



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

ENVIRONMENTAL ASSESSMENT
FOR THE
TRIGA RESEARCH REACTOR OF THE
PENNSYLVANIA STATE UNIVERSITY
LICENSE NO. R-2
DOCKET NO. 50-5

Description of Proposed Action

This Environmental Assessment is written in connection with the proposed renewal for 20 years of the operating license of the Pennsylvania State University Breazeale TRIGA Research Reactor (PSBR) at University Park, Pennsylvania, in response to a timely application from the licensee dated March 1, 1985, as supplemented. The proposed action would authorize continued operation of the reactor in the manner that it has been operated since License No. R-2 was issued in 1965. Currently there are no plans to change any of the structures or operating characteristics associated with the reactor during the renewal period requested by the licensee.

Need for the Proposed Action

The operating license for the facility was due to expire in June 1985. The proposed action is required to authorize continued operation so that the facility can continue to be used in the licensee's mission of education and research.

Alternatives to the Proposed Action

The only reasonable alternative to the proposed action that was considered was not renewing the operating license. This alternative would have led to cessation of operations, with a resulting change in status and a likely small impact on the environment.

Environmental Impact of Continued Operation

The PSBR operates in an existing shielded pool of water inside an existing multiple purpose building, so this licensing would lead to no change in the physical environment.

Based on the review of the specific facility operating characteristics that 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 are summarized below.

Argon-41, a product from neutron irradiation of air during operation, is the principal airborne radioactive effluent from the PSBR during routine operations. Conservative calculations by the staff, based on the total amount of Ar-41 released from the reactor during a year, predict a maximum potential annual whole body dose of less than 1 millirem in unrestricted areas. Radiation exposure rates measured outside of the reactor facility building are consistent with this computation.

The staff has considered hypothetical credible accidents at PSBR 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,
- b) at a thermal power level of 1 megawatt, 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
- c) 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 guideline values of 10 CFR 20.

In addition to the analyses 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 generic evaluation. This evaluation 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. We have determined that this generic evaluation is applicable to operation of the PSBR and that there are no special or unique features that would preclude reliance on the generic evaluation.

¹

NUREG-1185, "Safety Evaluation Report Related to the Renewal of the Operating License for the TRIGA Training and Research Reactor at Pennsylvania State University."

Agencies and Persons Consulted

The staff has obtained the technical assistance of the Los Alamos National Laboratory in performing the safety evaluation of continued operation of the PSBR facility.

Conclusion and Basis for No Significant Impact Finding

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 No Significant Impact Finding is appropriate.

Dated: December, 1985

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 MWe 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 is generally accomplished by use of a cooling tower located 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.

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. 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 occurs 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 effect 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 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 effluents can be limited to Ar-41, which is generated by neutron activation of air. Even this will be kept as low as practicable by using gases other than air for supporting experiments. 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 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 aesthetics, 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 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.