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

August 10, 2021

Dr. Siaka Yusuf, 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. 05000264/2021202

Dear Dr. Yusuf:

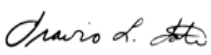
From June 28 - 30, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Dow TRIGA Research Reactor. The enclosed report documents the inspection results which were discussed on June 30, 2021, with you, members of your staff, and other management and support personnel.

The inspection examined activities conducted under your license as they relate to public health and safety, compliance with the Commission's rules and regulations, and compliance with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. Based on the results of this inspection, no findings of non-compliance with NRC requirements 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 https://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.

Sincerely,


Signed by Tate, Travis
on 08/10/21

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

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. 05000264/2021202
DATE: AUGUST 10, 2021

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

Docket No.	50-264
License No.	R-108
Report No.	05000264/2021202
Licensee:	Dow Chemical Company
Facility:	Dow TRIGA Research Reactor
Location:	Midland, Michigan
Dates:	June 28 - 30, 2021
Inspector:	Craig Bassett
Accompanied by:	Juan Arellano, Nuclear Regulator Apprenticeship Network
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. 05000264/2021202

The primary focus of this routine safety inspection was the onsite review of selected aspects of the Dow Chemical Company (the licensee's) 300 kilowatt, Class II research reactor safety program including: (1) organization and staffing; (2) procedures; (3) experiments; (4) health physics; (5) design changes; (6) emergency planning; and, (7) inspection of transportation activities. 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 the technical specifications (TSs).

Procedures

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

Experiments

- Experiments were reviewed and approved as required by the TSs.

Health Physics

- The facility radiation safety program (RSP) satisfied regulatory requirements and environmental monitoring was conducted in accordance with the license and the regulations.

Design Changes

- No changes, tests, or experiments, subject to the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests and experiments," were initiated or completed.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the licensee's emergency plan (E-Plan) and regulatory requirements.

Inspection of Transportation Activities

- The program for shipping radioactive material satisfied regulatory requirements.

REPORT DETAILS

Summary of Facility Status

The Dow Chemical Company (Dow) 300 kilowatt, TRIGA Mark I research reactor was operated in support of research, reactor operator training, and periodic equipment surveillances. During the inspection, the reactor was operated to support irradiation of research samples.

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
- Dow Annual Operating Reports for 2019 through 2020
- Reactor Operations Committee (ROC) meeting minutes for 2019 through 2021
- DTRR operation logbooks numbers (Nos.) 127 through 129, covering operations from December 12, 2018, to the present
- various DTRR Procedures Including: No. 3.2, “Programmatic and Personnel Responsibility;” 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 didn’t change since the previous NRC inspection, but a new personnel job assignment occurred. The individual who is designated as the Reactor Supervisor (RS) was appointed to also fill the position of Facility Director (FD) for the DTRR. The inspector was informed by the licensee that this was the manner in which the organization was set up under two of former FDs.

The inspector confirmed that the reactor staff consisted of three individuals: the RS/FD, an assistant RS, and a reactor operator. The inspector verified that all three maintained senior reactor operator licenses. The inspector reviewed the applicable records and verified that shift 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 TSs.

2. 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:

- ROC meeting minutes for 2019 through 2021
- procedural control, revision, and implementation
- various DTRR Procedures including: No. 3.2, “Programmatic and Personnel Responsibilities;” No. 3.3, “Rules Governing Experiments, Storage and Handling of and Accountability for Nuclear and Radioactive Materials;” and, No. 3.3.2, “Review Procedure”

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 operation and completion of an experiment, 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.

3. Experiments

a. Inspection Scope (IP 69001 – Section 02.06)

To ensure that the requirements of TS Sections 3.7, 4.7, and 6.5 were met concerning the experimental program, the inspector reviewed selected aspects of:

- DTRR operation logbooks Nos. 127 through 129
- review and approval process for experiments
- experimental administrative controls and precautions
- DTRR Procedure No. 3.3, “Rules Governing Experiments, Storage and Handling of and Accountability for Nuclear and Radioactive Materials”
- completed experimental request forms, “TRIGA Activation Request Form,” for 2019 to the present
- completed Approval Sheet for Special Experiments, “Annual Fuel Inspection,” for 2019 to the present

b. Observations and Findings

The inspector observed the systems used for the irradiation of various materials in the reactor core including the Pneumatic Tube Irradiation Facility and the Rotating Specimen

Rack or Lazy Susan system that surrounds the reactor core. The inspector noted that samples irradiated in the DTRR included various materials that were produced or utilized at Dow. The inspector verified that the FD/RS reviewed and approved all experiments conducted at Dow in accordance with the TS Sections 3.7 and 4.7. The inspector confirmed that all experiments conducted were in accordance with approved authorization requests. The inspector noted that one new experiment was initiated reviewed and approved by the ROC since the previous inspection at the facility; however, the experiment was never performed.

c. Conclusion

The inspector determined that experiments were reviewed and approved as required by the TSs.

4. Health Physics

a. Inspection Scope (Inspection Procedures (IP) 69001 – Section 02.07)

The inspector reviewed the following to verify compliance with 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection against Radiation," and the applicable TS requirements:

- radiation safety training records
- DTRR operation logbooks Nos. 127 through 129
- radiological signs and posting in various areas of the facility
- area and personnel dosimetry results from 2018 to present
- maintenance and calibration of radiation monitoring equipment, including the water radioactivity monitor, area radiation monitor, and the continuous air monitor
- various DTRR Procedures Including: No. 3.2., "Radiation Safety Officer;" No. 4.2.2, "Area Monitor Calibration;" No. 4.2.4, "Continuous Air Monitor Calibration;" No. 4.7.1, "Wipe Tests and Radiation Surveys;" and No. 4.7.2.a, "Procedure for the Disposal of Waste Generated in the Neutron Activation Analysis Group"
- semi-annual area radiation monitor, primary water radioactivity monitor, and continuous air monitor calibration records from 2018 to the present

b. Observations and Findings

(1) Surveys

The inspector reviewed monthly radiation and contamination surveys of the reactor building which were conducted by the facility staff. The results were documented on the designated forms and evaluated as by the Radiation Safety Officer (RSO). The inspector found that the surveys characterized the radiological conditions present in the facility. The inspector confirmed that the RSO also conducted an annual independent contamination survey of the facility and verified that all the readings were as expected.

(2) Postings and Notices

The inspector reviewed the postings required by 10 CFR Part 20 at the entrances to various controlled areas including the Reactor Bay and radioactive material storage areas. The inspector noted that the postings were acceptable and survey maps associated with the areas indicated the radiation and contamination hazards present. The inspector verified that the facility's radioactive material storage areas were also properly posted, and no unmarked radioactive material was found in the facility.

(3) Dosimetry

The inspector verified that the licensee used a National Voluntary Laboratory Accreditation Program-accredited vendor to process personnel dosimetry. Through direct observation, the inspector confirmed that Optically Stimulated Luminescent (OSL) whole body dosimeters and finger ring thermoluminescent dosimeters were used by facility personnel. The inspector examined the dosimetry records for facility personnel for the past three years and found that all exposures were well within NRC limits and licensee action levels. The inspector confirmed that all DTRR personnel were provided with an equivalent of NRC Form 5 annually.

(4) Radiation Monitoring Equipment

The inspector reviewed the calibration records of portable survey meters, the area radiation monitor, and the continuous air monitor in use at the facility. The inspector verified that calibration records were maintained as required, and calibration frequencies met the requirements established in TS Section 4.6. The inspector noted that the licensee's tracking system for ensuring the instrument calibrations were completed on time was appropriate.

(5) Radiation Safety and Training Programs

The inspector verified that the RSP provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20. The inspector confirmed that the RSP was reviewed annually as required by 10 CFR 20.1101, "Radiation protection programs," paragraph (c). The inspector verified that the RSP was established in Dow Standards, including IH-477, "Control of Ionizing Radiation Hazards," and through DTRR operating procedures.

The inspector noted that the RSP required all personnel who work with radioactive material to receive training in radiation protection, policies, procedures, requirements, and the facilities prior to having unescorted access at the facility. The inspector verified that the RSO was responsible for conducting the training and all the training was conducted via computer or by classroom presentation. The inspector confirmed that a test was administered at the end of the training to verify that the individuals understood the material presented. The inspector reviewed the training materials and noted that the reactor staff members were instructed on the appropriate subjects.

(6) Environmental Monitoring

The inspector verified that OSL environmental dosimeters were placed around three of the inside walls of the reactor facility and a fourth on the reactor console. Records reviewed by the inspector showed that there was minimal radiation exposure to the environment from the reactor during the past 2 years. The inspector verified that there was no liquid effluent discharged from the reactor facility. Through review of calculations conducted by the licensee, the inspector confirmed that gaseous effluents from the reactor facility were less than 25 percent of the allowed maximum concentrations in 10 CFR Part 20.

c. Conclusion

The inspector determined the RSP satisfied regulatory requirements and environmental monitoring was conducted in accordance with license and regulatory requirements.

5. Design Changes

a. Inspection Scope (IP 69001 – Section 02.08)

To ensure that facility changes were reviewed and approved as required by TS Section 6.2 and 10 CFR 50.59, the inspector reviewed selected aspects of:

- DTRR operation logbooks Nos. 127 through 129
- Dow Annual Operating Reports for 2019 through 2020
- ROC meeting minutes for 2019 through 2021
- DTRR Procedures including: No. 3.2.4, “Reactor Operations Committee – DOW TRIGA Reactor;” and, No. 4.5.3, “Facility Maintenance and Modifications”

b. Observations and Findings

The inspector confirmed that the program for reviewing and evaluating changes to facilities, experiments, and procedures was in place and satisfied NRC requirements. Through review of applicable records and interviews with licensee personnel, the inspector verified that no changes, tests, or experiments, subject to 10 CFR 50.59 requirements, were initiated or completed since the last inspection.

c. Conclusion

The inspector determined that no changes, tests, or experiments occurred since the last inspection.

6. Emergency Planning

a. Inspection Scope (IP 69001 – Section 02.10)

The inspector reviewed the implementation of selected portions of the emergency preparedness program including:

- monthly inventories of emergency equipment
- DTRR E-Plan dated December 4, 2012

- evacuation and emergency planning drills conducted in 2019 through 2021
- emergency response facilities, supplies, equipment, and instrumentation
- Memorandum of Agreement, Office of Emergency Management, County of Midland Michigan, dated March 23, 2021

b. Observations and Findings

The inspector reviewed the emergency facilities, instrumentation, and equipment and confirmed that the emergency response equipment was as described in the E-Plan. Through direct observation, records review, and interviews with emergency organization personnel, the inspector verified that the responders were knowledgeable of the proper actions to take in case of an emergency. The inspector found that all facility personnel received annual emergency response training. The inspector verified that the licensee reviewed the E-Plan and conducted an inventory of the emergency response equipment as required in the E-Plan.

The inspector confirmed that emergency and evacuation drills were conducted annually as required by the E-Plan. The inspector noted that critiques were discussed and written up following each drill to document any issues identified during the exercises.

The inspector toured various facilities at Dow Chemical Midland – Michigan Operations which would be available in case of an emergency at the DTRR. The inspector verified that the Dow Medical Health Services Building, which contained the facility and equipment used to support a response to a contaminated and/or injured worker, was properly equipped and maintained. The inspector interviewed the Associate Health Services Manager and found the individual to be knowledgeable of the facility's emergency support mission and its capabilities. The inspector also toured the Emergency Services and Security (ES&S) headquarters (building 1105), which contains the emergency response equipment and vehicles. The inspector noted that response vehicles were readily available and well equipped, and response personnel were knowledgeable of their support duties. In addition, the inspector visited the Dow ES&S Dispatch Center (building 2010), which is also the location of the Dow Emergency Operations Center. The inspector discussed the functions and capabilities of this facilities with the ES&S personnel. The inspector found everyone to be well trained and the facility to be properly staffed and well maintained.

c. Conclusion

The inspector determined that the emergency preparedness program was implemented in accordance with the licensee's E-Plan and regulatory requirements.

7. Inspection of Transportation Activities

a. Inspection Scope (IP 86740)

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

- DTRR operation logbooks Nos. 127 through 129
- Dow Annual Operating Reports for 2019 through 2020

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector noted that the licensee didn't ship any radioactive material under the reactor license since the previous inspection of transportation activities. The inspector verified that transfers of radioactive material to other Dow facilities, or shipments to other groups, were completed under Dow's Broad Scope License (No. 21-00265-06) by the Radiation Safety group with guidance from the RSO and the Dow Radiation Safety Manual.

c. Conclusion

The inspector determined that no radioactive material shipments were made under the auspices of the reactor license during the past 2 years.

8. Exit Interview

The inspection scope and results were summarized on June 30, 2021, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. 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

S. Brockington	Senior Leader, Dow Emergency Services and Security, Midland – Michigan Operation
N. Goodman	Senior Reactor Operator
M. Groendal	Delivery Leader, Dow Emergency Services and Security, Midland – Michigan Operation
G. Groeschen	Senior Environmental Health and Safety Specialist, Industrial Hygiene Expertise Center and Assistant Radiation Safety Officer
C. Grzegorczyk	Operations Excellence Technologist, Dow Emergency Services and Security, Midland – Michigan Operation
R. Gwizdala	Senior Security Technician, Dow Emergency Services and Security, Midland – Michigan Operation
J. Hadd	Senior Research and Development Leader, Analytical Sciences
B. Haskins	Assistant Reactor Supervisor and Senior Reactor Operator
L. Miller	Nurse Practitioner and Associate Health Services Manager, Dow Medical
K. Raquepaw	Technician, Dispatch, Dow Emergency Services and Security, Midland – Michigan Operation
K. Wegener-Gave	Site and Reactor Facility Radiation Safety Officer
J. Weldy	Reactor Operations Committee member and a Senior Environmental Health and Safety Improvement Manager
S. Yusuf	DTRR Facility Director and Reactor Supervisor

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened:

None

Closed:

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the *Code of Federal Regulations*
DTRR	Dow TRIGA Research Reactor
E-Plan	Emergency Plan
ES&S	Emergency Services and Security
FD	Facility Director
IP	Inspection Procedure
NRC	U.S. Nuclear Regulatory Commission
OSL	Optically Stimulated Luminescent (dosimeter)
ROC	Reactor Operations Committee
RS	Reactor Supervisor
RSO	Radiation Safety Officer
RSP	Radiation Safety Program
TRIGA	Training, Research, Isotopes, General Atomics
TSs	Technical Specifications