



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

October 18, 2018

Dr. Ayman I. Hawari, Director
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
2500 Stinson Drive
Campus Box 7909
Raleigh, NC 27695-7909

SUBJECT: NORTH CAROLINA STATE UNIVERSITY – REQUEST FOR ADDITIONAL
INFORMATION RE: LICENSE RENEWAL APPLICATION FOR FACILITY
OPERATING LICENSE NO. R-120 FOR THE NORTH CAROLINA STATE
UNIVERSITY PULSTAR RESEARCH REACTOR (EPID NO. L-2017-RNW-0026)

Dear Dr. Hawari:

The U.S. Nuclear Regulatory Commission (NRC) staff is continuing its review of the North Carolina State University (NCSU) PULSTAR Research Reactor license renewal application (LRA) letter, dated February 24, 2017 (a copy is available on the NRC's public website at www.nrc.gov under Agencywide Documents Access and Management System (ADAMS) Accession No. ML17088A819). Included with the NCSU LRA was the Safety Analysis Report (ADAMS Accession No. ML17201Q129 - redacted version), the Financial Qualifications Report (ADAMS Accession No. ML17088A828), the Environmental Report (ADAMS Accession No. ML17088A836) and the Reactor Operator Training and Requalification Program (ADAMS Accession No. ML17088A840).

The NRC staff has reviewed the NCSU proposed LRA and identified the items in the attached enclosure, which need additional information or clarification. We request that you provide responses within 60 days from the date of this letter.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 50.30(b), "Oath or affirmation," NCSU must execute its response in a signed original document under oath or affirmation. The response must be submitted in accordance with 10 CFR 50.4, "Written communications." Information included in your response that is considered sensitive or proprietary, that you seek to have withheld from the public, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any safeguards information included in your response should be submitted in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements." Following receipt of the additional information, the NRC staff will continue its evaluation of the renewal request application.

If you have any questions, or need additional time to respond to this request, contact me at 301-415-3724, or by electronic mail at Duane.Hardesty@nrc.gov.

Sincerely,

R/A

Duane A. Hardesty, Senior Project Manager
Research and Test Reactors Licensing Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket No. 50-297
License No. R-120

Enclosure:
As stated

cc: See next page

North Carolina State University

Docket No. 50-297

cc:

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SUBJECT: NORTH CAROLINA STATE UNIVERSITY – REQUEST FOR ADDITIONAL INFORMATION RE: LICENSE RENEWAL APPLICATION FOR FACILITY OPERATING LICENSE NO. R-120 FOR THE NORTH CAROLINA STATE UNIVERSITY PULSTAR RESEARCH REACTOR (EPID NO. L-2017-RNW-0026)
 DATE: OCTOBER 18, 2018

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ADAMS Accession No. ML18268A358 * concurrence via email **NRR-088**

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OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION REGARDING
LICENSE RENEWAL FOR THE
NORTH CAROLINA STATE UNIVERSITY-PULSTAR REACTOR
LICENSE NO. R-120; DOCKET NO. 50-297

The U.S. Nuclear Regulatory Commission (NRC) staff is continuing its review of the North Carolina State University (NCSU) PULSTAR Research Reactor license renewal application (LRA) letter, dated February 24, 2017 (a copy is available on the NRC's public website at www.nrc.gov under Agencywide Documents Access and Management System (ADAMS) Accession No. ML17088A819). Included with the NCSU LRA was the Safety Analysis Report (SAR) (ADAMS Accession No. ML17201Q129 - redacted version), the Financial Qualifications Report (ADAMS Accession No. ML17088A828), the Environmental Report (ADAMS Accession No. ML17088A836), and the Reactor Operator Training and Requalification Program (ROTRP) (ADAMS Accession No. ML17088A840). The NRC staff has reviewed the NCSU proposed LRA and identified the items below which need additional information or clarification. We request that you provide responses within 60 days from the date of this letter.

These RAIs have been developed based on the following requirements applicable to the NCSU LRA:

- The regulations in Title 10 of the *Code of Federal Regulations* (10 CFR).
- The regulations in 10 CFR Part 20, "Standards for Protection against Radiation," 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).
- The regulations in 10 CFR 50.9, "Completeness and accuracy of information," require that information provided to the Commission by a licensee shall be complete and accurate in all material respects.
- The regulations in 10 CFR 50.21, "Class 104 licenses; for medical therapy and research and development facilities," provides, in part, the definition for a class 104 license for a utilization facility useful in the conduct of research.
- The regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," provides requirements for environmental protection regulations applicable to NRC's domestic licensing and related regulatory functions.
- The regulations in 10 CFR Part 55, "Operators' Licenses," provided requirements for the issuance of operator licenses for utilization facilities.

Enclosure

Financial Qualifications Report (ADAMS Accession No. ML17088A828)

1. The NCSU LRA Financial Qualifications Report provided annual funding and operating expenditures, in Table 1, "PULSTAR Reactor Facility Annual Funding," and annual operating expenditures in Table 2, "PULSTAR Reactor Facility Annual Operating Expenditures," for fiscal years 2018 through 2022. However, based on the financial information provided, as referenced above, the NRC staff is unable to verify that the PULSTAR facility continues to operate within the definition of 10 CFR 50.21 as a class 104(c) research facility.

The regulations in 10 CFR 50.21(c), provide the definition of a class 104(c) facility, and which states, that the facility is "a production or utilization facility, which is useful in the conduct of research and development activities of the types specified in section 31 of the [Atomic Energy] Act, and which is not a facility of the type specified in paragraph (b) of this section or in [10 CFR] 50.22." Regulations in 10 CFR 50.22 state, in part, "that in the case of a production or utilization facility which is useful in the conduct of research and development activities of the types specified in section 31 of the [Atomic Energy] Act, such facility is deemed to be for industrial or commercial purposes if the facility is to be used so that more than 50 percent of the annual cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training."

Provide a confirmatory statement that no more than 50 percent of the cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training or justify why no changes are needed.

Environmental Report (ADAMS Accession No: ML17088A836)

2. The NCSU LRA letter (ADAMS Accession No: ML17088A819) requested a power level increase of its Facility Operating License from 1.0 megawatt (MWt) to 2.6 MWt. Included in the LRA environmental report (ER), Section 4, "Environmental Effects of Facility Operation," was the following statement: "Operation of the reactor at 2 MW will not cause a significant increase in radiation levels or effluent." The NRC staff is not clear if the ER was performed at the proposed 2.0 MWt or 2.6 MWt power levels.

The regulations in 10 CFR 51.45(c) contain the requirements for an applicant's ER, and states that an ER "...should contain sufficient data to aid the Commission in its development of an independent analysis."

Provide an updated ER with an environmental impact analysis that describes the operational changes associated with the proposed power level increase including effluents, doses, cooling demand, makeup water usage, and waste generation, including batch discharges to the sanitary sewer for operation at the proposed power level of 2.6 MWt, or justify why no changes are needed.

Note: The updated ER should properly bound the impacts commensurate with the proposed power level increase, including reference to a documented analysis methodology that identifies assumptions and accounts for any margins for instrument inaccuracies and measurement uncertainty in determining maximum power for the analysis.

Safety Analysis Report (ADAMS Accession No: ML17201Q129)

3. The NCSU LRA requested a power level increase from 1.0 MWt to 2.6 MWt. Included in LRA SAR, Section 11, "Radiation Protection Program and Waste Management," were radiation dose calculations that appear to assume operation at 2.0 MWt. The NRC staff is not clear if the dose calculations were performed at 2.0 MWt rather than the proposed 2.6 MWt power level.

The regulations in 10 CFR Part 20 require that doses to workers and members of the public be limited. LRA SAR Section 11 provided various dose calculations that would be necessary to make this determination (i.e., the concentrations of and the doses to workers/members of the public from any radiological effluents).

Provide clarification that the dose calculations provided in LRA SAR Section 11 comply with the limits in 10 CFR Part 20 for the proposed power level increase of 2.6 MWt or justify why no changes are needed.

Reactor Operator Training and Requalification Program (ADAMS Accession No. ML17088A840)

4. The regulations in 10 CFR 55.59, "Requalification," paragraph (a)(2) state: "Each licensee shall — Pass a comprehensive requalification written examination and an annual operating test."

ROTRP Section 2.c states, in part: "The responsibility for this program rests with the Manager of Engineering and Operations (or a duly authorized representative). This responsibility shall cover the following items: (c) Granting of exemptions to the requalification program as provided for in this plan."

The "granting of exemptions to the requalification program" statement is not explained anywhere in the ROTRP. Revise the ROTRP to clarify the use of this statement or justify why no changes are needed.

5. The regulations in 10 CFR 55.59(c)(4)(iii) state: "The requalification program must include — Systematic observation and evaluation of the performance and competency of licensed operators and senior operators by supervisors and/or training staff members, including evaluation of actions taken or to be taken during actual or simulated abnormal and emergency procedures."

ROTRP Section 3.f states, in part: "For the first 12 month interval and for the second 12 month interval of the 24 month period, the licensed individual shall (f) Complete a review of documents, including abnormal and emergency procedures."

ROTRP Section 5, "Evaluation," makes no mention of how the licensee is going to meet the requirements in 10 CFR 55.59(c)(4)(iii). Revise the ROTRP to state how the 10 CFR 55.59(c)(4)(iii) requirements will be satisfied or justify why no changes are needed.

Supporting Information

6. The regulations in 10 CFR 50.9, "Completeness and accuracy of information," require that information provided to the Commission by a licensee shall be complete and accurate in all material respects.

The NRC staff, in its review of the NCSU LRA, finds that the following supporting information is necessary to continue its review:

- a. North Carolina State University PULSTAR Reactor, "Safety Analysis for Assessing 2 MW Power Upgrade for the NCSU PULSTAR Reactor," March 2017.
- b. North Carolina State University, Burlington Hall Research Reactor Piping Upgrade Final Engineering Report, Enercon Services, October 2013.
- c. North Carolina State University PULSTAR Reactor, Calculation No. NRP-98-01-Criticality Analysis for a 250 Fresh Fuel Pin Storage Rack, December 1998 (SAR Reference 13-11).
- d. Hey, B.E., Computation of Delayed Fission Product Gamma Ray Dose Rates for NCSU PULSTAR Using Monte Carlo Number Albedo Approach, Master Thesis, 1984 (SAR Reference 13-16).

Provide the following information or justify why the supporting information cannot or will not be provided.