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

May 7, 2021

Dr. Hal Stern, Interim 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. 05000326/2020201

Dear Dr. Stern:

From October 27-29, 2020, 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 October 29, 2020, 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 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 Kevin Roche at (301) 415-1554, or by electronic mail at Kevin.Roche@nrc.gov.

Sincerely,

Philip B. O'Bryan Digitally signed by Philip B. O'Bryan for

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:

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Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
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University of Maryland
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College Park, MD 20742-2115

Dr. Howard Gillman, Chancellor
University of California, Irvine
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Irvine, CA 92697

SUBJECT: UNIVERSITY OF CALIFORNIA IRVINE – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000326/2020201 DATED: MAY 7, 2021

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

Docket No.:	50-326
License No.:	R-116
Report No:	05000326/2020201
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:	October 27-29, 2020
Inspector:	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
NRC Inspection Report No. 05000326/2020201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Board of Regents of the University of California Class II University of California, Irvine Nuclear Reactor Facility (UCINRF) 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, controll, and implementation facility procedures was appropriately maintained as required by the technical specifications (TSs) and the applicable procedures.

Experiments

- Experiments were reviewed and approved as required by TS.

Health Physics

- Surveys were completed and documented as required.
- 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.
- 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 and approved by the Reactor Operations Committee (ROC) in accordance with the applicable procedures.

Committee, Audits and Reviews

- The review and audit program were conducted by the ROC 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 operated for training.

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 TSs 6.2, 6.3, and 6.7:

- administrative controls as outlined in UCINRF Standard Operating Procedure (SOP) No. 1, "Introduction," Revision 3.3
- UCINRF SOP No. 5, "Radiological Safety Program," Revision 3.3
- TS for the "U.C. Irvine TRIGA® Mark I Nuclear Reactor," dated July 7, 2016

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 and approved by the ROC as required by TS. Through observation of various activities at the facility, including reactor operation, the inspector determined that licensee personnel conducted activities in accordance with applicable procedures. The inspector verified the licensee recently revised the SOPs to reference the current TS, therefore Inspection Follow-up Item (IFI) 50-326/2019-201-02 is closed. Additionally, the licensee submitted a license amendment request to update the organizational structure, which is reviewed by the NRC staff. Therefore IFI 50-326/2019-201-01 is also closed.

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 TS 3.8:

- TS for the "U.C. Irvine TRIGA® Mark I Nuclear Reactor," dated July 7, 2016
- UCINRF SOP Section 2, Experiments, Revision 3.3

- experiment review report – 2020, augmented March 2020 discusses experiments in 2019.
- Select UCINRF irradiation requests from July 2018 to present

b. Observations and Findings

The inspector determined 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 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 and 4.7 requirements:

- radiation and contamination surveys completed by reactor staff personnel
- radiation and contamination surveys completed by environmental health and safety (EHS) personnel
- UCINRF personnel and environmental dosimetry records for 2018 through the present
- UCINRF SOP No. 5, "Radiological Safety Program," Revision 3.3
- UCINRF annual report for the period from July 1, 2018, through and June 30, 2019
- UCINRF annual report for the period from July 1, 2019, through and June 30, 2020

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 EHS Health Physics personnel. The results of the licensee staff surveys were documented on the forms and entered into a Reactor Health Physics notebook. The inspector verified that the results of EHS surveys were

documented on survey maps and forms, reviewed as required, and forwarded to the licensee for information.

During the inspection, the inspector accompanied a senior reactor operator in training during the completion of routine radiation surveys. 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 properly 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. Dosimetry was issued to staff and visitors as outlined in licensee procedures. The issued exposure criteria met or exceeded 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. The inspector also found that records indicated the highest annual whole-body exposure and the highest annual extremity exposure received by a facility employee in 2019 were well within the regulatory limits.

(4) Radiation Monitoring Equipment

The inspector reviewed records of selected meters, detectors, and air monitoring equipment in use at the facility. The inspector noted that the calibration of instruments is controlled by EHS. 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 was further explained in the campus document entitled, "Radiation Safety Manual University of California Irvine," latest revision dated July 2019. 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 EHS.

The inspector determined the EHS office completed an annual review of the radiation protection program in accordance with 10 CFR 20.1101, "Radiation protection programs," paragraph (c) for 2019. 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 determined the releases were well within 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 for the period from July 1, 2018, through and June 30, 2019
- UCINRF annual report for the period from July 1, 2019, through and June 30, 2020
- UCINRF SOP Nos. 1-3, “Implementation of Standard Operating Procedures and Facility Changes,” Revision 3.3
- UCINRF change documentation form 2020-04, "Checklist revisions," dated September 13, 2020
- UCINRF change documentation form 2020-03, "Update of reactor Standard Operating Procedures, " dated September 1, 2020
- UCINRF change documentation form 2020-02, “Repair/replace SHIM rod DRIVE motor,” dated August 10, 2020
- UCINRF change documentation form 2020-01, “Reroute of airline delivering air to the ATR and FTR and DNS,” dated June 23, 2020

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. The inspector verified that the licensee documented changes by requiring a staff evaluation and an ROC review. 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 initiated by the licensee and subsequently approved by the ROC as required. 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 as required 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, as well as the 10 CFR 50.59 review functions, were met:

- safety review and audit records for the past 2 years
- ROC meeting minutes from January 2019
- ROC meeting held April 2020, but minutes not drafted yet
- UCINRF SOP No. 1, “Introduction,” Revision 3.3
- UCINRF supervisor report, dated April 2, 2020
- UCINRF supervisor report, for the period of December 12, 2017, to January 24, 2019

b. Observations and Findings

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

The inspector found that EHS personnel conducted surveys and walk-through tours of the facility which fulfilled audit 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:

- records of radioactive material shipments for 2019 and 2020
- UCINRF SOP No. 5, “Radiological Safety Program,” Revision 3.3

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector determined that the licensee made various shipments 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 determined that the shipping containers used were appropriate and showed the appropriate markings as required. All radioactive material shipment records reviewed by the inspector were completed in accordance with Department of Transportation 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 October 29, 2020. 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

G. Miller	Reactor Supervisor
J. Keffer	Reactor Facility Manager
R. Dendo	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:

50-326/2019-201-01	IFI	Update TS Org Chart
50-326/2019-201-02	IFI	Follow up on updates to procedural references to TS

Discussed:

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
EHS	Environmental Health and Safety
IFI	Inspection Follow-up Item
IP	Inspection Procedure
NRC	Nuclear Regulatory Commission
UCINRF	University of California, Irvine Nuclear Reactor Facility
ROC	Reactor Operations Committee
SOP	Standard Operating Procedure
TLD	Thermoluminescent Dosimeter
TS	Technical Specification