

December 5, 2005

Dr. S. Gottfredson
Executive Vice Chancellor
University of California, Irvine
Irvine, CA 92697-2025

SUBJECT: NRC INSPECTION REPORT NO. 50-326/2005-201

Dear Dr. Gottfredson:

This letter refers to the inspection conducted on November 14-17, 2005, at your University of California, Irvine 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 Nuclear Regulatory Commission (NRC) requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's 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 Craig Bassett at (404) 562-4712.

Sincerely,

/RA/

Brian E. Thomas, Branch Chief
Research and Test Reactors Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-326
License No. R-116

Enclosure: NRC Inspection Report No. 50-326/2005-201
cc w/ enclosure: Please see next page

University of California at Irvine

Docket No. 50-326

cc w/enclosures:

Dr. Richard Chamberlin, Chair
Department of Chemistry
University of California, Irvine
Irvine, CA 92697-2025

Dr. George E. Miller
Department of Chemistry
University of California, Irvine
Irvine, CA 92697-2025

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

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

Docket No: 50-326

License No: R-116

Report No: 50-326/2005-201

Licensee: The Regents of the University of California

Facility: University of California, Irvine Nuclear Reactor Facility

Location: Department of Chemistry
University of California, Irvine
Irvine, CA

Dates: November 14-17, 2005

Inspector: Craig Bassett

Approved by: Brian E. Thomas, Branch Chief
Research and Test Reactors Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of California, Irvine (UCI)
UCI Nuclear Reactor Facility
NRC Inspection Report No. 50-326/2005-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the UCI Class II research reactor facility safety programs including: organizational structure and staffing, review and audit functions, reactor operations, fuel handling, operator requalification, surveillance, maintenance, procedures, and emergency preparedness since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organizational Structure and Staffing

- The organizational structure and staffing were consistent with Technical Specification requirements.

Review and Audit and Design Change Functions

- The review and audit program was being conducted acceptably by a designee of the Reactor Operations Committee.
- A design change protocol was in place and was being implemented as required.

Reactor Operations

- Operational activities were consistent with applicable Technical Specification and procedural requirements.
- Shift staffing met the minimum requirements for current operations.

Fuel Handling

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

Operator Requalification

- The requalification program was being acceptably implemented, the program was generally up-to-date, and plan requirements were met.
- An Unresolved Item was identified because a licensed operator had not completed a biennial written examination for 2005 as required.

Maintenance and Surveillance

- Maintenance logs, records, and performance satisfied Technical Specification and procedure requirements.
- The licensee's program for completing surveillance inspections and Limiting Conditions for Operation verifications satisfied Technical Specification requirements.

Experiments

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

Procedures

- Facility procedures were being reviewed, controlled, and implemented as required by the Technical Specifications.

Emergency Preparedness

- The Emergency Plan was being reviewed by the Reactor Operations Committee as required.
- Training was being conducted for licensee personnel as specified.
- Emergency equipment and supplies were being checked and inventoried as required by the plan.
- Licensee personnel participated in annual emergency drills conducted by the UCI Office of Environmental Health and Safety.

REPORT DETAILS

Summary of Plant Status

The licensee's TRIGA Mark I research reactor, licensed to operate at a maximum steady-state thermal power of two hundred and fifty kilowatt (250 kW), continued to be operated on a limited basis in support of education, operator training, surveillance, and sample irradiations.

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 Section 6.1 of Technical Specifications (TS), Amendment No. 6, dated November 17, 2000, were being met:

- staff qualifications
- management responsibilities
- staffing requirements for the safe operation of the facility
- University of California, Irvine Nuclear Reactor Facility (UCINRF) organizational structure and staffing
- selected portions of the Reactor Operations Logbook for 2004 through the present
- UCINRF Standard Operating Procedure (SOP) Chapter 1, "Introduction," Section 1.1, "Organization," Revision 3, approved March 2000
- UCINRF SOP Chapter 3, "Personnel," Section 3.1, "Reactor Administrator," Revision 3, approved March 2000
- UCINRF SOP Chapter 3, "Personnel," Section 3.2, "Reactor Supervisor," Revision 3, approved March 2000
- UCINRF SOP Chapter 3, "Personnel," Section 3.3, "Associate Reactor Supervisor," Revision 3, approved March 2000
- UCINRF SOP Chapter 3, "Personnel," Section 3.4, "Reactor Operators," Revision 3, approved March 2000

b. Observations and Findings

The licensee's organizational structure and staffing had not functionally changed since the last inspection (refer to NRC Inspection Report No. 50-326/2004-201, dated December 1, 2004). The reactor staff consisted of one permanent half-time staff member (who was the Reactor Supervisor [RS] and also a licenced Senior Reactor

Operator [SRO]) and one licenced Senior Reactor Operator (who generally only provided coverage during routine reactor operations). During the inspection the RS informed the inspector that the other SRO would likely not maintain her qualification or her license to operate the reactor. Support staff for the UCINRF consisted of a one-eighth time student and a one-tenth time Health Physics Technologist working for the UCI Office of Environmental Health and Safety (EH&S). The inspector noted that the time that these individuals could dedicate to reactor operation and maintenance was quite limited.

The reactor operations staff satisfied the training and experience requirements stipulated in the facility procedures. The Reactor Operations Logbooks and associated records confirmed that shift staffing met the minimum requirements for on-duty personnel.

c. Conclusions

The organizational structure and staffing were consistent with TS requirements.

2. Review and Audit and Design Change Functions

a. Inspection Scope (69001)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of TS Section 6.2 and UCINRF SOP Chapter 3 were being met:

- Reactor Operations Committee (ROC) meeting minutes from August 2004 to date
- safety review and audit records for the past two years documented in reports to the ROC entitled "Health Physics Report"
- UCINRF SOP Chapter 3, "Personnel," Section 3.5, "Reactor Operations Committee (ROC)," Revision 3, approved March 2000
- UCINRF SOP Chapter 3, "Personnel," Section 3.6, "Radiation Safety Committee," Revision 3, approved March 2000

b. Observations and Findings

(1) Review and Audit Functions

The ROC membership satisfied the licensee's TS and procedural requirements. The ROC held semiannual meetings as required with a quorum being present at those meetings. Review of the committee meeting minutes indicated the ROC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor.

The review function of the ROC stipulated in TS Section 6.2 was fulfilled by an EH&S Health Physicist appointed to do so by the committee. The audits and reviews were reviewed by the ROC during the regularly scheduled semiannual meetings. Since the last inspection, all required audits of reactor facility activities and reviews of programs, procedures, and facility operations had been completed. Any deficiencies noted during the audits and reviews were addressed and corrected by the licensee as needed.

(2) Design Change Functions

Changes and modifications at the facility were required to be reviewed and approved by the ROC prior to implementation. The approval of changes and/or modifications were typically documented in the ROC minutes. Changes were controlled by requiring a staff evaluation and an ROC review although there was no written procedure that outlined the process. Completion of the changes or modifications were recorded in the Reactor Operations Logbook, which was also used to document maintenance activities at the facility. Through records review and interviews with licensee personnel, the inspector determined that no changes or modifications had been initiated by the licensee since the last inspection. Through this review, the inspector also verified that the design change protocol, presently in place at the facility, was functioning as required and was acceptable for the current operation and staffing of the facility.

c. Conclusions

The review and audit program was being conducted acceptably by a designee of the Reactor Operations Committee. The licensee's design change protocol was in place and was being implemented as required.

3. Reactor Operations

a. Inspection Scope (IP 69001)

To verify that the licensee was operating the reactor and conducting operations in accordance with TS Sections 2 and 3 and procedural requirements, the inspector reviewed selected portions of the following:

- staffing for operations documented in Reactor Operations Logbook No. 37
- selected UCI TRIGA Daily Startup Checklists for the past two years, latest version of this checklist dated December 14, 2003
- selected UCI TRIGA Shut-down Checklists for the past two years, latest version of this checklist dated December 14, 2003
- selected UCINRF Monthly Work Summary forms for the past two years

- UCINRF Annual Reports for the periods from July 1, 2003 - June 30, 2004 and July 1, 2004 - June 30, 2005
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.1, "Reactor Operations," Revision 3, approved March 2000
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.2, "Reactor Log," Revision 3, approved March 2000

The inspector also observed reactor operations, including a reactor start-up, steady-state operations, and a shutdown, on Wednesday during the week of the inspection.

b. Observations and Findings

During the inspection the reactor was started up, operated, and shutdown to support sample irradiation and experiments. The inspector observed these evolutions, as well as the insertion and extraction of samples. Reactor operations were carried out following written procedures and TS requirements. A review of the Reactor Operations Logbooks indicated that any problems or events, including 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 an SRO. The inspector verified that these items, and other TS and procedure required entries, were logged in the Reactor Operations Logbook and cross-referenced with other checklists or records 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. Shift staffing met the minimum requirements for current operations.

4. Fuel Handling

a. Inspection Scope (IP 69001)

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

- Fuel History Notebook
- fuel handling equipment and instrumentation
- fuel movement and inspection records maintained on UCINRF Annual Core Examination and Fuel Element History Record forms

- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.8, "Fuel Element and Control Rod Removal and Measurement," Revision 3.1, approved January 21, 2005
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.10, "Fuel Inventory," Revision 3.1, approved January 21, 2005

b. Observations and Findings

Procedures for refueling, fuel movement, and TS required fuel inspections and/or surveillances had been reviewed and approved as required and were available to ensure controlled operations. Fuel movement, log keeping, and data recording was being completed as directed by the procedures. The most recent five-year fuel element inspection had been completed in November 2002, as required. Data recorded for fuel handling was clear and cross-referenced in the Fuel History Notebook, on the Fuel Location Board in the Reactor Room, and in the Reactor Operations Logbooks. Log entries clearly identified, as required by procedure, that a minimum of three persons were present when fuel was being measured/inspected, and at least one of those persons was a licensed operator.

c. Conclusions

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

5. Operator Requalification

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to ensure that the requirements of the Operator Requalification Program for the University of California, Irvine Nuclear Reactor Facility, Revision 1, dated April 24, 2000, were being met:

- Reactor Operations Logbook No. 37
- status of qualified operators' licenses
- operator physical examination records
- operator training and operating and written examination records
- operator active duty confirmation as documented in the Reactor Operations Logbooks

b. Observations and Findings

The inspector verified that the individuals currently licensed to operate the licensee's TRIGA Mark I research reactor were successfully completing reactivity manipulations

and/or supervising reactor-related activities as required by the NRC-approved Requalification Program. Training records contained the documentation required by the program and indicated that requirements for completion of an annual operating test were being fulfilled. Quarterly operating hours were being recorded in the logbooks and completed as required. Biennial medical exams had been conducted as required as well. Records used for tracking requalification requirements were up-to-date and ensured that the plan elements were accomplished.

One problem was noted in that there was currently only one operator who was actively maintaining his qualifications to operate the reactor. This individual had not completed the required biennial written examination for 2005 as required. Due to the unusual circumstances in this situation (only one licensed operator at the facility), the licensee was informed that this issue would be identified as an Unresolved Item¹ (URI) and would be reviewed during a subsequent inspection (URI 50-326/2005-201-01).

c. Conclusions

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

6. Maintenance and Surveillance

a. Inspection Scope (IP 69001)

To verify that the licensee was meeting the requirements of their maintenance program and to verify that the licensee was meeting the requirements of TS Sections 3 and 4, the inspector reviewed selected aspects of:

- Reactor Operations Logbook No. 37
- surveillance, calibration, and test data sheets and records
- Radiation Log - Reactor from January 2004 to the present
- selected UCINRF Monthly Maintenance forms for the past two years
- selected UCINRF Monthly Work Summary forms for the past two years
- selected UCINRF Weekly Safety Items Check forms for the past two years
- selected UCINRF Portal Monitor Monthly Check forms for the past two years
- selected UCINRF Ventilation System Monthly Check forms for the past two years

¹An Unresolved Item is a matter about which more information is required to determine whether the issue in question is an acceptable item, a deviation, a nonconformance, or a violation.

- selected UCINRF Reactor Facility General Radiation Survey (monthly) forms for the past two years
- selected UCINRF Constant Air Monitor (CAM) Calibration (monthly) forms for the past two years
- UCINRF Annual Reports for the periods from July 1, 2003 - June 30, 2004 and July 1, 2004 - June 30, 2005
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.3, "Reactor Power Calibration," Revision 3, approved March 2000
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.4, "Reactor Control Rods and Drive Surveillance," Revision 3, approved March 2000
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.5, "Installation or Removal of Reactor Core Components," Revision 3, approved March 2000
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.6, "Work on Reactor Components," Revision 3, approved March 2000
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.7, "Maintenance and Testing of Reactor Systems," Revision 3.1, approved January 21, 2005
- UCINRF SOP Chapter 4, "Normal Operating Procedures," Section 4.8, "Fuel Element and Control Rod Removal and Measurement," Revision 3.1, approved January 21, 2005

b. Observations and Findings

(1) Maintenance

Routine maintenance was controlled and documented in the Reactor Operations Logbook and on the Monthly Maintenance forms consistent with the TS and licensee procedures. Unscheduled maintenance or repairs were reviewed by the RS or the SRO to determine what the problem entailed. Following subsequent maintenance and/or repair, equipment verifications and operational systems checks were performed to ensure system operability before being returned to service. This generally included a statement signed by the RS or SRO indicating that the reactor was approved for operation.

During a facility tour of the Control Room and Reactor Room, the inspector noted that required equipment was operational. Equipment, and the facility in general, appeared to be adequately maintained.

(2) Surveillance

The licensee used various forms and checklists to track daily, weekly, monthly, quarterly, and other periodic checks, inventories, calibrations, and inspections, as well as verifications for TS required Limiting Conditions for Operation (LCO). The checklists and forms included the date the surveillance or LCO was performed and by whom. These forms and checklists provided clear documentation of reactor control, operational tests, and completion of surveillances. All data reviewed, including surveillance inspections and LCO verifications, were completed on schedule as required by TS and in accordance with licensee procedures. All results reviewed were within prescribed TS and procedural parameters and in close agreement with the previous surveillance results.

c. Conclusions

Maintenance logs, records, and performance satisfied TS and procedure requirements. The licensee's program for completing surveillance inspections and LCO verifications satisfied TS and licensee administrative requirements.

7. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS Sections 3.7 and 6.8:

- Irradiation Request Forms
- Reactor Operations Logbook No. 37
- ROC meeting minutes for the past two years
- selected UCINRF Work Summary forms for the past two years
- approved reactor experiments documented in Experiment Plans
- Radiation Use Authorizations in use at the facility and issued by EH&S
- Experiment Performance Form B, (forms completed when using the Pneumatic Tube, Lazy Susan, or other experimental facilities)
- Experiment Performance Form C5-A, Rotary Specimen Rack Irradiation forms
- TRIGA Irradiation Request and Material Transfer Forms Nos. 1903-1912
- UCINRF SOP Chapter 2, "Experiments," Section 2.1, "Classifications," Revision 3, approved March 2000

- UCINRF SOP Chapter 2, "Experiments," Section 2.2, "Application Procedures for Experimenters," Revision 3, approved March 2000
- UCINRF SOP Chapter 2, "Experiments," Section 2.3, "Amendment and Renewal," Revision 3, approved March 2000
- UCINRF SOP Chapter 2, "Experiments," Section 2.4, "Irradiation of Samples," Revision 3, approved March 2000
- UCINRF SOP Chapter 2, "Experiments," Section 2.5, "Scheduling," Revision 3, approved March 2000
- UCINRF SOP Chapter 2, "Experiments," Section 2.6, "Conduct of Experiments," Revision 3, approved March 2000

b. Observations and Findings

The inspector noted that there were 8 experiment approvals on file at the facility. Of those 8, two experiments were actively being conducted at the facility. These were designated as Class I or "tried" experiments and were well-established procedures that had been in place for several years. The inspector verified that the experiments had been reviewed and approved by the RS of the UCINRF, or his designee, and the ROC, and that new experiments, designated as Class II or "untried" experiments, or significantly different ones would be referred to the ROC for Review and approval as required. Renewal of approved experiments was automatic pending successful performance and renewal of the principal experimenter's Radiation Use Authorization (RUA). The inspector verified that the RUA of the principal experimenter using the reactor was current.

Through reviewing the Reactor Operations Logbook, observing reactor operations, and interviewing staff members, the inspector verified that experiments and irradiations were conducted as required by the TS and the approved procedure governing experiments.

c. Conclusions

The approval and control of experiments met TS and applicable regulatory requirements.

8. Procedures

a. Inspection Scope (IP 69001)

To verify compliance with TS Section 6.3.a, the inspector reviewed selected portions of the following:

- administrative controls

- procedural implementation
- records of changes to procedures
- selected procedures as noted above
- ROC meeting minutes for the past two years
- UCINRF SOP Chapter 1, "Introduction," Section 1.3, "Implementation of Standard Operating Procedures," Revision 3, approved March 2000

b. Observations and Findings

Administrative policies and controls had been developed for changing and reviewing procedures. The inspector verified that recent written changes to specific sections of the operating procedures were reviewed and approved by the ROC as required and documented in the ROC meeting minutes. Training of personnel on procedures and changes was acceptable. Oversight and review of procedure implementation was provided by facility management and EH&S personnel. UCINRF staff members and other authorized users conducted TS activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive releases and contaminations, and reactor equipment problems) were available as required.

c. Conclusions

Procedures were being reviewed, controlled, and implemented as required.

9. Emergency Preparedness

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of:

- Emergency Plan for the University of California, Irvine Nuclear Reactor Facility, Revision 3.1, dated March 2005
- documentation of the emergency drills held in 2004 and 2005 and the follow-up critiques
- UCINRF SOP Chapter 6, "Emergency Procedures," Revision 3, approved March 2000
- UCINRF SOP Chapter 7, "Security Response Procedures," Revision 3, approved March 2000

b. Observations and Findings

The inspector reviewed the Emergency Plan (E-Plan) in use at the UCINRF and verified that the E-Plan was reviewed by the ROC as required. The inspector noted that the licensee's Emergency Implementing Procedures were comprised of chapters from the Standard Operating Procedures, specifically UCINRF SOP Chapter 6, "Emergency Procedures" and UCINRF SOP Chapter 7, "Security Response Procedures." The inspector also noted that the facility E-Plan had been incorporated into the UCI-EH&S Emergency Response Team Response Plan. It was located in a section of the UCI-EH&S Response Plan entitled "Contingency Pre-Plans."

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 UCINRF staff and EH&S personnel had been conducted as required. Emergency equipment and supplies were being checked weekly and inventoried annually as required.

The inspector verified that no Letters of Agreement with the various support agencies were maintained or needed because those agencies were required by law or mandate to provide support for the UCINRF. The inspector noted that communications capabilities with these support groups were acceptable and had been periodically tested. Emergency Call Lists were reviewed every six months, revised as needed but at least annually, and were currently up-to-date as required.

The inspector reviewed the annual emergency drills that had been conducted for 2004 and 2005. It was noted that, due to the small size of the facility staff, reactor personnel participated in the drills conducted by UCI-EH&S. The inspector determined that this met the intent of the E-Plan. The drill scenarios were challenging yet realistic. 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.

c. Conclusions

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

10. Exit Interview

The inspection scope and results were summarized on November 17, 2005, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

G. Miller Reactor Supervisor and Senior Reactor Operator
J. Stern Dean, Physical Sciences
K. Wolonsky Associate Dean, Physical Sciences

Other Personnel

K. Harkness Health Physicist, UCI EH&S (and Reactor Operator Trainee)
M. Klopfer Laboratory Assistant
W. Robinson, Jr. Chair, Radiation Safety Committee, UCI

INSPECTION PROCEDURES USED

IP 69001 Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-326/2005-201-01 URI A licensed reactor operator had not completed the required biennial written examination for 2005 as required.

Closed

None

PARTIAL LIST OF ACRONYMS USED

CFR Code of Federal Regulations
E-Plan Emergency Plan
EH&S (Office of) Environmental Health and Safety
IFI Inspector Follow-up Item
IP Inspection Procedure
LCO Limiting Conditions for Operation
NRC Nuclear Regulatory Commission
NRF Nuclear Reactor Facility
ROC Reactor Operations Committee
RS Reactor Supervisor
RUA Radiation Use Authorization
SOP Standard Operating Procedure
SRO Senior Reactor Operator
TS Technical Specifications
UCI University of California, Irvine
UCINRF University of California, Irvine Nuclear Reactor Facility
URI Unresolved Item