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August 18, 2005

U.S. Nuclear Regulatory Commission
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SUBJECT: ENVIRONMENTAL REPORT FOR THE OHIO STATE UNIVERSITY RESEARCH REACTOR, LICENSE R-75, DOCKET 50-150

As requested in the letter dated May 23, 2005 from Daniel E. Hughes, Project Manager, please find enclosed the Environmental Report for The Ohio State University Research Reactor. It is submitted in support of the application for renewal of Facility Operating License R-75 submitted in December of 1999. If you have questions concerning this report please contact Mr. Andrew C. Kauffman, Associate Director of the Nuclear Reactor Laboratory, at 614-688-8220.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on August 18, 2005

Jada D. Harmon

JADA DeANNE HARMON
NOTARY PUBLIC, STATE OF OHIO
My Commission Expires 04-25-09

Sincerely,

W. A. "Bud" Baeslack III
Dean, College of Engineering

c. A. Fentiman, Director, OSU Nuclear Reactor Laboratory
A. Kauffman, Associate Director, OSU Nuclear Reactor Laboratory
D. Hughes, U.S. Nuclear Regulatory Commission

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# ENVIRONMENTAL REPORT
# FOR THE OHIO STATE UNIVERSITY
# RESEARCH REACTOR
# LICENSE R-75 DOCKET 50-150

This report is being submitted to support the license renewal for The Ohio State University Research Reactor (OSURR) proposed in December of 1999. The environmental report is required by 10CFR51.45. The purpose of this document with the original license renewal application is to extend the original 40-year license of the reactor for another 20 years. The OSURR was licensed to operate at 10kW in 1960 and the license was amended in November of 1990 to allow operation up to 500kW thermal.

The OSURR is located on property owned by The Ohio State University between one and two miles west of main campus. The reactor building is a steel frame structure with insulated metal walls. The ground floor is a concrete slab on grade. The overall exterior ground floor dimensions of the building are 62 feet by 48 feet. This is the same footprint as constructed in 1959. With the power increase approved in 1990 a small dry cooler about 14 feet by 7 feet and 4 feet high was added to the east side of the building. It sits on an 8 foot by 14-foot concrete pad adjacent to the reactor building.

There are six environmental impacts that are considered in this report. These include the impact from the reactor cooling system operation, the impact from the release of Ar-41 to the atmosphere, the impact of direct radiation during reactor operation, the release of liquid radioactive waste to the sanitary sewer system, the generation of solid radioactive waste for ultimate disposal at a radioactive waste disposal site, and the impact of the maximum credible accident. These are all considered negligible as described below and all releases are made in compliance with regulations including those of the State of Ohio Bureau of Radiological Health, The U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency as required.

The heat removal system designed for the OSURR operating at 500kW is described in detail in Chapter 3 of the Safety Analysis Report. The system makes use of primary (pool water) to secondary (ethylene glycol and water mixture) coolant heat exchangers, a fan-forced air-cooling unit (dry cooler) 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 totally enclosed and a self-contained loop. No liquid effluent releases occur during normal reactor operation. Utilization of a dry cooler in the secondary loop eliminates the use of a cooling tower. Therefore there is no drift or fog formation. Makeup water for the reactor pool (for evaporative losses) is obtained from the city water supply, and all connections to the system have backflow preventers to preclude the possibility of reactor pool water being introduced in the potable water supply. The city water based supplementary heat exchanger draws water from the city water supply but its use is limited to those occasions where the outdoor dry cooler is unable, because of high outdoor air temperature, to reduce secondary coolant temperatures adequately. Therefore water use by the supplementary system is typically

limited to the summer months. This water released to the sanitary sewer system is normally less than 75 degrees F and is relatively small in volume. A conservative estimate for the last five years is that it makes up about 0.009% of The Ohio State University's average water release to the sanitary sewer system each summer.

The staff of the OSURR analyzes releases of Ar-41 from the building each day the reactor is operated per procedure RS-17, Ar-41 Release Calculations. The effluent monitor is calibrated annually per procedure RS-03, Calibrating Gaseous Effluent Monitor and is on whenever the reactor is being operated. Analyses are also completed weekly, semiannually, and annually to assure we are meeting the concentration limits for Ar-41 inside and outside of the facility. Data taken from the five most recent Annual Reports to the NRC indicate annual releases average about 0.77% of the allowed annual average concentration limit of 10CFR20. The annual average dose rate is about 0.073mr/yr calculated using the COMPLY Code of the USEPA 40CFR61.

Sources of direct radiation include the reactor, a Co-60 gamma irradiator, a Cs-137 gamma irradiator, and other radioactive sources. All of these are shielded and properly labeled according to 10CFR20. The staff of the reactor completes a radiation survey every day the reactor is operated and at least weekly per procedure RS-09, Area Radiation Surveys. The Radiation Safety Section of the Office of Environmental Health and Safety conducts an independent monthly survey. Staff and experimenters are issued personnel dosimetry, and visitors are monitored per the reactor's NRL Dosimetry Policy. Review of the Annual Reports to the NRC over the last five years indicate no visitors have received measurable exposures during this time period. During normal operations, staff and experimenters have received no more than 130 mrem TEDE in any year during this period. (TEDE are higher for a few individuals during two outage periods where reactor pool maintenance has taken place but are still far below 10CFR20 limits). The highest conservative estimate for a TEDE to a member of the general public is 61.47 mrem/year as calculated in procedure RS-18, Environmental Monitoring.

Releases to the sanitary sewer system are reported to the OSU Radiation Safety Section of the Office of Environmental Health and Safety. Measurable releases are made during outages for reactor pool maintenance when the water is drained from the pool after fuel is moved to the storage pit. This has occurred twice in the last five years and we have reported releases of H-3 of 1.76 mCi in 2003 and 4.15 mCi in 2000. These releases are made in about 5700 gallons of water and the resulting concentration is thus below the 10CFR20 Appendix B limits for H-3.

From July 1999 through June 2004 The OSURR made transfers of solid waste to the Radiation Safety Section of the Office of Environmental Health and Safety that totaled 12 cubic feet or about 2.4 cubic feet per year of un-compacted low-level radioactive waste. This waste is made up of gloves, pads, and various activation products from experiments conducted using the reactor. Since we converted to LEU fuel from HEU fuel in 1988, the only fuel shipment was the removal of the HEU in 1995. We have not shipped nor received LEU since the original receipt and we do not anticipate the need during the 20-year license extension period due to the small amount of U-235 utilization.

Chapter 8 of the OSURR Safety Analysis Report discusses the accident analysis for the reactor. The maximum credible accident analysis provides a conservative estimate of whole body gamma doses inside the building. Since procedure EP-01, Emergency Procedures, requires evacuation and closure of the building ventilation system, doses to occupants would be well below 10CFR20 limits for occupational exposures. In the most conservative case, an individual would have at least 30 minutes to evacuate the facility and remain below 10CFR20 limits.

As a part of The Ohio State University College of Engineering, the OSURR understands and endorses the College's Mission statement to:

- Foster a learning culture that prepares our students to be key contributors to society
- Provides new knowledge that can be assimilated by our customers and partners
- Create and disseminate new ideas and concepts that expand our understanding of science and engineering
- Be an innovative leader in engineering education
- Be a prime resource for Ohio economic development
- Provide life long learning for engineers and architects
- Promote and support the purposes of the entire university

We have routinely provided teaching, research, and service to numerous institutions. We recently have taught nuclear engineering laboratory classes for The Ohio State University, University of Cincinnati, and Tuskegee University and completed irradiations for the Air Force Institute of Technology Radiation Effects Laboratory and Miami University Physics classes. In the recent past, we have collaborated with four OSU departments and at least eight other universities on research projects involving radiation damage, neutron activation analysis, or sterilization. And we have provided radiation services to numerous Ohio based organizations including the NASA Glenn Research Center, GE Reuter-Stokes, The Cleveland Clinic, and Innovision. About forty-four colleges and universities and fifty-four secondary schools have utilized our resources for teaching, research, and service activities.

The OSURR is the only research reactor in Ohio and is thus a unique resource in advancing the mission of the College of Engineering specifically and the University more broadly. There are no significant environmental impacts from continued operation of the OSURR.