December 12, 2003

Mr. Stephen G. Frantz, Director
Reed Reactor Facility
Reed College
3203 SE Woodstock Blvd.
Portland, OR 97202

SUBJECT: ISSUANCE OF AMENDMENT NO. 7 TO AMENDED FACILITY OPERATING LICENSE NO. R-112 - REED COLLEGE NUCLEAR REACTOR (TAC NO. MC0354)

Dear Mr. Frantz:

The Commission has issued enclosed Amendment No. 7 to Facility Operating License No. R-112 for the Reed College Nuclear Reactor. The amendment consists of changes to the Technical Specifications (TSs) in response to your request of March 11, 2003.

10 CFR Part 50.36 requires that the licensee have TSs that meet the requirements of that section. Section 50.36(c)(2) (ii) contains the requirement for a Limiting Condition for Operation (LCO) if one or more of the criterion listed are met. The amendment reflects the requested change to one of the interlocks, a LCO, listed in Table II, Minimum Interlocks, of the TSs. The requested change does not change the functional effectiveness of the LCO and therefore meets the regulation. As part of this amendment the interlock is changed as requested.

A copy of the related Safety Evaluation supporting Amendment No. 7 is also enclosed.

Sincerely,

/RA/

Daniel E. Hughes, Project Manager
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-288

Enclosures: 1. Amendment No. 7
2. Safety Evaluation

cc w/encls.: Please see next page

cc:

Mayor of the City of Portland
1220 Southwest 5th Avenue
Portland, OR 97204

Reed College
ATTN: Dr. Peter Steinberger
Dean of Faculty
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Reed College
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Oregon Department of Energy
ATTN: David Stewart-Smith, Director
Division of Radiation Control
625 Marion Street, N.E.
Salem, OR 97310

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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REED COLLEGE

REED REACTOR FACILITY

DOCKET NO. 50-288

AMENDMENT TO AMENDED FACILITY OPERATING LICENSE

Amendment No. 7
License No. R-112

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that

   A. The application for an amendment to Amended Facility Operating License No. R-112 filed by the Reed College, Reed Reactor Facility (RRF) (the licensee) on March 11, 2003, 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 notice for this amendment is not required by 10 CFR 2.106.

2. 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 Amended Facility Operating License No. R-112 is hereby amended to read as follows:

   3.B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 7, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

/RA by Marvin Mendonca Acting for/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Enclosure: Appendix A Technical
Specifications Changes

Date of Issuance: December 12, 2003

ENCLOSURE TO LICENSE AMENDMENT NO. 7

AMENDED FACILITY OPERATING LICENSE NO. R-112

DOCKET NO. 50-288

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

Remove	Insert
7 of 7	7 of 7

(a) reactor operations, including unscheduled shutdowns;
(b) principal maintenance activities and the reasons therefore;
(c) shipments of radioactive materials;
(d) equipment and components surveillance activities;
(e) experiments performed with the reactor.

2. Records to be retained for the life of the facility:
(a) gaseous and liquid radioactive waste released to the environs;
(b) off-site environmental monitoring surveys;
(c) facility radiation and contamination surveys;
(d) fuel inventories and transfers;
(e) updated, corrected and as-built facility drawings.

TABLE I

MAXIMUM REACTOR SAFETY SYSTEM SCRAMS

Originating Channel	Set Point
1. Linear	110% of full power
2. Percent Power	110% of full power
3. Scram button on console	Manual

TABLE II

MINIMUM INTERLOCKS

Action Prevented
1. Control element withdrawal without a neutron induced signal on a reactor instrument channel.
2. Simultaneous manual withdrawal of two control elements.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 7 TO

AMENDED FACILITY OPERATING LICENSE NO. R-112

THE REED COLLEGE

REED REACTOR FACILITY

DOCKET NO. 50-288

1.0 INTRODUCTION

By letter dated March 11, 2003, the Reed College, (the licensee) submitted a request for amendment to the Technical Specifications (TSs), Appendix A, to Amended Facility Operating License No. R-112 for the Reed Reactor Facility (RRF). The request, when implemented, will be Amendment No. 7 to the TSs:

1.1 TABLE II, MINIMUM INTERLOCKS, Interlock No.1.

The request is to change the Interlock No. 1 such that control element withdrawal is prevented "....without a neutron induced signal on a reactor instrument channel." This is a change from the present which states that control element withdrawal is prevented "....with less than two induced counts on the startup channel."

2.0 EVALUATION

The staff has considered the change listed above. The change is discussed below.

The purpose of Interlock No.1 is to prevent the occurrence of either of these two events:

1. startup of the reactor with inoperable instrumentation, or
2. startup of the reactor without an inserted neutron source or sufficient intrinsic neutron source.

It is not safe to bring a reactor critical if the operator has no means to monitor the neutron population (i.e., power) in the core. The instrumentation in question is typically called "startup" instrumentation because the core neutron population level signal is within the range of this instrument during start up. The neutron population in the core at shutdown is generally too low to be seen by "power range" instrumentation thereby rendering it unresponsive. However the ranges of the different level instruments overlap such that the operator can verify the operation of the high level instruments as power increases. If that verification is not

made then the operator can safely shut down while still within the range of the "startup" instrument. It is therefore necessary to ensure proper operation of the low power or "startup" instrumentation prior to withdrawing control elements.

With many research and test reactors (RTR), of which RRF is one, operation is infrequent and at low enough power such that the intrinsic neutron sources are of very low intensity. In addition, the K_{eff} of the core at shutdown is low enough that the neutron population is unobservable with the low power or "startup instrument." This requires that a movable neutron source be placed in the core to ensure, through subcritical multiplication, that there are sufficient neutrons for an observable start up. If the source is placed properly and of high enough intensity, the low power or "startup" instrument will have a "neutron induced signal" greater than the instrument noise level. This gives the operator confidence that the source is in place and that the instrument is working properly.

An interlock is used when the consequences are grave enough that the decision to prevent action is taken from the operator and designed into the instrumentation as an action-inaction bistable. It is possible that a startup attempted without instrumentation or observable neutron induced signal or power level could result in the reactor exceeding the licensed power level or a Limiting Safety System Setting (LSSS).

In the case of the RRF, the TRIGA design parameters (large prompt negative temperature coefficient and robust fuel) also help to protect the health and safety of the public by mitigating the consequences of such a scenario. Even so, it is necessary that the TSs for RRF contain this Limiting Condition of Operation (LCO) as required by 10 CFR 50.36(c)(2)(ii)(C). In this case the implementation of the LCO is with Interlock No. 1 of RRF TSs, Table II, Minimum Interlocks.

The licensee's original "startup" instrumentation used a fission chamber detector and indicated neutron population/power level in counts per second. The TS was written to make the calibration of the original "startup" instrument easy. The TS set point was stated in counts per second. The licensee replaced the "startup" instrument with one that also used a fission chamber detector but with indication in percent full power. In order to implement the TS the licensee must make a calculation to obtain a percent power level set point that is equivalent to the one stated in the TSs. Since the regulatory requirement for the TS remains, the licensee seeks a change that will retain a functionally equivalent TS while facilitating its implementation. The TS will continue to ensure that a startup can not be attempted without instrumentation that is responsive and indicating neutron signal levels high enough to allow reliable observation of the rate and level of reactor power. The proposed TS is technically acceptable and continues to meet the regulatory requirement.

A similar change was made for another non-power reactor (the Pennsylvania State University, Docket No. 50-05, Amendment No. 32). This change is consistent with the regulations and regulatory guidance and is therefore acceptable.

3.0 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 staff has determined that this amendment involves 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 with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, on the basis of the considerations discussed above, that (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously evaluated, or create the possibility of a new or different kind of accident from any accident previously evaluated, and does not involve a significant reduction in a margin of safety, the amendment does not involve a significant hazards consideration; (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed changes; and (3) such changes are 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: Daniel E. Hughes

Date: December 12, 2003