April 8, 2008

Mr. William E. Bonzer, Reactor Manager
Missouri University of Science and Technology
Nuclear Reactor Facility
1870 Miner Circle
Rolla, MO 65409-0630

SUBJECT: NRC INSPECTION REPORT NO. 50-123/2008-201

Dear Mr. Bonzer:

This letter refers to the inspection conducted on March 24 to 27, 2008, at your Missouri University of Science and Technology Nuclear Reactor Facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concern or noncompliance of Nuclear Regulatory Commission (NRC) requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Document Access Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Marcus Voth at 301-415-1210.

Sincerely,

/RA/

Johnny H. Eads, Branch Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-123
License No. R-79

Enclosure: As stated

cc w/ enclosure:
See next page

Missouri University of Science and Technology Docket No. 50-123
cc:

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

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-123
License No:	R-79
Report No:	50-123/2008-201
Licensee:	Missouri University of Science and Technology
Facility:	Nuclear Reactor Facility
Location:	Rolla, Missouri
Dates:	March 24 to 27, 2008
Inspector:	Marcus H. Voth
Approved by:	Johnny H. Eads, Branch Chief Research and Test Reactors Branch B Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Missouri University of Science and Technology
Nuclear Reactor Facility
NRC Inspection Report No. 50-123/2008-201

The primary focus of this routine, announced inspection of facility operations was the onsite review of selected aspects of the licensee's Class II research reactor facility safety programs including organization and staffing; procedures; experiments; health physics; effluents and environmental monitoring; design changes; committees, audits, and reviews; and transportation. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organization and Staffing

- The renaming of the university had no impact on reactor safety or compliance with license and Technical Specification requirements.
- The followup item related to the demonstration of radiation survey meter skills was closed.

Procedures

- Written procedures were being maintained in accordance with Technical Specification requirements.
- The licensee discussed consideration for a procedure review and update initiative following license renewal.

Experiments

- Reactor experiments were being performed in accordance with the requirements of the Technical Specifications.

Health Physics

- The licensee maintained an effective radiation protection program in compliance with regulatory and Technical Specification requirements, resulting in low radiation exposures to facility workers and users.

Effluents and Environmental Monitoring

- The licensee evaluated annual environmental releases as required by Technical Specifications and reported results well below limits.

Design Changes

- The licensee maintained a procedure to process facility changes in accordance with regulatory requirements but had not made such a change since the previous inspection.

Committees, Audit and Reviews

- The Radiation Safety Committee continued to perform independent oversight in accordance with Technical Specification requirements.

Transportation

- The licensee did not ship any radioactive material under the R-79 license since the previous transportation inspection.

REPORT DETAILS

Summary of Facility Status

The Missouri University of Science and Technology (MST) Nuclear Reactor Facility (NRF) two hundred kilowatt research reactor continued to be operated in support of education, research, training, and surveillance. During the inspection, the reactor was operated to irradiate samples as part if its research mission.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedures (IP) 69001-02.02 and 92701)

The inspector reviewed the following related to the university name change:

- Technical Specifications
- MST website
- Operator Requalification Program, Rev. 3, August 20, 2004

b. Observations and Findings

As of January 1, 2008, the University of Missouri – Rolla was officially renamed the Missouri University of Science and Technology. The licensee had submitted a timely application for amendment to the facility license and Technical Specifications (TS); NRC issuance of the amendment was imminent.

Responsibility for reactor operations remained under the academic programs while independent safety oversight continued to reside with the Vice Chancellor - Administrative Services. The following individuals currently filled the positions defined in TS Figure 6-1:

Level 1 - Dr. S. Frimpong, Chair of the Mining and Nuclear Engineering Department
Level 2 - Dr. A. Kumar, Reactor Director and Chair of Nuclear Engineering
Level 3 - Mr. W. Bonzer, Reactor Manager
Radiation Safety Officer (RSO) - Mr. G. R. Bono, Director of Environmental Health and Safety (Reported to Vice Chancellor - Administrative Services)

The reactor staff consisted of three full time licensed reactor operators and nine part time student operators. At the time of the inspection two student operators were declared temporarily inactive until meeting requirements of the requalification program.

The inspector investigated an Inspector Follow-up Item (IFI) from a previous inspection, "The licensee would request a change to their Operator Requalification Program identifying who verifies operator proficiency in using portable radiation meters." The previous requalification program specified a single individual by position to perform this function; the program was revised to allow multiple qualified individuals to perform this function so the item was thereby closed. (IFI 50-123/2004-201-01 closed)

c. Conclusions

The renaming of the university had no impact on reactor safety or compliance with license and Technical Specification requirements.

The followup item related to the demonstration of radiation survey meter skills was closed.

2. Procedures

a. Inspection Scope (IP 69001-02.03)

The inspector reviewed the following to ensure that the requirements of TS Section 6.3, Operating Procedures, were being met concerning procedures:

- Standard Operating Procedures (SOP) Manual

b. Observations and Findings

TS Section 6.3, Operating Procedures, required that operating procedures be maintained for specific topic areas. It also specified a means for making minor and substantive changes to procedures. The inspector found that all specified topics were addressed by existing procedures. He also verified that the review given to procedure modifications were in accordance with the procedure.

The inspector noted many hand-written changes to procedures and also that many procedures had existed for over a decade without a documented review. The licensee indicated that as soon as the current license renewal initiative was completed, procedure review and updating will be emphasized.

c. Conclusions

Written procedures were being maintained in accordance with Technical Specification requirements. The licensee discussed consideration for a procedure review and update initiative following license renewal.

3. Experiments

a. Inspection Scope (IP 69001-02.06)

The inspector reviewed the following to ensure that the requirements of TS Sections 3.7 and 4.7, Experiments, and Section 6.4, Experiment Review and Approval, were being met concerning experiments:

- File of Completed Irradiation Request Forms (IRF)
- Permanent Reactor Logbook #15, March 28, 2007 to present
- SOP 702, Irradiation Request Forms, Rev. April 10, 1995

b. Observations and Findings

The inspector observed a reactor startup and the irradiation of a series of experimental samples. While the reactor operator appeared to have the procedure memorized, he was observed verifying that the proper steps were taken per the written procedure. The inspector verified that a current authorization was on file for the experiment and approved the specific sample for irradiation per the procedure.

The inspector also observed the experimenter who, under the supervision of a licensed Senior Reactor Operator (SRO), loaded the unirradiated samples into the rabbit terminal and unloaded the irradiated sample. Communication among reactor operators and the experimenter was clear, concise, and complete. Personnel demonstrated good As Low As Reasonably Achievable (ALARA) practices.

Pursuant to SOP 702, each IRF required review and approval by two individuals from among the following: an SRO, the Director, and the Health Physicist. If the IRF was determined to involve a new safety issue, review by the Radiation Safety Committee (RSC) was required. Once an experiment was authorized it could be repeated indefinitely as long as an SRO found the sample to be in compliance with the authorization. Since many of the authorizations had been in effect for many years, the licensee had pro-actively reviewed and reissued those being used most frequently. Seven new IRFs were approved to date in 2008 and 15 were approved in 2007, none of which required RSC review.

c. Conclusions

Reactor experiments were being performed in accordance with the requirements of the Technical Specifications.

4. Health Physics

a. Inspection Scope (IP 69001-02.07.a-d)

The following documents were reviewed to determine compliance with 10 CFR Parts 19 and 20 and with TS Sections 3.6.1 and 4.6.1, Radiation Monitoring Systems, requirements regarding radiation protection:

- Handbook of Radiological Operations
- 2007 and 2008 Monthly Reactor Audit file
- 2007 and 2008 Reactor Dosimetry file
- 2007 and 2008 Reactor Sump Water Analysis File
- 2007 and 2008 Monthly Contamination Survey file
- 2007 and 2008 Monthly Radiation Survey file
- 2007 and 2008 Reactor Sump Water Analysis file
- 2007 and 2008 Reactor Pool Water Analysis file
- 2007 and 2008 Reactor Pool Water Tritium file
- 2007 Audit of University of Missouri – Rolla (UMR) Radiation Protection and ALARA Program, W. Bonzer and M. Bresnahan, December 21, 2007
- 2002 to present Radiation Work Permit file

b. Observations and Findings

Through the review of procedures and records, observations during facility tours, and discussion with staff personnel, the inspector assessed the licensee's radiation protection program, including radiation protection training given to individuals.

The licensee maintained and adhered to written procedures and instructions for all aspects of the radiation safety program. During tours through the facility the inspector verified that warning signs and postings for radiation workers were in accordance with regulations and procedures. Protective clothing was available if needed but areas were maintained in a clean condition such that it was very rarely required. Likewise a radiation work permit was in place and while generally not necessary, was effectively implemented during the August 2007 control rod inspection.

The inspector reviewed the radiation monitoring instrumentation calibration program. Most survey instruments were calibrated using an in-house calibration facility. Permanently mounted process monitors were calibrated in-situ. High range ion chambers and neutron detectors were sent offsite for calibration. In all cases calibration stickers were used to record the valid calibration interval; all devices inspected throughout the facility were found to be within their defined calibration interval.

Workers and visitors were observed wearing appropriate dosimetry throughout the facility. Routine radiation surveys, smear samples, and fixed monitor readings were taken throughout the facility to verify that radiation exposure rates were known and maintained As Low As Reasonably Achievable (ALARA). The licensee maintained well organized files which contributed to good tracking of performance and early indication of unexpected results.

The overall effectiveness of the radiation protection program was monitored with Optically Stimulated Luminescence Devices (OSLD) worn by workers. The maximum annual deep dose equivalent among the reactor radiation workers (staff, students, and experimenters) during 2007 was 10 millirem; most students received less that 2 millirem during 2007.

c. Conclusions

The licensee maintained an effective radiation protection program in compliance with regulatory and Technical Specification requirements, resulting in low radiation exposures to facility workers and users.

5. Effluents and Environmental Monitoring

a. Inspection Scope (IP 69001-02.07.e, f, and g)

The following documents were reviewed to determine compliance with 10 CFR Part 20 and with TS Sections 3.6.2 and 4.6.2, Radioactive Effluents:

- Annual Progress Report, University of Missouri – Rolla Nuclear Reactor Facility, 2006-2007, W. Bonzer to USNRC, April 27, 2007
- Argon-41 Release file

- Memo by M. Bresnahan, Health Physicist, "Ar-41 Release Verification," April 23, 2007
- 2007 and 2008 Air Release file
- 2007 and 2008 Byproduct Release file
- 2007 and 2008 Air Release Summary file

b. Observations and Findings

The predominant gaseous effluent was Argon-41, the activation product of naturally occurring Argon in atmospheric air. The licensee analyzed air samples collected over the reactor pool surface to evaluate exposure to personnel in the reactor bay and also samples collected at an exhaust fan to evaluate exposure to the public. Measurements were done using Regulatory Guide 4.20, Constraint on Releases of Airborne Radioactive Material to the Environment for Licensees other than Power Reactors. Results showed compliance with 10 CFR Part 20 limits.

The licensee maintained good reactor water quality through pre-processing potable campus water used to make up for evaporative losses and continuous clean-up of circulating reactor pool water. Filters and resins from the pool clean-up system were collected as radioactive waste but activity levels were minimal. Likewise, a small quantity of laboratory waste (vials, absorbent paper, gloves, etc.) was collected in the reactor building consisting of very little activity.

c. Conclusions

The licensee evaluated annual environmental releases as required by Technical Specifications and reported results well below limits.

6. Design Changes

a. Inspection Scope (IP 69001-02.08)

The inspector reviewed the following to ensure that the requirements of 10 CFR 50.59 were being implemented effectively:

- Radiation Safety Committee (RSC) Meeting Minutes file for 2007
- Annual Progress Report, University of Missouri – Rolla Nuclear Reactor Facility, 2006-2007, W. Bonzer to USNRC, April 27, 2007
- SOP 310, Facility Modifications, Rev. April 28, 1997

b. Observations and Findings

The licensee reported that no changes were made since the previous inspection that required a 10 CFR 50.59 review. In January of 2007 the inspector reviewed design changes and noted that one change, installation of a reactor pool heat exchanger, had been reviewed and installation was nearly completed. The inspector verified that the 2007 change was properly completed and from review of subsequent RSC minutes concurred that no additional changes were initiated that constituted 10 CFR 50.59 changes. The inspector found that a procedure was in effect to address changes in the future when they are initiated.

c. Conclusions

The licensee maintained a procedure to process facility changes in accordance with regulatory requirements but had not made such a change since the previous inspection.

7. Committees, Audits and Reviews

a. Inspection Scope (IP 69001-02.09)

The inspector reviewed the following to ensure that the requirements of TS Section 6.2, Review and Audit, were being implemented effectively:

- Radiation Safety Committee (RSC) Meeting Minutes file for 2007
- Memo from F. S. Malott (Vice Chancellor for Administrative Services) to Radiation Safety Committee, RSC Appointments for FY 2007-2008, May 23, 2007

b. Observations and Findings

The licensee used a single independent oversight safety committee to fill requirements for both the reactor license and the campus broad byproduct material license. The committee members were appointed by the Vice Chancellor - Administrative Services, providing a reporting chain to the Chancellor that was fully independent of the reactor operations line of reporting. Inactive RSC members were replaced mid-year; the required quorum was present at each meeting. Meetings were conducted at the frequency specified by TS Section 6.2.2. The name change of the university (see Section 1 of this report) had no effect on the structure and organizational independence of the committee required by the TS.

Review of RSC minutes indicated that the committee was given regular briefings on matters relating to reactor safety and that committee members were actively engaged in the safety of the reactor. During the past year the RSC reviewed a new experiment and changes to the TS. There were no design changes or new procedures brought before the committee since the last inspection.

c. Conclusions

The Radiation Safety Committee continued to perform independent oversight in accordance with Technical Specification requirements.

8. Transportation

a. Inspection Scope (IP 86740)

- 2007 and 2008 Bill of Lading file
- 2007 Radioactive Material Receipts file
- 2007 and 2008 Radioactive Material Shipments file

b. Observations and Findings

The inspector reviewed the file for radioactive shipments made under the reactor license (R-79) and found that there were no shipments made since the previous transportation inspection.

c. Conclusions

The licensee did not ship any radioactive material under the R-79 license since the previous transportation inspection.

9. Exit Interview

The inspector met with members of licensee staff and management in an exit briefing on March 27, 2008. He summarized the areas inspected and presented preliminary inspection findings. The licensee did not present any dissenting comments at the briefing.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

G. R. Bono, Director of Environmental Health and Safety and Radiation Safety Officer
W. Bonzer, Reactor Manager
M. Bresnahan, Health Physicist
D. Estel, Senior Laboratory Mechanic
A. Kumar, Reactor Director and Chair & Professor of Nuclear Engineering
B. Porter, Senior Electronics Technician

INSPECTION PROCEDURES USED

IP 69001	Class II Non-Power Reactors
IP 86740	Transportation
IP 92701	Follow-up

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

50-123/2004-201-01	IFI	The licensee would request a change to their Operator Requalification Program identifying who verifies operator proficiency in suing portable radiation meters

Discussed

None

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
IFI	Inspector Follow-up Item
IP	Inspection Procedure
IRF	Irradiation Request Form
MST	Missouri University of Science and Technology
NRC	Nuclear Regulatory Commission
NRF	Nuclear Reactor Facility
OSLD	Optically Stimulated Luminescent Device
PARS	Publicly Available Records
Rev	Revision

RSC	Radiation Safety Committee
RSO	Radiation Safety Officer
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TS	Technical Specifications