



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

May 27, 2021

Dr. Paul O'Connor, Facility Director  
Dow Chemical TRIGA Research Reactor  
Dow Chemical Company  
Building 1602  
Midland, MI 48674

SUBJECT: DOW CHEMICAL COMPANY – U.S. NUCLEAR REGULATORY COMMISSION  
ROUTINE INSPECTION REPORT NO. 05000264/2021201

Dear Dr. O'Connor:

From March 8 - 10, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted a routine inspection at the Dow TRIGA Research Reactor facility. The enclosed report documents the inspection results, which were discussed on March 10, 2021, with you, Dr. Siaka Yusuf, Reactor Supervisor, and members of the Reactor Operations Committee and reactor 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 selected 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 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,

*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. 50-264  
License No. R-108

Enclosure:  
As stated

cc: See next page

Dow Chemical

Docket No. 50-264

cc:

Office of the Mayor  
333 West Ellsworth  
Midland, MI 48640

Office of the Governor  
Room 1 – Capitol Building  
Lansing, MI 48913

Ms. Kristan Soto, Chair  
Radiation Safety Committee  
The Dow Chemical Company  
Environmental Health and  
Safety Responsible Care Leader  
1790 Building  
Midland, MI 48674

Dr. Wayde Konze  
Global Research and  
Development Director for Analytical Sciences  
Chair, Reactor Operations Committee  
The Dow Chemical Company  
1897 Building  
Midland, MI 48667

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

Radiological Protection Section  
Office of Waste Management  
and Radiological Protection  
Michigan Department of Environmental Quality  
525 West Allegan Street  
P.O. Box 30473  
Lansing MI 48909-7973

SUBJECT: DOW CHEMICAL COMPANY – U.S. NUCLEAR REGULATORY COMMISSION  
ROUTINE INSPECTION REPORT NO. 05000264/2021201  
DATED: May 27, 2021

**DISTRIBUTION:**

PUBLIC

NrrDanuUnpo Resource

TTate, NRR

CBassett, NRR

NParker, NRR

JBorromeo, NRR

WKennedy, NRR

GWertz, NRR

BSmith, NRR

HLogarus, R III

ABarker, R III

**ADAMS Accession No.: ML21078A114**

**NRC-002**

|               |                  |                  |                     |
|---------------|------------------|------------------|---------------------|
| <b>OFFICE</b> | NRR/DANU/UNPO/PM | NRR/DANU/UNPO/LA | NRR/DANU/UNPO/BC    |
| <b>NAME</b>   | CBassett         | NParker          | TTate(PO'Bryan for) |
| <b>DATE</b>   | 3/22/2021        | 3/22/2021        | 5/27/2021           |

**OFFICIAL RECORD COPY**

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

Docket No.: 50-264

License No.: R-108

Report No.: 05000264/2021201

Licensee: Dow Chemical Company

Facility: Dow TRIGA Research Reactor

Location: Midland, Michigan

Dates: March 8 - 10, 2021

Inspector: Craig Bassett

Approved by: 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

Enclosure

## EXECUTIVE SUMMARY

Dow Chemical Company  
Dow TRIGA Research Reactor  
Inspection Report No. 05000264/2021201

The primary focus of this routine, announced inspection of the Dow Chemical Company (Dow, the licensee) Class II research reactor facility was the onsite review of selected aspects of the safety programs including: (1) organization and staffing; (2) operations logs and records; (3) procedures; (4) requalification training; (5) surveillance and limiting conditions for operation (LCOs); (6) committees, audits and reviews; (7) maintenance logs and records; and, (8) fuel handling logs and records. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's programs were acceptably directed toward the protection of public health and safety and in compliance with NRC requirements.

### Organization and Staffing

- The licensee's organization and staffing was in compliance with the requirements specified in its technical specifications (TSs).

### Operations Logs and Records

- The licensee's operations logs and record keeping program conformed to the TS requirements.

### Procedures

- The licensee maintained and implemented written procedures in accordance with TS requirements.

### Requalification Training

- Current operator requalification was conducted as required by the Requalification Program.

### Surveillance and Limiting Conditions for Operations

- Surveillance was conducted and LCOs were maintained in accordance with the TS requirements.

### Committees, Audits and Reviews

- The Reactor Operations Committee (ROC) provided the review and oversight required by the TS.

### Maintenance Logs and Records

- Maintenance activities were conducted in accordance with licensee procedures.

### Fuel Handling Logs and Records

- Fuel handling and inspection activities were completed and documented as required by the TS and licensee procedures.

## REPORT DETAILS

### Summary of Facility Status

The licensee continued to operate the 300-kilowatt Mark I Dow TRIGA Research Reactor in support of research and development, reactor operator training, and periodic equipment surveillances. During the inspection, the reactor was operated in support of an experiment.

#### 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 specified in TS Section 6.1:

- organizational structure and staffing
- staff qualifications and management responsibilities
- TSs for the Dow TRIGA Research Reactor (DTRR) dated June 18, 2014
- DTRR Annual Reports for calendar years 2019 and 2020
- reactor operation logbooks numbers (Nos.) 127 to 129, covering operations from December 12, 2018, to the present
- various Dow Nuclear Research Reactor Procedures (DNRRP) including: No. 3.2, "Programmatic and Personnel Responsibility;" No. 3.2.1, "Level 1, the Dow Core R&D Director;" No. 3.2.2, "Level 2, the Facility Director;" No. 3.2.7, "Level 3, the Reactor Supervisor;" and No. 3.2.8, "Senior Reactor Operators and Reactor Operators"

##### b. Observations and Findings

Through discussions with licensee staff, the inspector verified that the management structure at the facility had not changed since the previous NRC inspection. The inspector confirmed that the reactor staff consisted of three individuals: the reactor supervisor (RS), an assistant RS, and a senior reactor operator (SRO). The inspector verified that all three maintained SRO licenses. The inspector reviewed the applicable records and verified that staffing was as required by TS Section 6.1 and the licensee's procedures.

##### c. Conclusion

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

#### 2. Operations Logs and Records

##### a. Inspection Scope (IP 69001 – Section 02.02)

The inspector reviewed the following to ensure that selected records were maintained as required by TS Section 3 and licensee procedural requirements:

- reactor operations logbooks Nos. 127 to 129
- scram logbook entries from January 2018 to the present
- DTRR Annual Reports for calendar years 2019 and 2020
- various DNRRP Procedures Including: No. 3.3.5, "Authorization for Operation of the Reactor;" No. 3.4, "Procedural and Administrative Limitations;" No. 3.5, "Reactor Operations Log Book;" No. 4.1.1, "Daily Prestart Checkout;" No. 4.1.2, "Daily Startup/Shutdown;" and, No. 4.6.1, "Procedure for Startup, Operation, and Shutdown of the Dow TRIGA Research Reactor"

b. Observations and Findings

The inspector observed as the assistant RS completed a reactor pre-startup checkout, followed by a reactor startup to criticality, and then full power operation. The inspector verified that reactor operating characteristics and entries required by procedure were recorded in the Reactor Operations Logbook. Through a review of the logs, the inspector confirmed that TS operational limits were not exceeded. The inspector also verified that information required for the startup checklist and the shutdown checklist was documented as required by procedure. Through direct observation and a review of operations records, the inspector confirmed that shift staffing met the minimum requirements for reactor operations. The inspector verified that reactor operations were carried out following written procedures and TS requirements.

The inspector also reviewed operations logbooks from the previous 2 years, daily checklists for that period, and the scram logbook. The inspector noted that, during the past 2 years there were several scrams that occurred during the reactor startup sequence. Through discussions with the licensee the inspector noted that the cause was an old computer processor, and the licensee plans to replace the old equipment as part of a planned future reactor console upgrade project.

c. Conclusion

The inspector determined that the licensee's operational record keeping program conformed to TS requirements.

**3. Procedures**

a. Inspection Scope (IP 69001 – Section 02.03)

The inspector reviewed the following to ensure that the requirements of TS Section 6.4 were met:

- procedural control, revision, and implementation
- selected administrative and operations procedures
- ROC semi-annual meeting minutes for the past 2 years
- various DNRRP Procedures Including: No. 3.2, "Programmatic and Personnel Responsibilities;" No. 3.3.2, "Review Procedure;" No. 3.3.5, "Authorization for Operation of the Reactor;" No. 4.1.2, "Daily



Startup/Shutdown;" No. 4.2.4, "Continuous Air Monitor Calibration;" No. 4.2.5, "Control Rod Calibration;" and, No. 4.6.1, "Procedure for Startup, Operation, and Shutdown of the DOW TRIGA Research Reactor"

b. Observations and Findings

The inspector found that procedures were developed for the safe operation of the reactor as required by TS Section 6.4. The inspector verified through review of the ROC meeting minutes, as well as discussions with licensee personnel, that procedure and experiment changes were reviewed and approved by the ROC as required by the TSs. The inspector confirmed that training of personnel on procedures was acceptable. Through observation of various activities at the facility, including reactor start up and operation and experiment processing, the inspector verified that licensee personnel conducted activities in accordance with applicable operations procedures.

c. Conclusion

The inspector determined that the procedural review, revision, approval, and implementation program satisfied TS requirements.

**4. Requalification Training**

a. Inspection Scope (IP 69001 – Section 02.04)

The inspector reviewed the following to verify compliance with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' Licenses," and the facility Requalification Program:

- reactor operation logbooks Nos. 127 to 129
- operator requalification program records for 2018 to the present
- DTRR Requalification Program, approved by the NRC on September 6, 2011

b. Observations and Findings

The inspector noted that the licensee's requalification program was as described in the plan submitted to the NRC and was in accordance with 10 CFR 55.59 "Requalification." The inspector reviewed the requalification program records of the three SROs currently employed at the facility. The inspector found that the SROs were responsible for the implementation of the requalification program and administration of the written and operating examinations. The inspector verified that all the licensed operators reviewed the contents of all abnormal and emergency procedures on an annual basis. The inspector confirmed that the numbers of hours spent by each operator performing licensed duties were recorded in the operations logbook. The inspector verified that the SRO quarterly operating hours met 10 CFR 55.59 requirements and all operators' licenses were current. The inspector also verified that physical examinations of the licensed staff were conducted biennially as required by the regulations.

c. Conclusion

The inspector determined that the licensee's operator requalification program was conducted as required by the Requalification Program.

**5. Surveillance and Limiting Conditions for Operation**

a. Inspection Scope (IP 69001 – Section 02.05)

The inspector reviewed the following to ensure that the surveillance requirements and LCOs specified in TS Sections 3 and 4 were met:

- reactor operation logbooks Nos. 127 to 129
- surveillance data documented on various forms including: Form 4.1.3a, "Monthly Checklist;" Form 4.1.4, "Semi-Annual Checkout;" Form 4.1.5, "Annual Checkout;" Form 4.2.5b, "Control Rod Calibration Data Sheet;" and, Form 4.3.4a, "Procedure for the Annual Fuel Inventory"

b. Observations and Findings

The inspector noted that daily, monthly, semi-annual, and annual surveillances of systems and equipment checks, tests, and calibrations were completed as required by the TSs. The inspector confirmed that LCO verifications were completed on schedule and in accordance with licensee procedures. All the recorded results reviewed by the inspector were within the TS and procedurally prescribed parameter limits. The inspector confirmed that records and logs were maintained as required by procedures.

As noted above, the inspector observed the assistant RS complete a reactor startup. The inspector confirmed that all the checks required for the startup were carried out in accordance with procedure and operations were completed in a safe manner. The inspector verified that the results of the checks conducted were in compliance with TS required values.

c. Conclusion

The inspector determined that the licensee's program for completing surveillance inspections and LCO confirmations satisfied the TS and licensee administrative and operational controls.

**6. Committees, Audits and Reviews**

a. Inspection Scope (IP 69001 – Section 02.09)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2 were completed by the ROC.

- ROC semi-annual meeting minutes for the past 2 years
- DTRR Annual Reports for calendar years 2019 and 2020

- DNRRP Procedure No. 3.2.4, “Reactor Operations Committee - DOW TRIGA Reactor,” and, No. 3.4, “Procedural and Administrative Limitations”

b. Observations and Findings

The inspector verified that the ROC met at least annually and that a quorum was present as required by TS Section 6.2.2. Through a review of the minutes, the inspector confirmed that the ROC provided guidance and direction in support of reactor operations. The inspector noted that, at each meeting, the RS provided a report which contained details on reactor operations, reactor system maintenance, operator training, procedure updates, and internal audit results. The inspector noted that the ROC minutes and the RS report provided a record of ROC review functions and of their safety oversight of the reactor facility.

The inspector confirmed that audits of the items required by TS 6.2.3 were completed by individuals appointed by the ROC. Additionally, the inspector noted that an annual peer review audit was performed. The inspector noted that the last peer review was conducted December 15 – 18, 2020 and no safety concerns or areas of non-compliance with NRC regulations or TS requirements were found. The inspector confirmed that the safety reviews and audits, and the associated findings, were detailed and the licensee responded to the audit findings, if needed, and ensured that corrective actions were completed.

c. Conclusion

The inspector determined that the review and oversight functions required by the TSs were completed by the ROC.

**7. Maintenance Logs and Records**

a. Inspection Scope (IP 69001 – Section 02.11)

To ensure that maintenance activities were consistent with regulatory requirements, the inspector reviewed:

- reactor operation logbooks Nos. 127 to 129
- DNRRP Procedure No. 3.4, “Procedural and Administrative Limitations,” and, No. 4.5.3, “Facility Maintenance and Modification”
- completed maintenance form 4.5.3.b, “Maintenance Form,” for 2019 to the present

b. Observations and Findings

The inspector reviewed the maintenance records for preventive and corrective maintenance activities. The inspector confirmed that routine/preventive maintenance was controlled and documented on DTRR reactor maintenance forms, which were maintained in a binder at the reactor console and reviewed by the RS. The inspector verified that implementation of changes to equipment, systems, tests, or experiments were reviewed by the ROC prior to completion by the reactor staff. The inspector verified that after all maintenance items were

completed, item or system operational checks were performed to ensure the affected equipment and systems functioned properly before they were returned to service.

c. Conclusion

The inspector determined that maintenance activities were conducted in accordance with licensee procedures.

**8. Fuel Handling Logs and Records**

a. Inspection Scope (IP 69001 – Section 02.12)

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

- reactor operation logbooks Nos. 127 to 129
- selected DNRRP Procedures Including: No. 4.3.2, “Movement of Fuel - General Requirements;” No. 4.3.3, “Movement of Fuel - Approach to Criticality;” and, No. 4.3.4 a, “Procedure for the Performance of the Annual Fuel Inspection”

b. Observations and Findings

The inspector verified that the licensee maintained records of the various fuel movements that were completed and that the movements were conducted and recorded in compliance with licensee procedure. The inspector confirmed that all fuel movements were documented in the reactor operations logbook, as well as on the fuel element position indicator map in the reactor bay. The inspector noted that fuel element inspections included all the fuel elements every 4 years and inspection of the control rods on an annual frequency. The inspector confirmed that the results of the inspections of the fuel elements and control rods were consistent with accepted values and the results did not indicate any deterioration of cladding or other problems with the elements. The inspector verified that a minimum of three operators were present when fuel was moved as required by procedure.

c. Conclusion

The inspector determined that fuel handling and control rod inspection activities were completed and documented as required by TS and licensee procedures.

**9. Exit Interview**

The inspector presented the inspection results to licensee management and staff at the conclusion of the inspection on March 10, 2021. The inspector described the areas inspected and discussed 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

|                 |  |
|-----------------|--|
| P. Burns        | Physician, Dow Health Services   |
| N. Goodman      | Senior Reactor Operator  |
| G. Groeschen    | Health and Safety Specialist, Industrial Hygiene Expertise Center and Assistant Radiation Safety Officer |
| R. Gwizdala     | Security Specialist, Emergency Services and Security   |
| B. Haskins      | Assistant Reactor Supervisor and Senior Reactor Operator   |
| W. Konze        | Global Research and Development Director for Analytical Sciences and Chair, Reactor Operations Committee |
| L. Miller       | Nurse Practitioner, Dow Health Services  |
| P. O'Connor     | Facility Director  |
| K. Wegener-Gave | Site and Reactor Facility Radiation Safety Officer   |
| S. Yusuf        | Reactor Supervisor   |

**INSPECTION PROCEDURES USED**

|          |                                     |
|----------|-------------------------------------|
| IP 69001 | Class II Research and Test Reactors |
|----------|-------------------------------------|

**ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened:

None

Closed:

None