October 19, 2001

Mr. Ralph Butler, Interim Director
Research Reactor Center
University of Missouri-Columbia
Research Park
Columbia, MO 65211

SUBJECT: UNIVERSITY OF MISSOURI-COLUMBIA RESEARCH REACTOR - ENVIRONMENTAL ASSESSMENT RE: AMENDMENT FOR CONSTRUCTION PERMIT RECAPTURE (TAC NO. MB0850)

Dear Mr. Butler:

Enclosed is a copy of the final Environmental Assessment and Finding of No Significant Impact related to your application for amendment of Amended Facility License No. R-103 for the University of Missouri-Columbia Research Reactor submitted on December 27, 2000, as supplemented by letters dated April 12 and June 6, 2001. The proposed amendment would revise Amended Facility License No. R-103 to change the license expiration date from November 21, 2001, to October 11, 2006, to recapture the construction time between the issuance date of Construction Permit No. CPRR-68 (November 21, 1961) and issuance of Facility Operating License No. R-103 (October 11, 1966) to allow a 40-year operating license term.

An Environmental Assessment was issued for public comment on August 1, 2001. The NRC received a number of comments and considered the relevant comments in this final Environmental Assessment; changes in the text are highlighted by a bar in the margins. A separate document regarding the disposition of comments was issued on October 18, 2001, (ML012850463). The aforementioned document can be inspected or accessed in the manner described at the end of the Enclosure.

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Alexander Adams, Jr., Senior Project Manager
Operational Experience and
Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-186

Enclosure: Environmental Assessment

cc w/enclosures:

Please see next page

cc:

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UNITED STATES NUCLEAR REGULATORY COMMISSION

UNIVERSITY OF MISSOURI-COLUMBIA

DOCKET NO. 50-186

UNIVERSITY OF MISSOURI-COLUMBIA RESEARCH REACTOR

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an amendment to Amended Facility License No. R-103, issued to the University of Missouri-Columbia (the licensee), for operation of the University of Missouri-Columbia Research Reactor (MURR), located in Columbia, Missouri.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action:

The proposed action would revise Amended Facility License No. R-103 to change the license expiration date from November 21, 2001, to October 11, 2006, to recapture the construction time between the issuance date of Construction Permit No. CPRR-68 (November 21, 1961) and issuance of Facility Operating License No. R-103 (October 11, 1966) to allow a 40-year operating license term.

The proposed action is in accordance with the licensee's application for amendment dated December 27, 2000, as supplemented by letters dated April 12 and June 6, 2001.

The Need for the Proposed Action:

The proposed action is needed to recapture the time spent under the construction permit to allow operation of the MURR reactor for a term of 40 years from the date of issuance of the facility license.

Environmental Impacts of the Proposed Action:

The MURR is located on a 7.5-acre lot in University Research Park, about one mile (1.6 km) southwest of the University of Missouri main campus in Columbia, Missouri. MURR is a pressurized, reflected, light-water moderated and cooled heterogeneous design reactor. The reactor is fueled with high-enriched, aluminum-clad, plate type fuel. The reactor has a maximum steady-state power level of 10 Megawatts thermal [MW(t)] with the reactor core located in a pressure vessel. The reactor pressure vessel is located in a cylindrically shaped pool and is covered by about 23 feet (7 m) of water during operation for radiation shielding. The reactor pool is surrounded by a biological shield. The reactor is located within a containment building.

The construction permit for the facility (CPRR-68) was issued to the University of Missouri on November 21, 1961. On October 11, 1966, Facility Operating License No. R-103 was issued to the University with a maximum power level of 5 MW(t). On July 9, 1974, Amendment No. 2 to the license was issued increasing the maximum operating power level to 10 MW(t). The facility normally operates on a 24-hour-a-day schedule with a shutdown once a week for refueling and maintenance.

The NRC has completed its evaluation of the proposed action and concludes that the proposed amendment to change the expiration date of the facility license to recapture time between construction and operation to allow for a 40-year operating license term will not result in a significant increase in environmental impacts. The licensee has not requested any changes

to the facility design or operating conditions as part of this amendment request. Data from the last ten years of operation was assessed to determine the radiological impact of the facility on the environment.

Environmental surveys are performed by measuring the exposure to 41 thermoluminescent dosimeters (TLDs) placed on and off site at various distances and directions from the facility. The results of this monitoring for all TLDs averaged by year from 1991 to 2000, and the TLD with maximum exposure (both do not include TLDs affected by shipping operations) is as follows:

Year	Average(mrem/yr)	Maximum (mrem/yr)
2000	-1.3	18.6
1999	13.5	43.5
1998	3.4	51.9
1997	9.2	34.8
1996	9.2	34.9
1995	14.6	44.2
1994	20.5	49.7
1993	18.1	28.2
1992	6.3	26.7
1991	4.4	27.3

The 2000 average is slightly negative due to the inadvertent exposure of a control TLD.

In addition, the licensee has calculated the dose to the individual member of the public likely to receive the highest dose from air emission of radioactive material to the environment to demonstrate compliance with 10 CFR 20.1101(d). This regulation provides as low as is reasonably achievable criteria for air emissions which must result in an individual member of the public receiving a total effective dose equivalent (TEDE) of less than 10 mrem per year.

The results of calculations for the years 1991 - 2000, is as follows:

Year	Dose (mrem/yr)
2000	0.8
1999	0.9
1998	0.9
1997	0.7
1996	0.6
1995	0.7
1994	0.5
1993	0.6
1992	0.4
1991	0.4

These doses are within the constraint on air emissions of 10 mrem per year total effective dose equivalent in 10 CFR 20.1101(d).

The radioactive material released from the facility in airborne effluents is given as follows:

Year	Curies Released (Argon-41)	Curies Released (Total)
2000	975	982
1999	1130	1137
1998	1130	1134
1997	861	870
1996	728	739
1995	878	888
1994	370	385
1993	409	425
1992	470	475
1991	440	441

Airborne effluent releases from the facility consist primarily of argon-41. This is characteristic for research reactors. The releases from the facility met the average concentration requirements of the facility technical specifications. The increase in the amount of radioactive effluents reported released between 1994 and 1995 was the result of a change in the method used by the licensee to sample the effluent. Prior to 1995, the results were based on the analysis of a daily grab sample. From 1995, the activity released was based on calculations performed on data recorded from the gas channel of the exhaust stack radioactivity monitor which is in operation 24 hours a day. Analysis of continuous data provided better accuracy than the grab sample method that only measured the radioactive material concentration in the airborne effluent once per day at the time the sample was taken.

Liquid effluent releases to the sanitary sewer were as follows:

Year	Curies Released (Hydrogen-3)	Curies Released (Total)
2000	0.1199	0.1420
1999	0.1670	0.1740
1998	0.5901	0.5980
1997	0.1460	0.1510
1996	0.1487	0.1560
1995	0.0818	0.0900
1994	0.1089	0.1270
1993	0.2574	0.3160
1992	0.1711	0.2150
1991	0.2094	0.2580

Liquid effluent releases from the facility to the sanitary sewer consisted primarily of hydrogen-3. The licensee releases liquid effluent only to the sanitary sewer. The NRC inspection program confirmed that monthly concentrations met regulatory requirements found in Appendix B Table 3 of 10 CFR Part 20 in accordance with 10 CFR 20.2003.

Shipments of radioactive waste offsite for disposal at approved sites were as follows:

Year	Volume (cubic feet)	Activity (mCi)
2000	1207.5	249
1999	565.0	281
1998	910.0	53
1997	420.0	404
1996	337.5	1409
1995	0.0	0
1994	460.0	1228
1993	392.0	60,105
1992	679.0	1924
1991	772.5	1146

The NRC inspection program confirmed that waste shipments met the requirements of the regulations in 10 CFR Part 20 for waste disposal. The licensee did not ship radioactive waste offsite in 1995.

Shipments to return spent reactor fuel to the Department of Energy (DOE) were as follows:

Year	Shipments
2000	1
1999	2
1998	6
1997	4
1996	2
1995	4
1994	1
1993	3
1992	9
1991	0

Eight fuel elements are in each shipment. The fuel is returned to DOE facilities at the Savannah River Plant in Aiken, South Carolina. The NRC inspection program confirmed that fuel shipments met NRC and Department of Transportation requirements for the shipment of radioactive material.

Radiological releases from the facility and associated doses to the public are within regulatory limits or facility technical specifications and do not have a significant impact on human health or the environment. Monitoring of radiation levels in the environment includes soil, vegetative, and water sampling and direct radiation readings. Results of the monitoring program are reported in the Reactor Operations Annual Report and indicate that the facility does not have a significant impact on human health or the environment. Releases of radioactive material from the facility to the environment for the proposed construction permit recapture period are estimated to continue at levels similar to those above, which are well within regulatory limits.

Occupational doses to MURR staff and users meet the regulatory requirements found in 10 CFR Part 20, Subpart C, and are as low as is reasonably achievable. No changes in reactor

operation that would lead to an increase in occupational dose are expected as a result of the proposed action.

The proposed action will not increase the probability or consequences of accidents, no changes are being made in the types of any effluents that may be released off site, and there is no significant increase in occupational or public radiation exposure. Therefore, there are no significant radiological environmental impacts associated with the proposed action.

With regard to potential non-radiological impacts, the proposed action does not have a potential to impact historic properties. The facility uses and disposes of small quantities of chemicals [e.g., up to about 5 gallons (20 liters) per year of hydrochloric acid, nitric acid, aqua regia and isopropyl alcohol] in research laboratories. These chemicals are disposed of in compliance with Environmental Protection Agency (EPA) and Missouri Department of Natural Resources requirements by the University of Missouri Environmental Health and Safety Department. These chemical forms and quantities are consistent with small laboratory use at universities.

The quality of the secondary cooling water is maintained using two commercial biocides, a corrosion inhibitor, and sulfuric acid (for pH control). These chemicals are similar to those used in cooling towers for the air conditioning systems of large buildings and enter the environment by evaporation from the tower to the air and by blowdown to the sanitary sewer. About 105 gallons (400 liters) of the two biocides, 700 gallons (2650 liters) of corrosion inhibitor, and 4000 gallons (15,150 liters) of sulfuric acid are used annually. The use of these chemicals is approved by EPA. These chemicals are stored in a manner that will contain the chemicals in the event of material storage container failure. The use and disposal of these chemicals will not have a significant impact on the environment. The proposed action will not result in significant increases in the use of these chemicals.

The facility uses approximately 38 million gallons of water annually. The water is supplied by university owned and maintained deep wells which provide water to the campus. Most of the water (28 million gallons) is used in the cooling tower with the majority of the water lost to the atmosphere as water vapor. Wastewater from the facility discharges to the City of Columbia sewer system and is treated at the Columbia Regional Wastewater Treatment Plant.

The Missouri Department of Conservation has determined that no Federal or State listed plants or animals are known to occur on the MURR site, but did identify two species in the vicinity of the project site. One species, the Topeka Shiner, is listed as endangered. MURR withdraws a minimal amount of groundwater for reactor operation, has no major refurbishment or construction activities planned, and will have no significant change in the types or amounts of effluents leaving the facility as a result of construction permit recapture. Therefore, the proposed action is not expected to affect aquatic and terrestrial biota. The staff concludes there are no significant non-radiological environmental impacts associated with the proposed action.

Accordingly, the NRC concludes that there are no significant environmental impacts associated with the proposed action.

Alternatives to the Proposed Action:

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., the “no-action” alternative). Denial of the proposed action would result in expiration of the current license in November 2001, and the commencement of decommissioning if an application for license renewal is not made. If the application is denied, it is expected that the licensee would apply for renewal of the license. With operation under the proposed action or with a renewed license or during the evaluation of a timely renewal application, the environmental impacts of the proposed action and the alternative are similar.

If the Commission denied the application for license renewal, facility operations would end and decommissioning would be required with no significant impact on the environment. The environmental impacts of the proposed action and this alternative action are similar. In addition, the benefits of education and research conducted by the facility would be lost.

Alternative Use of Resources:

This action does not involve the use of any resources not previously considered in the Hazards Analysis Report prepared for initial licensing of the facility and the power upgrade to 10 MW(t).

Agencies and Persons Consulted:

In accordance with its stated policy, on September 14, 2001, the staff consulted with the Missouri State official, Mr. Ron Kucera, Director of Intergovernmental Cooperation and Special Projects of the Missouri Department of Natural Resources, regarding the environmental impact of the proposed action. The State official had no comments. In addition, the NRC determined to exercise its discretion to circulate an Environmental Assessment and Finding of No Significant Impact to the public for a 30-day comment period in response to a request from the State of Missouri Department of Natural Resources. The Notice of "Request for Public Comment, Environmental Assessment and Finding of No Significant Impact" appeared in the FEDERAL REGISTER on August 1, 2001 (66 FR 39803). During the comment period, the staff received 12 comment letters. All of the comments have been reviewed by the NRC. The majority of the comments received related to the operation of the reactor and other issues not related to the EA or the license amendment request. In response to comments relevant to the EA, several changes were made to the text of the EA to clarify issues raised in the comments.

A "Discussion of Comments Received on the Environmental Assessment for the University of Missouri-Columbia Construction Permit Recapture Amendment" has been prepared by the NRC staff. This document contains the NRC staff's discussion and response to the public comments relative to the EA and copies of the comment letters. This document has accession number ML012850463. Members of the public may view the document by using ADAMS or contacting the Public Document Room staff as discussed below.

FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated December 27, 2000, as supplemented by letter dated April 12 and June 6, 2001, and the NRC staff's "Discussion of Comments Received on the Environmental Assessment for the University of Missouri-Columbia Construction Permit Recapture Amendment," which are available for public inspection, and can be copied for a fee, at the U.S. Nuclear Regulatory Commission's Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. The NRC maintains an Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents. These documents may be accessed through the NRC's Public Electronic Reading Room on the internet at http://www.nrc.gov/NRC/ADAMS/index.html. Persons who do not have

access to ADAMS or who have problems in accessing the documents located in ADAMS may contact the PDR reference staff at 1-800-397-4209, 301-415-4737 or by email at pdr@nrc.gov.

Dated at Rockville, Maryland, this 12th day of October 2001.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Eugene V. Imbro, Acting Chief
Operational Experience and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation