

January 4, 2011

Mr. Stephen Frantz, Director
The Reed Research Reactor
Reed College
3203 SE Woodstock Blvd.
Portland, OR 97202-8199

SUBJECT: REED COLLEGE - AMENDMENT RE: SPECIAL NUCLEAR AND BYPRODUCT
MATERIAL POSSESSION LIMITS (TAC NO. ME4086)

Dear Mr. Frantz:

The U. S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 8 to Facility License No. R-112 for the Reed Research Reactor (RRR). The amendment consists of changes to the facility license and technical specifications in response to your application dated May 28, 2010, as supplemented by letters dated October 21 and December 6, 2010, and by electronic mail dated December 17, 2010, and January 3, 2011.

The amendment increases the facility license possession limit of special nuclear and byproduct material to allow fuel from the University of Arizona Research Reactor to be received, possessed and used in the RRR. The amendment also revises the format of the special nuclear and byproduct material license conditions to reflect the current format supported by the NRC staff for these conditions.

The safety evaluation supporting Amendment No. 8 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. 50-288

Enclosures:

1. Amendment No. 8
2. Safety Evaluation

cc w/encl: See next page

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ADAMS Accession No: ML103440421 * Concurrence via e-mail

NRR-058

OFFICE	PRLB:LA	PRLB:PM*	OGC	PRLB:BC	PRLB:PM
NAME	GLappert*	AAdams	BMizuno, NLO	JQuichocho	AAdams
DATE	12/17/2010	1/3/2011	12/27/2011	1/4/2011	1/4/2011

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REED COLLEGE

DOCKET NO. 50-288

AMENDMENT TO THE FACILITY LICENSE

Amendment No. 8
License No. R-112

1. The U. S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for an amendment to Facility License No. R-112 filed by Reed College (the licensee) on May 28, 2010, as supplemented on October 21 and December 6 and 17, 2010, and January 3, 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, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," and all applicable requirements have been satisfied; and
 - F. Prior notice of this amendment was not required by 10 CFR 2.105, "Notice of proposed action," and publication of a notice for this amendment is not required by 10 CFR 2.106, "Notice of issuance."

2. Accordingly, the license is amended by changes to paragraph 2.B of Facility License No. R-112 which is hereby amended to read as follows:

B. Pursuant to the Act and Title 10, Chapter I, CFR, Part 70, "Domestic Licensing of Special Nuclear Material:"

- (1) to receive, possess, use, but not separate, in connection with operation of the facility, up to 2500 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel;
- (2) to receive, possess, use, but not separate, in connection with operation of the facility, up to 3100 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel from the University of Arizona reactor and to receive, possess, use, but not separate, in connection with operation of the facility, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor;
- (3) 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 reactor;
- (4) to receive and possess, but not use or separate, up to 250 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel elements 2898, 4058, 7879, 10211, shim rod fuel follower, and regulating rod fuel follower from the University of Arizona reactor and to receive and possess, but not use or separate, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor; and
- (5) to receive, possess, use, but not separate, in connection with operation of the facility, up to 11 grams of uranium-235 in the form of fission chambers.

3. Accordingly, the license is amended by changes to paragraph 2.C of Facility License No. R-112 which is hereby amended to read as follows:

C. Pursuant to the Act and Title 10, Chapter I, CFR, Part 30, "Rules of General Applicability to Licensing of Byproduct Material:"

- (1) to receive, possess and use in connection with operation of the facility, a 1.64-curie sealed americium-beryllium neutron startup source;
- (2) to receive, possess, use, but not separate, in connection with operation of the facility, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(2) above;

- (3) to receive and possess, but not use or separate, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(4) above; and
 - (4) to receive, possess, use, but not separate, in connection with operation of the facility, such byproduct material as may be produced by operation of the facility.
4. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the enclosure to this license amendment, and paragraph 3.B. of Facility License No. R-112 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 8, are hereby incorporated in the license. The licensee shall operate the reactor in accordance with these Technical Specifications. No changes shall be made in the Technical Specifications unless authorized by the Commission as provided in Section 50.59 of 10 CFR Part 50.

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

FOR THE NUCLEAR REGULATORY COMMISSION

/LTran for RA/

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

Attachments:

Changes to Facility License
and Technical Specifications

Date of Issuance: January 4, 2011

REED COLLEGE

ATTACHMENT TO LICENSE AMENDMENT NO. 8

FACILITY LICENSE NO. R-112

DOCKET NO. 50-288

Replace the following pages of Facility License No. R-112 with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility License

Remove

Page 2

Page 3

Insert

Page 2

Page 3

1. This license applies to the TRIGA Mark I type nuclear reactor (herein "the reactor"), owned by Reed College and located on its campus in Portland, Oregon, and which is described in the application for license dated April 15, 1967, and supplements thereto dated July 5 and August 22, 1967, and March 13 and April 26, 1968 (herein referred to as "the application"), and authorized for construction by Construction Permit No. CPRR-101.
2. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses Reed College:
 - A. Pursuant to Section 104 c of the Act and Title 10, Chapter 1, CFR, Part 50, "Licensing of Production and Utilization Facilities", to possess, use and operate the reactor as a utilization facility in accordance with the procedures and limitations described in the application and in this license;
 - B. Pursuant to the Act and Title 10, Chapter I, CFR, Part 70, "Domestic Licensing of Special Nuclear Material:"
 - (1) to receive, possess, use, but not separate, in connection with operation of the facility, up to 2500 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel;
 - (2) to receive, possess, use, but not separate, in connection with operation of the facility, up to 3100 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel from the University of Arizona reactor and to receive, possess, use, but not separate, in connection with operation of the facility, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor;
 - (3) 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 reactor;
 - (4) to receive and possess, but not use or separate, up to 250 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel elements 2898, 4058, 7879, 10211, shim rod fuel follower, and regulating rod fuel follower from the University of Arizona reactor and to receive and possess, but not use or separate, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor; and
 - (5) to receive, possess, use, but not separate, in connection with operation of the facility, up to 11 grams of uranium-235 in the form of fission chambers.
 - C. Pursuant to the Act and Title 10, Chapter I, CFR, Part 30, "Rules of General Applicability to Licensing of Byproduct Material:"

- (1) to receive, possess and use in connection with operation of the facility, a 1.64-curie sealed americium-beryllium neutron startup source;
- (2) to receive, possess, use, but not separate, in connection with operation of the facility, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(2) above;
- (3) to receive and possess, but not use or separate, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(4) above; and
- (4) to receive, possess, use, but not separate, in connection with operation of the facility, such byproduct material as may be produced by operation of the facility.

3. This license shall be deemed to contain and be subject to the conditions specified in Part 20, Section 30.34 of Part 30, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70 of the Commission's regulations; is subject to all applicable provisions of the Act and rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

A. Maximum Power Level

The licensee may operate the reactor at steady-state power levels up to a maximum of 250 kilowatts (thermal).

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 8, are hereby incorporated in the license. The licensee shall operate the reactor in accordance with these Technical Specifications. No changes shall be made in the Technical Specifications unless authorized by the Commission as provided in Section 50.59 of 10 CFR Part 50.

C. Records

(This entire section deleted as per amendment of 10-3-72. See Section K of the Technical Specifications.)

D. Reports

In addition to reports otherwise required by applicable regulations:

REED COLLEGE

ATTACHMENT TO LICENSE AMENDMENT NO. 8

FACILITY LICENSE NO. R-112

TECHNICAL SPECIFICATIONS

DOCKET NO. 50-288

Replace the following page of Appendix A, "Technical Specifications," with the enclosed page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove

Page 4

Insert

Page 4

G. Radiation Monitoring

1. The radiation levels within the reactor room shall be monitored by at least one area radiation monitor during reactor operation or when work is done on or around the reactor core or experimental facilities. The monitor shall have a readout and provide a signal which actuates an audible alarm. During short periods of repair to this monitor (up to one week), reactor operations may continue while a detector capable of displaying gamma dose rate is utilized as a temporary substitute. (Amended by Change No.6)
2. A continuous air monitor with readout and audible alarm shall be operable in the reactor room when the reactor is operating.
3. The alarm set points for the above radiation monitoring instrumentation shall be verified at least once a week. This instrumentation shall be calibrated at least once a year.

H. Fuel Storage

1. All fuel elements or fueled devices shall be rigidly supported during storage in a safe geometry (k_{eff} less than 0.8 under all conditions of moderation) except for five elements (two with thermocouples, two control rod followers, and one damaged element S/N 4058) being held in an approved NAC-LWT transfer basket. The five elements in the transfer basket shall have a k_{eff} less than 0.95. The edge of the transfer basket shall not be stored within 40 cm of any other fuel elements.
2. Irradiated fuel elements and fuel devices shall be stored in an array which will permit sufficient natural convection cooling such that the fuel element or fuel device temperature will not exceed design values.

I. Administrative Requirements

1. The facility shall be under the direct control of the Facility Director. He or she shall be responsible to the President of Reed College for safe operation and maintenance of the reactor and its associated equipment. The Director's staff shall include a reactor supervisor, senior reactor operators, and reactor operators. The Director (or appointee) shall review and approve all experiments and experimental procedures prior to their use in the reactor. The Director shall enforce rules for the protection of personnel against radiation. (Amended by Change No.6)
2. A Radiation Safety Committee shall review and approve safety standards associated with operation and use of the facility. It shall report directly to the President of Reed College. Its membership shall consist of faculty members and individuals from outside organizations not connected with operation of the reactor facility. It shall meet at least twice yearly to review safety aspects of facility operation. (Amended by Change No. 2)
3. A Reactor Operations Committee shall be composed of a minimum of four members of the faculty and facility staff, including the reactor supervisor and a qualified health physicist. It shall review facility operations at least twice yearly and shall meet as required to review all questions of safety of operation and scheduling of work of a non-routine nature. (Amended by Change No.2) It shall review all experiments of the following types:
 - (a) Any experiment involving fissionable material.
 - (b) Any new experiment of a type not previously reviewed by the committee.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 8 TO

FACILITY LICENSE NO. R-112

REED COLLEGE

DOCKET NO. 50-288

1.0 INTRODUCTION

By letter dated May 28, 2010, as supplemented by letters dated October 21 and December 6, 2010, and by electronic mail dated December 17, 2010, and January 3, 2011, Reed College (Reed or the licensee) requested an amendment to Facility License No. R-112 for the Reed Research Reactor (RRR) (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML101590513, ML103000126, ML103490406, ML103610287, and ML110040002). The requested amendment would increase the possession limit of special nuclear and byproduct material to allow fuel from the University of Arizona Research Reactor (UARR) to be received, possessed and used in the RRR. The May 28, 2010, amendment application also requested changes to license paragraph 2.B to specify the enrichment and form of special nuclear material (SNM). During its review, the U. S. Nuclear Regulatory Commission (NRC) staff identified areas where clarification and additional information was needed from the licensee. Requests for additional information (RAIs) were sent to the licensee on September 27 and November 15, 2010 (ADAMS Accession Nos. ML102570089, ML103190002). The licensee has provided additional information and proposed changes to the license and technical specifications (TSs) to address the issues identified by the NRC staff.

2.0 BACKGROUND

The RRR is a 250 kilowatt thermal power (kW(t)) TRIGA (Training, Research, Isotopes, General Atomics) pool-type research reactor that uses TRIGA uranium-zirconium hydride fuel elements. The amendment request would allow the receipt, possession and use at Reed College of fuel from the UARR. The UARR has been permanently shut down. The fuel from the UARR is standard 8.5 weight-percent stainless-steel clad TRIGA fuel enriched to less than 20 percent in uranium-235. Currently, the RRR fuel is primarily aluminum clad although the licensee does possess and use some stainless-steel clad fuel. Both reactors use low-enriched uranium (LEU) (less than 20 percent U-235) fuel having the same basic physical dimensions. The licensee states that by replacing the RRR's aluminum clad fuel with stainless-steel clad fuel, cladding failure will be less likely to occur.

3.0 EVALUATION

The regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 70, "Domestic Licensing of Special Nuclear Material" and Part 30, "Rules of General Applicability to Licensing of Byproduct Material" require SNM and byproduct material to be licensed. The RRR license authorizes the receipt, possession and use of SNM and byproduct material. License condition 2.B., for the possession of SNM, reads as follows:

- B. Pursuant to the Act and Title 10, Chapter 1, CFR, Part 70, "Special Nuclear Material", to receive, possess and use up to 2500 grams of contained uranium-235 and a 1-curie plutonium-beryllium source, all for use in connection with operation of the reactor; and

License condition 2.C., for the possession of byproduct material, reads as follows:

- C. Pursuant to the Act and Title 10, Chapter 1, CFR, Part 30, "Rules of General Applicability to Licensing of Byproduct Material", to receive, possess and use a 1.64-curie sealed americium-beryllium neutron source for reactor startup; and to possess, but not to separate, such byproduct material as may be produced by operation of the reactor.

The licensee wants to take possession of fuel that was used in the reactor at the UARR. Because this fuel was irradiated in the UARR, the fuel contains SNM and byproduct material produced in the UARR. The RRR license conditions must account for this SNM and byproduct material.

The UARR irradiated fuel will be shipped by the Department of Energy (DOE) to the licensee. The DOE plans to ship 97 stainless-steel clad TRIGA fuel elements to Reed College from the UARR. Along with the UARR fuel to be used in the RRR, the licensee will take possession of six fuel elements from the UARR that cannot be used in the RRR. It is estimated that the UARR fuel will contain 3,252 grams (this amount consists of fuel that will be used in the RRR and fuel that cannot be used) of contained uranium-235 enriched to less than 20 percent. At some point in the future after operations of the RRR are established using the UARR stainless-steel clad fuel, the aluminum clad fuel will be returned to DOE. At that time, five of the six fuel elements that cannot be used in the RRR will be returned to DOE. The sixth fuel element will be retained for possible future use (subject to NRC approval of its use). The RRR license conditions must account for the fact that these fuel elements are not to be used in the reactor. The licensee inspected the UARR fuel during a site visit to the UARR and found the fuel acceptable for shipment to Reed.

The licensee has requested additional changes to the license conditions. The licensee has requested changes to the license to specifically state that the uranium is "enriched to less than 20 percent in the form of TRIGA reactor fuel." The license condition as currently written does not contain any restriction on the enrichment or form of SNM. This clarifies the license condition. The licensee has also requested that the authority to possess a 1-curie plutonium-beryllium neutron source be removed from the license because the licensee no longer needs to use the source in the reactor (it is also possessed on a separate material license).

During its review of the amendment application, the NRC staff noted that the license conditions contained a typographic error (Chapter 1 of 10 CFR should be Chapter I). The NRC staff noted that the title of Part 70 had been revised since the RRR license was issued. The NRC staff also noted that the Part 70 license condition did not specifically authorize possession and use of SNM produced during operation of the reactor. Not including this authority was common for research reactor SNM license conditions written in the 1960s. The NRC staff sent the licensee an RAI asking the licensee to amend the proposed license condition to account for the issues noted by the NRC staff. The NRC staff also asked the licensee to confirm that there was not any SNM under the reactor license other than the reactor fuel. The NRC staff also asked the licensee to reformat the license conditions into the format currently used for license conditions. The licensee responded that they also possessed fission chambers that contained small amounts of high-enriched uranium. The licensee proposed changes to the license conditions that addressed the issues identified by the NRC staff and to add the fission chambers to the license condition. The amended proposed SNM license condition is as follows:

- B. Pursuant to the Act and Title 10, Chapter I, CFR, Part 70, "Domestic Licensing of Special Nuclear Material:"
- (1) to receive, possess, use, but not separate, in connection with operation of the facility, up to 2500 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel;
 - (2) to receive, possess, use, but not separate, in connection with operation of the facility, up to 3100 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel from the University of Arizona reactor and to receive, possess, use, but not separate, in connection with operation of the facility, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor;
 - (3) 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 reactor;
 - (4) to receive and possess, but not use or separate, up to 250 grams of contained uranium-235 enriched to less than 20 percent in the form of TRIGA[®] fuel elements 2898, 4058, 7879, 10211, shim rod fuel follower, and regulating rod fuel follower from the University of Arizona reactor and to receive and possess, but not use or separate, such special nuclear material that was produced by operation with this fuel in the University of Arizona reactor; and
 - (5) to receive, possess, use, but not separate, in connection with operation of the facility, up to 11 grams of uranium-235 in the form of fission chambers.

The amended proposed byproduct material license condition is as follows:

- C. Pursuant to the Act and Title 10, Chapter I, CFR, Part 30, "Rules of General Applicability to Licensing of Byproduct Material:"
- (1) to receive, possess and use in connection with operation of the facility, a 1.64-curie sealed americium-beryllium neutron startup source;
 - (2) to receive, possess, use, but not separate, in connection with operation of the facility, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(2) above;
 - (3) to receive and possess, but not use or separate, byproduct material contained in fuel from the University of Arizona authorized by license condition 2.B.(4) above; and
 - (4) to receive, possess, use, but not separate, in connection with operation of the facility, such byproduct material as may be produced by operation of the facility.

The format of the proposed license conditions is amended to break down the license conditions into subsections to clarify the license conditions. The NRC staff has reviewed the proposed license conditions, and finds the proposed format makes the license conditions easier to understand and therefore, amending the format of the license conditions is acceptable to the NRC staff.

License condition B.(1) is the authority to receive, possess and use the uranium-235 in the current RRR fuel. The uranium enrichment of less than 20 percent and form of the uranium as TRIGA fuel has been added to the license condition to be consistent with current license condition formatting which clarifies the license condition. Based on its review of the licensee's application, the NRC staff finds that the changes to the license condition enhances the description of the uranium under the license and is therefore, acceptable to the NRC staff.

License condition B.(2) is the authority to receive, possess and use the uranium in the fuel to be received from the UARR in the RRR. The licensee has requested a possession limit of 3,100 grams of contained uranium-235 to account for potential uncertainties in the amount of uranium-235 in the UARR fuel. Because the fuel was used in the UARR, the fuel contains SNM and byproduct material produced during operation of the UARR. In response to a RAI from the NRC staff, the licensee proposed modifications to the proposed license conditions to account for this byproduct material and SNM. The license condition is written so that the licensee can receive, possess and use such SNM as was produced by operation of the UARR. This is the standard wording for this type of license condition. Based on a review of the licensee's application, the NRC staff finds the proposed possession limit to be consistent with the material to be received from the UARR and that the proposed license condition is properly written to account for the uranium in the fuel and other SNM produced during operation of the fuel in the UARR. The licensee has requested the authority to use the UARR fuel in the RRR. The original

amendment application from the licensee did not request use of the fuel. Use of the UARR fuel was requested in the licensee’s responses to the NRC staff’s RAIs. The licensee compared the design characteristics of the UARR fuel and the stainless-steel clad fuel allowed under the RRR license. Table 1 below provides the licensee’s comparison of the key fuel element characteristics between the fuel types. The RRR fuel and the UARR fuel have very similar uranium content. The RRR and UARR stainless steel (SS) fuel elements have identical beginning of life enrichment, physical dimensions, and built-in poisons. The UARR fuel has higher average and maximum burnup than the RRR fuel but is still considered to have low burnup and will perform similar to the RRR fuel. The licensee states that the UARR fuel meets the requirements of the RRR TS E.1, “Reactor Core.” The NRC staff reviewed the licensee’s application and TS E.1. Based on our review, the NRC staff finds that the RRR and UARR SS fuel elements are very similar, and in most cases, identical with regard to important reactor core design characteristics, and that the UARR fuel meets the requirements of the RRR TS E.1.

Table 1: RRR and UARR Fuel Element Comparison

Fuel Element Characteristic	RRR Aluminum Fuel Elements	RRR SS Fuel Elements	UARR SS Fuel Elements
Uranium Content (mass %)	8.55	8.55	8.5
BOL U-235 Enrichment (mass %)	19.89	19.75	19.75
Fuel Alloy Outer Diameter (mm)	35.82	36.45	36.45
Fuel Alloy Length (mm)	355.6	381	381
Cladding Material	Aluminum	304 SS	304 SS
Cladding Outer Diameter (mm)	37.47	37.47	37.47
Overall Fuel Element Length (mm)	720	734	734
Fuel Element Poisons	None	Sm/Mo	Sm/Mo
Average Burnup (MW-hrs)	21.31	12.53	87.41
Maximum Burnup (MW-hrs)	27.47	23.34	174.84

TS H, “Fuel Storage” specifies that all fuel elements or fueled devices shall be rigidly supported during storage in a safe geometry (k_{eff} less than 0.8 under all conditions of moderation). In addition, irradiated fuel elements (the UARR fuel elements are irradiated fuel elements) shall be stored in an array which will permit sufficient natural convection cooling such that the fuel element temperature will not exceed design values. The licensee states that they have constructed sufficient additional fuel storage racks similar to their existing racks to store the UARR fuel. The licensee states that the additional fuel storage racks will be mounted on the walls of the reactor storage pool in a manner similar to the existing racks. These additional fuel storage racks are constructed and installed under the authority given to licensees to make changes to their facility under 10 CFR 50.59. Because the RRR and UARR fuel are similar, and the licensee will provide sufficient storage capability, the NRC staff finds that storage of the UARR fuel to be used in the RRR meets the requirements of TS H.

The NRC staff has reviewed the licensee’s application and proposed license condition to receive, possess and use fuel from the UARR in the RRR. The NRC staff finds that the license condition for the authority to receive, possess and use the UARR fuel in the RRR is properly written and is complete. The NRC staff finds that receipt, possession and use of the UARR fuel in the RRR meets the requirements of the RRR TSs because the fuel is essentially identical to

the fuel currently used at the RRR. Based on these findings, the NRC staff concludes that the receipt, possession and use of the UARR fuel in the RRR is acceptable.

License condition B.(3) is the authority to receive, possess and use SNM produced by operation of the RRR. This clause is not in the current license. It was common not to state this authority in the license for licenses such as Reed's that were written in the 1960s. However, for completeness, the NRC staff now requests that this license condition be placed in research and test reactor licenses to clarify that operation of the reactor will produce some SNM and that the receipt, possession and use of that material is allowed. Based on its review of the licensee's application, the NRC staff finds that this license condition clarifies the receipt, possession and use of SNM produced by operation of the reactor and is consistent with the current license format. Therefore, this license condition is acceptable to the NRC staff.

Proposed license condition B.(4) is for UARR fuel that will not be used in the RRR. According to the licensee, there are six fuel elements that will be received from the UARR that will not be used in the RRR. DOE requested that all of the UARR fuel, even fuel that will not be used in the RRR, be initially shipped to Reed. The UARR fuel will be used to retire from service the aluminum-clad fuel currently used in the RRR. After the aluminum-clad fuel is removed from service, the licensee plans to return the aluminum-clad fuel to DOE. Five of the six UARR fuel elements will be returned to DOE with the existing aluminum-clad fuel. The last UARR fuel element is an experimental fuel element (dismountable) that the licensee plans to keep. Its use in the reactor would be requested by license amendment at some point in the future. License condition B.(4) is similar to license condition B.(2) concerning the UARR fuel except license condition B.(4) does not allow the licensee to use the 250 grams of uranium-235 authorized by the license condition. The UARR fuel to be returned to DOE by the licensee consists of two fuel elements for fuel-followed control rods, two instrumented fuel elements which are not used in the RRR, and one damaged fuel element. One fuel element was removed from service at the UARR because it was damaged. The proposed uranium possession limit allows for the possession of the six fuel elements with a sufficient margin for uncertainty in uranium content of the fuel elements.

The damaged fuel element developed a pinhole leak while in operation at the UARR in 1974. The fuel element only released fission products during operation and has been safely stored in the UARR pool since being removed from service. The licensee inspected the fuel element during a site visit to the UARR and concluded that the damage to the UARR fuel element is similar to two fuel elements that developed pinhole leaks during operation at the RRR which have been safely stored in the RRR pool. The licensee determined that the damaged UARR fuel element could be safely stored at the RRR. However, the damaged fuel element will be placed in a sealed damaged fuel can for shipment. This can will isolate the fuel element from the licensee's pool during storage at the RRR. The shipping cask to be used to transport the fuel from the UARR to the RRR is a NAC International, Legal Weight Truck spent fuel shipping cask (NAC-LWT) (Docket number 71-9225, package identification number USA/9225/B(U)F-96). The NRC has reviewed the design of the shipping cask including the use of the damaged fuel can and has found it acceptable issuing Certificate of Compliance 9225. Based on a review of the licensee's application and Certificate of Compliance 9225, the NRC staff finds the storage of the damaged UARR fuel element in the RRR pool in a sealed damaged fuel can will provide a greater level of isolation than fuel damaged at Reed currently has in the RRR pool, and is therefore, acceptable.

To store the five fuel elements that will be returned to DOE in the RRR pool, the licensee has requested an amendment to TS H. 1., "Fuel Storage." TS H. 1. currently states:

1. All fuel elements or fueled devices shall be rigidly supported during storage in a safe geometry (k_{eff} less than 0.8 under all conditions of moderation).

The licensee has proposed changing the TS to read (the proposed TS contained a typographical error in the location of the parentheses. The NRC staff discussed this with the facility Director who confirmed the error and corrected the error in an electronic-mail):

1. All fuel elements or fueled devices shall be rigidly supported during storage in a safe geometry (k_{eff} less than 0.8 under all conditions of moderation except for five elements (two with thermocouples, two control rod followers, and one damaged element S/N 4058) being held in an approved NAC-LWT transfer basket. The five elements in the transfer basket shall have a k_{eff} less than 0.95.) The edge of the transfer basket shall not be stored within 40 cm of any other fuel elements.

The five fuel elements from the UARR to be returned to DOE will be stored in the RRR pool in a non-poisoned basket from the NAC-LWT shipping cask. The licensee proposed that the approved k_{eff} limit of the shipping cask be the limit for the temporary storage of the five fuel elements in the shipping basket. The basket can hold up to 24 fuel elements with up to five baskets holding up to 120 fuel elements in the shipping cask. The k_{eff} of the fully loaded cask under accident conditions (flooding with water) was evaluated by NRC as part of the review to issue the certificate of compliance for the cask and found to be less than 0.95. Because only one basket will be used at Reed with only five fuel elements, the NRC staff finds that the k_{eff} of the five fuel elements in the storage basketed will be less than 0.95. The NRC staff in an RAI asked the licensee about the potential for interaction between the fuel in the basket and the fuel already in storage or in the reactor core. The licensee proposed that the basket not be stored within 40 cm of other fuel elements whether in storage or in the reactor core. The NRC staff notes that in a light water environment, 30 cm of water is considered an infinite reflector. This means that with 40 cm of separation in light water, the fuel in the storage basket cannot significantly impact other fuel in storage or in the core and vice versa. The NRC staff has reviewed the licensee's application, the certificate of compliance for the NAC-LWT cask, and the safety analysis report for the NAC-LWT cask. Based on our review, the NRC staff finds that these five fuel elements can be stored safely in the approved NAC-LWT transfer basket and that the proposed changes to TS H.1. are acceptable.

As discussed above, the NRC staff has reviewed proposed license condition B.(4). Based on the proposed possession limits, the storage of the damaged fuel element in a sealed damaged fuel can and the proposed changes to TS H.1. to store the five UARR fuel elements to be

returned to DOE in a NAC-LWT basket with a k_{eff} limit of less than 0.95, the NRC staff concludes that proposed license condition B.(4) is acceptable.

The licensee has proposed a new license condition, B.(5), to allow receipt, possession and use of a small amount of high-enriched uranium in the form of fission chambers. Fission chambers are used during reactor operation to detect subcritical multiplication and power level. This authority has existed in the license condition but was not specifically noted because the license did not restrict uranium enrichment or form. The NRC staff finds that this license condition clarifies the existing uranium possession limits and is therefore acceptable.

License condition C.(1) allows receipt, possession and use of a 1.64-curie sealed americium-beryllium neutron startup source. This authority current exists and the amended license condition is a change in format only and is acceptable to the NRC staff.

License condition C.(2) is the byproduct material license condition corresponding to license condition B.(2) for SNM that allows receipt, possession and use of the byproduct material contained in the fuel elements from the UARR that are to be used in the RRR. License condition C.(3) is a similar byproduct license condition corresponding to license condition B.(3) for the six fuel elements that are not to be used in the RRR. The byproduct material consists of fission and activation products in the fuel elements that were produced during operation with the fuel in the UARR. This is equivalent to license condition C.(4) for byproduct material produced by operation of the RRR. Based on our review of the licensee's application, the NRC staff finds that this license condition is written in the current format for byproduct material produced by operation of a research reactor and is therefore acceptable to the NRC staff.

License condition C.(4) is the authority currently in the license to receive, possess and use byproduct material produced by operation of the RRR. This is a change in format and is acceptable to the NRC staff.

Some of the proposed license conditions contain a restriction on separation of SNM and byproduct material. This is to help ensure that the RRR does not become a production facility. This is the current format for research reactor license conditions and is acceptable to the NRC staff.

The licensee states that the increase in the SNM possession limit will not impact security. The quantity of SNM authorized by the proposed license amendment continues to meet the definition in 10 CFR Part 73 for SNM of low strategic significance. The licensee's security plan is written for protecting SNM of low strategic significance. The licensee has not requested any changes to the approved security plan. The NRC staff, based on review of the licensee's application and security plan, concludes that the requested changes in possession limits will not impact the licensee's security plan.

The NRC staff has not identified any accidents for this reactor design that are dependent on the amount of fuel in storage. The proposed license amendment did not change any of the accident analysis for the RRR.

The NRC staff has reviewed the application from the licensee to receive, possess and use fuel from the UARR in the RRR. The format of the license conditions have been brought up to date. The clarification of the enrichment and form of SNM limits the high-enriched uranium that could potentially be possessed by the licensee. Because the requested changes to the license condition clarifies the possession of SNM and byproduct material and brings the wording of the license condition up to date, the requested changes are acceptable to the NRC staff. The NRC staff finds that the licensee has demonstrated a need for the requested SNM under the reactor license. The requested material will be received, possessed and used under the terms of the facility license, TSs, and security plan. The NRC staff therefore concludes that the increase in the SNM and byproduct material possession limits and the use of the UARR fuel in the RRR is acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. 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: January 4, 2011