



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

May 26, 2022

Dr. Wesley D. Frey, Director  
McClellan Nuclear Research Center  
University of California-Davis  
5335 Price Avenue, Building 258  
McClellan, CA 95652-2504

SUBJECT: UNIVERSITY OF CALIFORNIA - DAVIS – U.S. NUCLEAR REGULATORY  
COMMISSION ROUTINE INSPECTION REPORT NO. 05000607/2022201

Dear Dr. Frey:

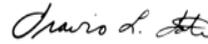
From January 10-13, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at your University of California-Davis/McClellan Nuclear Research Center. The enclosed report documents the inspection results discussed on January 13, 2022, with you and Burton Mehciz, Interim Reactor 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 selected procedures and records, observed various activities, and interviewed various 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 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).

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

Sincerely,



Signed by Tate, Travis  
on 05/26/22

Travis 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. 50-607  
License No. R-130

Enclosure:  
As stated

cc: See next page

University of California-Davis

Docket No. 50-607

cc:

David Reap, Radiation Safety Officer  
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Burton Mehciz, Interim Reactor Supervisor  
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California Energy Commission  
1516 Ninth Street, MS-34  
Sacramento, CA 95814

Radiologic Health Branch  
California Department of Public Health  
P.O. Box 997414, MS 7610  
Sacramento, CA 95899-7414

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

Dr. Prasant Mohapatra  
Vice Chancellor for Research  
Department of Computer Science  
University of California  
Davis, CA 95616

SUBJECT: UNIVERSITY OF CALIFORNIA - DAVIS – U.S. NUCLEAR REGULATORY  
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DATED: MAY 26, 2022

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<b>NAME</b>	CBassett	NParker	TTate
<b>DATE</b>	2/17/2022	2/18/2022	5/26/2022

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

Docket No.: 50-607

License No.: R-130

Report No: 05000607/2022201

Licensee: University of California-Davis

Facility: McClellan Nuclear Research Center

Location: McClellan Park  
Sacramento, California

Dates: January 10-13, 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

University of California-Davis  
McClellan Nuclear Research Center  
Inspection Report No. 05000607/2022201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of California-Davis (UCD, the licensee's) 2 megawatt Class I research reactor safety program including: (1) effluent and environmental monitoring; (2) experiments; (3) organization and operations and maintenance activities; (4) review and audit and design change functions; (5) procedures; (6) radiation protection; and (7) inspection of transportation activities. 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 NRC requirements.

### Effluent and Environmental Monitoring

- The licensee's environmental radiation doses as measured by dosimetry were below regulatory limits. An unresolved item (URI) was opened related to a potential calculation error. Although gaseous effluent and environmental monitoring appeared to satisfy license and regulatory requirements, calculated doses from gaseous releases indicated that results are above the specified regulatory limits.

### Experiments

- The program for reviewing, approving, and conducting experiments satisfied procedural and technical specification (TS) requirements.

### Organization and Operations and Maintenance Activities

- The organizational structure and staffing were consistent with TSs requirements.

### Review and Audit and Design Change Functions

- The Nuclear Safety Committee (NSC) met at the required frequency, reviewed the topics outlined in TS Section 6.2, and conducted audits of facility programs as required by the TSs.
- The design change and control program satisfied NRC requirements.

### Procedures

- The procedure review, revision, control, and implementation program satisfied TS requirements.

### Radiation Protection

- The radiation safety program was conducted in compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation," requirements, TSs, and licensee procedures.

### Transportation Activities

- Radioactive material (RAM) was shipped in accordance with the applicable regulations.

## REPORT DETAILS

### Summary of Facility Status

The UCD 2 megawatt Training, Research, Isotope, General Atomics research reactor continued to operate in support of neutron radiography, neutron tomography, experimental sample irradiation, and for tours of students and other members of the public. During the inspection, the reactor operated several hours per day at various power levels up to 1 megawatt to support neutron radiography, sample irradiation, and a tour.

### 1. Effluent and Environmental Monitoring

#### a. Inspection Scope (Inspection Procedure (IP) 69004)

The inspector reviewed the following procedures and reports to verify compliance with the requirements of 10 CFR Part 20 and Section 6.4.2(d) of the UCD/McClellan Nuclear Research Center (UCD/MNRC) TSs, Revision 13, dated March 28, 2003:

- Facility Procedure UCD/MNRC-0029-DOC-21, "UCD/MNRC Radiation Protection Procedures," including: Sections 3, 4, and 17
- quarterly environmental dosimeter reports for the last 2 years
- radiochemical analysis data/results of water samples taken from a ground water well near the facility for 2021
- UCD/MNRC Annual Reports for 2019 and 2020

#### b. Observations and Findings

##### (1) Environmental Samples and Dosimetry

The inspector verified that there were no liquid effluent releases from the facility during 2021 and that no solid radioactive waste shipments were made from the facility in 2020 or 2021. The inspector confirmed that environmental water samples were collected and analyzed, and the results of these analyses were within regulatory limits. The inspector also noted that the results of on-site and off-site gamma radiation monitoring produced no measurable doses.

##### (2) Gaseous Releases

The inspector confirmed that facility gaseous releases continued to be monitored, totals were calculated, and the results were documented in the annual operating report as required by the TSs. The inspector noted that airborne concentrations of gaseous releases appeared to be within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2. However, the inspector noted that the annual radiation dose to the public from gaseous effluents as the result of reactor operations was reported to be above the dose constraint of 10 millirem per year as specified in 10 CFR 20.1101, "Radiation protection programs," paragraph (d).

During the inspection period, the NRC Project Managers for the UCD/MNRC and other NRC technical staff were reviewing the environmental monitoring data for the MNRC as part of the facility license renewal. They also noted the dose to the public from gaseous effluents was reportedly above the dose constraint of 10 millirem per

year. The inspector asked the licensee about the gaseous release results and the licensee indicated that there was an error in the calculations and/or method used and stated that they would review the situation further and provide the NRC with the results of their investigation.

Following the inspection, the NRC also issued the licensee a request for additional information (RAI) which requested various aspects of the current and previous annual reports and gaseous releases from 2009 to 2020. The licensee indicated that they would review the data for the previous years and supply the NRC with answers to the RAI questions as soon as possible. Because of the calculation error and unanswered questions concerning the gaseous releases from the facility, the licensee was informed that this issue will be considered by the NRC as an URI which will be reviewed during a future inspection (URI 05000607/2022201-01).

c. Conclusion

The inspector determined that the licensee's environmental radiation doses were below regulatory limits. The inspector opened an URI related to a potential calculation error. Although effluent and environmental monitoring appeared to satisfy license and regulatory requirements, calculated doses from gaseous releases indicated that results are above the specified regulatory limits.

## 2. Experiments

a. Inspection Scope (IP 69005)

The inspector reviewed selected aspects of the following to verify compliance with the licensee's program for conducting experiments outlined in Facility Procedure UCD/MNRC-0033-DOC-05, "University of California, Davis/McClellan Nuclear Research Center Research Reactor Facility Experiment Review and Authorization Process," and TS Sections 3.8, 4.8, and 6.5:

- various UCD/MNRC irradiation request forms (IRFs) for 2021
- various UCD/MNRC safety review forms for 2021
- selected UCD/MNRC irradiation summary forms and tracking sheets for 2021
- listing of current experiments, recent reviews, and authorized users
- various entries documented in UCD/MNRC operations logbooks Nos. 182 through 189
- UCD/MNRC Annual Reports for 2019 and 2020

b. Observations and Findings

The inspector verified that experiments were reviewed, evaluated, approved, and conducted in accordance with procedural and TS requirements.

c. Conclusion

The inspector determined that the program for reviewing, approving, and conducting experiments satisfied TS and procedural requirements.

### 3. Organization and Operations and Maintenance Activities

#### a. Inspection Scope (IP 69006)

The inspector reviewed the following regarding the UCD/MNRC organization, staffing, and staff responsibilities to ensure that the requirements of TS Section 6.1 were met:

- current UCD/MNRC organizational structure
- staffing requirements for safe operation of the research reactor facility
- UCD/MNRC Annual Reports for 2019 and 2020

#### b. Observations and Findings

The inspector noted that the current organization consisted of a number of individuals including: (1) the UCD/MNRC Director, (2) the Interim Reactor Supervisor, (3) the Radiography Supervisor, (4) the Radiation Safety Officer/Security Manager, (5) an Electronics Engineer, and (6) various radiographers, radiographer trainees, and an assistant. The organization was consistent with that specified in the TSs.

The inspector verified that five of the staff members mentioned above were licensed senior reactor operators. The inspector found that staffing for safe reactor operation was adequate based on the current level of operations at the facility and staffing at the facility was as required by the TSs.

#### c. Conclusion

The inspector determined that the licensee's organization and staffing were in compliance with the requirements outlined in TS Section 6.0.

### 4. Review and Audit and Design Change Functions

#### a. Inspection Scope (IP 69007)

To verify that the required reviews and audits were completed as required by TS Section 6.2, and facility changes were controlled and evaluated as required in 10 CFR 50.59, "Changes, tests and experiments," the inspector reviewed selected aspects of:

- NSC meeting minutes for 2020 through the present
- MNRC UCD audit – annual operations audits for 2020 and 2021
- MNRC radiation safety program review report – annual radiation protection program reviews for 2020 and 2021
- UCD/MNRC "Facility Modification Notebook," containing the "Facility Modification Log," forms
- UCD/MNRC Annual Reports for 2019 and 2020

#### b. Observations and Findings

(1) Review and Audit Functions

The inspector verified that the composition of the NSC and qualifications of committee members were as specified in TS Section 6.2.1; the committee continued to meet semiannually as required by TS Section 6.2.2; and the NSC provided oversight of the UCD/MNRC as specified in TS Section 6.2.3. The inspector also confirmed that reviews were conducted by the NSC or designated representatives. In addition, the inspector noted that the audits covered the activities specified in TS Section 6.2.4. The inspector found that the audit findings, and the licensee's corrective actions were appropriate.

(2) Design Change Functions

The inspector found that the requirements involving review and approval of facility changes stipulated in 10 CFR 50.59, were implemented at the facility through facility procedure UCD/MNRC-0043-DOC-04, "Facility Modification Procedure." The inspector confirmed that the procedure incorporated criteria provided by the regulations with additional requirements mandated by site-specific conditions. The inspector confirmed that no changes or modifications were completed in the last year.

c. Conclusion

The inspector determined the NSC met as required by the TSs and that audits of various reactor operations and programs were conducted as required by the TSs. The inspector also determined the design change control program satisfied NRC requirements.

**5. Procedures**

a. Inspection Scope (IP 69008)

To verify compliance with TS Section 6.4, the inspector reviewed selected portions of the following:

- selected "Document Review," forms completed by staff members
- selected facility operations, health physics, and maintenance procedures
- "MNRC Document List," showing all the licensee's current documents and procedures including the date each was last reviewed

b. Observations and Findings

The inspector confirmed that approved procedures were available for the activities listed in TS Section 6.4. The inspector verified that the process for reviewing and approving new procedures and changes to procedures was followed. The inspector also verified that operations and health physics procedures were reviewed annually by staff members, while maintenance and other procedures were reviewed biennially. The activities and operations observed by the inspector during this inspection were completed in accordance with the applicable procedures.

c. Conclusion

The inspector determined the current procedure review, revision, and implementation program satisfied TS requirements.

## 6. Radiation Protection

### a. Inspection Scope (IP 69012)

The inspector reviewed selected portions of the following records and reports regarding the licensee's radiation protection program to ensure that the requirements of 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, and TS Sections 4.7 and 6.4.2 were met:

- radiation safety training records for facility and visitor personnel
- selected periodic contamination and radiation survey results for 2021
- calibration records of selected radiation detection and monitoring instruments
- monthly occupational radiation exposure reports for UCD/MNRC personnel for the past 2 years
- latest individual NRC Form 5, "Occupational Dose Record for A Monitoring Period," for UCD/MNRC personnel
- MNRC radiation safety program review reports for 2020 and 2021
- Facility Procedure UCD/MNRC-0029-DOC-21, "UCD/MNRC Radiation Protection Procedures"
- Facility Procedure UCD/MNRC-0042-DOC-19, "MNRC Health Physics Instrumentation and Test Procedures"
- UCD/MNRC Annual Reports for 2019 and 2020

### b. Observations and Findings

#### (1) Surveys

The inspector confirmed that periodic contamination and radiation surveys were completed in accordance with radiation protection procedures, and that survey results were documented and posted so that facility personnel could maintain their doses as low as reasonably achievable (ALARA).

#### (2) Postings and Notices

The inspector verified that the current version of NRC Form 3, "Notice to Employees," was prominently posted as required by 10 CFR 19.11, "Posting of notices to workers." The inspector confirmed that radiological signs were also posted as required by 10 CFR 20.1902, "Posting requirements."

#### (3) Dosimetry

The inspector observed that dosimetry use was in accordance with facility procedures and doses to workers were within 10 CFR Part 20 limits.

#### (4) Radiation Monitoring Equipment

The inspector found that installed and portable radiation monitoring equipment was calibrated in accordance with facility procedures and at the frequencies required by the TSs.

#### (5) Radiation Protection Training

The inspector reviewed the radiation protection training given to staff members, authorized experimenters, students, and visitors, and found that training was in accordance with facility procedures and regulatory requirements.

#### c. Conclusion

The inspector determined that the radiation protection and ALARA programs, as implemented by the licensee, satisfied regulatory and TS requirements and licensee procedures.

### 7. **Transportation Activities**

#### a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed RAM, the inspector reviewed the following:

- selected licenses of various UCD/MNRC shipment consignees
- records of the RAM shipments made during 2020 including completed radiological survey forms
- training records for staff personnel authorized to ship hazardous material in accordance with the regulations specified by the Department of Transportation (DOT)
- Facility Procedure UCD/MNRC-0029-DOC-21, "UCD/MNRC Radiation Protection Procedures," including Sections 11, 21, and Appendix 21-A

#### b. Observations and Findings

The inspector found that the licensee made three shipments of various types of RAM since the last inspection of this area. The inspector noted that shipping records were filled out and the shipments were completed as required by the regulations.

The inspector verified that the licensee retained copies of consignees' RAM possession licenses, and that training for staff members involved in the shipment of RAM was completed as required by the regulations.

#### c. Conclusion

The inspector determined that RAM was shipped in accordance with the applicable NRC and DOT regulations.

## **8. Exit Interview**

The inspector summarized the inspection scope and results on January 13, 2022, with members of licensee management. The inspector described the areas inspected and discussed the inspection findings. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed during the inspection.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee Personnel

C. Dresser	Radiography Supervisor and Reactor Operator Trainee
W. Frey	Facility Director and SRO
T. Essert	Electrical Engineer and SRO
E. Gabler	Radiographer Trainee
B. Mehciz	Interim Reactor Supervisor and SRO
D. Reap	Radiation Safety Officer, Security Officer, and SRO
T. Slattery	Radiographer Helper
S. Warren	Radiographer Level III and SRO
M. Wilkinson	Radiographer Trainee

## **INSPECTION PROCEDURES USED**

IP 69004	Class I Research and Test Reactor Effluent and Environmental Monitoring
IP 69005	Class I Research and Test Reactor Experiments
IP 69006	Class I Research and Test Reactors Organization and Operations and Maintenance Activities
IP 69007	Class I Research and Test Reactor Review and Audit and Design Change Functions
IP 69008	Class I Research and Test Reactor Procedures
IP 69012	Class I Research and Test Reactor Radiation Protection
IP 86740	Inspection of Transportation Activities

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### Opened

05000607/2022201-01	URI	Review the answers to the license renewal RAI questions concerning the calculations of gaseous releases from the facility and previous annual reports to determine whether the licensee violated the requirements in 10 CFR 20.1101.
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### Closed

None