

**REQUEST FOR ADDITIONAL INFORMATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
297-NC STATE LICENSE RENEWAL AND POWER UPRATE
NORTH CAROLINA STATE UNIVERSITY AT RALEIGH
NORTH CAROLINA STATE UNIVERSITY, UNIT 1
DOCKET NO. 05000297
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Background

The U.S. Nuclear Regulatory Commission (NRC) staff is continuing its review of the North Carolina State University (NCSU) PULSTAR Nuclear Research Reactor license renewal application (LRA) letter, dated February 24, 2017 (Agencywide Documents Access and Management System Accession No. ML17088A819). Included with the NCSU LRA was the Safety Analysis Report (ML17201Q129 - redacted version). In reference to the Pool Inlet Break and Pool Outlet Break Loss-of-Coolant Accident scenarios performed by NCSU for their PULSTAR reactor safety analysis that drain the reactor pool and result in air cooling of the fuel (NCSU letter dated February 2, 2022 (ML22033A245) and supplemented in letter dated June 7, 2022 (ML22159A237), the NRC staff requires the following additional information to continue its review of the LRA. We request that you provide responses within 30 days from the date of this letter.

These requests for additional information have been developed based on the following requirements and guidance applicable to the NCSU LRA:

- Title 10 of the Code of Federal Regulations (10 CFR).
- Part 20, "Standards for Protection against Radiation," of 10 CFR require that radiation doses to workers and members of the public be limited. To support meeting the public dose limits, 10 CFR Part 20, also limits the release of radioactive materials from the licensed facility to the environment (e.g., 10 CFR Part 20, Appendix B, Table 3).
- Section 50.9, "Completeness and accuracy of information," of 10 CFR require that information provided to the Commission by a licensee shall be complete and accurate in all material respects.
- NUREG-1537 Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Format and Content," issued February 1996 (ADAMS Accession No. ML042430055).
- NUREG-1537 Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Standard Review Plan and Acceptance Criteria," issued February 1996 (ADAMS Accession No. ML042430048).

Question 1

Degradation of the NCSU PULSTAR reactor, the reactor coolant systems, and associated components is a function of time, pressure, temperature, and stress. The NCSU PULSTAR operates at atmospheric pressure (SAR 4.3) and nominal pool temperature of 70 °F-105°F (SAR Table 4-9) and therefore these factors in a reactor environment are not significant. However, the reactor and its systems have been in service for approximately 60 years and the NRC staff need reasonable assurance of its continued operability and reliability, e.g., that the chances of a pipe

failure and material degradation are highly unlikely, to allow the NRC staff to make a determination that these components and materials are not highly susceptible to failure over time.

- Provide a detailed description of the NCSU PULSTAR reactor coolant system to include information such as:
 - a. Joint designs and related specifications.
 - b. Pipe diameter and wall thickness (nominal and any measurements since installation, if performed).
 - c. All welding information such as material classification, material type and weld inspection records from original construction.
 - d. All piping, fittings, and valves primary material specifications and material type.
 - e. Design and any related specifications for all piping supports.
- Provide diagrams/drawings that shows all locations where the piping system penetrates the NCSU PULSTAR reactor pool and any other structures (such as walls and piping supports).
- Provide any history of deviation from the specified NCSU PULSTAR reactor pool water chemistry limits and operating temperature and the corrective action taken.

Question 2

Although a Certified Material Test Report (CMTR) is not required for a Non-Power Production and Utilization Facility (NPUF), provide an equivalent written report or an equivalent quality assurance (QA) documentation that contains data and information that attests to the actual physical and chemical properties of the primary coolant system piping, fittings, and weld materials.

Question 3

Describe in detail any degradation of piping materials that is known or suspected to have occurred in the NCSU PULSTAR reactor. Discuss any other recurrence of this type of material degradation at other research and test reactors, if known, and how they apply to the NCSU PULSTAR reactor.

Question 4

The NCSU PULSTAR reactor primary coolant system is comprised of the reactor pool and liner, the ¹⁶N delay tanks, the primary pump, the heat exchanger, a purification loop and associated piping (SAR 5.2). The primary coolant loop is modeled with primary components including the ¹⁶N decay tank, coolant pump, heat exchanger and pipes connecting the components (SAR 4.6.2.1). Provide the frequency of the primary coolant loop utilization during reactor operation. Specify in your response the frequency when the primary coolant loop line has operated with:

- a. No water flow (not in use).
- b. Low water flow.
- c. Stagnant water flow.

Question 5

A "code of construction," also commonly referred to as a "building code," is a set of regulations established by local or state governments that define minimum standards for the design and construction of buildings, aiming to protect public health and safety by ensuring structures meet requirements for structural integrity, fire safety, plumbing, electrical systems, and accessibility features. Provide the "code of construction/building code(s)" used for the NCSU PULSTAR reactor pool and the primary coolant loop if different from the references given in SAR 3.1.3 and SAR 3.1.5.

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