

January 3, 2005

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

SUBJECT: NRC ROUTINE, ANNOUNCED INSPECTION REPORT NO. 50-188/2004-201

Dear Mr. Whaley:

This letter refers to the inspection conducted on November 16-19, 2004, at your 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 NRC requirements were 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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Mr. Stephen Holmes at 301-415-8583.

Sincerely,

**/RA/**

Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket No. 50-188  
License No. R-88

Enclosure: NRC Inspection Report No. 50-188/2004-201

cc w/enclosure: Please see next page

Kansas State University

Docket No. 50-188

cc:

Office of the Governor  
State of Kansas  
Topeka, KS 66612

Mayor of Manhattan  
P.O. Box 748  
Manhattan, KS 66502

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

January 3, 2005

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

SUBJECT: NRC ROUTINE, ANNOUNCED INSPECTION REPORT NO. 50-188/2004-201

Dear Mr. Whaley:

This letter refers to the inspection conducted on November 16-19, 2004, at your 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 NRC requirements were 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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Mr. Stephen Holmes at 301-415-8583.

Sincerely,  
**/RA/**

Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket No. 50-188  
License No. R-88  
Enclosure: NRC Inspection Report No. 50-188/2004-201  
cc w/enclosure: Please see next page

**Distribution w/encl.:**

PUBLIC RNRPAR&TR r/f AAdams CBassett PDoyle TDragoun  
WEresian SHolmes DHughes EHylton PIsaac PMadden  
MMendonca WBeckner KWitt PYoung RidsNrrDrip  
BDavis (Ltr only O5-A4) NRR enforcement coordinator (Only for IRs with NOVs, O6-E3)

**ADAMS ACCESSION NO.: ML043640526**

**TEMPLATE No.: NRR-106**

OFFICE	RNRP:RI		RNRP:LA		RNRP:SC	
NAME	SHolmes		EHylton		PMadden	
DATE	12/ 30 /2004		12/ 30 /2004		1/ 3 /2005	

**C = COVER**

**E = COVER & ENCLOSURE  
OFFICIAL RECORD COPY**

**N = NO COPY**

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

Docket No: 50-188

License No: R-88

Report No: 50-188/2004-201

Licensee: Kansas State University

Facility: TRIGA MARK II

Location: Manhattan, Kansas

Dates: November 16-19, 2004

Inspector: Stephen W. Holmes, Reactor Inspector

Approved by: Patrick M. Madden, Section Chief  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

Kansas State University  
Report No: 50-188/2004-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II research reactor programs including: organizational structure and staffing, reactor operations, procedures, operator requalification, surveillance, experiments, radiation protection, effluent releases, transportation of radioactive material, review, audit, and design change functions, emergency preparedness, and fuel handling since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward ensuring the protection of public health and safety, and in compliance with NRC requirements.

### Organizational Structure and Staffing

- The organizational structure and functions were consistent with the requirements specified in Section H of the Technical Specifications and facility management orders.

### Reactor Operations

- Operational activities were consistent with applicable Technical Specification and procedural requirements.

### Procedures

- The procedural control and implementation program was acceptably maintained.

### Operator Requalification

- The Requalification Program was being acceptably implemented, the program was up-to-date, and plan requirements were met.

### Surveillance

- The licensee's program for completing surveillance inspections and Limiting Conditions for Operation confirmations satisfied Technical Specification and licensee administrative requirements.

### Experiments

- The approval and control of experiments met Technical Specification and licensee procedural requirements.

### Radiation Protection

- Periodic surveys were completed and documented as required by procedure.
- Postings and signs met regulatory requirements.

- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.
- Radiation survey and monitoring equipment were being maintained and calibrated as required.
- The Radiation Protection and ALARA Programs met regulatory requirements.
- Radiation protection training was acceptable.

#### Effluent Releases

- Effluent releases were within the specified regulatory and Technical Specification limits.

#### Transportation of Radioactive Material

- Radioactive materials were transferred to the licensee's Byproduct Materials License for shipment and/or disposal.

#### Review, Audit, and Design Change Functions

- Reviews and audits were being conducted by the Reactor Operations Committee in accordance with the requirements specified in Technical Specification Sections 6.2, 6.3, and 6.4 and licensee procedures.
- Design changes under 10 CFR 50.59 were acceptable.

#### Emergency Preparedness

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

#### Fuel Handling

- Fuel handling was being completed and documented in accordance with the requirements specified in the Technical Specification and facility procedures.

## REPORT DETAILS

### Summary of Plant Status

The licensee's 250 kilowatt TRIGA Mark II research reactor has been operated in support of educational demonstrations, experiments, reactor operator training, and periodic equipment surveillances. During the inspection the reactor was operated at 250 kilowatts in support of ongoing work and operator training.

### 1. Organizational Structure and Staffing

#### a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Technical Specifications (TS) Section H, "Administrative Requirements," was being met:

- TS for the Kansas State University (KSU) TRIGA Mark II Reactor, Amendment No. 13, dated November 16, 1999
- KSU TRIGA MARK II Reactor organizational structure and staffing
- management responsibilities and staff qualifications
- staffing requirements for the safe operation of the facility
- Reactor Logbooks covering operations from June 22, 2001 to present
- KSU TRIGA MARK II Management Orders, undated

#### b. Observations and Findings

Through discussions with the Reactor Manager the inspector determined that management responsibilities and the organization at the facility had not changed since the previous NRC inspection in September 2002 (refer to NRC Inspection Report No. 50-188/2002-201, ADAMS Accession No. ML022770654). The Reactor Manager was a full-time University staff position and the Reactor Supervisor position was filled by a graduate student. The licensed staff consists of two Senior Reactor Operators (SRO), two Reactor Operators (RO) and a number of trainees.

The inspector verified that organizational structure and staffing at the facility was as required by TS Sections H.4 and H.5. Review of records confirmed that management responsibilities were administered as required by TS and administrative procedures. The operations log and associated records confirmed that shift staffing met the TS minimum requirements for duty personnel.

#### c. Conclusions

The licensee's organization and staffing were in compliance with the facility TS Section H and facility management orders.

### 2. Reactor Operations

#### a. Inspection Scope (IP 69001 )

To verify that the licensee was operating the reactor and conducting operations in accordance with TS Sections C through G and procedural requirements, the inspector reviewed the following:

- Reactor Logbooks covering operations from June 22, 2001 to present
- KSU Annual Reports for the periods from October 1, 2001 to September 30, 2002 and October 1, 2002 to September 30, 2003
- KSU Management Order (MO) SOM2, "Routine Communications and Approval for Operations," Revision 1, dated August 12, 2004
- KSUMO SOM4, "Access and Visitor Controls," Revision 0, dated May 28, 2004
- KSUMO SOT1, "Instrument Checkout," Revision 1, dated August 10, 2004
- KSUMO SOP2, "Visual Surveillance System," Revision 0, dated August 12, 2004
- KSU Operation, Test, and Maintenance Procedure (OTMP) No. 15, "Reactor Startup," dated June 7, 1994
- KSUOTMP No. 16, "Reactor Shutdown," dated July 11, 1996
- Forms KSUTMII - 3, "Daily checklist," dated July 1994, from June 2002 to present
- Forms "Maintenance and Surveillance Report for the Month of: \_\_\_\_\_," dated June 1996. Data for January 2002 to present

The inspector also observed reactor operations, including reactor start-up, multiple experiments, and shutdown during the week of the inspection.

b. Observations and Findings

Reactor operations were carried out following written procedures and TS requirements. Significant problems and events, including unanticipated reactor scrams, were identified in the logs and records, and were reported and resolved as required before the resumption of operations under the authorization of a SRO. The inspector verified that reactor related problems and events, and other TS and procedure required entries, were logged in the Operating Log and cross-referenced with other logs and checklists as required. A review of the logs and records indicated that TS operational limits had not been exceeded. Operations records confirmed that shift staffing met the minimum requirements for duty personnel.

c. Conclusions

Operational activities were consistent with applicable TS and procedural requirements.

**3. Procedures**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that safety standards and written instructions for those activities specified in TS Sections H.1.a through f and licensee procedure were in effect:

- KSU TRIGA MARK II Management Orders, undated
- KSU Operation, Test, and Maintenance Procedure
- Radiation Protection Program KSU Nuclear Reactor Facility, Mechanical and Nuclear Engineering Department, Kansas State University, May 7, 2002
- records of changes and temporary deviations to procedures
- observation of procedural implementation
- Reactor Safeguards Committee (RSC) meeting minutes documenting procedure change reviews and approvals

- administrative controls
- procedural implementation

b. Observations and Findings

The inspector determined that written procedures were available for the activities delineated in TS Section H.1. These procedures provided guidance for the administrative, operations, and health physics (HP) functions of the facility. During the inspector's tours of the facilities, the inspector noted that personnel performing reactor operations, conducting various checks, and performing maintenance were doing so in accordance with applicable procedures. The inspector also observed a number of reactor experiment runs. The procedures were followed methodically and were found to be acceptable for the current facilities' status and staffing level.

The procedures were routinely updated as needed. Administrative controls of changes and temporary changes to procedures, and associated review and approval processes were as required. Review of procedures verified that changes had been evaluated and approved as required.

c. Conclusions

Based on the procedures and records reviewed and observations of staff during the inspection, the inspector determined that the procedural control and implementation program was acceptably maintained.

#### 4. **Operator Requalification**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the requirements of the KSU TRIGA Research Reactor Requalification Program (RRP), dated August 14, 1987, were being met:

- RRP, dated August 14, 1987
- status of operator licenses
- operator active duty confirmation
- operator training and examination records since June 2002
- operator physical examination records since June 2002
- Reactor Logbooks covering operations from June 22, 2001 to present
- radiation protection training since October 2002

b. Observations and Findings

The inspector verified that the currently licensed operators were successfully completing the emergency procedure and abnormal events training, reactivity manipulations, and participating in the ongoing training as required by the NRC-approved program. Training was also provided to the reactor operators on maintenance operations and 10 CFR 50.59 design changes and evaluations.

Requalification records contained the documentation required by the program and indicated that requirements for completion of an annual operating test, a biennial written examination, and participation in the annual emergency drill were being fulfilled. Required quarterly operating hours, as a SRO, were being tracked and completed. Biennial medical exams had been conducted as required. Checklists used for tracking requalification requirements were up-to-date and ensured that the plan elements were accomplished.

c. Conclusions

The Requalification Program was being acceptably implemented, the program was up-to-date, and plan requirements were met.

**5. Surveillance**

a. Inspection Scope (IP 69001)

To verify that the licensee was meeting the requirements of TS Sections C through G and procedural requirements, the inspector reviewed:

- surveillance, calibration, and test data sheets and records since June 2002
- Reactor Logbooks covering operations from June 2002 to present
- KSU Annual Reports for the periods from October 1, 2001 to September 30, 2002 and October 1, 2002 to September 30, 2003
- Forms KSUTMII - 3, "Daily checklist," dated July 1994, from June 2002 to present
- Forms "Maintenance and Surveillance Report for the Month of: \_\_\_\_\_", dated June 1996. Data for January 2002 to present
- KSUMO SOT1, "Instrument Checkout," Revision 1, dated April 18, 1989
- KSUOTMP No. 1, "Biennial-Annual Control Rod Inspection," dated July 11, 1996
- KSUOTMP No. 2, "Annual Power Level Calibration," dated July 11, 1996
- KSUOTMP No. 3-2, "Annual Remote Area Monitor Calibration RMS II," dated July 11, 1996
- KSUOTMP No. 4, "Biennial-Annual Control Rod Drop Time Measurement," dated June 26, 1996
- KSUOTMP No. 5-1, "Semi-Annual Check of Minimum Interlocks," dated June 20, 1996
- KSUOTMP No. 5-2, "Semi-Annual Check of 100% Safety Circuits," dated June 20, 1996
- KSUOTMP No. 6, "Semi-Annual Pulse Rod Drive Cylinder and Air Supply Inspection," July 11, 1996
- KSUOTMP No. 7, "Semi-Annual \$1.00 Comparison Pulse," dated June 16, 1994
- KSUOTMP No. 8, "Calibration of Continuous Air Monitors," dated July 2, 1999
- KSUOTMP No. 10, "Fuel Element Inspection," dated January 1980
- KSUOTMP No. 12, "Functional Performance Check of Transient (Pulse) Rod," dated June 15, 1994
- KSUOTMP No. 17, "Periodic Reactor Intrusion Alarm Testing," dated March 5, 1992
- KSUOTMP No. 18, "Evacuation Alarm Response Test," dated January 22, 1987
- KSUOTMP No. 15, "Reactor Startup," dated June 7, 1994
- KSUOTMP No. 16, "Reactor Shutdown," dated July 11, 1996

b. Observations and Findings

The licensee used various checklists to track daily, monthly, and other periodic checks, audits, drills, training, and inspections, as well as verifications for TS required Limiting Conditions for Operation (LCO). These checklists provided documentation and control of reactor operational tests and surveillances.

The inspector reviewed selected records of all TS required surveillances and LCO verifications performed since June 2002. All data reviewed, including surveillance inspections and LCO verifications showed that the periodic checks, tests, and verifications were completed in accordance with and at the intervals defined in TS Sections C through G and licensee procedures. The results of these surveillances and LCOs were within prescribed TS Section and licensee procedural limits and were consistent with the previous surveillance results.

c. Conclusions

The licensee's program for completing surveillance inspections and LCO confirmations satisfied TS and licensee administrative controls.

**6. Experiments**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with TS Section I:

- experimental program requirements
- experimental administrative controls and precautions
- KSU TRIGA Mark II approved reactor experiment documentation, Experiment Nos. 1 to 47
- RSC meeting minutes since June 2002
- Memorandum from P.M. Whaley to J.K Shultis, Acting Chair, RSC, RE: New Experiment Approval, Air-filled Central Thimble Detector Testing Facility
- Reactor Logbooks covering operations from June 22, 2001 to present

b. Observations and Findings

The inspector noted that the experiments conducted at the facility were well-established types or variations of ones that had been reviewed and approved by the RSC. One new experiment was approved since the last inspection. The inspector determined that the RSC reviewed approved the new experiment as required by TS Sections I.1 through I.3 and licensee procedures.

The inspector reviewed selected experiment and irradiation request forms and approved experiments and confirmed that they were evaluated by the RS and, if appropriate, the RSO. New experiments were referred to the RSC as required. The inspector also verified that approved experiments complied with TS Section H.3.c through H.3.e limitations. The inspector's review of current experiment, activation, and irradiation authorizations, procedures, and related reactor log book and sample irradiation log entries confirmed that experiments were installed, performed, and

removed as outlined in the approved experiment authorizations and licensee procedures. Engineering and radiation protection controls were implemented as required to limit exposure to radiation.

c. Conclusions

The approval and control of experiments met TS and licensee procedural requirements.

**7. Radiation Protection**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Parts 19 and 20 and TS Section F requirements:

- radiological signs and posting in various areas of the facility
- C area and personnel dosimetry results for 2003 and 2004
- facility and equipment during tours
- facility monthly, annual, and other periodic contamination and area radiation surveys since June 2002
- C Document, "KSU Nuclear Reactor Radiation Protection Program (RPP)", May 2002
- C Radiation survey procedure "12.4, Experiment 3 - Radiation Survey of Reactor," dated February 12, 1969
- C KSUMO SOR 1, "Dosimeter Logs," Revision 0, dated May 28, 2004
- C KSUMO SOR 4, "Radiation Detector Calibration," Revision 0, dated June 16, 2004
- C KSUOTMP No. 3-2, "Annual Remote Area Monitor Calibration, RMS II," dated October 3, 1990
- KSUOTMP No. 8, "Calibration of Continuous Air Monitor," dated July 2, 1999
- KSUOTMP No. 13, "Portable Radiation Survey Meter Calibration," dated December 1986
- KSUOTMP No. 14, "Pocket Dosimeter Calibration," dated February 13, 1987.
- KSUOTMP No. 19, "Gamma Ray Assay of Reactor Samples," dated January 27, 1987
- C KSUOTMP No. 20, "Liquid Scintillation Assay Methods", dated January 19, 1987
- C KSUOTMP No. 21, "Alpha Particle Assay of Reactor Liquids", dated August 3, 1989
- periodic checks, quality control, and test source certification documentation since June 2002
- selected individual training histories since June 2002
- annual radiation protection training rosters since June 2002
- maintenance and calibration records of radiation monitoring equipment June 2002
- Beckman LS-1801 Series Liquid Scintillation Counter Users Manual
- C Genie 2000 Spectrometry System, Version 1.4, Operations Manual, dated November 15, 1999

b. Observations and Findings

(1) Surveys

Selected monthly and other periodic radiation and contamination surveys were reviewed by the inspector. The surveys had been completed by the reactor or HP staff members as required by RPP Section 4.0. Any contamination detected in concentrations above established action levels of 100 cpm/100cm<sup>2</sup> was noted and the area decontaminated. Results of the surveys were documented so that facility personnel would be knowledgeable of the radiological conditions that existed in the controlled areas of the facility. The inspector noted that contamination was infrequent. The inspector determined that the survey program satisfied 10 CFR 20.1501(a) requirements.

(2) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. Radiological signs were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. Copies of NRC Form-3, "Notice to Employees," noted at the facility were the latest issue, as required by 10 CFR Part 19.11, and were posted in various areas throughout the facility.

During tours, the inspector observed that caution signs, postings, and controls were acceptable for the hazards involving radiation and contaminated areas and were implemented as required by 10 CFR 20, Subpart J. Through observations of and interviews with reactor and Environmental Health and Safety (EH&S) staff the inspector confirmed that personnel complied with the signs, postings, and controls. No unmarked radioactive material was detected in the facility.

(3) Dosimetry

The inspector determined that the licensee used Landuar Luxel© Optically Stimulated Luminescence dosimeters for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee used finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor. An examination of the results of exposures to radiation at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations. The records showed that the annual whole body exposures received by the reactor staff for 2003 was less than 50 millirem deep dose equivalent and less than 100 millirem deep dose equivalent for 2004. These doses are significantly lower than the 10 CFR 20.1201 limit of 5,000 millirem.

Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel.

(4) Radiation Monitoring Equipment

The calibration and periodic checks of the portable survey meters, radiation monitoring, and counting lab instruments were performed by the licensee's staff, EH&S, or by certified contractors. The inspector confirmed that the licensee's calibration procedures and frequencies satisfied TS Section F, "Radiation Monitoring," reactor and EH&S calibration procedures, 10 CFR 20.1501(b) requirements, and the American National Standards Institute N323 "Radiation Protection Instrumentation Test and Calibration" or the instrument manufacturers' recommendations. The inspector verified that the calibration and check sources were traceable to the National Institute of Standards and Technology and that the sources' geometry and energies matched those used in actual detection/analyses.

The inspector reviewed the facility calibrations performed since June 2002. The portable meters, Area Radiation Monitors and Continuous Air Monitor were calibrated annually and records were maintained as required. The calibrations were performed by licensee staff, EH&S personnel, or certified contractors and were being performed in accordance with HPSOP No. 1, KSUMO's, KSUOTMP's, or their manufactures' recommendations. The inspector reviewed selected procedures and determined them to be acceptable. All instruments checked had current calibrations appropriate for the types and energies of radiation they were used to detect and/or measure.

The EH&S's liquid scintillation counter "self calibrated" during each use using manufacture supplied check sources while the reactor's multichannel gamma system was calibrated before each use with the Genie 2000 software. The inspector verified that these calibrations met the manufactures' calibration recommendations.

(5) Radiation Protection Program

The licensee's Radiation Protection and ALARA programs were established and described in KSU TRIGA Mark II RPP documents. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, and reports. The ALARA program provided guidance for keeping doses as low as reasonably achievable which was consistent with the guidance in 10 CFR Part 20. The programs, as established, appeared to be acceptable.

The inspector also determined that the licensee had completed an annual review of the radiation protection program for 2002 and 2003 in accordance with 10 CFR 20.1101(d).

(6) Radiation Protection Training

The inspector reviewed the radiation worker (radiation safety) training given to staff members and to those who are not on staff but who are authorized to use the experimental facilities of the reactor. Training, and refresher training, for reactor staff and others was given annually.

The initial and refresher training covered the topics specified in 10 CFR Part 19 as required. Training records showed that personnel were acceptably trained in radiation protection practices. The training program was acceptable.

(7) Facility Tours

The inspector toured the Reactor Control Room, the Reactor Rooms, and selected support laboratories and Rooms with licensee representatives on various occasions. No unmarked radioactive material was noted. Radiation and Radioactive Material Storage Areas were posted as required.

c. Conclusions

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, was in accordance with regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; 4) radiation survey and monitoring equipment were being maintained and calibrated as required; and 5) the radiation protection training program was acceptable.

**8. Effluent Releases**

a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirements of 10 CFR Part 20 and licensee procedures, the inspector reviewed the following:

- KSU Annual Reports for the periods from October 1, 2001 to September 30, 2002 and October 1, 2002 to September 30, 2003
- C KSUMO SOR 3, "Reactor Bay Sump Discharge," Revision 1, dated May 10, 2004
- KSUOTMP No. 19, "Gamma Ray Assay of Reactor Samples," dated January 27, 1987
- C KSUOTMP No. 20, "Liquid Scintillation Assay Methods," dated January 19, 1987
- C KSUOTMP No. 21, "Alpha Particle Assay of Reactor Liquids," dated August 3, 1989
- KSUOTMP No. 24, "Sump Water Discharge System," dated October 15, 1997
- waste transfer and liquid discharge records since June 2002
- RPP Section 4.2, "Effluent Monitoring"
- RPP Section 4.4, "Environs Monitoring"
- calibration records for the radiation area monitor and the Continuous Air Monitor since June 2002

b. Observations and Findings

Licensee calculations in Section A.2.4 of the Safety Analysis Report showed that the offsite dose to the public would be 2.8 millirem per year from airborne effluent for operation at 500 KW twice the currently authorized reactor power level. This satisfies the annual 10 millirem dose constraints of 10 CFR 20.1101(d), Appendix B

concentrations, and TS limits. Observation of the facility by the inspector found no new potential release paths.

The program for the monitoring, storage, or transferring of radioactive liquid was consistent with applicable regulatory requirements. Potentially contaminated liquid waste consisting of condensate from the air conditioners was sampled and discharged to the sewer. Data from June 2002, to present indicated that the discharges satisfied the limits specified in 10 CFR 20, Appendix B. In-line mechanical filters were used to ensure that the solubility requirements in 10 CFR 20.2003 were met.

The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusions

Effluent releases were within the specified regulatory and TS limits.

**9. Transportation**

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for the transfer or shipment of licensed radioactive material, the inspector reviewed the following:

- training records of staff members responsible for shipping licensed radioactive material (EH&S staff)
- RPP Section 4.1, "Radioactive Materials Accountability"
- RPP Forms F(14) "Log for Solids Transfer to University Radiation Safety Office," from June 2002 to present
- RPP Forms F(15) "Report on Solid Waste Activity," from June 2002 to present
- radioactive material transfer forms since June 2002

b. Observations and Findings

Records showed that no radioactive material was shipped under the reactor license, R-188 since the last inspection. All radioactive material was transferred to campus Byproduct Materials License for packaging, shipment, and/or disposal in accordance with licensee requirements. This was documented on radioactive material transfer forms as required.

c. Conclusions

Radioactive materials were transferred to the licensee's Byproduct Materials License for shipment and/or disposal.

## 10. Review, Audit, and Design Change Functions

### a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits as required by TS Sections H.2 and H.3, and licensee procedures, the inspector reviewed the following:

- RSC meeting minutes since June 2002
- safety review records and audit reports since June 2002
- responses to the review and audit reports
- RSC review and approval of the Air-filled Central Thimble Detector Testing Facility
- RSC review of the new compressor installation
- RSC review and approval of KSU Procedure ADM-420 "Qualification and Authorization for Unescorted Access to the KSU Nuclear Reactor Facilities," dated October 24, 2003
- facility design change records for the ARM system and Sump Level and Control Panel modifications.

### b. Observations and Findings

The inspector verified that the RSC membership and semiannual meeting schedule met TS Section H.2 and RSC charter requirements. Review of the meeting minutes since June 2002 indicated that the committee provided guidance, direction, and oversight for the reactor and ensured suitable and safe reactor operations

The RSC minutes and audit records showed that the RSC evaluated procedures and changes to the facility, performed audits of the reactor including the radiation safety program, the security, emergency preparedness, and requalification plans and reviewed and approved experiments as specified by TS Sections H and I, licensee procedures, and the individual programs and plans themselves. The results of the audits were acceptably performed and documented. The inspector determined that the audit findings and licensee actions taken in response to the findings were acceptable.

Records and observations showed that changes at the facility were acceptably reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls. None of the changes constituted an unreviewed safety question or required a change to the TS.

The area radiation area system and sump level/control panel modifications were reviewed. The evaluation was acceptable with supporting documentation and information. RSC involvement was also comprehensive. Post installation verification testing of the systems was performed.

### c. Conclusions

Audits and reviews conducted by the RSC were in accordance with the requirements specified in TS, licensee procedures, and individual programs. Design changes under 10 CFR 50.59 were acceptable.

## 11. Emergency Preparedness

### a. Inspection Scope (IP 69001)

The inspector reviewed the following:

- KSU TRIGA Mark II Reactor Emergency Plan (E-plan), dated March 1999
- documentation of the emergency drills held in 2003 and 2004 and the follow-up critiques
- KSU TRIGA Mark II Reactor Notification List, dated October 2004
- KSU TRIGA Mark II Reactor Emergency Plan Procedures 1 through 14
- emergency training records from 2002 to present

### b. Observations and Findings

The inspector reviewed the E-Plan in use at the KSU TRIGA Mark II Reactor and verified that the RSC reviewed the E-Plan biennially as required by the plan itself. The Emergency Procedures were also reviewed and revised as needed to ensure effective implementation of the E-Plan.

Through direct observation, records review, and interviews with emergency organization personnel (i.e., emergency responders), the inspector determined that they were capable to respond, and knowledgeable of the proper actions to take, in case of an emergency. Training for reactor staff and EH&S personnel had been conducted as required. The inspector verified that, as required by the E-Plan, local fire and emergency staffs were invited, at least biennially, to attend training on radiation fundamentals and specific radiation hazards likely to be encountered in an emergency. The inspector also noted that communication capabilities with these support groups were acceptable and had been periodically tested.

The inspector reviewed the annual emergency drills that had been conducted for the past two years. It was noted that off-site support organization notification and/or participation was as required by the E-Plan. The latest drill on October 11, 2004, was an earthquake with a contaminated injury and possible gas leak. A critique was held following each drill to discuss the strengths and weaknesses noted during the exercise and to develop possible solutions to the problems identified.

The inspector verified that a list of emergency personnel, management, and offsite agencies was posted in the Control Room. An Emergency Call list was also verified to be available at the campus police department.

Supplies, instrumentation, and equipment maintained at the facility and at the building next door, were being controlled and inventoried as required in the E-Plan. Letters of Agreement with local offsite response organizations had been updated and maintained as required.

### c. Conclusions

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

## 12. Fuel Handling

### a. Inspection Scope (IP 69001)

To verify that TS Section 4.1 and procedural requirements were being met, the inspector reviewed the following:

- Reactor Logbooks covering operations from June 22, 2001 to present
- C KSUOTMP No. 26, "Fuel-handling Procedure," dated February 20, 2000
- fuel handling equipment and instrumentation
- fuel movement and inspection records

### b. Observations and Findings

Fuel is moved infrequently. Fuel movement, log keeping, and data recording was being completed as directed by the procedures. Data recorded for fuel handling was clear and concise. Log entries clearly identified, as required by procedure, that a minimum of two persons were present when fuel was being moved.

### c. Conclusions

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

## 13. Exit Meeting Summary

The inspector reviewed the inspection results with members of licensee management at the conclusion of the inspection on November 18, 2004. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

R. Bridges	Campus Radiation Safety Officer
R. Brunt	Reactor Trainee
E. Cullens	Senior Reactor Operator
R. Grice	Assistant Vice President for Public Safety
M. Hosni	Mechanical and Nuclear Engineering Department
C.J. Solomon	Reactor Operator
J. Vanmeter	Reactor Operator Chair
P. Whaley	Reactor Manager

## INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 86740	Inspection of Transportation Activities

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

None

### Closed

None

## LIST OF ACRONYMS USED

ALARA	as Low as Reasonably Achievable
CFR	Code of Federal Regulations
E-Plan	Emergency Plan
EH&S	Environmental Health and Safety
HP	Health physics
IP	Inspection Procedure
KSU	Kansas State University
LCO	Limiting Conditions for Operation
MO	Management Order
NRC	Nuclear Regulatory Commission
OTMP	Operation, Test, and Maintenance Procedure
RSC	Reactor Safeguards Committee
RRP	Reactor Requalification Program
RSO	Radiation Safety Officer
RO	Reactor Operator
SRO	Senior Reactor Operator
TS	Technical Specifications