ANSI/ANS-15.1-2007, Section 6.5, "Experiments Review and Approval." ANSI/ANS-15.1-2007, Section 6.5.(1) states: "All new experiments or class of experiments shall be reviewed by the review group (see Sec 6.2.3) and approved in

writing by Level 2 or designated alternates prior to initiation.” The February 14, 2018, letter also stated that the MIT “Level 2 [manager] or designated alternates,” are the DRO or designated acting DRO. TS 7.1.1 identifies the organizational structure for the management and operation of the reactor facility. TS Figure 7.1-1 identifies the DRO as the Level 2 manager and shows a line of communication between the DRO and the MITRSC.

The licensee also stated in its letter, dated February 14, 2018, that TS 7.4 “Procedures,” is consistent with the guidance in ANSI/ANS-15.1-2007, Section 6.4 “Procedures.” ANSI/ANS-15.1-2007, Section 6.4, “Procedures,” states in part that: “written procedures shall be prepared, reviewed, and approved prior to initiating any of the activities listed in this section,” which includes, “(6) administrative controls for the conduct of irradiations and experiments that could affect reactor safety or core reactivity ... shall be reviewed by the review group and approved by Level 2 management.” TS 7.4.2 [Procedure] “Approval Process,” requires review and approval by two licensed SROs and the DRO. The licensee indicated that review of written procedures by two SROs (review group) and the DRO (Level 2 manager) is consistent with the review group Level 2 manager identified in ANSI/ANS-15.1-2007 Section 6.4. However, the NRC staff notes that ANSI/ANS-15.1-2007, Section 6.4, refers to the review group in Section 6.2.3 of the standard which is the independent review and audit group which in the case of MIT is the MITRSC. Because the MITRSC reviews all new procedures and major revisions having safety significance, the NRC staff finds that review of experiment procedures is consistent with ANSI/ANS-15.1-2007.

Two SROs and the DRO will continue to review and approve all written procedures for the conduct of experiments. The NRC staff considers the SROs and the DRO to be an appropriate level of experiment procedure review and approval because the SROs and the DRO have detailed knowledge concerning reactor operations and have the skill and experience to determine both the adequacy of the experiment procedures and the impact of experiment procedures on reactor operations. The MITRSC must review and approve the experiment description, safety evaluation and written safety review before a type of experiment not previously approved may be performed. Also, the MITRSC would review new procedures and major revisions to procedures related to the conduct of experiments having safety significance. Also, if the review of an experiment procedure identifies a situation in which the criteria of 10 CFR 50.59(c)(1) are not met, then the proposal must be referred to the MITSC.

Based on its review, the NRC staff finds that the proposed revisions to TS 7.5.2 are adequate for performing experiments at the MITR. TS 7.5.2 continues to provide the necessary administrative controls to ensure safe reactor operations and protection of facility personnel and members of the public. Therefore, the NRC staff concludes that the regulatory requirements of 10 CFR 50.36 are met and the proposed revision to the TS is acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

The amendment changes recordkeeping, reporting, or administrative procedures or requirements in Section 7, “Administrative Controls,” of the TSs. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(10)(ii). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

4.0 CONCLUSION

The NRC staff has concluded, based on the considerations above, that (1) since the amendment changes an administrative requirement, no significant hazards are involved, (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed activities, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or the health and safety of the public.

Principal Contributor: Patrick G. Boyle

Date: June 12, 2018