



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 6, 2022

Dr. Alan Cebula
Nuclear Reactor Facility Manager
Kansas State University
112 Ward Hall
Manhattan, KS 66506-5204

SUBJECT: KANSAS STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION
ROUTINE INSPECTION REPORT NO. 05000188/2022201

Dear Dr. Cebula:

From May 9-12, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at your Kansas State Nuclear Reactor Facility. The enclosed report presents the results of that inspection, which were discussed on May 12, 2022, with you and the Reactor Supervisor.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selective procedures and records, observed various activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

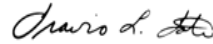
In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (Agencywide Documents Access and 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).

A. Cebula

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Should you have any questions concerning this inspection, please contact Craig Bassett at (240) 535-1842, or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,



Signed by Tate, Travis
on 07/06/22

Travis L. Tate, Chief
Non-Power Production and Utilization
Facility Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

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

Enclosure:
As stated

Kansas State University

Docket No. 50-188

cc:

Office of the Governor
State of Kansas
300 SW 10th Avenue, Suite 212 S
Topeka, KS 66612-1590

Kim Steves
Radiation Control Section
Kansas Department of Health and Environment
1000 SW Jackson, Suite 330
Topeka, KS 66612-1365

Mayor of Manhattan
City Hall
1101 Poyntz Avenue
Manhattan, KS 66502

Robert Seymour, Reactor Supervisor
Kansas State University
117 Ward Hall
Manhattan, KS 66506

Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
Department of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

SUBJECT: KANSAS STATE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION
ROUTINE INSPECTION REPORT NO. 05000188/2022201 DATED: JULY 6, 2022

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

Docket No.: 50-188

License No.: R-88

Report No: 05000188/2022201

Licensee: Kansas State University

Facility: Kansas State Nuclear Reactor

Location: Manhattan, Kansas

Dates: May 9 - 12, 2022

Inspector: Craig Bassett

Approved by: Travis L. Tate, Chief
Non-Power Production and Utilization
Facility Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

Kansas State University
Kansas State Nuclear Reactor
Inspection Report No. 05000188/2022201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Kansas State University (KSU, licensee's) Class II research reactor safety program including: (1) organization and staffing; (2) operations logs and records, (3) requalification training; (4) surveillance and limiting conditions for operation (LCOs); (5) experiments; (6) design changes; (7) committees, audits and reviews; (8) emergency planning; (9) maintenance logs and records; and (10) fuel handling logs and records. The U.S. Nuclear Regulatory Commission (NRC) staff determined the licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with the NRC requirements.

Organization and staffing

- Organizational structure and staffing were consistent with technical specification (TS) requirements.

Operations Logs and Records

- Record keeping program conformed to TS requirements and operational activities were consistent with applicable TS and procedural requirements.

Requalification Training

- Operator requalification was conducted as required by the Operator Requalification Plan and NRC requirements.

Surveillance and Limiting Conditions for Operation

- The LCOs and surveillances required by TSs and procedures were completed as required.

Experiments

- Experiments were reviewed and approved as required by TSs.

Design Changes

- The evaluation, and documentation of changes to the facility satisfied NRC requirements.

Committees, Audits and Reviews

- The review and audit program was completed by the Reactor Safeguards Committee (RSC) as stipulated in TSs.

- Emergency Planning
- The emergency preparedness program was conducted in accordance with the emergency plan (E-Plan) and implementing procedures.

Maintenance Logs and Records

- Maintenance was completed as required and logs, records, reviews, and performance satisfied TSs and procedural requirements.

Fuel Handling Logs and Records

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

REPORT DETAILS

Summary of Facility Status

The KSU Training, Research, Isotopes, General Atomics (TRIGA) Mark II 1250-kilowatt research reactor continued to be operated in support of the University's academic program in nuclear engineering laboratory instruction and research. During the inspection, the reactor was not operated.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001, Section 02.01)

The inspector reviewed the following to verify compliance with the organization and staffing requirements in TS Section 6.1, "Organization and Responsibilities of Personnel":

- KSU reactor organizational structure and shift staffing
- daily reactor startup and shutdown checklists for 2020 to the present
- KSU TRIGA Mark II reactor console logbooks covering operations for 2021 to the present
- current copy of the TSs for the KSU TRIGA Mark II Reactor

b. Observations and Findings

The inspector verified that the licensee's organization was in compliance with the requirements specified in TS Section 6.1. The inspector verified that management responsibilities were administered as required by TS and applicable procedures. The inspector confirmed that licensee shift staffing met the minimum requirements for duty and on-call personnel. The inspector noted that there were three licensed senior reactor operators (SROs) and two licensed reactor operators (ROs) on staff at the facility.

c. Conclusion

The inspector determined that the organizational structure and the responsibilities of the reactor management and staff have not changed since the last inspection and that shift staffing met the minimum requirements for duty and on call personnel.

2. Operations Logs and Records

a. Inspection Scope (IP 69001, Section 02.02)

The inspector reviewed the following reactor operations logbooks and associated records to ensure that the requirements of TS Section 6.10, "Plant Operating Records," were met:

- conditions/limit log
- KSU TRIGA Mark II reactor management orders
- KSU TRIGA Mark II reactor console logbooks for 2021 to the present
- current copy of the TSs for the KSU TRIGA Mark II Reactor

b. Observations and Findings

The inspector confirmed that routine operations and events were recorded in the logs. The inspector verified that required operational evolutions were logged and cross-referenced with other logs and forms, as required by the TSs, and that selected operational limits specified in TS Section 2, "Safety Limits and Limiting Safety System Settings," and TS Section 3, "Limiting Conditions for Operations," were not exceeded. The inspector also noted that operational problems, including unintentional shutdowns or scrams, were noted in the logs and were reported, reviewed, and resolved before the resumption of operations.

c. Conclusion

The inspector determined that the licensee's record keeping program and operational activities were consistent with applicable TSs and procedural requirements.

3. Requalification Training

a. Inspection Scope (IP 69001, Section 02.04)

The inspector reviewed the following to verify that the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' Licenses," were met:

- RSC meeting minutes for December 2020 to the present
- status of operator licenses for three SROs and two ROs
- various forms used to track operator training, operating hours, written and operating examination results, and medical examination due dates
- "Requalification Program, Kansas State University TRIGA Mark II Nuclear Reactor Facility," dated June 2003
- KSU TRIGA Mark II reactor console logbooks for 2021 to the present
- NRC Form 396, "Certification of Medical Examination by Facility Licensee," for the SROs and ROs

b. Observations and Findings

The inspector noted that the licensee's NRC licensed operating staff consisted of three SROs and two ROs. The inspector confirmed that the licensee's requalification program included the requirement for an annual operating test and a written examination. The inspector reviewed the written and operating examinations used for the 2021-2022 requalification cycle and verified that the licensee was following the requalification program. The inspector confirmed that the operators performed the required number of hours of reactor operation at the frequency specified in the requalification program. The inspector reviewed the medical records for two licensed operators and verified that they received a physical examination every 2 years as required by the regulations.

c. Conclusion

The inspector determined that operator requalification was conducted as required by the Requalification Program and NRC regulations.

4. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001, Section 02.05)

The inspector reviewed the following to verify compliance with TS Section 3, and to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4, "Surveillances":

- maintenance and surveillance reports for June 2020 to the present
- various KSU TRIGA Mark II Operation, test, and maintenance procedures
- KSU TRIGA Mark II reactor console logbooks 2021 to the present
- audit reports completed by the Reactor Manager (RM) and submitted to the RSC
- annual operating reports for the KSU TRIGA Mark II nuclear reactor facility for 2020 and 2021
- current copy of the TSs for the KSU TRIGA Mark II Reactor

b. Observations and Findings

The inspector found that the licensee used a monthly form which listed all the periodic checks, tests, calibrations, inventories, and inspections and the dates they are due, including those required by the TSs and procedures. The inspector verified that surveillances were completed on schedule, in accordance with licensee procedures, and in compliance with the TSs. The inspector confirmed that the results of the periodic checks, tests, calibrations, inventories, and inspections were within the specified parameters. During the inspection, the inspector observed as the licensee performed a portion of their biennial control rod inspection which was required by TSs.

c. Conclusion

The inspector determined that LCO confirmations and surveillance requirements stipulated by TSs and procedures were completed.

5. Experiments

a. Inspection Scope (IP 69001, Section 02.06)

In order to verify that existing experiments and newly proposed experiments met all TS requirements, the inspector reviewed selected aspects of:

- RSC meeting minutes for December 2020 to the present
- various KSU TRIGA Mark II experiment procedures including experiment (E)-1, "Isotope Production," E-6, "Control Rod Calibration," and, E-56, "Packed Bed Vapor Void Fraction Imaging"
- KSU TRIGA Mark II by-product logbook with entries dated 2021 to the present
- KSU TRIGA Mark II reactor console logbooks for 2021 to the present

b. Observations and Findings

The inspector noted that facility TSs required any new experiment to be reviewed by the Reactor Supervisor and, if it was not similar to an established one, the experiment must be approved by the RSC. The inspector confirmed that one new experiment was

proposed to the RSC since the last inspection. The experiment, E-56, "Packed Bed Vapor Void Fraction Imaging," was reviewed and approved by the RSC as required by procedure. The inspector verified that experiments were conducted in accordance with approved procedures and were logged in the reactor console logbook as required by the TSs.

c. Conclusion

The inspector determined that experiments were reviewed in accordance with TS requirements and performed as stipulated in the licensee's procedures.

6. Design Changes

a. Inspection Scope (IP 69001, Section 02.08)

The inspector reviewed the following to ensure that proposed design changes were reviewed and approved in accordance with 10 CFR 50.59, "Changes, tests and experiments," the TS, and the licensee's administrative procedures:

- KSU TRIGA Mark II reactor console logbooks covering operations for 2021 to the present
- RSC meeting minutes for December 2020 through the present
- annual operating reports for the KSU TRIGA Mark II nuclear reactor facility for 2020 and 2021
- current copy of the TSs for the KSU TRIGA Mark II Reactor

b. Observations and Findings

The inspector confirmed that the licensee performed 10 CFR 50.59 screenings for a facility modification and two experiments since the last inspection. The inspector noted that the screenings indicated no need to complete full evaluations for the proposed changes. As indicated by the inspector in a previous report, the licensee purchased and received a new reactor console but no 10 CFR 50.59 evaluation was initiated to place it into operation as of the date of this inspection.

c. Conclusion

The inspector determined that the facility's design change program satisfied NRC requirements specified in 10 CFR 50.59.

7. Committees, Audits and Reviews

a. Inspection Scope (IP 69001, Section 02.09)

The inspector reviewed the following to ensure that audits and reviews stipulated in the facility's TS Section 6.2, "Review and Audit," were conducted by the RSC:

- RSC meeting minutes for December 2020 through the present
- current copy of the TSs for the KSU TRIGA Mark II Reactor

- audit reports completed by the RM and submitted to the RSC
- annual operating reports for the KSU TRIGA Mark II nuclear reactor facility for 2020 and 2021

b. Observations and Findings

The inspector verified that the RSC conducted meetings at the required frequency with a quorum present pursuant to TS requirements. The inspector noted that the RSC reviewed and approved procedures and experiments and provided oversight of reactor operations. The inspector confirmed that the RSC also reviewed and audited facility operations and the radiation protection program as required in the TSs. The inspector verified that the audit frequency met the requirements of the TSs.

c. Conclusion

The inspector determined that the RSC provided the oversight required by the TSs.

8. Emergency Planning

a. Inspection Scope (IP 69001, Section 02.10)

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

- emergency telephone contact list dated May 28, 2021
- emergency equipment inventories for 2020 to the present
- documentation related to annual drills, biennial exercises, and related critiques
- “Emergency Plan and Emergency Plan Procedures, Kansas State University TRIGA Mark II Nuclear Reactor Facility,” dated December 5, 2016
- selected E-Plan procedures including Emergency Plan Procedure (EPP)-3, “Emergency Classification;” EPP-5, “Fire;” EPP-8, Radiation Hazard;” and, EPP-9, “Loss of Reactor Coolant”

b. Observations and Findings

The inspector reviewed the licensee’s emergency preparedness program as outlined in the KSU E-Plan and implementing procedures. The inspector confirmed that the E-Plan and procedures were reviewed biennially as required in the plan. The inspector confirmed that agreement letters with outside support groups were on file and updated every 2 years. The inspector verified that an emergency call list was updated as required and was available. The inspector noted that emergency equipment inventories were conducted quarterly. Through review of the annual drill and biennial exercise documentation, the inspector verified that they were conducted at the periodicity required in the E-Plan and critiques were held thereafter.

During the inspection, the inspector and the RM visited a nearby Manhattan Fire Department station and reviewed the support that would be received in case of an emergency. The inspector found that the Fire Department personnel were knowledgeable and have the proper equipment to respond to a fire at the licensee’s facility.

c. Conclusion

The inspector determined that the emergency preparedness program was conducted as required by the E-Plan and implementing procedures.

9. Maintenance Logs and Records

a. Inspection Scope (IP 69001, Section 02.11)

To verify compliance with applicable TS and licensee procedural requirements, the inspector reviewed selected aspects of:

- maintenance and surveillance monthly reports for 2021 to the present
- KSU TRIGA Mark II reactor console logbooks for 2021 to the present
- TSs for the KSU TRIGA Mark II Reactor
- annual operating reports for the KSU TRIGA Mark II nuclear reactor facility for 2020 and 2021

b. Observations and Findings

The inspector confirmed that maintenance records were kept which allowed the tracking and resolution of problems and trends. The inspector verified that maintenance was conducted consistent with the TSs and applicable procedures. The inspector noted that maintenance activities ensured that equipment remained consistent with the safety analysis report and TS requirements.

c. Conclusion

The inspector determined that maintenance was conducted and logs and records were maintained consistent with TS and licensee procedure requirements.

10. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001, Section 02.12)

The inspector reviewed the following procedures and logs to verify that fuel movements and inspections were conducted in accordance with TS Section 4.7, "Fuel Integrity," and applicable procedure requirements:

- fuel location status map
- KSU TRIGA Mark II reactor console logbooks covering operations for 2020 to the present, and,
- KSU TRIGA Mark II operation, test, and maintenance procedures, OP-10, "Fuel Element Inspection," and OP-26, "Fuel Handling Procedure"

b. Observations and Findings

The inspector verified that the licensee performed fuel inspections of approximately one third (1/3) of core elements during the periods of September 3-8, 2020, and July 19-21, 2021, as required by TS Section 4.7.

The inspector confirmed that all fuel movements were documented in the console log and data recordings were completed and maintained in accordance with facility procedure requirements.

The inspector noted that, during the last fuel inspection in 2021, two elements failed visual inspection of the cladding; one showed cladding corrosion and one had indications of mechanical damage. The inspector reviewed this situation with the licensee and was informed that the two elements were removed from service as required by the RSC which reduced the total core loading to less than 83 elements. The inspector noted that reduction in the number of fuel elements placed the reactor in a situation below the bounding number of elements utilized in the safety analysis report resulting in a suspension of reactor operations.

The inspector inquired about what the licensee was doing to resume operations and was informed that the licensee identified seven elements in storage as possible replacements but inspection of those elements precluded use due to various issues including some of those showing signs of corrosion. The inspector inquired about plans to move forward and was informed that the licensee plans to test three methods to remove the corrosion from the fuel including pressurized water, focused ultrasound, or laser. After the licensee completes the tests, a process would be chosen, a procedure developed, and the method would be presented to the RSC for review and approval. The licensee was informed that the resolution of the corrosion removal problem and the resumption of operations would be followed by the NRC as an Inspector Follow-up Item (IFI) and would be reviewed during a future inspection (IFI 05000188/2022201-01).

c. Conclusion

The inspector determined that fuel movements and fuel element inspections were performed in accordance with TS and licensee procedural requirements.

11. Exit Interview

The inspector presented the inspection results to licensee management at the conclusion of the inspection on May 12, 2022. The inspector described the areas inspected and discussed in detail the inspection observations. 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 Personnel

A. Cebula Reactor Manager
A. Guieb Reactor Operator Trainee
I. Hickert Reactor Operator
R. Seymour Reactor Supervisor

Other Personnel

M. Whitehair Battalion Chief, Manhattan Fire Department
B. Haus Assistant Fire Chief, Manhattan Fire Department

INSPECTION PROCEDURE USED

IP 69001 Class II Non-Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened:

05000188/2022201-01 IFI Follow-up on the licensee's actions to resolve the problem of removing corrosion from the affected fuel elements and resuming reactor operations.

Closed:

None