June 18, 2015

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

SUBJECT: UNIVERSITY OF MISSOURI AT COLUMBIA - REQUEST FOR ADDITIONAL INFORMATION REGARDING THE RENEWAL OF FACILITY OPERATING LICENSE NO. R-103 FOR THE UNIVERSITY OF MISSOURI AT COLUMBIA RESEARCH REACTOR (TAC NO. ME1580)

Dear Mr. Butler:

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of your application for the renewal of Facility Operating License No. R-103, dated August 31, 2006 (a redacted version of the application is available on the NRC's public web site at www.nrc.gov under Agencywide Documents Access and Management System Accession Nos. ML062540114 - cover letter; ML092110573 - Safety Analysis Report (SAR), Chapters 1-9; ML092110597 - SAR, Chapters 10-18), as supplemented, for the University of Missouri - Columbia Research Reactor. During our review, questions have arisen for which additional information is needed. The enclosed request for additional information (RAI) identifies the additional information needed to complete our review. We request that you provide responses to the enclosed RAI within 45 days from the date of this letter.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.30(b), you must execute your response in a signed original document under oath or affirmation. Your response must be submitted in accordance with 10 CFR 50.4, "Written communications." Information included in your response that is considered sensitive or proprietary, that you seek to have withheld from the public, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any information related to security should be submitted in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements." Following receipt of the additional information, we will continue our evaluation of your renewal request.

If you need additional time to complete this request, or have any questions regarding this review, please contact me at (301) 415-0893, or by electronic mail at Geoffrey.Wertz@nrc.gov.

Sincerely,

/RA/

Geoffrey A. Wertz, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-186

Enclosure:
Request for Additional Information

cc: See next page

cc:

Mr. Les Foyto, Associate Director
Reactor and Facilities Operations
Research Reactor Center
University of Missouri - Columbia
Research Park
Columbia, MO 65211

Homeland Security Coordinator
Missouri Office of Homeland Security
P.O. Box 749
Jefferson City, MO 65102

Planner, Dept. of Health and Senior Services
Section for Environmental Public Health
930 Wildwood Drive, P.O. Box 570
Jefferson City, MO 65102-0570

Deputy Director for Policy
Department of Natural Resources
1101 Riverside Drive
Fourth Floor East
Jefferson City, MO 65101

A-95 Coordinator
Division of Planning
Office of Administration
P.O. Box 809, State Capitol Building
Jefferson City, MO 65101

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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Docket No. 50-186

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Request for Additional Information

cc: See next page

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ADAMS Accession No: ML15162A098 ***concurrence via email** **NRR-088**

OFFICE	DPR/PRLB/PM*	DPR/PRLB/LA	DPR/PRLB/BC	DPR/PRLB/PM
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DATE	6/17/2015	06/17/15	06/18/15	06/18/15

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OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION

FOR THE RENEWED LICENSE FOR

THE UNIVERSITY OF MISSOURI-COLUMBIA RESEARCH REACTOR

LICENSE NO. R-103; DOCKET NO. 50-186

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of your application for the renewal of Facility Operating License No. R-103, dated August 31, 2006 (a redacted version of the application is available on the NRC's public web site at www.nrc.gov under Agencywide Documents Access and Management System (ADAMS) Accession Nos.: ML062540114 – cover letter; ML092110573 - Safety Analysis Report (SAR), Chapters 1-9; ML092110597 - SAR, Chapters 10-18), as supplemented, for the University of Missouri - Columbia Research Reactor (MURR). During our review, questions have arisen for which additional information is needed. The enclosed request for additional information (RAI) identifies the additional information needed to complete our review. We request that you provide responses to the enclosed RAI within 45 days from the date of this letter.

1. NUREG-1537 provides guidance regarding hot cells, glove boxes, and hoods, in the following sections:

    - Section 1.4 requests the licensee to describe hot cells, glove boxes, and hoods that are located within confinement structures, or the restricted area to which the SAR applies;
    - Section 6.2.2 requests the licensee to provide information regarding the connection of ventilation systems;
    - Section 9.5 requests the licensee to provide information regarding design bases for exhausts, drains, and shields;
    - Section 10.2 requests the licensee to describe and discuss in detail all experimental facilities, which would include hot cells;
    - Section 11.1.1.3 requests the licensee to provide information regarding programmatic consideration of hot cells for consideration regarding radiation protection; and
    - Appendix 14.1, Table 14.4 requests the licensee to provide information regarding required radiation measuring channels specifically for hot cells, glove boxes, and hoods.

    In addition, since the hot cells, glove boxes, and hoods are licensed within the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, the requirements of 10 CFR 50.59 are applicable to changes to the facility as described in the SAR.

    In our review of your application for the renewal of Facility Operating License No. R-103, dated August 31, 2006, and supporting information, including your most recent RAI response dated January 28, 2015 (redacted version is available in ADAMS, Accession No.

Enclosure

ML15034A474), we were unable to find a complete description of the MURR hot cells, glove boxes, and fume hoods. Additionally, we have not been able to determine if any analyses regarding the cumulative or integrated radiological effect of the use of the hot cells, glove boxes, and hoods (some of this equipment which has been added to MURR since the 2006 license renewal application), or if a review or analysis to determine the need for radiological control areas or radiation monitoring, have been performed. As such, the following information is needed:

a. Provide a comprehensive list of hot cells, glove boxes, and fume hoods under the reactor license. Describe their locations (including a map if necessary), and indicate the appropriate radiological control area boundaries.

b. Provide a reference to any analyses that establish inventory limits for the hot cells, glove boxes, and fume hoods, and demonstrates that a postulated accident would not exceed 10 CFR Part 20 limits for occupational workers or the public.

c. Identify support services that are required for any hot cells, glove boxes, and fume hoods, based on the assumptions used in the safety analyses or for equipment necessary to mitigate the consequences of any postulated accident (e.g., filters, ventilation, power, emergency power, instrumentation, etc.).

d. Identify technical specification changes that are required to ensure that assumptions of the postulated accident analyses for these hot cells, glove boxes, and fume hoods, and the associated work areas are maintained.

2. In your application supporting License Amendment No. 36, you provided the methodology describing the current MURR steady state operational limits.

a. In Table 3-8, Attachment 10, of your letter dated August 14, 2011 (ADAMS Accession No. ML11237A088), are 15 examples (cases) where critical states were evaluated using the Monte Carlo Neutron Production (MCNP) code. The average deviation provided is approximately 0.64 percent delta k/k (%Δk/k) (640 percent millirho (pcm)) and the maximum is 1.697 %Δk/k (1697 pcm). During discussions with your staff, they were able to demonstrate better agreement using other models and stated that it is possible that the referenced MCNP calculations were performed with control blades not fully represented. Describe the reasons for the differences between the measured and calculated critical eigenvalues for the 15 cited examples (cases).

b. Provide a description of how the MCNP results were used to arrive at the limiting peaking factors detailed in Table F.4 of Attachment 11 (ADAMS Accession No. ML11237A088). Specifically, provide confirmation that the week 58 case was used, indicate the agreement between that case and any measurements obtained, explain how the control blades were modeled, and provide information indicating if the peaking factors values determined were limiting values.