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

ENVIRONMENTAL IMPACT APPRAISAL

FOR THE

UNIVERSITY OF VIRGINIA REACTOR

LICENSE NO. R-66

DOCKET NO. 50-62

This Environmental Impact Appraisal is written in connection with the proposed renewal for 20 years of the operating license of the pool-type University of Virginia research reactor (UVAR).

The UVAR reactor operates in an existing water pool inside an existing building on the university campus in Charlottesville, so this licensing action would lead to no change in the physical environment on the campus. The UVAR facility has been operating since the initial licensing in June, 1960. Currently, there are no plans to change any of the structures or operating characteristics associated with the reactor during the time interval of the license renewal requested by the licensee.

Based on the review of the specific facility characteristics which are considered for potential impact on the environment, as set forth in the staff's Safety Evaluation Report (SER)[1] for this action, it is concluded that renewal of this operating license will have an insignificant environmental impact. Although judged insignificant, operating features with the greatest potential environmental impact, both radiological and non-radiological, respectively, are summarized below.

Argon-41, produced by neutron irradiation of air during normal operation, is the principal airborne radioactive effluent from the UVAR facility. Conservative calculations by the staff, based on the total amount of Ar-41 released from the reactor room stack during a year, predict a maximum potential annual whole body dose of less than two millirems in unrestricted areas. The radiation exposure rates measured by the environmental monitors located near the reactor facility have been indistinguishable from the ambient background.

The credible hypothetical accident with the greatest potential release of radioactivity from the reactor facility is the failure of an experiment containing fissile material (a fueled experiment). Consequently, the Technical Specifications of the license limit both the maximum fission rate and the locations for performing such experiments. Conservative analyses of the potential impact on the environment of the total failure of a maximum authorized fueled experiment predict doses in unrestricted areas which do not exceed the applicable 10 CFR 20 guidelines.

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[1] NUREG-0928, "Safety Evaluation Report Related to the Renewal of the Operating License for the University of Virginia Open-Pool Research Reactor."

The UVAR reactor's 2MW of thermal power is transferred to pool water that is pumped downward through the core into the shell side of a conventional aluminum shell-and-tube heat exchanger. In the heat exchanger, the thermal power is transferred by conduction to the secondary water, which eventually releases the heat to the outside environment through a cooling tower. The 2MW of reactor thermal power is comparable to the power dissipated to the atmosphere by the cooling tower of the air-conditioning system of a moderate-sized building.

In addition to the analysis in the SER summarized above, the environmental impact associated with operation of research reactors has been generically evaluated by the staff and is discussed in the attached memorandum.[2] This memorandum concludes that there will be no significant environmental impact associated with the operation of research reactors licensed to operate at power levels up to and including 2 MWt and that an environmental impact statement is not required for the issuance of construction permits or operating licenses for such facilities. Although the upper limit of applicability of this generic environmental impact appraisal is the 2 MW at which the UVAR is authorized to operate, the staff considers that the evaluation applies for the following two reasons:

1) The power limit in the generic evaluation is based on the hypothetical rapid loss of all coolant, which is not a credible event for the UVAR facility, and

2) The UVAR reactor has been equipped with a fail-safe gravity-feed core cooling system that is considered by the staff to be adequate to prevent fuel melting even following an instantaneous total loss of water from the primary coolant system.

Thus, based on the above considerations, the staff has determined that this generic evaluation is applicable to operation of the UVAR facility, and that there are no special or unique features which would preclude reliance on the generic evaluation.

Conclusion and Basis for Negative Declaration

Based on the foregoing considerations, the staff has concluded that there will be no significant environmental impact attributable to this proposed license renewal. Having reached this conclusion, the staff has further concluded that no environmental impact statement for the proposed action need be prepared and that a negative declaration to this effect is appropriate.

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2 Memorandum from R. H. Vollmer to D. G. Eisenhut, "Environmental Considerations Regarding the Licensing of Research Reactors and Critical Facilities," dated December 31, 1980.

Furthermore, based on the considerations discussed and evaluated above, the staff has concluded that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner and (2) 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: September 30, 1982

DEC 31 1980

MEMORANDUM FOR: Darrell G. Eisenhut, Director
Division of Licensing

FROM: Richard H. Vollmer, Director
Division of Engineering

SUBJECT: ENVIRONMENTAL CONSIDERATIONS REGARDING THE RENEWAL OF LICENSES FOR RESEARCH REACTORS

In response to your memorandum of November 24, 1980, subject as above, we have reviewed the Muller to Skovolt memorandum dated January 28, 1974. Based on that review, we have prepared the enclosed evaluation, and suggest that you utilize it for all future research reactor reviews.

Original Signed by:
Richard H. Vollmer

Richard H. Vollmer, Director
Division of Engineering
Office of Nuclear Reactor Regulation

Enclosure:
As stated

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ENVIRONMENTAL CONSIDERATIONS REGARDING THE LICENSING OF RESEARCH REACTORS AND CRITICAL FACILITIES

Introduction

This discussion deals with research reactors and critical facilities which are designed to operate at low power levels, 2 MWt and lower, and are used primarily for basic research in neutron physics, neutron radiography, isotope production, experiments associated with nuclear engineering, training and as a part of the nuclear physics curriculum. Operation of such facilities will generally not exceed a 5 day week, 8 hour day or about 2000 hours per year. Such reactors are located adjacent to technical service support facilities with convenient access for students and faculty.

Sited most frequently on the campus of large universities, the reactors are usually housed in already existing structures, appropriately modified, or placed in new buildings that are designed and constructed to blend in with existing facilities.

Facility

There are no exterior conduits, pipelines, electrical or mechanical structures or transmission lines attached to or adjacent to the facility other than utility service facilities which are similar to those required in other campus facilities, specifically laboratories. Heat dissipation is generally accomplished by use of a cooling tower located on the roof of the building. These cooling towers are on the order of 10' x 10' x 10' and are comparable to cooling towers associated with the air-conditioning system of large office buildings.

Make up for this cooling system is readily available and usually obtained from the local water supply. Radioactive gaseous effluents are limited to Ar 41 and the release of radioactive liquid effluents can be carefully monitored and controlled. These liquid wastes are collected in storage tanks to allow for decay and monitoring prior to dilution and release to the sanitary sewer system. Solid radioactive wastes are packaged and shipped off-site for storage at NRC approved sites. The transportation of such waste is done in accordance with existing NRC-DOT regulations in approved shipping containers.

Chemical and sanitary waste systems are similar to those existing at other university laboratories and buildings.

Environmental Effects of Site Preparation and Facility Construction

Construction of such facilities invariably occurs in areas that have already been disturbed by other university building construction and in some cases solely within an already existing building. Therefore, construction would not be expected to have any significant affect on the terrain, vegetation, wildlife or nearby waters or aquatic life. The societal, economic and esthetic impacts of construction would be no greater than that associated with the construction of a large office building or similar university facility.

Environmental Effects of Facility Operation

Release of thermal effluents from a reactor of less than 2 MWt will not have a significant effect on the environment. This small amount of waste heat is generally rejected to the atmosphere by means of small cooling towers. Extensive drift and/or fog will not occur at this low power level.

Release of routine gaseous effluent can be limited to Ar 41 which is generated by neutron activation of air. This will be kept as low as practicable by minimum air ventilation of the tubes. Yearly doses to unrestricted areas will be at or below established limits. Routine releases of radioactive liquid effluents can be carefully monitored and controlled in a manner that will ensure compliance with current standards. Solid radioactive wastes will be shipped to an authorized disposal site in approved containers. These wastes should not amount to more than a few shipping containers a year.

Based on experience with other research reactors, specifically TRIGA reactors, operating in the 1 to 2 MWt range, the annual release of gaseous and liquid effluents to unrestricted areas should be less than 30 curies and 0.01 curies respectively.

No release of potentially harmful chemical substances will occur during normal operation. Small amounts of chemicals and/or high-solid content water may be released from the facility through the sanitary sewer during periodic blowdown of the cooling tower or from laboratory experiments.

Other potential effects of the facility, such as esthetics, noise, societal or impact on local flora and fauna are expected to be too small to measure.

Environmental Effects of Accidents

Accidents ranging from the failure of experiments up to the largest core damage and fission product release considered possible result in doses of only a small fraction of 10 CFR Part 100 guidelines and are considered negligible with respect to the environment.

Unavoidable Effects of Facility Construction and Operation

The unavoidable effects of construction and operation involves the materials used in construction that cannot be recovered and the fissionable material used in the reactor. No adverse impact on the environment is expected from either of these unavoidable effects.

Alternatives to Construction and Operation of the Facility

To accomplish the objectives associated with research reactors, there are no suitable alternatives. Some of these objectives are training of students in the operation of reactors, production of radioisotopes, and use of neutron and gamma ray beams to conduct experiments.

Long-Term Effects of Facility Construction and Operation

The long-term effects of research facilities are considered to be beneficial as a result of the contribution to scientific knowledge and training.

Because of the relatively low amount of capital resources involved and the small impact on the environment very little irreversible and irretrievable commitment is associated with such facilities.

Costs and Benefits of Facility and Alternatives

The costs are on the order of several millions of dollars with very little environmental impact. The benefits include, but are not limited to, some combination of the following: conduct of activation analyses, conduct of neutron radiography, training of operating personnel and education of students. Some of these activities could be conducted using particle accelerators or radioactive sources which would be more costly and less efficient. There is no reasonable alternative to a nuclear research reactor for conducting this spectrum of activities.

Conclusion

The staff concludes that there will be no significant environmental impact associated with the licensing of research reactors or critical facilities designed to operate at power levels of 2 MWt or lower and that no environmental impact statements are required to be written for the issuance of construction permits or operating licenses for such facilities.