

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
UNIVERSITY OF WISCONSIN	)	Docket No. 50-156
	)	EA-09-141
(University of Wisconsin Nuclear Reactor)	)	

[NRC-2009-0245]

ORDER MODIFYING FACILITY OPERATING LICENSE NO. R-74

I.

University of Wisconsin (the licensee) is the holder of Amended Facility Operating License No. R-74 (the license) originally issued on February 4, 1974, by the U.S. Atomic Energy Commission. The license authorizes operation of the University of Wisconsin Nuclear Reactor (the facility) at a power level up to 1,000 kilowatts thermal and in the pulse mode, with reactivity insertions not to exceed 1.4 % $\Delta$ k/k, and to receive, possess, and use special nuclear material associated with facility operation. The facility is a research reactor located on the campus of the University of Wisconsin, in the city of Madison, Dane County, Wisconsin. The mailing address is Nuclear Reactor Laboratory, University of Wisconsin – Madison, 1513 University Avenue, Room 1215 ME, Madison, WI 53706-1687.

II.

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.64, "Limitations on the Use of Highly Enriched Uranium (HEU) in Domestic Nonpower Reactors," limits the use of high-enriched uranium (HEU) fuel in domestic non-power reactors (research and test reactors). The regulation, which became effective on March 27, 1986 (Volume 51 of the *Federal Register*, page 6514 (51 FR 6514)), requires that, if Federal Government funding for conversion-related costs is available, each licensee of a non-power reactor authorized to use HEU fuel shall replace it with low-enriched uranium (LEU) fuel acceptable to the Commission unless the

Commission has determined that the reactor has a unique purpose. The Commission's stated purpose for these requirements was to reduce, to the maximum extent possible, the use of HEU fuel in order to reduce the risk of theft and diversion of HEU fuel used in non-power reactors.

Paragraphs 50.64(b)(2)(i) and (ii) require that a licensee of a non-power reactor (1) not acquire more HEU fuel if LEU fuel that is acceptable to the Commission for that reactor is available when the licensee proposes to acquire HEU fuel, and (2) replace all HEU fuel in its possession with available LEU fuel acceptable to the Commission for that reactor in accordance with a schedule determined pursuant to 10 CFR 50.64(c) (2).

Paragraph 50.64(c)(2)(i) requires, among other things, that each licensee of a non-power reactor authorized to possess and to use HEU fuel develop, submit to the Director of the Office of Nuclear Reactor Regulation (the Director) by March 27, 1987, and at 12-month intervals thereafter, a written proposal for meeting the requirements of the rule. The licensee shall include in its proposal a certification that Federal Government funding for conversion is available through the U.S. Department of Energy or other appropriate Federal agency. The proposal should also provide a schedule for conversion, based upon the availability of replacement fuel acceptable to the Commission for that reactor and upon consideration of other factors such as the availability of shipping casks, implementation of arrangements for available financial support, and reactor usage.

Paragraph 50.64(c)(2)(iii) requires the licensee to include in the proposal, to the extent required to effect conversion, all necessary changes to the license, the facility, and licensee procedures. This paragraph also requires the licensee to submit supporting safety analyses in time to meet the conversion schedule.

Paragraph 50.64(c)(2)(iii) also requires the Director to review the licensee proposal, to confirm the status of Federal Government funding, and to determine a final schedule, if the licensee has submitted a schedule for conversion.

Section 50.64(c)(3) requires the Director to review the supporting safety analyses and to issue an appropriate enforcement order directing both the conversion and, to the extent consistent with the protection of public health and safety, any necessary changes to the license, the facility, and licensee procedures. In the *Federal Register* notice of the final rule (51 FR 6514), the Commission explained that in most, if not all cases, the enforcement order would be an order to modify the license under 10 CFR 2.204 (now 10 CFR 2.202).

Any person, other than the licensee, whose interest may be affected by this proceeding and who desires to participate as a party must file a written request for hearing or petition for leave to intervene meeting the requirements of 10 CFR 2.309, "Hearing Requests, Petitions to Intervene, Requirements for Standing, and Contentions."

### III.

The U.S. Nuclear Regulatory Commission (NRC) maintains the Agencywide Documents Access and Management System (ADAMS), which provides text and image files of the NRC's public documents. On August 25, 2008, the licensee submitted its conversion proposal (ADAMS Accession No. ML090760776), which was supplemented on April 10, 2009 (ADAMS Accession No. ML091470391), May 1, 2009 (ADAMS Accession No. ML091470390), and June 4, 2009 (ADAMS Accession No. ML091610704), including its proposed modifications and supporting safety analyses. HEU fuel elements are to be replaced with LEU fuel elements. The reactor core contains fuel elements of the TRIGA design, with the LEU fuel consisting of uranium-zirconium hydride with 30 weight percent uranium. These LEU fuel elements contain the uranium-235 isotope at an enrichment of less than 20 percent. The NRC staff reviewed the licensee's proposal and the requirements of 10 CFR 50.64 and have determined that public health and safety and common defense and security require the licensee to convert the facility from the use of HEU to LEU fuel in accordance with the attachments to this Order and the

schedule included herein. The attachments to this Order specify the changes to the license conditions, technical specifications, and emergency plan that are needed to amend the facility license and contain an outline of a reactor startup report to be submitted to the NRC within 6 months following the return of the converted reactor to normal operation.

IV.

Accordingly, pursuant to Sections 51, 53, 57, 101, 104, 161b, 161i, and 161o of the Atomic Energy Act of 1954, as amended, and to Commission regulations in 10 CFR 2.202 and 10 CFR 50.64, IT IS HEREBY ORDERED THAT:

Facility Operating License No. R-74 is modified by amending the license conditions, technical specifications, and emergency plan as stated in the attachments to this Order (Attachment 1: MODIFICATIONS TO FACILITY OPERATING LICENSE NO. R-74; Attachment 2: MODIFICATIONS TO EMERGENCY PLAN; Attachment 3: OUTLINE OF REACTOR STARTUP REPORT). License Condition 2.B, allowing possession of LEU fuel, becomes effective, provided there are no requests for a hearing, 20 days after the date of publication of this Order in the *Federal Register*. All other changes become effective, provided there are no requests for a hearing, on the later date of either (1) the day the licensee receives an adequate number and type of LEU fuel elements to operate the facility as specified in the licensee proposal dated August 25, 2008 (ADAMS Accession No. ML090760776), as supplemented on April 10, 2009 (ADAMS Accession No. ML091470391), May 1, 2009 (ADAMS Accession No. ML091470390), and June 4, 2009 (ADAMS Accession No. ML091610704), or (2) 20 days after the date of publication of this Order in the *Federal Register*.

V.

Those permitted to intervene become parties to the proceeding, subject to any limitations in the order granting leave to intervene, and have the opportunity to participate fully in the conduct of the hearing.

All documents filed in NRC adjudicatory proceedings, including a request for hearing, a petition for leave to intervene, any motion or other document filed in the proceeding prior to the submission of a request for hearing or petition to intervene, and documents filed by interested governmental entities participating under 10 CFR 2.315(c), must be filed in accordance with the NRC E-Filing rule, which the NRC promulgated in August 2007, 72 FR 49139 (Aug. 28, 2007). The E-Filing process requires participants to submit and serve all adjudicatory documents over the internet, or in some cases to mail copies on electronic storage media. Participants may not submit paper copies of their filings unless they seek an exemption in accordance with the procedures described below.

To comply with the procedural requirements of E-Filing, at least ten (10) days prior to the filing deadline, the petitioner/requestor should contact the Office of the Secretary by e-mail at HEARING.DOCKET@NRC.GOV, or by calling (301) 415-1677, to request (1) a digital ID certificate, which allows the participant (or its counsel or representative) to digitally sign documents and access the E-Submittal server for any proceeding in which it is participating; and/or (2) creation of an electronic docket for the proceeding (even in instances in which the petitioner/requestor (or its counsel or representative) already holds an NRC-issued digital ID certificate). Each petitioner/ requestor will need to download the Workplace Forms Viewer™ to access the Electronic Information Exchange (EIE), a component of the E-Filing system. The Workplace Forms Viewer™ is free and is available at <http://www.nrc.gov/site-help/e-submittals/install-viewer.html>. Information about applying for a digital ID certificate is available on NRC's public website at <http://www.nrc.gov/site-help/e-submittals/apply-certificates.html>.

Once a petitioner/requestor has obtained a digital ID certificate, had a docket created, and downloaded the EIE viewer, it can then submit a request for hearing or petition for leave to intervene. Submissions should be in Portable Document Format (PDF) in accordance with NRC guidance available on the NRC public website at <http://www.nrc.gov/site-help/e-submittals.html>.

A filing is considered complete at the time the filer submits its documents through EIE. To be timely, an electronic filing must be submitted to the EIE system no later than 11:59 p.m. Eastern Time on the due date. Upon receipt of a transmission, the E-Filing system time-stamps the document and sends the submitter an e-mail notice confirming receipt of the document. The EIE system also distributes an e-mail notice that provides access to the document to the NRC Office of the General Counsel and any others who have advised the Office of the Secretary that they wish to participate in the proceeding, so that the filer need not serve the documents on those participants separately. Therefore, applicants and other participants (or their counsel or representative) must apply for and receive a digital ID certificate before a hearing request/petition to intervene is filed so that they can obtain access to the document via the E-Filing system.

A person filing electronically using the agency's adjudicatory e-filing system may seek assistance through the "Contact Us" link located on the NRC website at <http://www.nrc.gov/site-help/e-submittals.html> or by calling the NRC electronic filing help desk, which is available between 8:00 a.m. and 8:00 p.m., Eastern Time, Monday through Friday, excluding government holidays. The toll-free help line number is (866) 672-7640. A person filing electronically may also seek assistance by sending an e-mail to the NRC electronic filing help desk at [MSHD.Resource@nrc.gov](mailto:MSHD.Resource@nrc.gov).

Participants who believe that they have a good cause for not submitting documents electronically must file an exemption request, in accordance with 10 CFR 2.302(g), with their initial paper filing requesting authorization to continue to submit documents in paper format. Such filings must be submitted by: (1) first class mail addressed to the Office of the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff; or (2) courier, express mail, or expedited delivery service to the Office of the Secretary, Sixteenth Floor, One White Flint North, 11555 Rockville, Pike,

Rockville, Maryland, 20852, Attention: Rulemaking and Adjudications Staff. Participants filing a document in this manner are responsible for serving the document on all other participants. Filing is considered complete by first-class mail as of the time of deposit in the mail, or by courier, express mail, or expedited delivery service upon depositing the document with the provider of the service.

Non-timely requests and/or petitions and contentions will not be entertained absent a determination by the Commission, the presiding officer, or the Atomic Safety and Licensing Board that the petition and/or request should be granted and/or the contentions should be admitted based on a balancing of the factors specified in 10 CFR § 2.309(c)(1)(i)-(viii). To be timely, filings must be submitted no later than 11:59 p.m. Eastern Time on the due date.

Documents submitted in adjudicatory proceedings will appear in NRC's electronic hearing docket which is available to the public at [http://ehd.nrc.gov/EHD\\_Proceeding/home.asp](http://ehd.nrc.gov/EHD_Proceeding/home.asp), unless excluded pursuant to an order of the Commission, an Atomic Safety and Licensing Board, or a Presiding Officer. Participants are requested not to include personal privacy information, such as social security numbers, home addresses, or home phone numbers in their filings, unless an NRC regulation or other law requires submission of such information. With respect to copyrighted works, except for limited excerpts that serve the purpose of the adjudicatory filings and would constitute a Fair Use application, participants are requested not to include copyrighted materials in their submission.

If a hearing is requested and the request is granted by the Commission, the NRC will issue an order designating the time and place of the hearing.

In the absence of any request for hearing, the provisions as specified in Section IV shall be final twenty (20) days after the date of publication of this Order in the *Federal Register*.

In accordance with 10 CFR 51.10(d), this Order is not subject to Section 102(2) of the National Environmental Policy Act, as amended. The NRC staff notes, however, that with

respect to environmental impacts associated with the changes imposed by this Order as described in the safety evaluation, the changes would, if imposed by other than an order, meet the definition of a categorical exclusion in accordance with 10 CFR 51.22(c)(9). Thus, pursuant to either 10 CFR 51.10(d) or 51.22(c)(9), no environmental assessment or environmental impact statement is required.

Detailed guidance that the NRC uses to review applications from research reactor licensees appears in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996, which can be obtained from the Commission's Public Document Room (PDR). The public may also access NUREG-1537 through the NRC's Public Electronic Reading Room on the Internet at <http://www.nrc.gov/reading-rm/adams.html> under ADAMS Accession Nos. ML0412430055 for Part 1 and ML042430048 for Part 2.

For further information see the application from the licensee dated August 25, 2008 (ADAMS Accession No. ML090760776), as supplemented on April 10, 2009 (ADAMS Accession No. ML091470391), May 1, 2009 (ADAMS Accession No. ML091470390), and June 4, 2009 (ADAMS Accession No. ML091610704), the NRC staff's request for additional information (ADAMS Accession No. ML090540005), and the cover letter to the licensee and the staff's safety evaluation dated June 11, 2009, (ADAMS Accession No. ML091390802). These documents are available for public inspection in the PDR, located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, MD. Publicly available

records will be accessible electronically from the Public Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who have problems accessing the documents in ADAMS should contact the NRC PDR reference staff by telephone at (800) 397-4209 or (301) 415-4737 or by e-mail to [pdr@nrc.gov](mailto:pdr@nrc.gov).

Dated this 11<sup>th</sup> day of June 2009.

FOR THE NUCLEAR REGULATORY COMMISSION

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James T. Wiggins, Deputy Director  
Office of Nuclear Reactor Regulation

ATTACHMENT 1 - MODIFICATIONS TO FACILITY OPERATING LICENSE NO. R-74

A. License Conditions Revised by This Order

1. The license applies to the University of Wisconsin's nuclear reactor with the TRIGA nuclear core and control system (herein "the reactor") owned by the University of Wisconsin (herein "the licensee"), and located on the University's campus in Madison, Wisconsin, and described in the licensee's application for license dated July 13, 1966, and amendments thereto including the amendment dated June 6, 1973, and supplements dated August 1, and August 21, 1973, (herein "the application").

2.B. Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material,"

(1) to receive, possess and use, in connection with operation of the facility, up to 15.0 kilograms of contained uranium-235 enriched to less than 20 percent in the form of TRIGA reactor fuel;

(2) to receive, possess and use, in connection with operation of the facility, up to 150 grams of contained uranium-235 of any enrichment in the form of neutron detectors;

(3) to receive, possess and use, in connection with operation of the facility, up to 16 grams of contained plutonium in the form of plutonium-beryllium neutron source;

(4) to receive, possess, use, but not separate, in connection with operation of the facility, such special nuclear material as may be produced by operation of the facility; and

(5) to possess, but not use, up to 18.0 kilograms of contained uranium-235 at equal to or greater than 20 percent enrichment in the form of TRIGA fuel until the existing inventory of this fuel is removed from the facility.

3.B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 17, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications

ATTACHMENT 2 - MODIFICATIONS TO EMERGENCY PLAN

Replace the following pages of the University of Wisconsin Nuclear Reactor Emergency Plan (EP) with the enclosed pages.

<u>Remove</u>	<u>Insert</u>
EP Page 1	EP Page 1, Rev 6
EP Page 5	EP Page 5, Rev 7
EP Page 6	EP Page 6, Rev 6
EP Page 7	EP Page 7, Rev 6
EP Page 13	EP Page 13, Rev 7
EP Page 14	EP Page 14, Rev 7
EP Page 15	EP Page 15, Rev 7

ATTACHMENT 3 - OUTLINE OF REACTOR STARTUP REPORT

Within six months following the return of the converted reactor to normal operation, submit the following information to the NRC. Information on the HEU core should be presented to the extent it exists.

1. Critical mass  
  
Measurement with HEU  
Measurement with LEU  
Comparisons with calculations for LEU and if available, HEU
2. Excess (operational) reactivity  
  
Measurement with HEU  
Measurement with LEU  
Comparisons with calculations for LEU and if available, HEU
3. Control rod calibrations  
  
Measurement of HEU and LEU rod worths and comparisons with calculations for LEU and if available, HEU
4. Reactor power calibration  
  
Methods and measurements that ensure operation within the license limit and comparison between HEU and LEU nuclear instrumentation set points, detector positions and detector output.
5. Shutdown margin  
  
Measurement with HEU  
Measurement with LEU  
Comparisons with calculations for LEU and if available, HEU
6. Thermal neutron flux distributions  
  
Measurements of the core and measured experimental facilities (to the extent available) with HEU and LEU and comparisons with calculations for LEU and if available, HEU.
7. Reactor physics measurements  
  
Results of determination of LEU effective delayed neutron fraction, temperature coefficient, and void coefficient to the extent that measurements are possible and comparison with calculations and available HEU core measurements.

8. Initial LEU core loading

Measurements made during initial loading of the LEU fuel, presenting subcritical multiplication measurements, predictions of multiplication for next fuel additions, and prediction and verification of final criticality conditions.

9. Primary coolant measurements

Results of any primary coolant water sample measurements for fission product activity taken during the first 30 days of LEU operation.

10. Results of any test pulses performed and comparison with calculations and available HEU core measurements.

11. Discussion of results

Discussion of the comparison of the various results including an explanation of any significant differences that could affect normal operation and accident analyses.