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

February 7, 2023

Dr. Hal Stern, Provost
and Executive Vice Chancellor
University of California, Irvine
509 Aldrich Hall
Irvine, CA 92697-2025

SUBJECT: BOARD OF REGENTS OF THE UNIVERSITY OF CALIFORNIA – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000326/2022201

Dear Dr. Stern:

From December 13-15, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the University of California, Irvine Nuclear Reactor Facility. The enclosed report presents the results of that inspection, which were discussed on December 15, 2022, with members of your staff.

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 website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Juan Arellano at (301) 415-0477, or by email to Juan.Arellano@nrc.gov.

Sincerely,


Signed by Tate, Travis
on 02/07/23

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. 50-326
License No. R-116

Enclosure:
As stated

cc: w/enclosure: See next page

cc:

Dr. Douglas Tobias, Chair
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California Department of Public Health
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Mr. John Keffer, Reactor Supervisor
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Dr. A.J. Shaka, Reactor Director
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Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
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University of Maryland
4418 Stadium Drive
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Dr. Howard Gillman, Chancellor
University of California, Irvine
510 Aldrich Hall
Irvine, CA 92697

SUBJECT: UNIVERSITY OF CALIFORNIA IRVINE – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000326/2022201 DATED: FEBRUARY 07, 2023

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

Docket No.:	50-326
License No.:	R-116
Report No:	05000326/2022201
Licensee:	Board of Regents of the University of California
Facility:	University of California, Irvine Nuclear Reactor Facility
Location:	Department of Chemistry University of California, Irvine, CA
Dates:	December 13-15, 2022
Inspectors:	Juan Arellano Kevin Roche
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

University of California, Irvine
Nuclear Reactor Facility
Inspection Report No. 05000326/2022201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of California – Irvine, Nuclear Reactor Facility (UCINRF, the licensee) Class II research reactor facility safety programs including: (1) procedures; (2) experiments; (3) health physics; (4) design changes; (5) committees, audits and review; and (6) transportation activities. The U.S. Nuclear Regulatory Commission (NRC) staff determined the licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with the NRC requirements.

Procedures

- The program for change, control, and implementation of facility procedures was maintained as required by the technical specifications (TSs) and the applicable procedures.

Experiments

- The program for reviewing, authorizing, and conducting experiments satisfied TS and procedural requirements.

Health Physics

- Surveys were completed and documented as required by procedure.
- Postings met the regulatory requirements specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," and 10 CFR Part 20, "Standards for Protection against Radiation."
- Personnel dosimetry was worn and recorded doses were within the NRC's regulatory limits.
- Radiation monitoring equipment was maintained and calibrated as required by the TS.
- The radiation protection program satisfied regulatory requirements.
- Environmental monitoring satisfied license and regulatory requirements.

Design Changes

- The licensee reviewed changes using the criteria specified in 10 CFR 50.59, "Changes, tests and experiments," and the changes were reviewed by the Reactor Operations Committee (ROC) in accordance with the applicable procedures.

Committee, Audits and Reviews

- The review and audit program were conducted as stipulated in TS.

Transportation Activities

- Shipments of radioactive material were made in accordance with the applicable regulatory and procedural requirements.

• REPORT DETAILS

Summary of Facility Status

The UCINRF 250 kilowatt TRIGA Mark-I research reactor continued to be operated in support of graduate and undergraduate research and laboratory instruction. During the inspection, the reactor was not operated.

1. Procedures

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

The inspector reviewed selected aspects of the following to verify that the licensee complied with the requirements of TS 6.4:

- TSs for the U.C. Irvine TRIGA Mark I Nuclear Reactor dated July 7, 2016
- UCINRF standard operating procedure (SOP) 1, “Introduction,” Revision 3.3 approved 2020
- UCINRF SOP 4.10, "Miscellaneous Procedures," Revision 3.3 approved 2020
- UCINRF SOP 6, "Emergency Procedures," Revision 3.3 approved November 2021

b. Observations and Findings

The inspector reviewed the licensee’s written procedures and revisions to procedures. The inspector found that the SOP manual was organized to address the full scope of activities conducted at the UCINRF. The inspector noted that procedural changes were reviewed by the ROC as required by TS. Through discussions of various activities at the facility, the inspector found that the licensee personnel conducted activities in accordance with applicable procedures.

c. Conclusion

The inspector determined the licensee maintained and implemented written procedures in accordance with TS requirements.

2. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with TSs 3.8, 4.8, and 6.5:

- TSs for the U.C. Irvine TRIGA Mark I Nuclear Reactor dated July 7, 2016
- UCINRF SOP 3, "Experiments," Revision 3.3 approved 2020
- reactor experiment approvals Number (No.) 5, 7, and 9
- experiment review report from 2021 - present
- select UCINRF irradiation request forms from 2021 - present

- select UCINRF irradiation performance forms from 2021 - present
- TRIGA Mark I 250 - kilowatt pulsing reactor mechanical maintenance and operating manual dated June 1, 1969
- UCINRF SOP, "Instrumental Neutron Activation Analysis," dated August 3, 2022

b. Observations and Findings

The inspector found UCINRF has experimental procedures approved for a broad class of applications. The mission of the UCINRF is primarily to provide irradiation services to researchers, and educational laboratory instruction. New experiments are uncommon. The inspector reviewed how experiments are performed in order to verify compliance with the TS and procedures. Additionally, from review of random samples of forms for experiments performed since the previous inspection, the inspector found that experiments were reviewed and performed in accordance with TS requirements and the licensee's written procedures.

c. Conclusion

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

3. Health Physics

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 19, and 10 CFR Part 20 and TSs 3.7, 4.7, and 6.3 requirements:

- UCINRF annual report 2020 - 2021
- UCINRF annual report 2021 – 2022
- UCINRF SOP 5, "Radiological Safety Program," Revision 3.3 approved 2020
- "UCI Nuclear Reactor Checklist for Miller RUA#7001," from 2021 - present
- environmental health and safety (EH&S) radiation protection monitoring records from 2021 - present
- EH&S swipe records from 2021 - present
- reactor DMC3000 Mirion operational check records 2021 - present
- environmental monitoring records from 2021 - present
- occupational radiation exposure reports from 2021 - present
- calibration records for portable detectors from 2021 - present
- calibration records for continuous air monitors and area radiation monitors 2021 - present
- radiation safety logbook from 2021 - present

b. Observations and Findings

(1) Surveys

The inspector reviewed monthly radiation and contamination surveys of the licensee-controlled areas conducted by the licensee staff and

quarterly radiation and wipe surveys completed by campus EH&S Health Physics personnel. The results of the licensee staff surveys were documented on the forms and entered into a Reactor Health Physics notebook which were verified by EH&S. The inspector verified that the results of EH&S surveys were documented on survey maps and forms, and forwarded to the licensee for information.

The inspector directly observed radiation readings and compared the results to the radiation levels observed by the licensee. The readings were comparable, and no anomalies were noted by the inspector.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas including the Control Room and the Reactor Room. The inspector found that the postings indicated the levels of radiation and/or contamination present. Other postings also showed the industrial hygiene hazards present in the areas. The inspector verified the licensee posted the facility's radioactive material storage areas. No unmarked radioactive material was identified in the facility by the inspector.

The inspector verified the licensee posted copies of current notices to workers, including copies of NRC Form 3, required by 10 CFR 19.11, "Posting of notices to workers," on various bulletin boards throughout the facility.

(3) Dosimetry

The licensee used thermoluminescent dosimeters (TLDs) for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee used TLD finger rings for extremity monitoring. Personal electronic dosimeters were issued to staff and visitors as outlined in licensee procedures and calibrated by EH&S. The licensees issued exposure criteria met or was more restrictive than the requirements of 10 CFR 20.1502, "Conditions requiring individual monitoring of external and internal occupational dose," for individual monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor.

The inspector reviewed the TLD monitoring results indicating radiological exposures at the facility for the past 2 years. The inspector verified that the highest occupational doses, as well as doses to the public, were well within 10 CFR Part 20 limitations.

(4) Radiation Monitoring Equipment

The inspector reviewed records of selected radiation meters, radiation detectors, and air monitoring equipment in use at the facility. The inspector noted that the calibration of instruments is controlled by EH&S. The inspector verified that calibrations were completed and that

appropriate calibration records were maintained by the licensee as required.

(5) Radiation Protection Program

The licensee's radiation protection program was established in the UCINRF SOP No. 5. The program required that all personnel with unescorted access to work in a radiation area or with radioactive material receive training in radiation protection, policies, procedures, requirements, and facilities prior to entry. The inspector verified that licensee staff received the required radiation protection training given by the Office of EH&S.

The inspector determined the EH&S office completed an annual review of the radiation protection program in accordance with 10 CFR 20.1101, "Radiation protection programs," paragraph (c). This audit was accomplished by the campus Radiation Safety Officer.

(6) Effluent Releases

The inspector found gaseous releases were monitored, calculated as prescribed by procedure, and documented in accordance with the TS. The inspector verified the releases were well within 10 CFR Part 20, Appendix B, Table 2 concentrations, and TS limits. To demonstrate compliance with the annual dose constraints of 10 CFR 20.1101(d), the inspector verified that the licensee used the computational method specified in UCINRF SOP No. 5, section 5.6.

(7) Facility Tours

The inspector toured the Control Room, the Reactor Room, the Pneumatic Tube Laboratory and the Preparation Laboratory within the UCINRF. The inspector verified the control of radioactive material and control of access to radiation and high radiation areas were acceptable. The inspector determined that the postings and signs for these areas were appropriate.

c. Conclusion

The inspector determined that the radiation protection program implemented by the licensee satisfied regulatory requirements.

4. Design Changes

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the regulatory requirements of 10 CFR 50.59 were met:

- UCINRF annual report 2020 - 2021
- UCINRF annual report 2021 - 2022

- UCINRF change documentation form 2020-05 dated November 17, 2020
- UCINRF change documentation form 2021-01 dated September 14, 2021
- UCINRF change documentation form 2021-02 dated August 24, 2021
- UCINRF change documentation form 2021-03 dated November 4, 2021
- UCINRF change documentation form 2021-04 dated November 15, 2021
- UCINRF change documentation form 2021-05 dated November 19, 2021
- UCINRF change documentation form 2022-01 dated September 15, 2022
- UCINRF change documentation form 2022-02 dated November 18, 2022

b. Observations and Findings

The inspector found that facility changes or modifications were reviewed by the ROC and documented in the committee's meeting minutes. TS 6.2.3a requires the review and approval by the ROC of all proposed changes to the facility including those made under 10 CFR 50.59. The inspector verified that the licensee documented changes by requiring a staff evaluation. Completion of the changes or modifications was documented on forms that were developed for that purpose and recorded in the reactor operations logbook, which was also used to document maintenance activities at the facility. The inspector noted that various changes or modifications were implemented by the licensee and subsequently reviewed by the ROC. The documentation and information concerning these changes and modifications were acceptable. Through this review, the inspector verified that the design change process at the facility was functioning and was acceptable for the current operation and staffing of the facility.

c. Conclusion

The inspector determined that changes at the facility were reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls.

5. Committees, Audits and Review

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the review and audit functions stipulated in the TS:

- safety review and audit records for the past 2 years
- ROC meeting minutes dated March 4, 2022
- ROC meeting minutes dated March 18, 2021
- UCINRF supervisors report for 2020
- UCINRF supervisors report for 2021

b. Observations and Findings

The inspector verified the ROC membership satisfied TS requirements and the ROC also held annual meetings with a quorum present at those meetings. The inspector found the ROC provided appropriate guidance and direction for reactor operations and ensured suitable use and oversight of the reactor.

The inspector found that EH&S personnel conducted radiation surveys and walk-through tours of the facility which fulfilled the review and audit of radiological safety function of the ROC stipulated in TS 6.2. The inspector determined that the licensee completed and documented all required audits of reactor facility operations and reviews of programs, and procedures.

c. Conclusion

The inspector concluded that the ROC provided the oversight required by the TS.

6. Transportation Activities

a. Inspection Scope (IP 86740)

The inspector interviewed personnel and reviewed the following to verify compliance with regulatory and procedural requirements for transferred licensed material:

- Department of Transportation (DOT) training records from 2020 - present
- transfer of radioactive material forms 2021 - present
- UCI radioactive sample shipping checklist dated March 15, 2022
- shipment records dated March 30, 2021
- UCINRF SOP 5.10, "Transportation of Radioactive Material," Revision 3.3 approved 2020

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector found that the licensee made a shipment of radioactive material since the previous inspection in this area. The inspector verified that the radioisotope types and quantities were calculated and dose rates measured as required. The inspector also found that the shipping containers used were appropriate and showed the appropriate markings as required by Title 49 of the CFR. All radioactive material shipment records reviewed by the inspector were completed in accordance with DOT and NRC regulatory requirements.

c. Conclusion

The inspector determined the radioactive material shipments were made in accordance with the applicable procedures and regulatory requirements.

7. Exit Interview

The inspector presented the inspection results to licensee management at the conclusion of the inspection on December 15, 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

A. Shaka	Reactor Director
J. Keffer	Reactor Supervisor
R. Dendo	UC Irvine Senior Health Physicist
A. Chung	UC Irvine Health Physicist

INSPECTION PROCEDURES USED

IP 69001	Class II Non-Power Reactors
IP 86740	Transportation

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None