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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 3 TO LICENSE NO. R-125

UNIVERSITY OF LOWELL

DOCKET NO. 50-223

INTRODUCTION

By letter dated March 16, 1979, the University of Lowell (the licensee) requested a change to the Technical Specifications for the University of Lowell Reactor (ULR) concerning the frequency of conducting the containment integrated leak rate test.

DISCUSSION

The ULR is a light-water cooled and moderated pool reactor of the MTR type authorized to operate up to 1 megawatt (thermal) power. The fuel elements are in the form of boxes containing flat fuel plates of aluminum-uranium alloy clad with aluminum. Control of the reactor is provided by four safety blades and a regulating rod which use boron carbide as the neutron poison material. The four safety blades subdivide the core into three sections. The modules surrounding the fuel array may be utilized for graphite reflectors or radiation baskets and must be filled with one or the other to ensure proper flow distribution with forced circulation. In addition, fuel elements in the interior of the core array may be replaced with radiation baskets. Since replacing a fuel element with a radiation basket changes the neutron flux distribution, flux measurements are required to ensure proper conditions exist before proceeding to higher power levels.

The core structure is located in a 31-foot deep pool where it is suspended from a movable bridge allowing it to be positioned at various locations adjacent to several experimental facilities. Connections to the primary coolant system are provided at two different bridge locations so that the reactor can be operated in the forced circulation mode (necessary for power levels above 0.1 MW) at either place.

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Cooling for the reactor at power levels above 0.1MW is provided by the primary coolant system which, when piping connections are established between the pipes in the pool walls and the movable bridge, pumps water through the core to a 3000 gallon holdup tank (for decay of short-lived water activation isotopes), to the pump, a heat exchanger, and back to the core.

Cooling is supplied to the core by a 10-inch aluminum pipe connected to the inlet flow channel box forming one side of the suspension frame. Cooling water is then directed from this plenum laterally to the top of the core where the coolant turns and flows downward through the core. From there, the coolant enters an outlet flow or riser channel box and finally a 10-inch diameter pipe which is connected to the primary coolant pump suction via the holdup tank.

The facility radiation monitoring system includes continuous air and area radiation monitors at various locations within the reactor building. In addition, a monitor located in the building ventilation stack monitors gaseous and particulate activity. Each radiation monitor can provide an alarm on detection of high radiation levels permitting emergency procedures to be put into effect to minimize radiation exposure of personnel.

The reactor building is in the form of a steel containment shell lined with concrete. The building is provided with two access airlocks and these and other penetrations are designed to maintain air leakage from the building to less than 10% of the building volume per day with a building overpressure of 2 psi. Building air is normally filtered and exhausted through a 100 foot stack adjacent to the building. In the event of a release of radioactivity within the building, the normal ventilation system will be isolated and the building air will be exhausted through a filter system at a slow rate, sufficient to maintain a negative air pressure within the building.

Evaluation

The University of Lowell Reactor is similar in characteristics to several other research reactors that have operated satisfactorily at power levels up to five megawatts (thermal) and whose operating experience provides confidence in the predicted behavior of the ULR.

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Containment leak rate was originally specified to be 0.1% of the building volume per day at 2 psig overpressure. The building as originally constructed was tested and determined to meet this value. However, because of various penetrations, it was concluded that the design leak rate could not be met. As a result, an analysis was provided by the licensee that a value of 10% per day would be a satisfactory rate. The NRC evaluation (see original safety evaluation dated 12/24/74) and testing of the containment showed that the actual leak rate was less than half the 10% per day value and that the calculations in the licensee's Safety Analysis were conservative. This evaluation also concluded from evaluation of several accident analyses that the routine production of radioactive wastes would present no substantial hazard to the public.

Containment integrated leak rate test results since commencement of operation December 24, 1974, have substantiated that the actual leak rate has been less than 10% of the building volume per day at 2 psig overpres ure. Actual rates have been less than 25% of the 10% specified in the Technical Specifications.

The licensee has requested that Technical Specification 4.4.3 be changed so that the integrated leak rate of the containment building shall be performed at intervals of 24 months (± 4 months) instead of 12 months (± 2 months) presently required.

The type test conducted by the licensee is similar to a type A test as described by Appendix J to 10 CFR Part 50 for power plants. Type A tests for power reactors are required in sets of three performed at approximately equal intervals during each 10-year period. This schedule was established because of the requirement to conduct Type B and C tests. Appendix J requirement are not applicable to research reactors.

Changing the Technical Specification requirement to conduct the tests at intervals of 24 months is consistent with Appendix J frequency and therefore would provide the ULR a sufficient surveillance frequency to ensure early detection of any major leaks in the containment.

ENVIRONMENTAL CONSIDERATION

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

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Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, 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 operation in the proposed manner, 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 to the health and safety of the public.

Dated: May 29, 1979

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