



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

September 21, 2021

Dr. Ayman I. Hawari, Director  
Nuclear Reactor Program  
Department of Nuclear Engineering  
North Carolina State University  
Campus Box 7909  
2500 Stinson Drive  
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 PULSTAR NUCLEAR RESEARCH  
REACTOR (EPID: L-2020-NFR-0007)

Dear Dr. Hawari:

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 (ADAMS) Accession No. ML17088A819). Included with the NCSU LRA was the safety analysis report (ADAMS Accession No. ML17201Q129), and the environmental report (ADAMS Accession No. ML17088A836). The requested licensing action would renew the facility operating license for a period of 20 years.

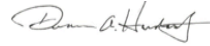
The NRC staff has reviewed the NSCU proposed LRA and identified the items in the enclosure, which need additional information or clarification. We request that you provide responses within 30 days from the date of this letter.

The response to the request for additional information (RAI) must be submitted in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.4, "Written communications," and pursuant to 10 CFR 50.30(b), "Oath or affirmation," be executed in a signed original document under oath or affirmation. Information included in the response that you consider sensitive or proprietary, and seek to have withheld from public disclosure, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any information related to safeguards 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 LRA. In the case that the NRC staff requires additional information beyond that provided in the response to this RAI, the NRC staff will request that information by separate correspondence.

If you have any questions regarding the NRC staff's review or if you intend to request additional time to respond, please contact me at 301-415-3724, or by electronic mail at [Duane.Hardesty@nrc.gov](mailto:Duane.Hardesty@nrc.gov).

Sincerely,



Signed by Hardesty, Duane  
on 09/21/21

Duane Hardesty, Senior 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. 50-297  
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 PULSTAR NUCLEAR RESEARCH REACTOR (EPID: L-2020-NFR-0007) DATED: SEPTEMBER 21, 2021

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**ADAMS Accession No. ML21244A336**

**NRR-088**

OFFICE	NRR/DANU/UNPL/PM	NRR/DANU/UNPL/LA	NRR/DANU/UNPL/BC	NRR/DANU/UNPL/PM
<b>NAME</b>	DHardesty	NParker	JBorromeo	DHardesty
<b>DATE</b>	9/1/2021	9/2/2021	9/21/2021	9/21/2021

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OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION

REGARDING LICENSE RENEWAL FOR THE

NORTH CAROLINA STATE UNIVERSITY

PULSTAR NUCLEAR RESEARCH 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 Nuclear Research Reactor license renewal application (LRA) letter, dated February 24, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17088A819). The NRC staff has reviewed the NCSU proposed LRA and identified the items below which need additional information or clarification.

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 requires 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 requires that information provided to the Commission by a licensee shall be complete and accurate in all material respects.
- Section 51.45, "Environmental report," of 10 CFR require that the environmental report discuss, in part, the impact of the proposed action on the environment and any adverse environmental effects.
- 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).

The guidance in NUREG-1537, Part 2, Section 12.12, "Environmental Reports," states that the environmental report should meet the requirements 10 CFR 51.45. The guidance in NUREG-1537, Part 2, Section 11.2.3, "Release of Radioactive Waste," states, in part, that the applicant should discuss waste expected to be released and should include the type and quantities of radionuclides and the methods and locations of release. It also states that the applicant should show that all releases of radioactive effluents would be managed, controlled,

Enclosure

and monitored. Based on its review, the NRC staff requires the following additional information to continue its review of the LAR.

Since the submittal of the environmental report, dated March 29, 2017 (ADAMS Accession No. ML17088A836), the NRC staff has been made aware of an ongoing series of leaks from the reactor pool. By a letter dated August 5, 2020 (ADAMS Accession No. ML20191A277), the NRC staff issued NCSU Routine Inspection Report No. 05000297/2020201 and a Notice of Violation (one Severity Level IV violation) from an inspection conducted at the NCSU PULSTAR Nuclear Research Reactor from June 15-25, 2020. The inspection found that contrary to NCSU PULSTAR Nuclear Research Reactor technical specification 6.7.4, "Annual Operating Report," NCSU had not documented the release of radioactivity (e.g., tritium) from the reactor pool leak in any of the annual operating reports submitted to the NRC since the leaks started in 2015. NCSU replied to the notice of violation by letter dated August 31, 2020 (ADAMS Accession No. ML20246G577), and supplemented the annual reports for 2015, 2016, 2017, 2018, and 2019 (ADAMS Accession Nos. ML20273A337, ML20273A338, ML20273A340, ML20273A341 and ML20273A343, respectively). The reply only discusses the annual report supplements and the revision of a NCSU procedure. The reply and annual report supplements do not include all types and quantities of radionuclides released, the locations of release, or how the releases are managed, controlled, and monitored. The impact of the releases on the environment and any adverse environmental effects are also not discussed. Therefore, the NRC staff requests that the following information be provided:

- (1) a description of the corrective action measures, including non-administrative measures, taken to date and planned (include dates of work completed and planned, as appropriate) to address the leak(s) and characterize the efficacy of those corrective actions;
- (2) additional information for the period of 2015 to 2019 that includes the following:
  - a. provide activity levels for all quantified activation products, as applicable. [Note that this request is in addition to the information already provided for reactor coolant system (RCS) water activity for tritium and volume of water released to unrestricted areas in Section 6.7.4.f, "Liquid Waste," subsection iv., "Release to Unrestricted Areas," of the supplemental reports];
  - b. RCS water activity for tritium, activation products, and water volumes assumed released to the unrestricted areas for the 2020 reporting period;
  - c. the results of the latest (2020) environmental monitoring results for the facility's surveillance well (MW-1) and surface water (stream) monitoring sites inclusive of gross alpha, gross beta, tritium, and gamma spec. results.
- (3) a summary of any reporting made related to the leak(s) that NCSU PULSTAR Nuclear Research Reactor has provided to oversight bodies at NCSU, including reports made to the environmental regulatory agencies for the State of North Carolina (specify dates reported); provide copies of any written reports submitted to oversight bodies and State environmental regulatory agencies as well as written responses from the aforementioned entities over the last 5 years (2015-2020).
- (4) a characterization of the likely pathways for the subject pool leak water through the building substructure and to soil, groundwater, storm water, and surface water including likely travel times (note: this characterization may be based on an existing environmental site or geotechnical characterization, site conceptual model, or other available information to

supplement the licensee's characterization provided in Section 2.4.2 of the updated safety analysis report.)

- (5) a description of the nature and results (include dates) of any additional environmental characterization or subsurface surveys, including environmental sampling and analysis, conducted to assess the disposition of the leaks; describe any plans to conduct any such investigations and/or surveys.
- (6) for the requested power uprate and proposed fueled experiment activities, provide a comparative analysis with current operations at 1.0 MW and quantify any anticipated changes to occupational and public doses, gaseous and radiological liquid effluents (types and activity levels), and radiological solid waste generation.