NCNR Status Update

04.05.2022

Photo credit: Brian Renegar

Recent Progress

OFFICE OF NUCLEAR REACTOR REGULATION

REGULATORY AUDIT PLAN

REGARDING REVIEW OF THE RESTART REQUEST

FACILITY OPERATING LICENSE NO. TR-5

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

NATIONAL BUREAU OF STANDARDS TEST REACTOR

DOCKET NO 50-184

Background

The U.S. Nuclear Regulatory Commission (NRC) staff is continuing its review of the National Institute of Standards and Technology (NIST, the licensee) request to resume operation of the National Bureau of Standards test reactor (NBSR, the facility), Facility Operating License No. TR-5. The requested action would allow the NBSR to resume operations after exceedance of the cladding temperature safety limit (SL) per Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Section 50.36 "Technical specifications." This regulatory audit is intended to assist the NRC staff in making an independent assessment regarding the decision to permit the restart of the NBSR. This audit will continue the review of the information request in the NRC letter dated November 18, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21294A277).

Regulatory Bases for the Audit

The purpose of this audit is to determine if the licensee's proposed corrective actions, inspections, evaluations, test results, and acceptance criteria conducted in response to the events on February 3, 2021, which resulted in the NBSR exceeding the cladding temperature SL are consistent with the regulation in 10 CFR Part 50 and addresses applicable guidance provided in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Part 2, "Standard Review Plan and Acceptance Criteria," (ADAMS Accession No.: ML042430048).

Regulatory Scope for the Audit

The NRC staff will conduct initial teleconference and/or video conference supported discussions with NIST. As facilitated in part by the online portal discussed below, the NRC staff will also audit inspection and review documents to gain a better understanding of the information related to the restart request. Additionally, NRC staff will visit and tour (as necessary) the NBSR in Gaithersburg, Maryland, to gain further understanding of the proposed corrective actions, review the NBSR test results and acceptance criteria to ensure safe operations, and review processes and procedures for the safe operation of the NBSR. The NRC may request access to the contractor facility where testing and evaluations are conducted.

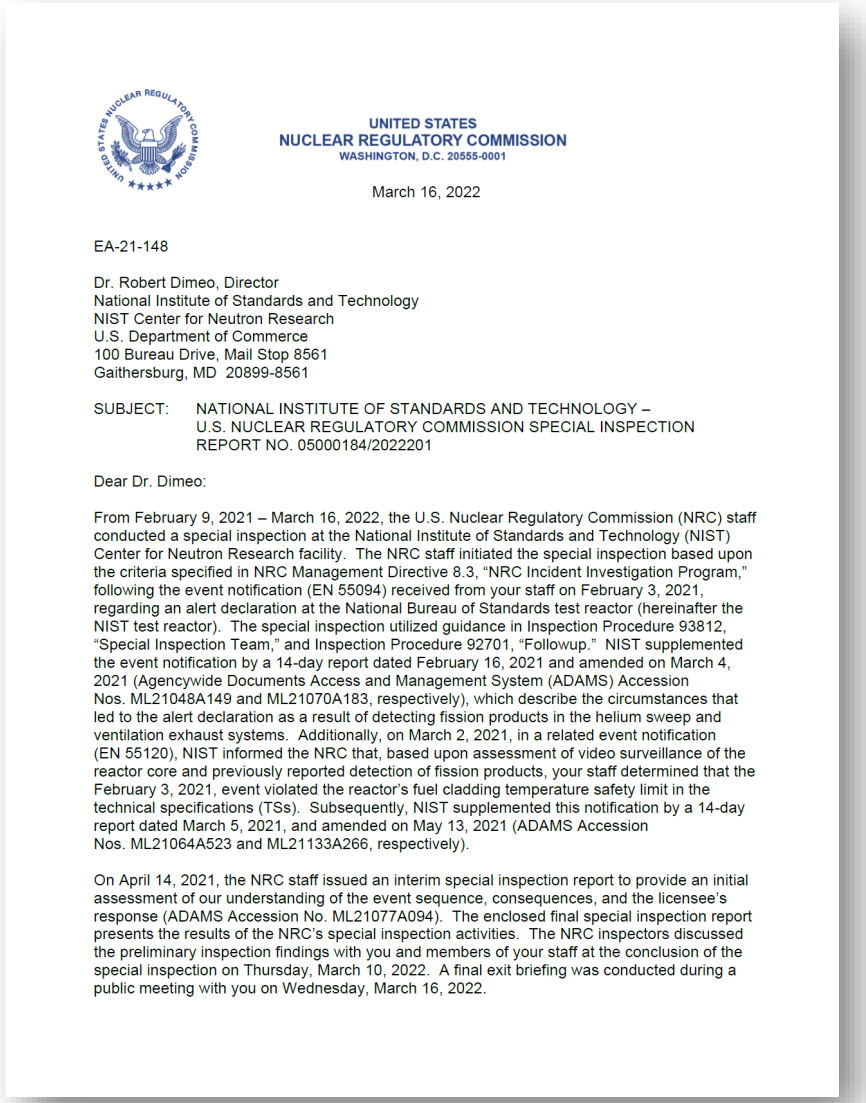
Submitted documents and request to restart to NRC (10.01)

→ Responding to audit questions

Bulk debris cleanup completed Feb 6

External review complete

NRC Special Inspection Report Issued



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

March 16, 2022

EA-21-148

Dr. Robert Dimeo, Director
National Institute of Standards and Technology
NIST Center for Neutron Research
U.S. Department of Commerce
100 Bureau Drive, Mail Stop 8561
Gaithersburg, MD 20899-8561

SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY – U.S. NUCLEAR REGULATORY COMMISSION SPECIAL INSPECTION REPORT NO. 05000184/2022201

Dear Dr. Dimeo:

From February 9, 2021 – March 16, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff conducted a special inspection at the National Institute of Standards and Technology (NIST) Center for Neutron Research facility. The NRC staff initiated the special inspection based upon the criteria specified in NRC Management Directive 8.3, "NRC Incident Investigation Program," following the event notification (EN 55094) received from your staff on February 3, 2021, regarding an alert declaration at the National Bureau of Standards test reactor (hereinafter the NIST test reactor). The special inspection utilized guidance in Inspection Procedure 93812, "Special Inspection Team," and Inspection Procedure 92701, "Followup." NIST supplemented the event notification by a 14-day report dated February 16, 2021 and amended on March 4, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML21048A149 and ML21070A183, respectively), which describe the circumstances that led to the alert declaration as a result of detecting fission products in the helium sweep and ventilation exhaust systems. Additionally, on March 2, 2021, in a related event notification (EN 55120), NIST informed the NRC that, based upon assessment of video surveillance of the reactor core and previously reported detection of fission products, your staff determined that the February 3, 2021, event violated the reactor's fuel cladding temperature safety limit in the technical specifications (TSs). Subsequently, NIST supplemented this notification by a 14-day report dated March 5, 2021, and amended on May 13, 2021 (ADAMS Accession Nos. ML21064A523 and ML21133A266, respectively).

On April 14, 2021, the NRC staff issued an interim special inspection report to provide an initial assessment of our understanding of the event sequence, consequences, and the licensee's response (ADAMS Accession No. ML21077A094). The enclosed final special inspection report presents the results of the NRC's special inspection activities. The NRC inspectors discussed the preliminary inspection findings with you and members of your staff at the conclusion of the special inspection on Thursday, March 10, 2022. A final exit briefing was conducted during a public meeting with you on Wednesday, March 16, 2022.

NRC public meeting and report released on March 16th

"Observation" meeting in which attendees have an opportunity to observe the NRC performing its regulatory function or discussing regulatory issues.

7 apparent violations

Next step: *Alternative Dispute Resolution*

Outcome: Final confirmatory order to NIST

What's Next?


Filter elements received

cleanup

Filter primary coolant system (Apr)
Inspect/clean fuel elements (Apr)

All corrective actions funded
Restore reactor to operational readiness

NIST response to external review
NRC issues decision on restart request

Schedule user experiments


March 11, 2022 - President signs FY2022 omnibus spending bill. Official White House Photo by Adam Schultz

Restart Date

Restart = Technical Readiness **&** NRC Authorizes Restart

Technical Readiness

Assumptions:

- Primary filtering goes perfectly
- Fuel cleaning and qualification goes perfectly

Low power testing: mid-June
Neutron production: mid-July

NRC

Enforcement action process
Verify implementation of enforcement actions
License amendment approval
Complete required regulatory inspections

Uncertainties potentially affecting 2022 restart

Risk item	Probability	Potential impact
Cleanup of ~~reactor vessel and~~ primary does not go as planned	Medium	High
Fuel elements cannot be reused	Low	High
Procedure revisions required for startup delayed	Medium	Low
Additional corrective actions from external review impacts restart	Medium	Medium
~~Thermal column survey impacts restart~~	~~Medium~~	~~Low~~
~~Insufficient funds to implement corrective actions~~	~~Low~~	~~High~~
Protracted license amendment disposition	~~Medium~~ Low	Medium
NRC does not authorize restart • Not satisfied with corrective actions • Not satisfied with progress towards corrective actions	Medium	High

Note: COVID continues to be a risk that could lead to delays in several of the items above

Facility Upgrades and 2023 Outage

Major benefit to scientific community

NCNR down for 11 months starting in January 2023

Replace H_2 cold source with new D_2 source

- Use cold neutrons for larger structures & slower motions
- With D_2 we will fully moderate thermal neutrons
- ~ 2x gain for all 20 guide hall instruments

Replace neutron guides 5, 6, & 7

- 30-year old ^{58}Ni guide replaced with modern supermirror guides
- ~ 2x-10x gain in data rate

New instruments

- NSF-funded Neutron Spin Echo 2 (2024, ~10x NSE data rate)
- Cold Neutron 3-axis (2027, ~ 10x – 100x SPINS data rate)

On-going facility upgrades: https://www.nist.gov/ncnr/ncnr-facility-upgrades