

# UNIVERSITY *of* MISSOURI

## RESEARCH REACTOR CENTER

March 12, 2013

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Mail Station P1-37  
Washington, DC 20555-0001

REFERENCE: Docket 50-186  
University of Missouri-Columbia Research Reactor  
Amended Facility License R-103

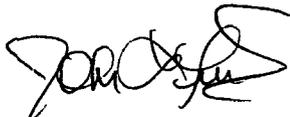
SUBJECT: Written communication as specified by 10 CFR 50.4(b)(1) regarding the response to the "University of Missouri at Columbia – Request for Additional Information Re: Updated Financial Information for License Renewal (TAC No. ME1580)," dated February 11, 2013

On August 31, 2006, the University of Missouri-Columbia Research Reactor (MURR) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) to renew Amended Facility Operating License R-103.

On July 10, 2009, as part of the NRC staff's review of the renewal request, the NRC requested financial information in the form of four (4) questions. By letter dated September 14, 2009, the MURR responded to those questions.

By letter dated February 11, 2013, the NRC requested updated financial information in the form of four (4) questions because the information provided by the September 14, 2009 response had become outdated. Those questions, and the MURR's responses to those questions, are attached. If there are questions regarding this response, please contact me at (573) 882-5319 or [FruitsJ@missouri.edu](mailto:FruitsJ@missouri.edu). I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,



John L. Fruits  
Reactor Manager

ENDORSEMENT:  
Reviewed and Approved,



Ralph A. Butler, P.E.  
Director



MARGEE P. STOUT  
My Commission Expires  
March 24, 2016  
Montgomery County  
Commission #12511436



Enclosed:

1. University of Missouri System – 2011 Financial Report
2. University of Missouri System – 2012 Financial Report
3. Statement of Intent, from the Office of the Vice Chancellor for Administrative Services, University of Missouri-Columbia, dated March 5, 2013
4. Letter from the Office of the General Counsel, University of Missouri, dated February 28, 2013
5. Section 70.010, “General Execution of Corporate or Board Instruments,” of Chapter 70, “Execution of Instruments,” University of Missouri Collected Rules and Regulations

xc: Reactor Advisory Committee  
Reactor Safety Subcommittee  
Dr. Robert Duncan, Vice Chancellor for Research  
Mr. Alexander Adams, U.S. NRC  
Mr. Geoffrey A. Wertz, U.S. NRC  
Mr. Craig Basset, U.S. NRC

1. *The U.S. Nuclear Regulatory Commission (NRC) staff will analyze the financial statements for the current year, which are required by 10 CFR 50.71(b), to determine if the applicant is financially qualified to operate the MURR. Since MU's financial statements included with the application are out of date, please provide a copy of the latest financial statements for the NRC staff's review.*

Enclosed you will find the 2011 and 2012 Financial Reports for the University of Missouri System. Each report provides an overview of the financial position and activities of the University for the fiscal years that ended June 30, 2011 and 2010 and June 30, 2012 and 2011. The University is a component of the state of Missouri and an integral part of the state's Comprehensive Annual Financial Report.

The University of Missouri System 2011 and 2012 Financial Reports include the following five financial statements:

- The three financial statements for the University of Missouri and its Discretely Presented Component Unit include the Statement of Net Assets, the Statement of Revenues, Expenses, and Changes in Net Assets, and the Statement of Cash Flows, where applicable.
- The two financial statements for the University's fiduciary fund, which include the Retirement and the Other Postemployment Benefits Trust Funds, are the Statement of Plan Net Assets and the Statement of Changes in Plan Net Assets.

The University's financial statements are prepared in accordance with U.S. generally accepted accounting principles as prescribed by the Governmental Accounting Standards Board (GASB), which establishes financial reporting standards for public colleges and universities.

2. *Pursuant to 10 CFR 50.33(f)(2), "[t]he applicant shall submit estimates for total annual operating costs for each of the first five years of operations of the facility." Since the information included in the application is now out of date, please provide the following additional information:*

- (a) *Projected operating costs of the MURR for each of the fiscal years (FY) 2014 thru FY 2019 (the first five year period after the projected license renewal).*

**TABLE 1**  
**FISCAL YEAR 2014-2018 PROJECTED EXPENDITURES**  
(in thousands of dollars)

	<u>FY 2014</u> <u>Projected</u>	<u>FY 2015</u> <u>Projected</u>	<u>FY 2016</u> <u>Projected</u>	<u>FY 2017</u> <u>Projected</u>	<u>FY 2018</u> <u>Projected</u>
Salaries/Wages & Benefits	11,088	11,421	11,763	12,116	12,480
Supplies/Services/Equipment < \$5K	3,154	3,248	3,346	3,446	3,550
Debt Service	934	934	934	934	934
Reserves	659	679	699	720	742
Grants	3,900	4,017	4,138	4,262	4,389
Other	<u>940</u>	<u>969</u>	<u>998</u>	<u>1,028</u>	<u>1,058</u>
<b>TOTAL EXPENDITURES</b>	<b>\$ 20,675</b>	<b>\$ 21,268</b>	<b>\$ 21,878</b>	<b>\$ 22,506</b>	<b>\$ 23,153</b>

(b) *MU's source(s) of funding to cover the operating costs for the above fiscal years.*

**TABLE 2**  
**FISCAL YEAR 2014-2018 PROJECTED REVENUES**  
(in thousands of dollars)

	FY 2014 <u>Projected</u>	FY 2015 <u>Projected</u>	FY 2016 <u>Projected</u>	FY 2017 <u>Projected</u>	FY 2018 <u>Projected</u>
Campus Allocation	3,488	3,592	3,700	3,811	3,925
Service Operations	11,902	12,259	12,626	13,005	13,395
Partnerships	52	53	55	56	58
Grants	3,900	4,017	4,138	4,262	4,389
Other	<u>1,154</u>	<u>1,188</u>	<u>1,224</u>	<u>1,261</u>	<u>1,298</u>
<b>TOTAL REVENUES</b>	<b>\$ 20,494</b>	<b>\$ 21,109</b>	<b>\$ 21,742</b>	<b>\$ 22,395</b>	<b>\$ 23,067</b>

Notes:

1. The University of Missouri fiscal year (FY XXXX) begins July 1 and ends June 30.
2. All projected revenues and expenditures reflect a 3% increase per year except for Debt Service.
3. MURR reserves will be used to cover fiscal year end deficits as needed.

“Campus Allocation” represents an annual allocation of the State of Missouri funds for the University. “Service Operations” is primarily based on the sale of irradiation, processing and analytical services. Revenue is subject to market fluctuations, however many of the MURR’s major customers have been clients for several years and the MURR continues to develop significant new customers each year. “Grants” are a revenue source received from non-University sources.

3. *The application references a decommissioning cost estimate for the MURR that was developed using NUREG/CR-1756, Technology, Safety and Costs of Decommissioning Reference Research and Test Reactors. The application states that the decommissioning cost estimate was \$47.3 million in 2009 dollars, including safe storage (SAFSTOR) costs, and a 25 percent contingency factor. The NRC staff needs the following additional information to complete its review of the MURR decommissioning cost estimate:*

(a) *A current decommissioning cost estimate in 2013 dollars for the MURR to meet the NRC’s radiological release criteria for decommissioning the facility for unrestricted use, pursuant to 10 CFR 50.75(d)(2). Accordingly, describe the basis for how the cost estimate was developed (if NUREG/CR-1756 is still the basis for the decommissioning cost estimate, please so state).*

The current decommissioning cost estimate is \$58.9 million in 2013 dollars. The original decommissioning cost estimate was developed using the methodology proposed in NUREG/CR-1756, Technology, Safety and Costs of Decommissioning Reference Research and Test Reactors, for a reference test reactor using the passive safe storage (SAFSTOR) option for a period of 30 years. The reference test reactor approach was used because this was thought to more closely represent the decommissioning efforts that would be needed for the MURR. The original decommissioning estimate was transmitted to the NRC in a letter dated June 29, 1990. In this

letter, the MURR committed to adjusting our cost estimate at five year intervals using the decommissioning inflation formula provided in 10 CFR 50.75(c)(2).

Our initial decommissioning cost estimate was \$9.0 million, which included a 25% contingency. In 1995 this estimate was revised to delete the 30-year annuity method of determining the present values of the annual costs associated with SAFSTOR. This revision to the original estimate, which changed the cost estimate to \$11.8 million (1989 \$), was made to assure that this aspect of the decommissioning cost would not introduce significant under-estimation of the annual costs.

The current decommissioning cost estimate was developed using the inflation formula provided in 10 CFR 50.75(c)(2). The use of this formula requires information from the most recently published NUREG-1307, Report on Waste Burial Charges; in this case Revision 15, dated January 2013.

The calculation also requires information from Bureau of Labor Statistics (BLS) data for Employment Cost Index (ECI) to develop  $L_x$  and for Producer Price Index (PPI) to develop  $E_x$  for the formula. These BLS datasets currently contain preliminary data for January 2013, thus the inflation calculation provided in 2013 dollars.

(b) *A summary of total decommissioning costs by labor, waste disposal, other items (such as energy, equipment, and supplies) in current dollars, and a 25 percent contingency factor.*

The following Table 3, an update of Table 17-2 found in Chapter 17 of the Safety Analysis Report (SAR) that was submitted as part of the MURR's renewal application, provides a summary of the breakdown of categories in current dollars. This table contains the categories the MURR used to develop our initial decommissioning estimate using the guidance of NUREG/CR-1756 that was submitted to the NRC by letter dated June 29, 1990.

**TABLE 3**  
**SUMMARY OF COST**  
(in millions of dollars)

Category	Cost (1989 \$)	Cost (2013 \$)
Labor	4.9	24.4
Equipment	0.27	1.35
Radioactive Shipments	0.6	2.99
Termination Survey	0.06	0.30
Annual Storage Cost	3.6	17.96
Subtotal	\$ 9.43	\$ 47.04
Contingency (25%)	\$ 2.36	\$ 11.76
<b>Total</b>	<b>\$ 11.8</b>	<b>\$ 58.9</b>

- (c) *Provide an update of the total and annual MURR SAFSTOR costs provided in your September 14, 2009 response to RAI No. 3. (c) to current dollars as well as the supporting bases for the costs associated with the SAFSTOR option. Also, please provide a numerical example showing how the SAFSTOR costs will be escalated each year.*

The following Table 4, an update of Table 17-1 found in Chapter 17 of the SAR, indicates the annual cost estimates from the original cost estimate as revised in 1995 as well as these same annual costs in current dollars as escalated using the cost inflation formula of 10 CFR 50.75(c)(2). Table 4 is an example of the items in each category of the table. These examples are taken from NUREG/CR-1756, Volume 2 of 2, page J-79.

By letter dated June 29, 1990, the MURR committed to escalating the decommissioning cost estimates at five year intervals using the methodology proposed in 10 CFR 50.75(c)(2). There is no regulatory requirement to escalate these costs on a yearly basis. With the 25% contingency included in the estimate, because of the uncertainty of an estimate, an annual escalation exercise would provide little benefit.

The supporting bases for the annual costs associated with the SAFSTOR option were the categories specified in NUREG/CR-1756, adjusted to our judgment in 1990 where the reference test reactor estimates could be revised. One example was the cost for security systems. MURR decided the current system we have in use would provide more than adequate security for the safe storage period so that category estimate was reduced.

**TABLE 4**  
**ANNUAL COST DURING SAFSTOR**  
(in thousands of dollars)

SAFSTOR Categories	Cost (1989 \$)	Cost (2013 \$)
Security	15.0	74.8
Minor Maintenance and Repair	10.0	49.9
Major Repair	10.0	49.9
Offsite Laboratory Work and Equipment Repair	6.0	29.9
Reactor Facility Services	50.0	249.4
Laboratory Samples, EPA Reports, and Surveillance	30.0	149.7
<b>Total</b>	<b>\$ 121.0</b>	<b>\$ 603.6<sup>a</sup></b>

<sup>a</sup>The summation of the estimated annual cost during SAFSTOR is \$18.1 million dollars (\$603,600/year x 30 years).

Examples of Items in Each SAFSTOR Category of Table 4

<p><u>Security</u></p> <ul style="list-style-type: none"> <li>• Maintenance of existing security system</li> <li>• Monitoring, supervision and security patrols</li> </ul> <p><u>Offsite Laboratory Work and Equipment Repairs</u></p> <ul style="list-style-type: none"> <li>• Sample analysis</li> <li>• Contamination counter repairs</li> </ul> <p><u>Reactor Facility Services</u></p> <ul style="list-style-type: none"> <li>• Electrical</li> <li>• Water</li> <li>• HVAC</li> <li>• Sewer</li> </ul>	<p><u>Minor Maintenance and Repair</u></p> <ul style="list-style-type: none"> <li>• Custodial</li> <li>• Grounds and yard</li> </ul> <p><u>Laboratory Samples, EPA Reports, and Surveillance</u></p> <ul style="list-style-type: none"> <li>• Surveys</li> <li>• Regulatory reports</li> </ul> <p><u>Major Repair</u></p> <ul style="list-style-type: none"> <li>• Roof repairs</li> <li>• Ventilation system repairs</li> <li>• Water systems repair</li> </ul>
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(d) *Provide a numerical example showing how the 2013 cost estimate will be updated periodically in the future.*

Future cost estimates will be performed using the same methodology that was used for the most recent 2013 estimate, as described below.

Adjustment Factor

The adjustment factor was designed for updating reference Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) decommissioning estimates, but serves as a convenient method to adjust the MURR decommissioning cost estimates over time. Whenever a calculation is specified for a PWR or BWR, an average of the PWR and BWR factors is used.

The decommissioning cost inflation equation of 10 CFR 50.75(c)(2) is divided into three general categories that tend to escalate similarly: (1) labor, materials and services, (2) energy and waste transportation, and (3) radioactive waste burial/treatment. A relatively simple equation is used to update the estimate of cost by multiplying the revised original cost estimate (in our case, \$11.8 million in 1989 \$) by a factor developed using the three categories described above. The equation is:

$$\begin{aligned}
 &\text{Estimated Cost (2013):} \\
 &= [\text{Cost in 1989 \$}] \times [A L_x + B E_x + C B_x]; \\
 &= \text{estimated decommissioning costs in 2013 dollars;}
 \end{aligned}$$

where:

- [Cost in 1989 \$]  
= revised original decommissioning cost estimate (\$11.8M in 1989 \$);
- A = fraction of the [Cost in 1989 \$] attributable to labor, materials and services;
- B = fraction of the [Cost in 1989 \$] attributable to energy and transportation;
- C = fraction of the [Cost in 1989 \$] attributable to waste burial/treatment;
- L<sub>x</sub> = labor, materials, and service cost adjustment, January 1989 to December 2012;

$E_x$  = energy & waste transportation cost adjustment, January 1989 to January 2013; and  
 $B_x$  = LLW burial/treatment cost adjustment, January 1989 to January 2013.

The coefficients in the adjustment factor of 10 CFR 50.75(c)(2) are established as  $A = 0.65$ ,  $B = 0.13$ , and  $C = 0.22$ . The escalation formula then becomes:

$$\begin{aligned} \text{Estimated Cost (2013)} \\ &= [\text{Cost in 1989 \$}] \times [0.65 L_x + 0.13 E_x + 0.22 B_x] \end{aligned}$$

#### Determination of $L_x$ , $E_x$ , and $B_x$

These ratios are determined using the information supplied in the most recently published NUREG-1307, Report on Waste Burial Charges, Revision 15, January 2013, and by using the most recent U.S. Department of Labor-Bureau of Labor Statistics (BLS) data.

#### Labor Adjustment Factor

The Employment Cost Index (ECI) is taken from Table 6 of current BLS data entitled "Employment Cost Index for total compensation for private industry workers, by bargaining status, census region and metropolitan area status." The Base  $L_x$  is taken from Table 3-2, Regional Factors for Labor Cost Adjustment, in NUREG-1307 referenced above.

$$\begin{aligned} L_x &= [(ECI, December 2012) \times (\text{Base } L_x)] / 100 \\ &= [(115.9) \times (2.08)] / 100 \\ &= 2.411 \end{aligned}$$

#### Energy Adjustment Factor

This adjustment factor for energy,  $E_x$ , is a weighted average of two components, namely, industrial electrical power,  $P_x$ , and light fuel oil,  $F_x$ .

$$\text{For the reference PWR: } E_x(\text{PWR}) = 0.58 P_x + 0.42 F_x$$

$$\text{For the reference BWR: } E_x(\text{BWR}) = 0.54 P_x + 0.46 F_x$$

$P_x$  and  $F_x$  are the ratios of the current Producer Price Indexes (PPI) divided by the corresponding indexes for January 1986.

$$\begin{aligned} P_x &= 198.8 (\text{January 2013 value for code wpu0543}) / 114.2 (\text{January 1986 value for code wpu0543}) \\ &= 1.74 \end{aligned}$$

$$\begin{aligned} F_x &= 303.4 (\text{January 2013 value for code wpu0573}) / 82.0 (\text{January 1986 value for code wpu0573}) \\ &= 3.70 \end{aligned}$$

Therefore:

$$\begin{array}{ll} E_x(\text{PWR}) & E_x(\text{BWR}) \\ = (0.58 \times 1.74) + (0.42 \times 3.70) & = (0.54 \times 1.74) + (0.46 \times 3.70) \\ = 2.563 & = 2.642 \end{array}$$

$E_x$  for MURR is calculated as an average of  $E_x(\text{PWR})$  and  $E_x(\text{BWR})$ , therefore:

$$\begin{aligned} E_x(\text{average}) &= (2.563 + 2.6416) / 2 \\ &= 2.602 \end{aligned}$$

#### Waste Burial Adjustment Factor

The adjustment factor for waste burial/treatment,  $B_x$ , is taken directly from Table 2-1 of NUREG-1307, Values of  $B_x$  as a Function of LLW Burial Site, Waste Vendor, and Year. For facilities that have no disposal site available for LLW, the NUREG assumes the cost of disposal is the same as that provided for the Atlantic Compact, for lack of a better alternative at this time.

$$B_x(\text{PWR}) = 13.885 \qquad B_x(\text{BWR}) = 14.160$$

$B_x$  for MURR is calculated as an average of  $B_x(\text{PWR})$  and  $B_x(\text{BWR})$ , therefore:

$$\begin{aligned} B_x(\text{average}) &= (13.885 + 14.160) / 2 \\ &= 14.023 \end{aligned}$$

#### Adjusted Decommissioning Cost Estimate

$$\begin{aligned} \text{Estimated Cost (in 2013 \$)} &= [\text{Cost in 1989 \$}] \times [A L_x + B E_x + C B_x] \\ &= [\text{\$11.8 Million}] [(0.65 \times 2.411) + (0.13 \times 2.602) + (0.22 \times 14.023)] \\ &= [\text{\$11.8 Million}] [4.990] \\ &= \text{\$58.9 Million (this includes the 25\% contingency)} \end{aligned}$$

4. *The application indicates that MU plans to use a statement of intent (SOI) as the method to provide decommissioning funding assurance, as provided for by 10 CFR 50.75(e)(1)(iv). Where the applicant intends to use a SOI, the NRC staff must find that the applicant "is a Federal, State, or local government licensee." To make this finding, the applicant must state that it is a State government organization and that the decommissioning funding obligations of the applicant are backed by the State government, and also provide corroborating documentation. Further, the applicant must provide documentation verifying that the signator of the SOI is authorized to execute said document that binds the University. This document may be a governing body resolution, management directives, or other form that provides an equivalent level of assurance. As the application does not include all of the above information, please submit the following:*
  - (a) *An updated SOI which includes the current (2013 dollars) cost estimate for decommissioning, a statement that funds for decommissioning will be obtained when necessary, and the signator's oath or affirmation attesting to the information.*

Enclosed you will find the most recent Statement of Intent (dated March 5, 2013), signed by Jacquelyn K. Jones, Vice Chancellor of Administrative Services of the University of Missouri, which provides assurance that funding will be requested from the Board of Curators of the University of Missouri if decommissioning activities are commenced at the MURR.

- (b) *Documentation that corroborates the statement in the application that MU is a State agency and a State of Missouri government licensee under 10 CFR 50.75(e)(2)(iv).*

Enclosed you will find a letter from Kelly Mescher (dated February 28, 2013), Office of the General Counsel, University of Missouri, which states that The Curators of the University of Missouri is a state university which was created by the Missouri Constitution in Article IX Section 9(a).

- (c) *A statement as to whether the decommissioning funding obligations for the MURR are backed by the State of Missouri government. The application must also present documentation that corroborates this statement. For example, the documentation may be a copy of or complete citation to a state statute that expressly provides that the obligations, or at least the decommissioning funding obligations, of the applicant are backed or supported by the full faith and credit of the State of Missouri, or an opinion of the applicant's General Counsel with citations to statutes, regulations, and/or case law that the obligations, or at least those with respect to the decommissioning funding of the applicant are obligations back or supported by the full faith and credit of the State of Missouri.*

Enclosed you will find a letter from Kelly Mescher (dated February 28, 2013), Office of the General Counsel, University of Missouri, which states that the state is constitutionally required to provide funding to the University.

- (d) *Documentation verifying that the signator of the SOI is authorized to execute such a document that binds the applicant financially. For example, provide a copy of MU's governing board or equivalent resolution that shows that the signator of the SOI has been authorized by MU to bind MU financially, at least with respect to funding the decommissioning of the MURR, or provide a copy of an official MU delegation of authority showing that the signator of the SOI is authorized to bind MU financially, at least with respect to funding the decommissioning of the MURR.*

Enclosed is a copy of Section 70.010, "General Execution of Corporate or Board Instruments," of Chapter 70, "Execution of Instruments," from the University of Missouri Collected Rules and Regulations, which authorizes Jacquelyn K. Jones, Vice Chancellor of Administrative Services of the University of Missouri, to execute the Statement of Intent regarding decommissioning costs for the MURR.