

November 8, 2000

Dr. Michael R. Gottfredson
Executive Vice Chancellor
University of California, Irvine
Irvine, CA 92697-1000

SUBJECT: UNIVERSITY OF CALIFORNIA, IRVINE TRIGA RESEARCH REACTOR -
AMENDMENT ON FUEL SURVEILLANCE (TAC NO. MB0406)

Dear Dr. Gottfredson:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 5 to Facility License No. R-116 for the University of California, Irvine TRIGA research reactor. The amendment consists of changes to the Technical Specifications (TS) in response to your application of November 6, 2000.

The amendment increases the time for fuel inspection from 36 months to 60 months. A copy of the safety evaluation supporting Amendment No. 5 is also enclosed.

Sincerely,

/RA/

Marvin M. Mendonca, Senior Project Manager
Events Assessment, Generic Communications and
Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-326

Enclosures:

1. Amendment No. 5
2. Safety Evaluation

cc w/enclosures:

Please see next page

University of California at Irvine

Docket No. 50-326

cc:

Dr. Richard Chamberlain, Chair
Department of Chemistry
University of California, Irvine
Irvine, CA 92697-2025

Mr. Steve Hsu
Radiological Health Branch
State Department of Health Services
P.O. Box 9442732
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Dr. George E. Miller
Department of Chemistry
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University of California, Irvine
Irvine, CA 92697-2025

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

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ACCESSION NO.: ML003767650

TEMPLATE #: NRR-056

*Please see previous concurrence

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UNIVERSITY OF CALIFORNIA, IRVINE

DOCKET NO. 50-326

AMENDMENT TO FACILITY LICENSE

Amendment No. 5
License No. R-116

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that
 - A. The application for an amendment to Facility License No. R-116 filed by the University of California, Irvine (the licensee) on November 6, 2000, 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 be operated in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance that (i) the activities authorized by this amendment can be conducted without endangering the health and safety of the public and (ii) such activities will be conducted in compliance with the regulations of the Commission;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;
 - E. This amendment is issued in accordance with the regulations of the Commission as stated in 10 CFR Part 51, and all applicable requirements have been satisfied; and
 - F. Prior notice of this amendment was not required by 10 CFR 2.105 and publication of a notice for this amendment is not required by 10 CFR 2.106.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the enclosure to this license amendment, and paragraph 3.B. of Facility License No. R-116 is hereby amended to read as follows:

B. 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. 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.

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

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications and
Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Enclosure:
Appendix A, Technical
Specifications Changes

Date of Issuance: November 8, 2000

ENCLOSURE TO LICENSE AMENDMENT NO. 5

FACILITY LICENSE NO. R-116

DOCKET NO. 50-326

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
13

Insert
13

Reactivity with water, potentially explosive materials or liquid fissionable materials are doubly encapsulated.

Basis

It is shown in the SAR p. 8.53, that a release of 0.024 curies of iodine activity will result in a maximum dose to the thyroid of a person in an unrestricted area of less than 1/20 of the permissible dose. The limit on iodine inventory is set at 10 times this value. The limit for Strontium 90 is that which corresponds to the iodine yield of 0.3 curies for a given number of fission events and would be no hazard. Specifications 3.8b and 3.8c reduce the likelihood of damage to reactor components resulting from experiment failure.

4.0 SURVEILLANCE REQUIREMENTS

4.1 Fuel

Applicability

This specification applies to the surveillance requirement for the fuel elements.

Objective

The objective is to assure that the dimensions of the fuel elements remain within acceptable limits.

Specifications

- a. The standard fuel elements shall be measured for length and bend at intervals separated by not more than 500 pulses of magnitude greater than \$1.00 of reactivity, but the intervals shall not exceed 60 months. Fuel follower control rods shall be measured for bend at the same time interval. However, full surveillance shall be carried out before further operations are conducted if any significant changes are observed in pool water conductivity, pool water radioactivity, control rod drop times, control rod reactivity worths, or core reactivity worths such that it could be concluded that fuel element or control rod integrity may be compromised. |
- b. A fuel element indicating an elongation greater than 1/10 of an inch over its original length or a lateral bending greater than 1/16 of an inch over its original length shall be considered to be damaged and shall not be used in the core for further operation. |

A fuel follower control rod shall be considered to be damaged and shall not be used for further operation if it indicates a lateral bending greater than 1/16 of an inch over the fuel containing portion of the rod. |
- c. Fuel elements in the B- and C-ring shall be measure for possible distortion in the event that there is indication that fuel temperatures greater than the limiting safety system setting on temperature may have been exceeded. |

Bases

The most severe stresses induced in the fuel elements result from pulse operation of the reactor, during which differential expansion between the fuel and the cladding occurs and the pressure of the gases within the elements increases sharply. The above limits on the allowable distortion of a fuel element have been shown to correspond to strains that are considerably lower than the strain expected to cause rupture of a fuel element and have been successfully applied at other TRIGA installations. The surveillance interval is selected based on the past history of more frequent, uneventful, inspections for over 20 years at this facility and experience at other TRIGA facilities with similar power levels, fuel type, and operational modes. It is also designed to reduce the possibilities of mechanical failures as a result of handling elements, and to minimize potential radiation exposures to personnel.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 5 TO

FACILITY LICENSE NO. R-116

THE UNIVERSITY OF CALIFORNIA, IRVINE

DOCKET NO. 50-326

1.0 INTRODUCTION

By letter dated November 6, 2000, the University of California, Irvine (UCI or the licensee) submitted a request for amendment to Facility License No. R-116 for the UCI TRIGA research reactor. The requested changes would amend the technical specifications (TSs) to increase the surveillance period from 36 months to 60 months for fuel inspection.

2.0 EVALUATION

The current TSs item 4.1.a requires surveillance of fuel elements and fuel follower control rods at intervals not to exceed 36 months. This surveillance was designed to provide assurance of the integrity of these components. The fuel elements and fuel follower control rods were examined annually from 1969 until 1993. In 1993, a 36-month cycle was instituted. This surveillance was last performed in November 1997. No evidence of significant change was ever noted.

The licensee indicated that low staffing levels and operations at the facility create a burden for carrying out this fuel inspection on the 36 month cycle. Since 1993, the licensee has reduced the operating hours and energy generation at this reactor as evidenced in annual reports. In addition, UCI did the last pulse operation of any kind in October 1993. No operations since then have exceeded 250 kilowatts steady state. This power level is much below the proven capacity of this type of TRIGA fuel and fuel follower control rod elements. NRC licenses about 17 other TRIGA research reactors that use fuel similar or identical to that of UCI. Of these TRIGA research reactors, 5 are licensed for maximum power level approximately equal to that at UCI (about 9 of the TRIGAs are licensed at power levels greater than at UCI).

Measurements of pool water conductivity done as part of daily start-up requirements, and of radioactivity levels of pool water performed monthly continue to show the absence of corrosion. Measurements of control rod worths and drop times have continued to show a high degree of reproducibility from year-to-year. These other surveillances continue to show the absence of change in fuel integrity.

The licensee requested a change to TS 4.1.a to extend the period for this requirement to 60 months (5 years), effective immediately for the current cycle. The change request included a provision for additional surveillance before further operations if any significant changes are observed, specifically, changes in pool water conductivity, pool water radioactivity, control rod drop times, control rod reactivity worths, or core reactivity worths that could show that fuel element or control rod integrity may be compromised.

The licensee noted that TS 4.1.a requires that they do measurements every 500 pulses of greater than \$1.00 in magnitude. Pulse operations put high levels of energy in a short time into the fuel and provide the primary challenge to fuel integrity at TRIGA reactors. Enhanced surveillance of fuel conditions is generally required for pulsing reactors. The continued measurement of fuel for the same level of pulse operations ensures acceptable protection for fuel integrity for this aspect of operations. Also, UCI noted that TS 4.1.c. requires that they carry out measurements if fuel temperature limits have been exceeded. These TSs will remain in place and provide assurance that examination of the fuel elements and fuel follower control rods will continue to be acceptable.

The requested extension is generally consistent with the "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-power Reactors," NUREG-1537. That is, for fuel surveillance related to non-pulsing TRIGA operations, the fuel is to be inspected and measured on at least a 5-year cycle. However, a yearly verification of 20 percent of the fuel as recommended in the guidance is not required. As compensation for this difference from the guidance, the license has proposed provisions for fuel inspections on indication of a potential problem as discussed above. These provisions provide additional assurance that fuel integrity will be maintained. Further, given industry and facility experience with this type of fuel, and the limited operations of this specific facility, the staff finds reasonable assurance that fuel integrity will be maintained. Therefore, increasing the inspection period to 60 months will not affect analyzed or potential accidents or reduce the margin of safety of facility operations, and the proposed amendment 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 in connection 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 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.

Principal Contributor: Marvin M. Mendonca

Date: November 8, 2000