UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 6 TO

FACILITY OPERATING LICENSE NO. R-117

THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

DOCKET NO. 50-356

1.0 INTRODUCTION

By letter dated February 10, 1995, as supplemented on April 24, 1995, and October 2, 1996, the University of Illinois at Urbana-Champaign (UIUC) submitted a request for authorization to decommission, dismantle, and dispose of component parts of the Low Power Reactor Assembly (LOPRA), and to terminate Facility Operating License No. R-117. The LOPRA will be converted into a subcritical assembly and transferred to the license for the Advanced TRIGA Research Reactor (Facility License No. R-115, Docket No. 50-151). Amendment No. 9 to Facility License No. R-115 which was issued on August 8, 1996, added authorization to the Advanced TRICA Reactor license to possess byproduct and special nuclear material produced by the operation of the LOPRA. The amendment also added technical specifications requirements to the Advanced TRIGA Reactor license for use of the subcritical assembly.

A "Notice of Proposed Issuance of Orders Authorizing Disposition of Component Parts and Terminating Facility License" was published in the *Federal Register* on May 15, 1995 (60 FR 25931). No request for a hearing or petition for leave to intervene was filed following notice of the proposed action. This *Federal Register* notice meets the requirement of 10 CFR 50.82(b)(5) to give notice to interested persons of the proposed decommissioning. A final rule that became effective on August 28, 1996, changed the method of approving decommissioning plans from the issuance of an order to the issuance of a license amendment.

2.0 EVALUATION

2.1 Introduction

The licensee intends to decommission the LOPRA and convert the facility to a subcritical assembly. The subcritical assembly will be possessed and operated under the license for the Advanced TRIGA Research Reactor (TRIGA).

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2.2 Facility Description and History

The TRIGA and LOPRA are both located in the confinement of the Nuclear Reactor Laboratory (NRL). The LOPRA is a 10-kW reactor utilizing TRIGA-type fuel assemblies located in the bulk shielding tank of the TRIGA reactor. In place of the LOPRA, the licensee has requested that a subcritical assembly be reestablished under the TRIGA license. A subcritical assembly was in use at the NRL under the TRIGA license before the LOPRA license was issued in December 1971. This subcritical assembly operated by the UIUC was upgraded by adding fuel elements to the core to become the LOPRA. From 1971 to 1974, the LOPRA was used for nuclear coupling studies between the LOPRA and TRIGA reactor. Since 1974, the LOPRA has been used primarily for approach to critical experiments. The licensee has deemed the LOPRA to be unnecessary to the future utilization of the NRL at the UIUC.

The LOPRA fuel has a total burnup of 595 kW-hrs. Of that amount, 480 kW-hrs were generated prior to 1965 when the fuel was used at the Armed Forces Radiobiology Research Institute (AFRRI). The fuel was transferred from the AFRRI to the UIUC to be used in the subcritical assembly that would become the LOPRA.

2.3 Decommissioning Plan

The licensee has described a modified form of the DECON option for decommissioning the LOPRA reactor. The plan converts the reactor back into a subcritical assembly without delay when this license amendment is issued. Decommissioning will be done by reducing the number of elements in the core so that k_{eff} is not greater than 0.99 under all conditions. At that point the LOPRA will no longer be a nuclear reactor because a nuclear reactor is defined in 10 CFR 50.2 as an apparatus other than an atomic weapon, designed or used to sustain nuclear fission in a self-supporting chain reaction. Aluminum slugs will be placed in the grid plate to ensure that fuel cannot be reintroduced into places from which it was removed. All special nuclear material and byproduct material on the LOPRA license (the fuel and reactor structure) will then be administratively transferred to the TRIGA license. At that point, the LOPRA will no longer exist and decommissioning will be complete. All systems associated with the LOPRA (e.g., control rods and neutron detection instrumentation) will remain in existence under the TRIGA license to be used in operation of the subcritical assembly.

Authority to possess special nuclear material for a subcritical assembly and technical specifications (TS) controlling the operation of a subcritical assembly exist under the TRIGA license. The licensee submitted an amendment request to the TRIGA license which requested authorization to possess under the TRIGA license special nuclear material and byproduct material produced during operation of the LOPRA. The request also would add new TS to the TRIGA license for operation of the subcritical assembly. This amendment request was approved by the NRC staff on August 8, 1996 (Amendment No. 9 to the TRIGA license).

The LOPRA fuel to be transferred to the TRIGA license consists of 58 aluminum-clad TRIGA elements (containing 2251 grams of uranium-235) and 11 stainless steel TRIGA elements (containing 422 grams of uranium-235). The aluminum-clad elements will be possessed under the portion of License Condition 2.B of the TRIGA license that allows 2.6 kilograms of contained uranium-235 in TRIGA-type fuel elements in connection with operation of a subcritical assembly in the bulk shield facility of the reactor. The stainless steel elements will be possessed under the portion of License Condition 2.B which allows 7.0 kilograms of contained uranium-235 for use in connection with the operation of the reactor.

Amendment No. 9 to the TRIGA license authorized the receipt, possession, and use of up to 1.0E-5 gram of plutonium in the form of reactor fuel transferred from the LOPRA license. This accounts for plutonium produced in the fuel during operation. Amendment No. 9 also authorizes the receipt, possession, and use of up to 0.2 curie of byproduct material in the form of subcritical assembly components. These are the components of the LOPRA, such as control rods and the grid plate, that are to be used in operation of the subcritical assembly. The amendment authorizes the receipt, possession, and use, but not the separation, of up to 0.5 curie of byproduct material in the form of reactor fuel transferred from the LOPRA license. This accounts for the fission products produced in the LOPRA fuel during operation.

The licensee did not consider the SAFSTOR or ENTOMB decommissioning alternatives. Other alternatives would deny the licensee use of the subcritical assembly. If the LOPRA would be permanently shut down without conversion into a subcritical assembly, some reactor components could be disposed of, but because the LOPRA is in the Bulk Shielding Facility which is integral to the biological shield of the TRIGA reactor, any decontamination and dismantlement activities of the bulk shielding tank would be delayed until such time that the TRIGA ceased operation and was decommissioned.

All decommissioning activities will be carried out by the NRL staff, which operates and conducts maintenance on both reactors. The activities to convert the LOPRA into a subcritical assembly, such as movement of fuel, are similar to those carried out on a day-to-day basis by the NRL staff using existing procedures. The radiation protection program in place at the NRL for operation of the reactors will be used during decommissioning. All LOPRA fuel will be handled with remote operators, and a shielded cask will be used, if needed.

The licensee estimates that dose to the NRL staff for decommissioning activities will be less than 1 mrem. The licensee states that no release of radioactivity or dose commitment external to the facility is expected, so that dose to the public will also be less than 1 mrem. The NRC staff agrees with the licensee's estimates.

The NRC-approved physical security plan and emergency plan for the NRL will be in place during decommissioning. Because the TRIGA reactor will continue to operate, no changes to these plans are anticipated as a result of decommissioning. The decommissioning plan did not propose any changes to the LOPRA TS. The LOPRA TS as currently written will remain in place during decommissioning. The LOPRA and TRIGA TS contain quality assurance provisions in the form of surveillance requirements and administrative requirements. In response to a request for additional information from the NRC staff, the licensee confirmed that all LOPRA records will be archived and maintained in accordance with the TRIGA TS. This helps to ensure that LOPRA records pertinent to the decommissioning of the TRIGA will be retained until the TRIGA is decommissioned.

Decommissioning activities will require the movement of fuel. LOPRA fuel is handled routinely as part of surveillance activities for the LOPRA. The failure of a fuel element's cladding would not be a significant event and would not endanger the NRL staff or the public. The consequences of a failure of a fuel element with its low fission product inventory would be well within the analysis of fuel element failure for the TRIGA reactor which the staff found acceptable. In November 1993, the cladding of a LOPRA fuel element was damaged during maintenance. Facility radiation monitors did not detect any release of fission products. The fission product inventory in the subcritical assembly elements would be less than the LOPRA due to additional decay. The staff concludes that fuel cladding failure would not result in consequences greater than that analyzed for the TRIGA and LOPRA reactors and would not represent a hazard to health and safety of the public.

Any radioactive waste produced during decommissioning of the LOPRA would be added to waste from the TRIGA reactor. The amount of waste produced would be very small.

As a State institution, the UIUC uses a statement of intent [see 10 CFR 50.75(e)(2)(iv)] indicating that funds for decommissioning will be obtained when necessary. Decommissioning activities will be carried out by the NRL staff. It is estimated that 3 hours of staff effort will be required to complete decommissioning activities. The cost of decommissioning will be covered from the existing budget for the NRL.

The licensee has described the planned final radiation survey by stating that a final radiation survey plan is not proposed at this time because all of the radioactive material on the LOPRA license will be transferred to the TRIGA license. This radioactive material will be disposed of and the bulk shielding tank will be decontaminated to allow release for unrestricted use when the TRIGA reactor is decommissioned and released for unrestricted use.

3.0 ENVIRONMENTAL CONSIDERATION

The Commission has prepared an Environmental Assessment and Finding of No Significant Impact (EA), which was published in the *Federal Register* on January 16, 1997 (62 FR 2400). On the basis of the EA and this safety evaluation, the Commission has determined that no environmental impact statement is required and that issuance of this amendment approving decommissioning will have no significant adverse effect on the quality of the human environment.

4.0 CONCLUSION

On the basis of the staff's review of the licensee's decommissioning plan, it is concluded that the licensee is adequately aware of its continuing responsibilities to protect the health and safety of both workers and the public from undue radiological risk until the NRC terminates the reactor facility license. The decommissioning plan demonstrates that the licensee is prepared to convert the LOPRA into a subcritical assembly and transfer all radioactive material to the TRIGA license in accordance with applicable regulations and applicable NRC guidance.

The staff concludes that decommissioning operations can be conducted without undue risk to health and safety of the workers and the public and without causing any significant impact on the environment. The staff, therefore, finds the licensee's plan acceptable.

The staff has concluded, on the basis of the considerations discussed above, that (1) there is reasonable assurance that health and safety of the public (including NRL employees) will not be endangered by the proposed activities; (2) such activities will be conducted in compliance with the Commission's regulations; and (3) the issuance of this amendment will not be inimical to the common defense and security or health and safety of the public.

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Dated: January 21, 1997