

February 14, 2003

Dr. Barry M. Klein
Vice Chancellor for Research
University of California, Davis
One Shields Avenue
Davis, CA 95616-8558

SUBJECT: ISSUANCE OF AMENDMENT NO. 5 TO AMENDED FACILITY OPERATING
LICENSE NO. R-130 - REGENTS OF THE UNIVERSITY OF CALIFORNIA
(TAC NO. MB5598)

Dear Dr. Klein:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 5 to Facility Operating License No. R-130 for the McClellan Nuclear Radiation Center (MNRC) TRIGA Research Reactor. The amendment consists of changes to the Technical Specifications (TSs) in response to your submittal of October 17, 2002, and is discussed in the enclosed Safety Evaluation Report.

Sincerely,

/RA/

Warren J. Eresian, Project Manager
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-607

Enclosures: 1. Amendment No. 5
2. Safety Evaluation Report

University of California - Davis/McClellan MNRC

Docket No. 50-607

cc:

Dr. Wade J. Richards
5335 Price Avenue, Bldg. 258
McClellan AFB, CA 95652-2504

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

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REGENTS OF THE UNIVERSITY OF CALIFORNIA AT

McCLELLAN NUCLEAR RADIATION CENTER

DOCKET NO. 50-607

AMENDMENT TO AMENDED FACILITY OPERATING LICENSE

Amendment No. 5
License No. R-130

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-130 filed by the Regents of the University of California at McClellan Nuclear Radiation Center (the licensee) on October 17, 2002, 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 2.C.(ii) of Amended Facility Operating License No. R-130 is hereby amended to read as follows:

2.C.(ii) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 5, 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/

Warren J. Eresian, Project Manager
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Enclosure: Appendix A, Technical
Specification Changes

Date of Issuance: February 14, 2003

ENCLOSURE TO LICENSE AMENDMENT NO. 5
AMENDED FACILITY OPERATING LICENSE NO. R-130
DOCKET NO. 50-607

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

<u>Remove</u>	<u>Insert</u>
17	17
18	18
40	40

Basis-

- a. A limitation of less than one dollar (\$1.00)(0.7% $\Delta k/k$) on the reactivity worth of a single movable experiment positioned in the pneumatic transfer tube, the central irradiation facility (SAR, Chapter 10, Section 10.4.1), the central irradiation fixture (CIF-1)(SAR, Chapter 10, Section 10.4.1), or any other in-core or in-tank irradiation facility, will assure that the pulse limit of \$1.75 is not exceeded (SAR Chapter 13, Section 13.2.2.2.1). In addition, limiting the worth of each movable experiment to less than \$1.00 will assure that the additional increase in transient power and temperature will be slow enough so that the fuel temperature scram will be effective (SAR Chapter 13, Section 13.2.2.2.1).
- b. The absolute worst event which may be considered in conjunction with a single secured experiment is its sudden accidental or unplanned removal while the reactor is operating. For such an event, the reactivity limit for fixed experiments (\$1.75) would result in a reactivity increase less than the \$1.92 pulse reactivity insertion needed to reach the fuel temperature safety limit (SAR Chapter 13, Section 13.2.2.2.1).
- c. A reactivity limit of less than \$1.75 for any single experiment or for all experiments collectively positioned in the sample can of the automated central irradiation facility (ACIF)(SAR Chapter 10, Section 10.4.2) is based on the pulsing reactivity insertion limit (Technical Specification 3.1.2)(SAR Chapter 13, Section 13.2.2.2.1) and on the design of the ACIF, which allows control over the positioning of samples into and out of the central core region in a manner identical in form, fit, and function to a control rod.
- d. It is conservatively assumed that simultaneous removal of all experiments positioned in the pneumatic transfer tube, and in any other reactor in-core and in-tank irradiation facilities at any given time shall be less than the maximum reactivity insertion limit of \$1.92. The SAR Chapter 13, Section 13.2.2.2.1 indicates that a pulse reactivity insertion of \$1.92 would be needed to reach the fuel temperature safety limit.

3.8.2 Materials Limit

Applicability - This specification applies to experiments installed in reactor experiment facilities.

Objective - The objective is to prevent damage to the reactor or significant releases of radioactivity by limiting material quantity and the radioactive material inventory of the experiment.

Specification - The reactor shall not be operated unless the following conditions governing experiment materials exist:

- a. Experiments containing materials corrosive to reactor components, compounds highly reactive with water, potentially explosive materials, and liquid fissionable materials shall be appropriately encapsulated.
- b. Each fueled experiment shall be controlled such that the total inventory of iodine isotopes 131 through 135 in the experiment is no greater than 1.5 curies and the maximum strontium inventory is no greater than 5 millicuries.
- c. Each experiment in the I-125 production facility shall be controlled such that the total inventory of I-125 in the I-125 glove box shall not exceed 40 curies.
- d. Each experiment in the I-125 production facility shall be controlled such that the total inventory of I-125 being handled in the I-125 fume hood at any one time in preparation for shipping shall not exceed 20 curies. An additional 1.0 curie of I-125 (up to 400 millicuries in the form of quality assurance samples and up to 600 millicuries in sealed storage containers) may also be present in the I-125 fume hood.

e. Explosive materials in quantities greater than 25 milligrams of TNT equivalent shall not be irradiated in the reactor tank. Explosive materials in quantities of 25 milligrams of TNT equivalent or less may be irradiated provided the pressure produced upon detonation of the explosive has been calculated and/or experimentally demonstrated to be less than the design pressure of the container.

f. Explosive materials in quantities of three (3) pounds of TNT equivalent or less may be irradiated in any radiography bay. The irradiation of explosives in any bay is limited to those assemblies where a safety analysis has been performed that shows that there is no damage to the reactor safety systems upon detonation (SAR Chapter 13, Section 13.2.6.2).

Basis -

a. Appropriate encapsulation is required to lessen the experimental hazards of some types of materials.

b. The 1.5 curies limitation on iodine 131 through 135 assures that in the event of failure of a fueled experiment leading to total release of the iodine, occupational doses and doses to members of the general public in the unrestricted areas shall be within the limits in 10 CFR 20 (SAR Chapter 13, Section 13.2.6.2).

c&d. Limiting the total I-125 inventory to forty (40.0) curies in the I-125 glove box and to twenty-one (21.0) curies in the I-125 fume hood assures that, if either of these inventories of I-125 is totally released into their respective containments, the occupational doses and doses to members of the general public in the unrestricted areas shall be within the limits of 10 CFR 20 (SAR Chapter 13, Section 13.2.6.2).

e. This specification is intended to prevent damage to vital equipment by restricting the quantity of explosive materials within the reactor tank (SAR Chapter 13, Section 13.2.6.2).

f. The failure of an experiment involving the irradiation of 3 lbs TNT equivalent or less in any radiography bay external to the reactor tank will not result in damage to the reactor controls or the reactor tank. Safety Analyses have been performed (SAR Chapter 13, Section 13.2.6.2) which show that up to six (6) pounds of TNT equivalent can be safely irradiated in any radiography bay. Therefore, the three (3) pound limit gives a safety margin of two (2).

3.8.3 Failure and Malfunctions

Applicability - This specification applies to experiments installed in reactor experiment facilities.

Objective - The objective is to prevent damage to the reactor or significant releases of radioactive materials in the event of an experiment failure.

Specification -

a. All experiment materials which could off-gas, sublime, volatilize, or produce aerosols under:

- (1) normal operating conditions of the experiment or reactor,
- (2) credible accident conditions in the reactor, or
- (3) where the possibility exists that the failure of an experiment could release radioactive gases or aerosols into the reactor building or into the unrestricted area, the quantity and type of material in the experiment shall be limited such that the airborne radioactivity in the reactor room will not result in exceeding the applicable dose limits in 10 CFR Part 20 in the unrestricted area, assuming 100% of the gases or aerosols escapes.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 5 TO

AMENDED FACILITY OPERATING LICENSE NO. R-130

REGENTS OF THE UNIVERSITY OF CALIFORNIA AT

McCLELLAN NUCLEAR RADIATION CENTER

DOCKET NO. 50-607

1.0 INTRODUCTION

By letter dated October 17, 2002, the Regents of the University of California (the licensee) submitted a request for amendment of the Technical Specifications (TSs), Appendix A, to Facility Operating License No. R-130 for the McClellan Nuclear Radiation Center (MNRC) TRIGA research reactor. The request provides for the following changes, which if implemented, will result in Revision 12 of the TSs:

1. Incorporate a new management position, the "Site Manager" into the Technical Specifications.
2. Revise Technical Specification 3.8.2, Materials Limit, to allow an increase in the Iodine-125 inventory in the Iodine Production Facility from 20 curies to 61 curies.

Each of these requests is discussed below.

2.0 EVALUATION

The current management structure includes an UCD/MNRC Director to whom reports a Health Physics Manager and Reactor Operations Manager. The proposed management structure creates a new position of Site Manager, who reports directly to the UCD/MNRC Director, and to whom reports the Health Physics Manager and the Reactor Operations Manager. The proposed management structure thus creates an additional layer of oversight. Since this change increases oversight and supervision of facility operations, the staff concludes that it is acceptable.

Amendment No. 4 of the Technical Specifications was approved on August 9, 2001. This amendment approved the installation of an Iodine-125 production loop. The production loop included a reactor room glove box containing up to 20 curies of Iodine-125. Technical Specification 3.8.2, which provides materials limits of experiments installed in reactor experiment facilities, was expanded to include limits associated with the production loop and in particular, the reactor room glove box. The justification for the 20 curie limit was provided in Chapter 13, Accident Analysis, of the facility Safety Analysis Report.

Previous calculations supporting the 20 curie limit of Iodine-125 were based on the worst-case assumption that all 20 curies of Iodine-125 volatilized and left the glove box through the glove box exhaust system, eventually to make its way to the unrestricted area. The exposure (CEDE to the thyroid) to a person in the unrestricted area for the entire 30 second duration of this event is much less than 1 millirem. If the exposure duration is increased to 10 minutes, the estimated CEDE to the thyroid would still be less than 1 millirem. For those exposed in the reactor room for the maximum assumed occupancy time of 5 minutes the CEDE to the thyroid would be about 67 millirem.

The results of all of the assumptions and calculations in the accident sequence are directly proportional to the initial inventory of Iodine-125 in the production system. Increasing the initial assumed inventory from 20 curies to 61 curies will simply result in a tripling of the exposure. The analysis in the SAR that supports the increase in iodine inventory shows that the CEDE to the thyroid for a 10-minute exposure in the unrestricted area would be about 3.0 millirem. For those exposed in the reactor room for the maximum assumed occupancy time of 5 minutes the CEDE to the thyroid would be about 205 millirem.

In order to assess the potential consequences of the worst-case assumption, the resulting doses are compared to the doses which are expected for the Maximum Hypothetical Accident (MHA), which serves as the bounding accident for radiological consequences. The MHA has been analyzed in the licensee's Safety Analysis Report (SAR), and is a complete cladding rupture of a highly-irradiated single fuel element, followed by the instantaneous release of fission products into the air. The accident analysis calculates the radiological consequences of the MHA with regard to doses to the general public in the unrestricted area, and also calculates occupational doses within the site boundary. The MHA results in a CEDE of 53 millirem in the unrestricted area. Since the release of 61 curies of Iodine-125 through the glovebox exhaust system and eventually to the unrestricted area results in a CEDE of about 3 millirem, the radiological result is significantly less than that of the MHA, the bounding accident.

For those exposed in the reactor room, the MHA results in an exposure (CEDE) of 360 millirem. For the failure analyzed here, the five-minute is about 205 millirem. Again, the exposures are less than that of the MHA, the bounding accident.

The staff concludes that the consequences of the complete volatilization of 61 curies of Iodine-125 are much less than the consequences of the bounding MHA, and that increasing the allowable activity of Iodine-125 in the Iodine Production Facility from 20 curies to 61 curies does not significantly reduce the margin of safety with respect to the Maximum Hypothetical Accident and to 10 CFR Part 20 limits and that the increase is 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 or changes in inspection and surveillance requirements. 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: Warren J. Eresian

Date: February 14, 2003