NIST Test Reactor Restart Review

NRC Public Meeting

March 2, 2023

Agenda

- Welcome and Introductions
- NIST Introductory Remarks
- Discussion of NRC Review
- Opportunity for Members of the Public to Ask the NRC Staff Questions
- Closing Remarks
- Adjourn

NRC Opening Remarks

Rob Taylor
Deputy Director for New Reactors
Office of Nuclear Reactor Regulation

NIST Opening Remarks

NRC Review of NIST Restart Request

Jeremy Bowen
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Office of Nuclear Reactor Regulation

NRC Preparing to Authorize Restart of the NIST Test Reactor

- Safety systems and components were unaffected and will perform as intended
- Corrective actions and enhancements will preclude recurrence of a similar event
- Additional planned actions provide further enhancements to safety
- Increased NRC oversight of the facility will continue

Restart Decision

- The NRC staff is finalizing a formal memorandum to NIST describing the NRC's decision on restart
- The basis for the staff’s decision will be detailed in a technical evaluation report attached to the memo
- An inspection report will be issued in parallel, documenting NRC review of corrective actions and ongoing oversight
- Pending receipt of the restart authorization, NIST must still finish loading fuel in the core and begin controlled power ascension and operation under increased NRC oversight

Josh Borromeo
NPUF Licensing Branch Chief
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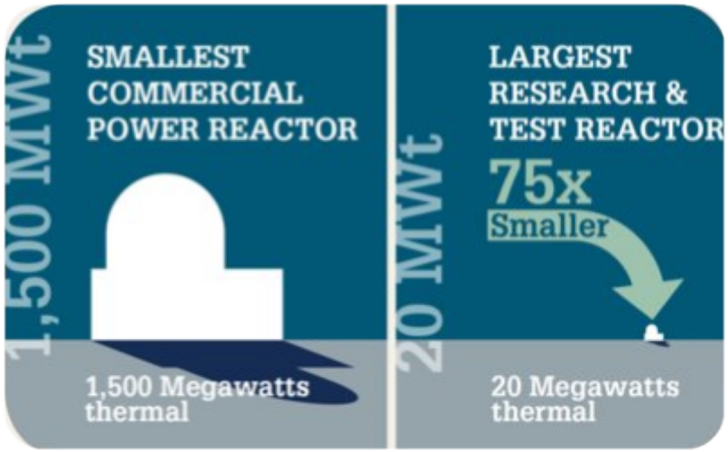
NIST Test Reactor Background

- Located on the NIST campus in Gaithersburg, MD
- Normally Operated 24/7
  - Refueling ~50 days
- Plate-type fuel with 34 plates per element and up to 30 elements in the core
- Non-pressurized heavy water primary cooling system with helium cover gas
- Carbon and HEPA filtered emergency exhaust ventilation and recirculation cleanup



Event Overview

- On February 3, 2021, operators were raising power level from 10 MW to 20 MW
- Immediately after beginning the power ascension, there was increasing radioactivity at the building exhaust stack monitor which automatically shutdown the reactor
- All safety systems functioned properly and there were no significant radiological consequences for NIST workers, the public, or the environment
- The direct cause of the event is attributed to a fuel element that was not properly latched in place which resulted in the element being displaced and overheating

No Offsite Consequences

- Fuel temperature safety limit (450°C) was exceeded based on observations of small amount once molten fuel material present on the lower grid plate
- Radiation doses onsite were a small fraction of the regulatory limits for members of the public, with even lower doses beyond NIST property
  - Less than a fraction of a millirem measured at site boundary and confirmed by the staff
    - standard chest x-ray is about 10 mrem
    - regulatory limit is 100 mrem/year

Causes of the Event Understood

- NIST submitted a request to restart the facility which included root causes and corrective actions
  - 7 root causes and 23 corrective actions were identified
- The NRC special inspection team (SIT) evaluated the root causes and corrective actions and identified necessary improvements
- Following the SIT, the NRC staff and NIST agreed to a series of additional corrective actions to enhance safety, which were memorialized in a confirmatory order on August 1, 2022

NRC's Review of Restart Request

- The NRC staff's review of the event and the licensee's subsequent corrective actions are documented in a technical evaluation report
- The NRC staff ensured there was no functional damage, which included:
  - the effectiveness of NIST's clean-up activities in removing sufficient debris from the reactor vessel and reactor vessel internals to confirm structures, systems, and components can perform their functions,
  - the primary coolant system will perform its intended design function with the potential remaining debris; and
  - NIST will not reuse any fuel that was in the core at the time of the event
- The NRC also reviewed the limiting safety system settings and maximum hypothetical accident and confirmed both continue to meet regulatory requirements and are adequate

License Amendments to Support Restart Decision

- An amendment to revise the fuel element latch verifications in technical specifications to address a root cause of the event
- An amendment to modify Safety Analysis Report to address potential debris remaining in the primary coolant system
- An amendment on core load methodology authorizing the method used for the use of additional fresh fuel elements

Travis Tate

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Office of Nuclear Reactor Regulation

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

NRC Oversight of NIST

- NIST has been under enhanced NRC oversight since the February 3, 2021, event
- A special inspection was performed following the event to understand the direct and contributing causes
- Apparent violations of NRC regulatory requirements were included in the associated inspection report and informed NIST's corrective actions
- The NRC staff conducted inspections to assess the effectiveness of completed corrective actions and support NIST's ability to safely restart
- A confirmatory order was issued on August 1, 2022, outlining additional actions required to be completed by NIST

NRC Inspection Areas

- Emergency response (equipment, procedures)
- Fueling, defueling, latching procedures
- Primary system clean-up and restart core
- Start-up and abnormal conditions procedures
- Operator and supervisor training
- Safety Culture

Future NRC Inspection and Oversight

- A supplemental inspection plan was issued on August 1, 2022, outlining NRC enhanced oversight activities
- The NRC staff will continue to assess NIST's implementation of corrective actions, confirm completion of all confirmatory order actions, and document the results in inspection reports
- Increased oversight of the NIST reactor will continue until routine inspections are appropriate

Question and Answer Session

List of Acronyms

ADR-alternative dispute resolution

CO-confirmatory order

HEPA-high efficiency particulate air

mrem-millirem

MW-megawatt

NIST-National Institute of Standards and Technology

NRC-U.S. Nuclear Regulatory Commission

NPUF-non-power production and utilization facilities

SIT-special inspection team

TER-technical evaluation report

TS-technical specifications