ENVIRONMENTAL REPORT FOR THE RENSSELAER POLYTECHNIC INSTITUTE REACTOR CRITICAL FACILITY

License No. CX-22
Docket No. 50-225

Rensselaer

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1.0 Introduction

Section 50.30, "Filing of Application for Licenses; Oath and Affirmation" of 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," requires that an application for a facility operation license must include an environmental impact report. This report is intended to state the probable impacts on the environment that can be attributed to the operation of the Rensselaer Polytechnic Institute Reactor Critical Facility (RCF).

2.0 Description of Facility

2.1 Introduction and Location

The RCF reactor is a pool-type, light water-reflected reactor operated typically below 10 watts. The reactor core rests in a 1-cm-thick stainless steel tank, seven feet in diameter and seven feet tall. The core is shielded by about 3 feet of water on the sides and 10 inches of water on the top. The water is used for moderation and shielding only.

The RCF is located on the southern bank of the Mohawk River, on Erie Blvd. in Schenectady, New York. The facility is on property formerly owned by the American Locomotive Company (ALCO), about 35 minutes from the main RPI campus in Troy.

2.2 Building

The facility building is dominated by the reactor room, which is 30 feet wide, 40 feet long, and 30 feet high. The reactor room, three sides of which consist of one-foot reinforced concrete, is separated from the office, control room and bathroom by three feet of reinforced concrete. The counting room is shielded by a total of five feet of concrete from the reactor room, two feet on the adjacent sides, and one foot on the roof. [redacted]

2.3 Cooling, Make-up Water, and Clean-up Systems

The reactor tank contains 2000 gallons of light water used for moderation and shielding only. The reactor operates at such low power levels that cooling is not an issue, even in the case of the design basis accident in the SAR.

Make-up water is obtained from the city water supply, though it is rarely needed.

A filtering system is set up near the storage tank to filter the water in the storage tank when desired. Impurities in the reactor water are generally not a concern.

2.4 Ventilation System

A stack extends above the reactor room to 50 feet above ground level. It contains a CWS filter for removing the small amount of fission products that might evolve from a maximum credible accident. Air circulation occurs via natural circulation. Forced circulation ventilation is provided in all other rooms in the facility.

Temperature control in the facility is provided by an air conditioning system near the bathroom, and a small boiler house outside the maintenance hallway (which is located immediately outside the reactor room).

2.5 Liquid Waste Storage

The RCF currently does not produce, nor is it projected to produce, any liquid waste.

2.6 Dry Waste Storage

The RCF currently does not produce, nor is it projected to produce, any dry waste.

3.0 Environmental Effects of Site Preparation and Facility Construction

Since facility construction in 1956, there has been no noticeable effect on the land or river in the vicinity of the structure. Most people in the area do not even take notice of the facility.

4.0 Environmental Effects of Facility Operation

4.1 Thermal Effluents

Because the RCF reactor operates at power levels usually below 10 watts, heat production is negligible.

4.2 Radioactive Gaseous Effluents

Operation of the RCF reactor does not generate detectable levels of radioactive gases.

4.3 Radioactive Liquid Effluents

Operation of the reactor does not produce radioactive liquid waste.

4.4 Solid Radioactive Waste

Fuel consumption of the reactor is negligible due to the low power levels of operation. The small amount of fission products that are produced are contained within the fuel pins.

4.5 Hazardous and Chemical Waste

The RCF does not produce hazardous or chemical waste products.

4.6 Mixed Waste

The RCF does not produce mixed waste.

5.0 Environmental Effects of Accidents

The design basis accident scenario for the RCF is as follows: with the reactor operating initially at 200 watts, the insertion of $0.60 positive reactivity causes power to promptly jump to 600 watts and then increase on a period of 3.0 seconds to 1800 watts, at which point linear power monitors LP1 and/or LP2 generate a scram signal. Allowing 1.5 seconds thereafter for the rods to be bottomed (Technical Specification is 900 msec), analysis conservatively assumed the instantaneous insertion of $1.000 negative reactivity (less than the core shutdown margin) at 5 seconds after the excursion began. Maximum power reached during the transient is slightly below 3050 watts, depositing about 10 kJ of energy in the core and inducing a fuel temperature rise of less than 0.1°C above an initial value of 20°C. This energy deposition is roughly a factor of 10^3 less than the core safety limit identified in the Technical Specifications. Therefore, the integrity of the fuel is not in question, and no fission products are released from the fuel pins.

6.0 Unavoidable Effects of Facility Construction and Operation

The unavoidable effects of construction and operation consist of materials that are used in construction and can not be recovered and the fissionable material in the reactor. No adverse impact on the environment has occurred consequently.

7.0 Alternatives to Construction and Operation of the Facility

There are no reasonable alternatives to the many of the benefits of a working research reactor. Even the latest computer technology is not a substitute for the wide range of experimentation that may be carried out using the reactor.

8.0 Long-Term Effects of Facility Construction and Operation

The net effect of long-term facility operation is overwhelmingly positive. Operational costs are extremely low, and the RCF has been used to teach and/or train numerous students and conduct many valuable experiments.

9.0 Cost and Benefits of Facility and Alternatives

Operational costs of the RCF are less than $50,000 annually, and there is essentially no environmental impact. Benefits include nuclear engineering education for RPI students and the public, reactor operations training, conduction of thesis experiments, and more. There is no suitable alternative to the RCF reactor that can provide such a broad span of benefits.