7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT ENVIRONMENTAL IMPACT

REGARDING PROPOSED POWER INCREASE OF

FACILITY OPERATING LICENSE NO. R-75

OHIO STATE UNIVERSITY

DOCKET NO. 50-150

The U.S. Nuclear Regulatory Commission (the Commission) is considering issuance of an amendment to Facility Operating License No. R-75 to the Ohio State University (the licensee) for the Ohio State University Pool-Type Research Reactor (OSURR) located on the Ohio State University campus in Columbus, Ohio.

ENVIRONMENTAL ASSESSMENT

This environmental assessment relates to the proposed power increase for the OSURR at Columbus, Ohio, in response to an application from the licensee of October 7, 1987, as supplemented on May 26, 1989, February 28, and June 12, 1990. The proposed action would authorize operation at a power level of 500 kilowatts (thermal) (kW(t)), from the presently licensed power level of 10 kW(t). The only hardware modifications that are required by the power increase and that change the environment are those necessary to increase the capacity of the heat removal system and to increase the coverage of the radioactivity monitoring system, along with their associated instrumentation and controls. The heat removal system uses primary (pool water)-to-secondary (ethylene glycol and water mixture) coolant heat exchangers, a fan-forced air cooling unit (also

called a drycooler) for initial cooling of the secondary coolant, and a city water-based heat exchanger for additional cooling of the secondary coolant. The primary-secondary coolant loop is a totally enclosed and self-contained loop. No liquid effluent releases are expected from normal OSURR operation. Any release of water from the reactor pool or secondary coolant fluid from the cooling system will be planned and controlled, and performed in accordance with appropriate regulations. By including a drycooler in the secondary loop, the OSURR avoids the use of a cooling tower. Thus, the drycooler produces no drift or fog and does not use city water. Makeup water for the reactor pool is obtained from the city water supply, after first passing through an initial cleanup demineralizer. All connections to the city water system will have backflow preventers to preclude the possibility of introducing reactor pool water to the potable water supply. The city water-based supplementary heat exchanger will draw water from the city water supply, but it will be used only when the outdoor drycooler is unable, because of the outdoor air temperature, to reduce secondary coolant temperatures to the point where primary coolant temperature returned to the pool is within specified limits. Thus, water use by the supplementary heat exchanger will be monitored and kept within thermal limits for discharge to the sanitary sewer system. Installation of the outdoor drycooler unit will require very little land because the unit is mounted on an 8 foot by 17 foot concrete pad, on an unused part of the grounds of the reactor building. Thus, no additional land use will result. To install the cooling unit, the licensee will not need to remove trees or move animal life. In addition, the cooling unit stands about 48 inches tall, and covers an area of about 8 feet by 14 feet, and thus will cause no disruption of visibility or visual distraction in the area. Operation of the fans of the drycooler will

cause a small amount of noise, but no more than may be expected from a building air conditioner of modest size. In any case, the nearest residences are about one-quarter of a mile upwind of the reactor building, and persons in and near these areas will not experience any additional noise exposure because of fan operation. The environmental effluents (warm air) caused by increasing the power to 500 kilowatts are negligible.

The licensee plans to expand the radioactive monitoring system by installing additional monitors outside the restricted area. At least four of these monitors will be positioned in the unrestricted area about 100 feet from the reactor building. The areas are normally unoccupied in all directions except about 150 feet to the south where a van de Graaff laboratory is located. The effect on the environment of these monitors is negligible.

Need for the Proposed Action

The licensee is planning to conduct research in neutron activation analysis, boron neutron capture therapy, and related medical and biological research, materials analysis, and instrumentation research and testing. Operation at 10 kW would not provide sufficient neutron flux to conduct these activities.

Environmental Impact

The OSURR operates in a shielded pool of water inside the reactor building on the Columbus campus of the Ohio State University. This licensing action does not lead to a change in the physical environment except for the heat removal system and radioactivity monitoring system previously discussed.

Based on the review of the facility specific operating characteristics that are considered for possible effect on the environment, as set forth in the staff s safety evaluation report (SER) (see SER for Amendment No. 13 to Facility

Operating License No. R-75) for this action, the staff concludes that increasing the power level to 500 kW at OSURR will have an insignificant environmental effect. Although the proposed operating features are judged to have an insignificant effect on the environment, the following paragraphs summarize those features with the greatest possible environmental effect.

Argon-41, a product from neutron irradiation of air during operation, is the principal airborne radioactive effluent from the OSURR during routine operations. Conservative calculations by the staff, based on the total amount of Ar-41 released from the reactor during the year, place the maximum credible dose assessment to members of the general public in areas that would normally be occupied at about 0.2 millirem per year.

The staff has considered hypothetical credible accidents at the OSURR and has concluded that there is reasonable assurance that such accidents will not release a significant quantity of fission products from the fuel cladding and, therefore, will not cause significant radiological hazard to the environment or the public.

This conclusion is based on the following:

1) The excess reactivity available under the technical specifications is insufficient to support a reactor transient generating enough energy to cause overheating of the fuel or loss of integrity of the cladding.

2) At a thermal power level of 500 kilowatts, the inventory of fission products in the fuel cannot generate sufficient radioactive decay heat to cause fuel damage even in the hypothetical event of instantaneous total loss of coolant, and

3) The hypothetical loss of integrity of the cladding of the maximum irradiated fuel rod will not lead to radiation exposures in the unrestricted environment that exceed guidelines values of 10 CFR Part 20.

In addition to the analyses in the SER summarized herein, the environmental effect associated with the operation of research reactors has been generically evaluated by the staff and is discussed in the attached generic evaluation. This evaluation concludes that there will be no significant environmental effect associated with the operation of research reactors licensed to operate at power levels up to and including 2 MW(t) and that an environmental impact statement is not required for the issuance of construction permits or operating licenses for such facilities. We have determined that this generic evaluation is applicable to operation of the OSURR and that this facility will have no special or unique features that would preclude reliance on the generic evaluation.

Alternatives to the Proposed Action

Alternatives considered to the proposed action were to not increase the power level or to increase the power level to some lesser power. Operation at 10 kW would not achieve the licensee's research objectives. Operation at a lesser power could achieve some but not all of the objectives and would result in essentially the same environmental effect as at 500 kW. The environmental effect between operation at 10 kW and at 500 kW is not significant.

Alternative Use of Resources

This action does not involve the use of any resources beyond those normally allocated for such activities.

Agencies and Persons Consulted

The staff has obtained the technical assistance of the Idaho National Engineering Laboratory in performing the safety evaluation of continued operation of the OSURR facility.

FINDING OF NO SIGNIFICANT IMPACT

Based upon the foregoing environmental assessment, the Commission has concluded that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the Commission has determined not to prepare an environmental impact statement for this proposed action. For further details with respect to this action, see the licensee's request for a license amendment of October 7, 1987, as supplemented on May 26, 1989, February 28 and June 12, 1990. These documents are available for public inspection at the Commission's Public Document Room, 2120 L Street, N.W., Washington, D.C. 20555.

Dated at Rockville, Maryland this 5th day of November 1990.

FOR THE NUCLEAR REGULATORY COMMISSION

Seymour H. Weiss

Seymour H. Weiss, Director
Non-Power Reactor, Decommissioning and
Environmental Project Directorate
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

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 MW(t) 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 a 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 campuses 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. However, the environmental considerations discussed herein are not limited to those which are part of universities.

Facility

There are no exterior conduits, pipelines, electrical or mechanical structures or transmission lines attached to or adjacent to the facility other than for utility services, which are similar to those required in other similar facilities, specifically laboratories. Heat dissipation, if required, is generally accomplished by use of a cooling tower located next to or on the roof of the building. These cooling towers typically are on the order of 10' x 10' x 10' and are comparable to cooling towers associated with the air-conditioning systems of large office buildings. Heat dissipation may also be accomplished by transfer through a heat exchanger to water flowing directly to a sewer or a chilled water system. Make-up for the 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. Liquid wastes are collected in storage tanks to allow for decay and monitoring prior to dilution and release to the sanitary sewer system. This liquid waste may also be solidified and disposed of as solid waste 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 similar laboratories and buildings.

Environmental Effects of Site Preparation and Facility Construction

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

Environmental Effects of Facility Operation

Release of thermal effluents from a reactor of less that 2 MW(t) 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. The small amount of waste heat released to sewers, in the case of heat exchanger secondary flow directly to the sewer, will not raise average water temperatures in the environment.

Release of routine gaseous effluents can be limited to Ar-41, which is generated by neutron activation of air. In most cases, this will be kept as low as practicable by using gases other than air for supporting experiments. Experiments that are supported by air are designed to minimize production of Ar-41. Yearly doses to unrestricted areas will be at or below established guidelines in 10 CFR 20 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 require more than a few shipping containers a year.

Based on experience with other research reactors, specifically TRIGA reactors operating in the 1 to 2 MW(t) range, the annual release of gaseous and liquid effluents to unrestricted areas should be less than 30 curies and 0.01 curie, 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 that are less than 10 CFR Part 20 guidelines and are considered negligible with respect to the environment.

Unavoidable Effects of Facility Construction and Operation

The unavoidable effects of construction and operation involve 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 small 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 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 level of 2 MW(t) 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.

Dated: August 8, 1988