

September 2, 2008

Mr. Paul. M. Whaley, Manager  
KSU TRIGA Mark II Reactor Facility  
Department of Mechanical and Nuclear Engineering  
112 Ward Hall  
Kansas State University  
Manhattan, KS 66506-5204

SUBJECT: NRC INSPECTION REPORT NO. 50-188/2008-202

Dear Mr. Whaley:

During the period August 4 to 7, 2008, the U.S. Nuclear Regulatory Commission (NRC) conducted a routine inspection at your Kansas State University TRIGA Mark II Research Reactor 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 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. 50-188  
License No. R-88

Enclosure: As stated  
cc w/ enclosure:  
See next page

Kansas State University

Docket No. 50-188

cc:

Office of the Governor  
State of Kansas  
Topeka, KS 66612

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Test, Research, and Training  
Reactor Newsletter  
University of Florida  
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DATE	8/26/08	9/2/08	9/2/08

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

Docket No: 50-188

License No: R-88

Report No: 50-188/2008-202

Licensee: Kansas State University

Facility: TRIGA Mark II Research Reactor

Location: Manhattan, Kansas

Dates: August 4 to 7, 2008

Inspector: Marcus H. Voth

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

## EXECUTIVE SUMMARY

Kansas State University  
TRIGA Mark II Research Reactor Facility  
NRC Inspection Report No. 50-188/2008-202

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the licensee's Class II research reactor facility safety programs including requalification training; surveillance and limiting conditions for operations; effluent and environmental monitoring; emergency planning; fuel handling logs and records; and followup on previously identified items since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

### Requalification Training

- The records reviewed by the inspector indicated that the licensee was in compliance with 10 CFR Part 55 and the licensee's Requalification Plan.

### Surveillance and Limiting Conditions for Operation

- The inspector found that the licensee had effectively converted the surveillance program and supporting procedures to implement the revised Technical Specifications.
- Operations were found to be in compliance with the limiting conditions for operation and surveillances requirements as stated in the Technical Specifications.

### Effluent and Environmental Monitoring

- Environmental monitoring satisfied license and regulatory requirements. Effluents were within the regulatory limits.

### Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan.

### Fuel Handling Logs and Records

- Fuel handling and inspection activities were completed and documented as required by Technical specifications and facility procedures.

### Follow-up on Previously Identified Items

- Actions taken in response to two follow-up items questioned in previous inspections were considered adequate and the follow-up items were closed.

## REPORT DETAILS

### Summary of Facility Status

The Kansas State University (KSU) TRIGA Mark II Research Reactor Facility 1250 kilowatt reactor continued to be operated in support of the University's academic program in nuclear engineering laboratory instruction and research. Since the inspection was performed during the summer recess, laboratory experiments were not scheduled and the reactor was operated only for short sample irradiations. In addition to the routine inspection considerations, this inspection also considered two unique events; changes associated with a March 13, 2008, license amendment for an increased licensed reactor power level and recovery from the June 12, 2008, tornado.

### 1. Requalification Training

#### a. Inspection Scope (IP [IP] 69001-02.04)

The inspector reviewed the following to verify that the requirements of 10 CFR Part 55, Operators' Licenses, were being met:

- 2007 Requalification Exam Report file
- Reactor Facility Requalification Plan, Rev. 2, October 8, 2000
- Requalification Program. Kansas State University, September 11, 2002
- Reactor Operations Report for the Months of April through June of 2008, Form Rev. June 1996
- Personal Reactor Operator (RO) files
- Letter from Whaley (KSU) to NRC, Termination of Operator Licenses, July 14, 2008

#### b. Observations and Findings

The licensee noted that a revised Requalification Plan was submitted as part of the licensee's amendment request which was approved by the NRC on March 13, 2008.

The inspector reviewed the last operator requalification examination given and found it to be timely and of comparable difficulty to NRC-administered examinations. A section of the licensee's monthly data sheets for the reactor operations report contained operator requalification data such as each operator's manipulations, operating hours, and last date of operating.

The inspector reviewed the personal files for two randomly selected NRC-licensed ROs. A physician's medical report noted that the operator had no medical restrictions based on ANSI 15.4, a reference to medical qualification criteria found in Section 7 of the American National Standards Institute and the American Nuclear Society Standard ANSI/ANS 15.4-1988, Selection and Training of Personnel for Research Reactors.

c. Conclusions

The records reviewed by the inspector indicated that the licensee was in compliance with 10 CFR Part 55 and the licensee's Requalification Plan.

**2. Surveillance and Limiting Conditions for Operations**

a. Inspection Scope (IP 69001-02.05)

The inspector reviewed the following to verify compliance with Technical Specification (TS) Section 3.0, Limiting Conditions for Operations, and to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0, Surveillances:

- Maintenance and Surveillance Reports for the Months of April through July of 2008, Form Rev. June 2005
- KSU TRIGA Mark II Operating, Test and Maintenance Procedures Manual, March 14, 2008

b. Observations and Findings

Upon receipt of the March 13, 2008, license amendment which replaced the TS in their entirety, the licensee implemented the updated operations manual cited above. Two new procedures were required by the new TS; many TS which were not part of the safety bases were dropped from the previous version. The inspector selected a sample of the TS limiting conditions for operations (LCO) and surveillances to verify proper implementation. In all cases the licensee demonstrated a method of compliance built into procedures and documented completion in reactor logbooks and surveillance record sheets.

The licensee published a computer-generated form listing periodic tests, those required by TS plus others not required by TS, to be performed in the month. This tool aided the licensee in assuring that surveillances were completed on a timely basis. The inspector verified that a random selection of surveillances had all been completed on schedule, in accordance with licensee procedures, and in compliance with the TS.

c. Conclusions

The inspector found that the licensee had effectively converted the surveillance program and supporting procedures to implement the revised Technical Specifications.

Operations were found to be in compliance with the limiting conditions for operation and surveillances requirements as stated in the Technical Specifications.

**3. Effluent and Environmental Monitoring**

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

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Sections 6.11.e.6 and 6.11.e.7:

- Maintenance and Surveillance Reports for the Months of April through July of 2008, Form Rev. June 2005
- Control Room [Radiation Survey] Surveillance Notebook

b. Observation and Findings

The annual reporting requirement of the current TS became effective with their issuance on March of 2008; therefore no annual reports were on file pursuant to those requirements. In the future annual reports must address radioactive effluents and environmental monitoring.

The inspector interviewed licensee staff and reviewed records to ascertain that since the previous inspection there were no shipments of solid radioactive waste from the reactor; liquid releases from the reactor building sump were significantly below regulatory release limits; and the predominant gaseous effluent was the small amount of argon 41 resulting from the activation of argon naturally found in air.

The licensee maintained records of radiation surveys of the reactor facility. To date in 2008 surveys had been performed in January, March and June. They included smear samples for contamination and direct radiation measurements at designated locations throughout the reactor at full power and shutdown conditions. Reactor operators performed the surveys, with at least one survey per year being done under the direct observation of the Campus Radiation Safety officer.

The inspector asked the licensee the status of a previously identified unresolved item (URI), 50-188/2007-202-01, storage of reactor waste at the campus decay-in-storage facility. The licensee stated that the waste in question had not been surveyed recently and may have decayed below the threshold of designating it radioactive waste. The inspector asked this matter be addressed at the next inspection and left URI 50-188/2007-202-01 as an open item.

c. Conclusions

Environmental monitoring satisfied license and regulatory requirements. Effluents were within the regulatory limits.

**4. Emergency Planning**

a. Inspection Scope (IP 69001-02.10)

The inspector reviewed documentation verifying implementation of selected portions of the emergency preparedness program including:

- P.M. Whaley and R. Bridges, Critique of Emergency Drill, October 17, 2007
- P.M. Whaley, Radiation Safety Committee (RSC) Review [KSU Tornado Response], June 17, 2008
- 50.59 Screening Form, Confinement Temporary Repairs, June 16, 2008
- Emergency telephone contact list
- Emergency Plan, KSU TRIGA Mark II Nuclear Reactor Facility, August 2006
- Emergency Procedures, KSU TRIGA Mark II Nuclear Reactor Facility, March 2007

b. Observations and Findings

The inspector noted that during each of the past 2 years the licensee conducted emergency exercises in accordance with the above cited plans and procedures; performed follow-up critiques to evaluate performance, define lessons learned, and formulate action plans for follow-up actions; and tracked action plans to completion.

The inspector noted that outside support groups responded in accordance with plans and procedures. Agreement letters with support groups were on file, dated from 2002 to 2005. The licensee stated that agreement letters were in the process of being updated.

The inspector verified that current emergency call lists were available and personnel knew where to find the current list. When an outdated staff list was noted on the student operators' office door outside the reactor control room, the licensee immediately removed it.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan.

**5. Fuel Handling Logs and Records**

a. Inspection Scope (IP 69001-02.12)

The inspector reviewed the following to verify compliance with requirements of TS Sections 5.2 and 6.3.a.2:

- Reactor Console Logbook, November 5, 2007 to March 13, 2008
- Reactor Console Logbook, March 14, 2008 to May 22, 2008
- Reactor Console Logbook, May 22, 2008 to present
- Procedure No. 26, Fuel Handling Procedure, March 14, 2008
- Procedure No. 27, Removal of Fuel from the Reactor Tank, March 14, 2008
- KSU TRIGA Mark II, Special Nuclear Material (SNM) Notebook
- Fuel location status map

b. Observations and Findings

In the process of implementing the power upgrade approved in March of 2008 the licensee added a fourth control rod to the reactor core and made significant fuel moves, initiating a new numbering designation for four rod cores. Power ascension testing above the previous limit of 250 kilowatts was performed but there was insufficient reactivity to achieve full power. While the new licensed limit for reactor thermal power is 1250 kilowatts, the licensee expressed the intention to acquire sufficient fuel to conduct routine operation up to 1000 kilowatts.

Procedures for refueling, fuel movement, and TS-required fuel inspections and surveillances had been reviewed and approved as required and were available to control operations. Fuel movement and data recording were being done per procedures.

c. Conclusions

Fuel handling and inspection activities were completed and documented as required by Technical Specifications and facility procedures.

**6. Follow-up on Previously Identified Items**

a. Inspection Scope (IP 92701)

The inspector interviewed personnel and reviewed the following to verify compliance with regulatory and procedural requirements regarding two inspector follow-up items (IFI):

- NRC Routine Inspection Report 50-188/2007-201, March 9, 2007
- NRC Non-Routine Inspection Report 50-188/2008-201, July 17, 2008

b. Observations and Findings

During an NRC inspection in February 2007 the inspector noted that the licensee was not completing and reviewing the Request for Operations Forms in accordance with the approved experiment review and approval process. In subsequent inspections this matter was discussed with the licensee who noted that a new computer-assisted documentation process obviated the need for the Request for Operations Form. At the present inspection the licensee reported that procedures had been updated, removing the requirement for the obsolete forms. On this basis, IFI 50-188/2007-201-02 was closed.

During an inspection in June 2008 an inspector noted that personnel reported difficulty finding operable portable radiation survey meters when performing the post-tornado damage assessment. While all equipment was suspect at the time because of storm damage that included potential water damage, portable survey devices were subsequently checked out and verified to be operable. One specific comment that was documented in the inspector's report was that digital display readouts were difficult to read. During the present inspection, the inspector and licensee reviewed this carefully and found that two survey instruments used in the reactor confinement did have readouts that were difficult to read under certain lighting conditions, the primary difficulty being the prefix to the R/Hr range indication. Radiation levels throughout the facility were predominantly in the micro-R/Hr or milli-R/Hr range, indicated by the prefixes  $\mu$  and m, respectively. The faint nature of these characters appeared to be an artifact of the device. Not seeing the prefix resulted in a conservatively large indication of dose rate, giving cause for the user to question the reading. The licensee stated that future radiation training, which was next scheduled for the beginning of the fall semester, would alert users to this artifact as a skill of the craft. On this basis, IFI 50-188/2008-201-01 was closed.

c. Conclusions

Actions taken in response to two follow-up items questioned in previous inspections were considered adequate and the follow-up items were closed.

## **7. Exit Interview**

The inspection scope and results were summarized on August 7, 2008, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

R. Bridges	Head of Radiation Safety Office, Environmental Health and Safety Division and Campus Radiation Safety Officer
T. Halphen	Assistant Head of Head of Radiation Safety Office, Environmental Health and Safety Division
K. Shultis	Mechanical and Nuclear Engineering Department, Nuclear Program Director and Reactor Safeguards Committee Backup Chairman
A. Tipton	Reactor Support Staff
P. M. Whaley	Reactor Manager

### Other Personnel

None

## **INSPECTION PROCEDURES USED**

IP 69001	Class II Research and Test Reactors
IP 92701	Follow-up

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### Opened

None

### Closed

50-188/2007-201-02	IFI	Failure to complete Reactor Operation Request Forms for late 2006
50-188/2008-201-01	URI	Follow-up on the status of portable radiation survey equipment affected by the storm

### Discussed

50-188/2007-202-01	URI	Storage of reactor waste at campus decay-in-storage facility
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## **PARTIAL LIST OF ACRONYMS USED**

10 CFR	Title 10 of the Code of Federal Regulations
ADAMS	Agency-wide Document Access Management System
IFI	Inspector Follow-up Item
IP	Inspection Procedure

KSU	Kansas State University
LCO	Limiting Conditions for Operations
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
Rev.	Revision
RO	Reactor Operator
RSC	Radiation Safety Committee
TS	Technical Specifications
URI	Unresolved Item