

June 22, 2011

Dr. Gunter H. R. Kegel, Director
Nuclear Radiation Laboratory
University of Massachusetts Lowell
Pinanski Building
One University Avenue
Lowell, MA 01854

SUBJECT: UNIVERSITY OF MASSACHUSETTS LOWELL – AMENDMENT NO. 14 RE:
BYPRODUCT AND SPECIAL NUCLEAR MATERIAL POSSESSION LIMIT (TAC
NO. ME6139)

Dear Dr. Kegel:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 14 to Facility Operating License No. R-125 for the University of Massachusetts Lowell Research Reactor (UMLR). The amendment consists of changes to the facility operating license in response to your application dated April 25, 2011, as supplemented by letters dated May 25 and June 7, 2011.

The amendment increases the byproduct and special nuclear material possession limits for the UMLR to allow receipt and possession of byproduct and special nuclear material contained in fuel to be transferred from the Worcester Polytechnic Institute Research Reactor. In addition, this amendment corrects wording for license condition 2.B.(4).

The safety evaluation supporting Amendment No. 14 is enclosed.

Sincerely,

/RA/

Alexander Adams Jr., Senior Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-223

Enclosures:

1. Amendment No. 14
2. Safety Evaluation

cc w/encl: See next page

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UNIVERSITY OF MASSACHUSETTS LOWELL

DOCKET NO. 50-223

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 14
License No. R-125

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for an amendment to Facility Operating License No. R-125 filed by the University of Massachusetts Lowell (the licensee) on April 25, 2011, as supplemented by letters dated May 25 and June 7, 2011, conforms to the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the regulations of the Commission as stated in Chapter I of Title 10 of the *Code of Federal Regulations* (10 CFR);
 - 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 that (i) the activities authorized by this amendment can be conducted without endangering the health and safety of the public and (ii) such activities will be conducted in compliance with the regulations of the Commission;
 - 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. This amendment is issued in accordance with the regulations of the Commission as stated in 10 CFR Part 51, and all applicable requirements have been satisfied; and
 - F. Prior notice of this amendment was not required by 10 CFR 2.105 and publication of a notice for this amendment is not required by 10 CFR 2.106.

2. Accordingly, the license is amended by changes to paragraph 2.B.(4) of Facility Operating License No. R-125 which is hereby amended to read as follows:
 - (4) Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use, up to 5.0 kilograms of contained uranium-235 enriched to less than 20 percent in the form of Worcester Polytechnic Institute MTR-type reactor fuel.

3. Accordingly, the license is amended by the addition of paragraph 2.B.(5) to Facility Operating License No. R-125 which reads as follows:
 - (5) Pursuant to the Act and 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," and Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use or separate, such byproduct and special nuclear materials produced by the operation of the Worcester Polytechnic Institute Research Reactor (WPIRR), contained in MTR-type fuel transferred from the WPIRR.

This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/WKennedy for RA/

Jessie F. Quichocho, Chief
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Attachment:
Changes to Facility Operating License

Date of Issuance: June 22, 2011

UNIVERSITY OF MASSACHUSETTS LOWELL
ATTACHMENT TO LICENSE AMENDMENT NO. 14
FACILITY OPERATING LICENSE NO. R-125
DOCKET NO. 50-223

Replace the following pages of the Facility Operating License No. R-125 with the attached revised pages. The revised pages are identified by amendment number and contain a marginal line indicating the areas of change.

Remove

Page 2
Page 3

Insert

Page 2
Page 3

- G. The issuance of this license will not be inimical to the common defense and security or to the health and safety of the public.
 - H. The issuance of this license is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied; and
 - I. The receipt, possession and use of the byproduct and special nuclear materials as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Parts 30 and 70, including Sections 30.33, 70.23 and 70.31.
2. Facility Operating License No. R-125 is hereby amended in its entirety to read as follows:
- A. This license applies to the one megawatt, pool-type nuclear reactor (the facility) owned by the University of Massachusetts Lowell on its campus in Lowell, Massachusetts, as described in the application for license renewal dated February 14, 1985, as supplemented.
 - B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the University of Massachusetts Lowell:
 - (1) Pursuant to Section 104c of the Act and 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," to possess, use, and operate the facility at the designated location in Lowell, Massachusetts, in accordance with the procedures and limitations set forth in this license;
 - (2) Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to receive, possess, and use at any one time up to 6.0 kilograms of contained uranium-235 at enrichment less than 20 percent in the form of material test reactor (MTR) type reactor fuel for use in connection with operation of the reactor.
 - (3) Pursuant to the Act and 10 CFR 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the reactor, and to receive, possess and use up to 5 Ci Am-Be and 10 Ci Sb-Be neutron sources in connection with operation of the reactor, and to receive, possess, use and transfer byproduct materials activated in reactors other than the University of Massachusetts Lowell reactor, in the form of Cobalt-60, in quantities not to exceed 1,500,000 curies at any time.
 - (4) Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use, up to 5.0 kilograms of contained uranium-235 enriched to less than 20 percent in the form of Worcester Polytechnic Institute MTR-type reactor fuel.

- (5) Pursuant to the Act and 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," and Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use or separate, such byproduct and special nuclear materials produced by the operation of the Worcester Polytechnic Institute Research Reactor (WPIRR), contained in MTR-type fuel transferred from the WPIRR.
- C. This license shall be deemed to contain and is subject to the conditions specified in Parts 20, 30, 50, 51, 55, 70 and 73 of 10 CFR Chapter I, to all applicable provisions of the Act, and to the rules, regulations and orders of the Commission now or hereafter in effect and to the additional conditions specified below:
- (1) Maximum Power Level
The licensee is authorized to operate in the facility at reactor core power levels not in excess of one megawatt (thermal).
 - (2) Technical Specifications
The Technical Specifications contained in Appendix A, as revised through Amendment No. 13, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.
 - (3) Physical Security Plan
The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security plan, including all amendments and revisions made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p), which are part of the license. This plan, which contains information withheld from public disclosure under 10 CFR 2.790, is entitled "Security Plan for Protection of Special Nuclear Material at University of Massachusetts Lowell," with revisions submitted through April 15, 1981.
 - (4) The licensee shall submit a startup test report within six months of the initial criticality with low-enriched uranium reactor fuel in accordance with Amendment No. 12. This report shall be sent as specified in 10 CFR 50.4, "Written Communications."
- D. This license is effective as of the date of issuance and shall expire thirty years from its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION
/RA/

Dennis M. Crutchfield, Acting Director
Division of Licensing

Enclosure:
Appendix A Technical
Specifications

DATE OF ISSUANCE: November 21, 1985

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 14 TO

FACILITY OPERATING LICENSE NO. R-125

THE UNIVERSITY OF MASSACHUSETTS LOWELL

DOCKET NO. 50-223

1.0 **INTRODUCTION**

By letter dated April 25, 2011, as supplemented by letters dated May 25, and June 7, 2011, the University of Massachusetts Lowell (UML or the licensee) requested an amendment to Facility Operating License No. R-125 for the University of Massachusetts Lowell Research Reactor (UMLR) (Agencywide Documents Access and Management System (ADAMS) ML11115A018, ML11147A158 and ML11159A221). The requested amendment would increase the possession limit for byproduct material and special nuclear material (SNM) to allow for the receipt and possession of byproduct material and SNM produced by the operation of the Worcester Polytechnic Institute (WPI) Research Reactor (WPIRR), contained in the material test reactor (MTR)-type reactor fuel transferred from the WPIRR. In addition, the licensee requested that the wording of license condition 2.B.(4) be amended to be consistent with the May 7, 2010, letter requesting License Amendment No. 13 to correct a typographical error made during issuance of the license condition.

2.0 **BACKGROUND**

The UMLR is a 1000 kilowatt thermal power (kW(t)) pool-type research reactor that uses MTR-type plate fuel elements. The WPIRR has permanently shut down and is planning to decommission. Amendment No. 13 to Facility Operating License No. R-125 issued on June 2, 2010, allowed the receipt and possession at UML of uranium-235 contained in fuel to be transferred from the WPIRR.

While Amendment No. 13 authorized the receipt and possession of SNM of up to 5.0 kilograms of contained uranium-235 enriched to less than 20 percent in the form of WPI MTR-type reactor fuel, the Amendment No. 13 application and subsequent issued amendment did not specifically authorize receipt and possession of byproduct material and SNM contained in the WPI fuel produced by the operation of the fuel in the WPIRR.

This amendment would allow receipt and possession of the byproduct and SNM produced by the operation of the WPIRR, contained in the MTR-type reactor fuel transferred from the WPIRR. The licensee states that the byproduct and SNM produced and contained in the WPI fuel are significantly less by orders of magnitude than that for the previously stored UML fuel. Although the current fuel inventory at UMLR is expected to last 9 years, subsequent usage of the WPI fuel

could provide an additional 7.5 years of life assuming an average usage of 20 megawatt-days (MWD) per year.

A wording error was identified in license condition 2.B.(4) for which clarification has been requested to make the wording consistent with the wording in the request for License Amendment No. 13 dated June 29, 2009, as supplemented by letters dated May 7 and 14, 2010.

3.0 EVALUATION

The regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 30, "Rules of General Applicability of Byproduct Material," and 10 CFR 70, "Domestic Licensing of Special Nuclear Material," require byproduct and SNM to be licensed. License Amendment No. 13 for the UMLR authorizes the receipt and possession, but not use of SNM in the form of WPIRR MTR-type reactor fuel (uranium-235).

A typographical error was made in the wording of the license condition 2.B.(4) in Amendment No. 13. To be consistent with the licensee's request on May 7, 2010, license condition 2.B.(4) is corrected to read:

- (4) Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use, up to 5.0 kilograms of contained uranium-235 enriched to less than 20 percent in the form of Worcester Polytechnic Institute MTR-type reactor fuel.

The correction adds the words "receive and" to the license condition. This change is a wording change only and License Amendment No. 13 remains valid. The corrected wording was proposed by the licensee and was evaluated and found acceptable by the NRC staff in Amendment No. 13. Since the proposed change to the license condition 2.B.(4) corrects wording and results in the license conditions being consistent with the intent of Amendment No. 13, the changes are acceptable to the NRC staff.

License condition 2.B.(4), is for the receipt and possession of this SNM, however, the WPIRR fuel elements to be shipped by the Department of Energy (DOE) to the licensee were previously irradiated and therefore not only contain uranium-235, but also contain byproduct material in the form of fission products and activation products, and SNM in the form of plutonium produced during operation with the fuel at the WPIRR. In order to take receipt and possess the WPI fuel, a license amendment is necessary to account for the byproduct material and SNM contained in the WPI fuel produced by operation while in the WPIRR. The licensee has proposed a new license conditions which reads as follows:

- (5) Pursuant to the Act and 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," and Part 70, "Domestic Licensing of Special Nuclear Material," to receive and possess, but not use or separate, such byproduct and special nuclear materials produced by the operation of the Worcester Polytechnic Institute Research Reactor (WPIRR), contained in MTR-type fuel transferred from the WPIRR.

The licensee states that the safety evaluation included in Amendment No. 13 applies to this amendment request. The UMLR facility has storage capability for 72 fuel elements. The licensee has confirmed that this is sufficient to hold all existing fuel on site as well as the WPI fuel. The quantity of byproduct and SNM in the WPI fuel will be relatively small because the burn-up on the WPI fuel elements is negligible. Following conversion of the reactor in 2000, the licensee had safely possessed irradiated fuel in storage at the facility for four years. The licensee states that "the utilization history of the WPI reactor core is approximately 335 kilowatt hours (0.014 megawatt day) for an average burn-up of less than 0.001 MWD per fuel element. The fuel has been in wet-storage at WPI since June 2007." In contrast, the UMLR stored fuel had an average burn-up rate of 8.4 MWD per fuel element. The byproduct and SNM produced and contained in the WPI fuel are significantly less than that for the previously stored fuel at the UMLR. The wording of the amendment request is consistent with wording of license conditions approved by NRC for byproduct material and SNM contained in irradiated fuel. Based on the NRC staff review of the licensee's application, the NRC staff finds that the existing systems, plans, and procedures associated with the irradiated fuel storage will be adequate for possession of the WPI fuel.

The TS 5.4, "Fuel Storage" specifies that all reactor fuel element storage facilities shall be designed in geometrical configuration so that K_{eff} is less than 0.85 under quiescent flooding with water. The NRC staff reviewed the licensee's previous analysis of K_{eff} for the fresh and spent fuel arrangements in the UMLR pool and determined that the existing fuel holding racks will keep the K_{eff} value well below the TS 5.4 maximums. The additional byproduct material and SNM produced by the operation of WPIRR, contained in MTR-type fuel transferred from the WPIRR, would have a negligible effect on the k_{eff} since the quantities of byproduct and SNM in WPI is small. The licensee states that the presence of byproduct material and SNM in the fuel does not affect the prior evaluation for fuel storage and does not affect the requirements of TS 5.4. Because the WPI fuel elements have negligible burn-up, and contain relatively small quantities of byproduct and SNM, storage of the WPI fuel is within the parameters of the evaluation discussed above, which was found acceptable by NRC. Therefore, the NRC staff concludes that storage of the WPI byproduct material and SNM meets the requirements of TS 5.4.

The licensee's security plan is written for protecting SNM of moderate strategic significance. The licensee has not requested any changes to the approved security plan and states that the presence of byproduct material and SNM in the fuel will not affect the security plan for SNM of moderate strategic significance. The licensee has not requested any changes to the facility TSs or emergency plan as part of the increase in the byproduct material and SNM possession limit. There are no accidents identified for this reactor that are dependent on the amount of fuel in storage.

The NRC staff reviewed the UML license material possession limits, the application from the licensee, supplements, and the 2010 NRC staff safety evaluation for Amendment No. 13 to the UMLR license. Based on its review, the NRC staff finds that the licensee has demonstrated a need under the UML license for the requested byproduct material and SNM, produced by the operation of WPIRR, contained in the MTR-type fuel transferred from the WPIRR. The requested material will be received and possessed under the terms of the existing TSs, security, and emergency plans. The licensee has formerly safely stored fuel for extended periods of time. The NRC staff concludes that the increase in the byproduct material and SNM possession limit

is acceptable. The changes to the license condition 2.B.(4) to correct typographical errors to be consistent with the May 7, 2010, request for license amendment is also acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

The NRC staff has determined that this amendment involves no significant hazards consideration, no significant increase in the amounts, and no significant change in the types, of any effluents that may be released off site, and no significant increase in individual or cumulative occupational radiation exposure. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

5.0 CONCLUSION

The NRC staff concludes, on the basis of the considerations discussed above, that (1) the amendment does not involve a significant hazards consideration because the amendment does not involve a significant increase in the probability or consequences of accidents previously evaluated, create the possibility of a new kind of accident or a different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety; (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.

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Date: June 22, 2011

University of Massachusetts - Lowell

Docket No. 50-223

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