



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

November 18, 2021

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 –
SUPPLEMENTAL INFORMATION NEEDED FOR THE REQUEST TO
RESTART THE NATIONAL BUREAU OF STANDARDS TEST REACTOR
FOLLOWING EXCEEDANCE OF THE CLADDING TEMPERATURE SAFETY
LIMIT (EPID L2021LLN0000)

Dear Dr. Dimeo:

The purpose of this letter is to acknowledge receipt of your restart authorization request and to identify supplemental information needed by the U.S. Nuclear Regulatory Commission (NRC).

By letter dated October 1, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21274A027), with enclosures (ADAMS Package Accession No. ML21274A018), the National Institute of Standards and Technology requested NRC authorization to restart the National Bureau of Standards test reactor (NBSR). The requested authorization would allow the resumed operations of the NBSR, following its shutdown on February 3, 2021, when the NBSR experienced an event in which the cladding temperature safety limit was exceeded. Title 10 of the *Code of Federal Regulations* Section 50.36(c)(1)(i)(A) requires that the NBSR remain shut down until restart is authorized by the NRC following the exceedance of a safety limit.

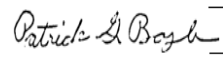
The restart request included enclosures providing information related to the root cause investigation, improvements to the fuel handling tool latching mechanism, and planned corrective actions to be completed before and after the restart of the NBSR. The enclosures were provided to support the request for NRC authorization to resume operations of the NBSR.

The NRC staff reviewed your restart request and determined that the information delineated in the enclosure to this letter is necessary to inform the NRC's independent assessment of whether to authorize restart of the NBSR. Review of the information in the restart request is one step in a multi-part process. The authorization decision will be informed by various factors, including the findings of the technical review, inspection activities (e.g., Special Inspection, restart readiness inspections, etc.), and additional information needs identified during the review process. Receiving the information delineated in the enclosure will allow the NRC staff to expeditiously continue its detailed technical review and will be used to inform the review schedule.

The NRC staff discussed the enclosure and the timeframe for providing a supplement with you and Thomas Newton, Deputy Director on October 20, 2021.

If you have any questions, please contact me at (301) 415-3936, or by electronic mail at Patrick.Boyle@nrc.gov.

Sincerely,

 Signed by Boyle, Patrick
on 11/18/21

Patrick G. Boyle, Project Manager
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No 50-184
License No. TR-5

Enclosure:
As stated

cc: See next page

National Institute of Standards and Technology

Docket No 50-184

cc:

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Radiological Health Program
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Power Plant Siting Program
Energy and Coastal Zone Administration
Tawes State Office Building
Annapolis, MD 21401

President
Montgomery County Council
100 Maryland Avenue
Rockville, MD 20850

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

Dr. Thomas H. Newton, Deputy Director
National Institute of Standards and
Technology
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SUPPLEMENTAL INFORMATION NEEDED FOR THE REQUEST TO
RESTART THE NATIONAL BUREAU OF STANDARDS TEST REACTOR
FOLLOWING EXCEEDANCE OF THE CLADDING TEMPERATURE SAFETY
LIMIT (EPID L2021LLN0000) DATED: NOVEMBER 18, 2021

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ADAMS Accession No. ML21294A277

NRR-088

OFFICE	NRR/DANU/PM	NRR/DANU/LA	OGC/NLO	NRR/DANU/BC	NRR/DANU/PM
NAME	PBoyle	NParker	JWatchutka	JBorromeo	PBoyle
DATE	10/21/2021	10/21/2021	10/25/2021	11/18/2021	11/18/2021

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OFFICE OF NUCLEAR REACTOR REGULATION
SUPPLEMENTAL INFORMATION NEEDED FOR
THE REVIEW OF THE REQUEST TO RESUME REACTOR OPERATIONS
NATIONAL BUREAU OF STANDARDS TEST REACTOR
LICENSE NO. TR-5; DOCKET NO 50-184

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the National Institute of Standards and Technology (NIST) request for authorization to restart the National Bureau of Standards test reactor (NBSR) and determined that the following additional information is necessary to inform the NRC's independent assessment of whether to authorize restart of the NBSR:

1. In Enclosure 6, "Memorandum on Recovery Items" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21274A024), NIST stated that a contract has been awarded to clean the reactor upper and lower grid plates. In the NRC special inspection team interim report (ADAMS Accession No. ML21077A094), the inspectors observed the presence of once molten material deposited on the lower grid surfaces. Enclosure 6 does not include a discussion specifically related to an assessment to examine additional components such as, but not limited to, shim arm extensions, fuel element transfer chute, and the lower grid plate.
 - a. Describe how these components were examined or, if they were not examined, provide a justification that the event did not impact these components.
 - b. Discuss if non-destructive examinations are planned for these components or, if none are planned, provide a justification that the event did not impact these components.
2. The restart request included lists of planned inspections; however, the request did not describe the details of these future inspections.
 - a. Describe the major activities and evaluations that are part of these inspections and provide the associated acceptance criteria to demonstrate that the scope and depth of these activities are sufficient to ensure the safe operation of the facility.
 - b. Describe how NIST intends to use the results of the inspections to inform its assessment of the components in the surrounding area.
 - c. Describe how NIST will determine if there are any residual issues from the damaged fuel element.
 - d. Additionally, to support NRC schedule planning, provide the dates for the planned inspections.

3. In Enclosure 5, "Latch Improvement Safety Analysis" (ADAMS Accession No. ML21274A023), NIST identified improvements in the latching process. However, this enclosure did not include a description of how the improvements in the latching process will be demonstrated prior to restart. Describe the plans for demonstrating the improved latching process, and training reactor operators, prior to restart.
4. The restart request and enclosures did not identify the actions to prevent inadvertent unlatching of a fuel element by the pickup tool during reactor startup activities. Describe the actions that NIST plans to take during reactor startup activities to prevent inadvertent unlatching of a fuel element.
5. In Enclosure 7, "Corrective Actions Required Prior to Reactor Startup" (ADAMS Accession No. ML21274A025), NIST indicated that Corrective Action IE-CA-2 for the improved latching process is complete. Describe the activities that were implemented to verify the effectiveness of the improved latching process, including long-term plans to incorporate the improvements in the latching process into operator training and each future reactor startup.
6. Many of the proposed corrective actions reference procedure enhancements, however, procedure enhancement appears to be inconsistent with the root cause evaluations related to lack of procedure use. Describe how NIST plans to address reinforcement of procedure use during complex or infrequent evolutions.
7. The restart request and enclosures did not describe the multiple coolant pump starts and the need to reperform latching inspections. Provide an evaluation of the impact of restarting the pump multiple times, including the potential effect on latched fuel elements.
8. In Enclosure 4, "Root Cause Response" (ADAMS Accession No. ML21274A022), NIST included: "QT-CA-4: Provide consistent and structured training and immediate and continual feedback to trainees during OTJ [on the job] training to ensure comprehension of performance expectations," and "QT-SPI-3: Continuously evaluate and revise the training based on the performance of licensed SROs [senior reactor operators] on the job."
 - a. Describe how NIST will ensure, test, and measure the proficiency of operator training (including fuel movements and latching) consistent with the root cause "QT-CA-4" and "QT-SPI-3" responses.
 - b. Describe how the training will be incorporated into future operator actions, including enhanced procedure use.
9. NIST discussed in the restart request that technical specification (TS) 3.9.2.1 (1) is not an effective means to ensure that the fuel element is latched between the reactor grid plates. Therefore, it appears that a license amendment revising TS 3.9.2.1 may be necessary prior to the NRC authorizing restart. Provide an assessment of the existing TS and plans related to a license amendment request to revise the TS if it is deemed necessary to ensure safe reactor operation.

10. In Enclosure 6, NIST indicated that a fuel reuse evaluation is underway.
 - a. Provide details about the studies performed to support this evaluation.
 - b. Identify and provide a technical justification for the specific conditions under which the existing fuel elements can be reused.
 - c. Provide calculation notes or files associated with the analysis of foreign particle size and the effect of reactor coolant flow on the remaining elements.
 - d. Identify and describe the analytic methods used for these analyses.
 - e. Provide information demonstrating that the methods used for these analyses are appropriately qualified.
 - f. Provide additional detail concerning the status and plan for these analyses, given that the paragraph concludes with the statement that "This work will be performed under the SATOC [Single Award Task Order Contract]."
11. In Enclosure 6, NIST indicated that an engineering study of future redesign of the fuel head is underway. State whether the redesign is necessary prior to the restart of the reactor. If so, provide additional detail about this engineering study, including specifically how the study will evaluate the impact of such a redesign on the thermal-hydraulic and mechanical performance of the fuel bundles.
12. In Enclosure 8, NIST indicated that Corrective Action MS-CA-3 provides the assessment of the efficacy of all tools. In addition, Corrective Action IE-SPI-2 requires the tool manufacturer to provide accurate dimensional inspection reports to be completed after the restart of the NIST reactor. Identify the date when the NRC will be notified of the completion of these corrective action items for potential follow-up review by the NRC staff.