MISSOURI S&T

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

Formerly University of Missouri-Rolla

September 16, 2008

US Nuclear Regulatory Commission
Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Subject: Response to request for additional information letter dated September 8, 2008 for the Missouri University of Science and Technology Reactor (MSTR) Facility, R-79, Docket 50-123.

Mr. John Nguyen:

The Missouri University of Science and Technology Reactor (MSTR) Facility is responding to the request for additional information that was submitted to us in letter dated September 8, 2008. The following are the questions and the MSTR response:

1. Provide the purpose, frequency, and duration of operating the reactor at power levels ranging from 200 kW to 300 kW. Discuss reactor design, safety function, and procedures that prevent the reactor from exceeding the fuel cladding temperature and an uncontrolled reactor transient.

The reactor is not operated at powers greater than 200 kW.

The following control room instrumentation shuts down the reactor if power levels would exceed 200 kW or an uncontrolled reactor transient would occur:

- Two Safety Channels scram the reactor at 300 kW
- The Log & Linear Channel activates a rundown trip at 240 kW
- The Linear Channel activates a rundown trip at 240 kW
- The Log & Linear Channel activates a scram trip with a < 5 second period and a rundown trip with a < 15 second period

These scrams and rundown trips are tested on a routine basis with the reactor shutdown.

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2. Section 14.3.2.2. Section 7.2.2.4 of the MSTR SAR specifies two channels: High Voltage (HV) Safety Channel No.1 and HV Safety Channel No. 2 for scram functions. However, these channels are missing in TS 14.3.2.2. Provide justification why these channels are not included in TS 14.3.2.2.

The control room instrumentation has two Safety Channels designed to scram the reactor if reactor power would exceed 150% full power, 300 kW. There are HV trip settings built into each Safety Channel that activate the scram circuit if HV were lost. The HV trips are part of the instrumentation as received from the manufacturer when these Safety Channels were purchased several years ago. MSTR does not consider the HV trips as separate trip circuits, but just part of the Safety Channels. The HV trip was mentioned in Section 7.2.2.4 to describe the Safety Channel equipment and is not intended to be a separate trip circuit.

Procedures for the MSTR require a channel check be performed after each power change and after each hour at a stable power. The channel check compares the Linear, Log & Linear and both Safety Channels power readings. The readings are recorded and verified that they read the same power. If a channel's power reading is different than other channels the reactor is shutdown to determine the existing discrepancy between channels. The failure of a channel would be determined at this point.

The last paragraph of Section 7.2.2.4 is listed as the following:

"Safety amplifiers are contained in separate NIMs (Nuclear Instrumentation Module). HV power supplies for the ion chambers are contained in a single NIM. In the case of failure of either HV power supply, the scram circuit is actuated. An indicator light will illuminate on the HV NIM upon failure of the HV power supply. The magnet power supply is contained in a NIM. A SCRAM indicator lamp will illuminate on the magnet power supply when the safety channel scram circuit is initiated. The four NIMs are located in a NIM Bin power supply, which provides power to each NIM."

MSTR proposes to remove two sentences describing the trip action for loss of HV in the last paragraph of Section 7.2.2.4 to be listed as the following:

"Safety amplifiers are contained in separate NIMs (Nuclear Instrumentation Module). HV power supplies for the ion chambers are contained in a single NIM. The magnet power supply is contained in a NIM. A SCRAM indicator lamp will illuminate on the magnet power supply when the safety channel scram circuit is initiated. The four NIMs are located in a NIM Bin power supply, which provides power to each NIM."

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3. Section 14.3.4. The specification in this section states: "The reactor shall not be operated unless the reactor truck door is closed and the ventilation intake and exhaust duct louvers are operable or secured in a closed position." Discuss whether any work is allowed involving core fuel loading, or installed control rods when the confinement is not operable.

MSTR proposes to modify Section 14.3.4 to the following:
Unless the reactor is secured the truck door is to be closed and the ventilation intake and exhaust duct louvers operable or secured in a closed position.

4. Section 14.3.6.1. The specification in this section states: "The reactor shall not be operated unless the Continuous Air Monitor (CAM) is operable and the Radiation Area Monitors (RAMs) located at the reactor bridge, at the demineralizer, and in the basement experimental area are operable." Discuss the CAM design (associated alarms, set points, and warning circuitry), surveillance, and reactor procedure that ensure the CAM can perform its intended function including preventing an undetected release of airborne radioactivity to the health and safety of the public, MSTR personnel, or the environment.

The Continuous Air Monitor (CAM) draws air, from the reactor bay, through a paper filter. Dust particulates on the filter are monitored by a Geiger Muller detector. The CAM outputs a counts per minute (cpm) signal to a meter located on the CAM and a recorder located in the control room.

Operating procedures instruct operators to do the following to verify the CAM is performing its intended function:

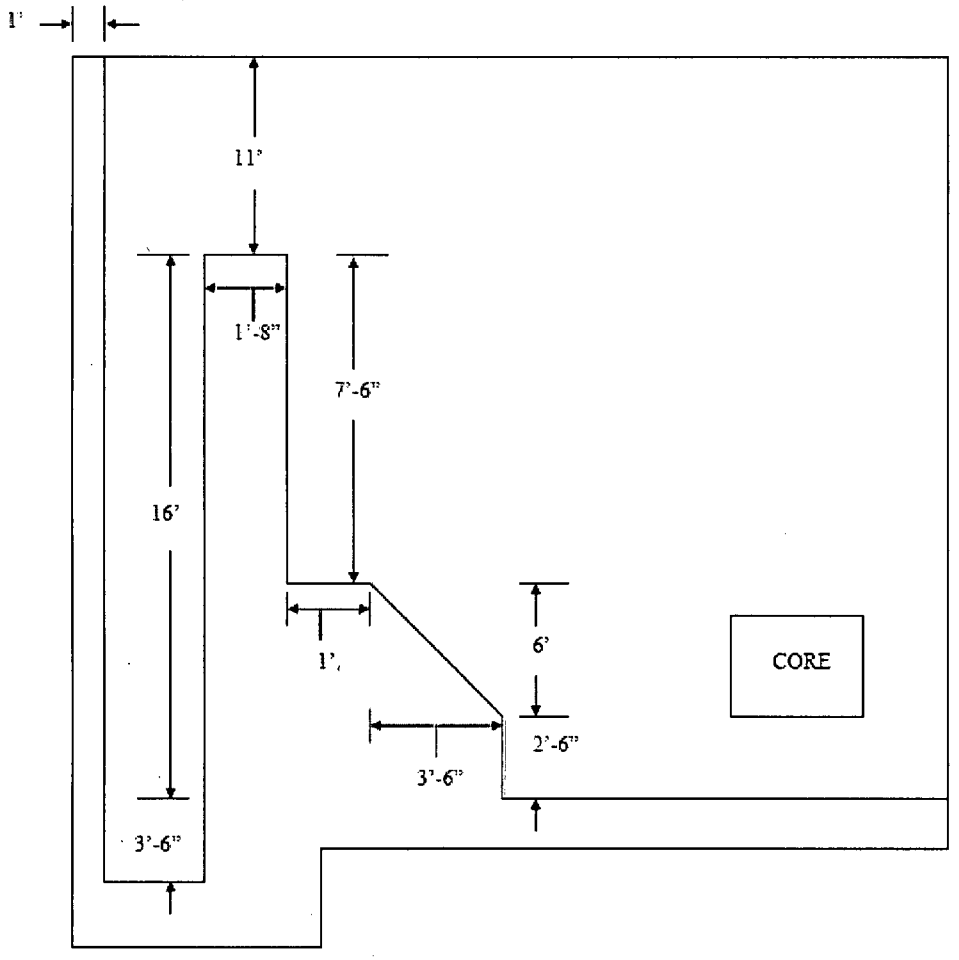
- Verify the CAM is operable during a pre-startup checklist
- Record the CAM's recorder reading after each power change and each hour power is maintained longer than one hour
- Turn on a vent fan when the CAM's count rate reaches 1500 cpm
- Analyze and replace the CAM filter on a routine basis

5. Section 6.2.1 of the current TS specifies that the Committee shall be composed of at least five members. However, Section 14.6.2.1 of the proposed TS specifies that the Committee shall be composed of at least three members. Provide justification why the Committee specified in the proposed TS is composed of at least three members. Also provide discussion on how the quorum requirement in TS 14.6.2.2 (1) will be met if two of the minimum three members have reactor operation responsibilities.

MSTR proposes to modify Section 14.6.2.1 to the following:
The Committee shall be composed of at least five members, one of whom shall be the Radiation Safety Officer of the campus.

6. Section 9.2, "Handling and Storage of Reactor Fuel". Provide dimensions of the wall that separates the main pool and the fuel storage pit.

The following diagram contains dimensions of the bulkhead within the reactor pool. The one foot dimension on the left side of the drawing is a pool wall. The right side of the drawing only shows the pool side of the wall without wall thicknesses. The pool is nineteen feet long from left to right.



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7. Under 10 CFR 50.33(d), "Contents of applications; general information," certain information is required by the applicant, Missouri University of Science and Technology Reactor (MSTR), as applicable. To comply with this regulation, please update the application to include a statement of the organizational form of MSTR (e.g., corporation, etc.), the state where it is incorporated or organized and the principal location where MSTR does business, and the names, addresses and citizenship of directors and principal officers. Also, please state whether the MSTR is owned, controlled, or dominated by an alien, foreign corporation, or foreign government, and if so, give details.

The Missouri University of Science and Technology Reactor (MSTR) is located on the campus of the Missouri University of Science and Technology in Rolla, Missouri, which is one of four state universities under the University of Missouri. The University of Missouri is regulated under the supervision or direction of the Board of Curators of the University of Missouri. The Missouri State Governor, with the advice and approval of the senate, appoints nine members to serve on the Board of Curators.

Principle officers of the MSTR are the following:
Board of Curators of the University of Missouri

Marion H. Cairns
Webster Groves, District 3
Term Expires January 1, 2009
316 University Hall
Columbia, MO 65211

John M. Carnahan III
Springfield, District 7
Term Expires January 1, 2011
316 University Hall
Columbia, MO 65211

Warren K. Erdman
Kansas City, District 5
Term Expires January 1, 2013
316 University Hall
Columbia, MO 65211

Doug Russell
Lebanon, District 4
Term Expires January 1, 2011
316 University Hall
Columbia, MO 65211

Judith G. Haggard
Kennett, District 8
Term Expires January 1, 2013
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Columbia, MO 65211

Bo Fraser, Vice Chair
Columbia, District 9
Term Expires January 1, 2013
316 University Hall
Columbia, MO 65211

Cheryl D. S. Walker, Board Chair
St. Louis, District 1
Term Expires January 1, 2009
316 University Hall
Columbia, MO 65211

Don Walsworth
Marceline, District 6
Term Expires January 1, 2009
316 University Hall
Columbia, MO 65211

David G. Wasinger
St. Louis, District 2
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President of the University of Missouri
Gary Forsee
321 University Hall
Columbia, MO 65211

Chancellor of the Missouri University of Science and Technology
John F. Carney III
206 Parker Hall
300 W. 13th St.
Rolla, MO 65409-0910

8. Under 10 CFR 50.33(f)(2), "The applicant shall submit estimates for total annual operating costs for each of the first five years of operation of the facility." Provide the projected operating costs of the MSTR for each of the years FY2009 to FY2013 (the first five year period after the projected license renewal) as well as MSTR's primary source(s) of funding that covers the operating costs for the above fiscal years.

	Salary and Wages	Benefits	Equipment & Expenses	Total
FY 2009	$143,469	$43,589	$12,730	$197,788
FY 2010	$147,773	$44,896	$13,111	$205,780
FY 2011	$152,206	$46,243	$13,505	$211,954
FY 2012	$156,772	$47,630	$13,910	$218,312
FY 2013	$161,475	$49,059	$14,327	$224,861

9. The supplement to the application indicates that that cost to decommission the MSTR ranges from $ 1.9 million to $ 5.8 million depending on the disposal option selected. The staff needs the following additional information to complete its review:
   a. Selected disposal option and the basis for the disposal option selected.
   b. MSTR's plans to adjust the level of funds in the escrow account periodically over the life of the MSTR to meet changes in the decommissioning cost estimate.
   c. Copy of the financial mechanism that reflects the updated decommissioning costs.

The selected disposal option is Washington Site, using venders. The Washington Site, using venders, was determined to be lower in cost for decommissioning than the other sites listed in NUREG-1307 rev. 12.

The latest decommissioning costs (fourth quarter of 2007) for the MSTR is $1,944,691 as determined by using NUREG-1307 rev. 12 with the Washington Site, using venders option.

The decommissioning cost is based from the first decommissioning cost found in 1990. The 1990 decommissioning cost of $816,000 was determined by averaging costs of previously decommissioned university reactors and cost estimates from other research reactors of comparable size. NUREG-1307 rev. 12 was followed to determine the decommissioning cost for the fourth quarter of the year 2007.

The following equation from NUREG-1307 rev. 12 was utilized to find the updated decommissioning cost:

$$Cost_x = Cost_o \cdot [A \cdot L_x + B \cdot E_x + C \cdot B_x]$$

Where: $Cost_x$ = Updated Estimated Decommissioning Cost for 2007 (4^{th} quarter)
$Cost_o$ = Estimated UMRR Decommissioning Cost for 1990 ($816,000)
A = 0.65 (Fraction of cost attributed to labor, NUREG-1307)
B = 0.13 (Fraction of cost attributed to energy, NUREG-1307)
C = 0.22 (Fraction of cost attributed to burial, NCREG-1307)
L_x = Labor Cost Adjustment (1990-2007)
E_x = Energy Cost Adjustment (1990-2007)
B_x = Burial Cost Adjustment (1996-2008)

The fractions A, B, and C are defined in NUREG-1307 rev. 12. The factor L_x is based on the Employment Cost Index found at the US Bureau of Labor Statistics webpage (www.bls.gov/data). The factor was found using the data for the Midwest region (US Bureau of Labor Statistics data series ecu 13302i) for years 1990 and 2007. The factor E_x was based on the Producers Price Index for both industrial electrical power and light fuel oils (US Bureau of Labor Statistics data series wpu0543 and

wpu0573 respectively) for years 1990 and 2007. The last factor, B_x, is determined from data contained within NUREG-1307 rev. 12 table 2.1.

$$L_x = \frac{\text{Employment Cost Index (Quarter 4, 2007)}}{\text{Employment Cost Index (Quarter 3, 1990)}} = \frac{105.3}{57.8} = 1.82$$

The employment figure of 1.82 was arrived at based off the most recent information available for quarter 4, 2007 for the Midwest region and the quarter 3, 1990 information (matching the date of the original estimated decommissioning cost of 1990).

$$E_x(\text{PWR}) = 0.58 \bullet P_x + 0.42 \bullet F_x = 0.58 \bullet 1.45 + 0.42 \bullet 4.42 = 2.70$$

Where: P_x = Producers Price Index for Electricity normalized
F_x = Producers Price Index for Fuel Oil normalized

$$P_x = \frac{\text{Producers Price Index Electricity (November 2007)}}{\text{Producers Price Index Electricity (July 1990)}} = \frac{180.3}{124.4} = 1.45$$

$$F_x = \frac{\text{Producers Price Index Fuel Oil (July 2007)}}{\text{Producers Price Index Fuel Oil (July 1990)}} = \frac{228.2}{51.6} = 4.42$$

The energy figure of 2.70 was based off the November 2007 and July 1990 Producers Price Index for both industrial electricity and light fuel oil.

The B_x values were determined by finding the average percent increase per year from the given 1996 to 2006 values for PWR disposal contained within NUREG-1307 rev. 12 table 2.1. The B_x values were extrapolated to 2008 and were determined to be the following:

Washington Site (not using venders) ..... $B_x = 8.29$

The Washington Site (using venders) estimated cost of decommissioning for 2007 is....

$$\text{Cost}_{2007} = \$816{,}000 \bullet [0.65 \bullet 1.82 + 0.13 \bullet 2.70 + 0.22 \bullet 3.86] = \$1{,}944{,}691$$

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Documentation will be provided later declaring the funds are available for MSTR operations and decommissioning costs referenced in questions 8 and 9.

To contact me, please call 573-341-4384 or e-mail at webonzer@mst.edu.

I declare under penalty of perjury that the foregoing is true and correct.

William Bonzer

Executed on

September 16, 2008

Sincerely,

William Bonzer

William Bonzer
MSTR Manager

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