

# Illinois Microreactor Demonstration Project

NRC Public Meeting | June 8, 2023



UNIVERSITY OF  
**ILLINOIS**  
URBANA-CHAMPAIGN



## Meeting Purpose

- Discuss NRC questions on the UIUC Topical Report “Applicability of Nuclear Regulatory Commission Requirements”, dated December 9, 2022 (ADAMS Accession No. ML22343A282)

## Meeting Participants

- Nuclear Regulatory Commission (NRC)
- University of Illinois Urbana-Champaign (UIUC)
- Ultra Safe Nuclear Corporation (USNC)
- MPR Associates

## Desired Meeting Outcomes

- Clear understanding of NRC questions
- Clear understanding of UIUC draft responses
- Feedback from NRC on UIUC draft responses needed to inform UIUC final responses

## UIUC

Dr. Caleb Brooks, Director of Illinois Microreactor RD&D Center

Dr. Timothy Grunloh, Associate Director of Illinois Microreactor RD&D Center

Les Foyto, Licensing Director, Illinois Microreactor Demonstration Project

## USNC

Zackary Rad, V.P. Regulatory Assurance and Quality

Kevin Pigg, Licensing Manager

Eric Oesterle, Senior Reactor Licensing Specialist (BGS-LLC)

## MPR Associates

Storm Kauffman, Director of Nuclear Technology (MPR Associates)

# Introduction to Topical Report (TR)



- UIUC TR “Applicability of Nuclear Regulatory Commission Regulations” was submitted to the NRC on December 9, 2022
- The TR considered that the UIUC reactor would be licensed as a research reactor per 10 CFR 50.21(c)
- TR development was informed by:
  - 1) Recognition that the UIUC reactor is a non-LWR research reactor for which many of the existing regulations may not be applicable
  - 2) “NRC Staff Draft White Paper Analysis of Applicability of NRC Regulations for Non-Light Water Reactors” July 2021 (ML20241A017)
  - 3) Kairos Power TR “Regulatory Analysis for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor”
- Table 5-1 of the TR summarized the UIUC determination process for regulatory applicability



- 1) Determine which regulations have limitations on applicability to UIUC:
  - i. eliminate regulations N/A to reactors (e.g., 10 CFR 72 for ISFSI's)
  - ii. eliminate regulations for which entry conditions included specific requirements
  - iii. eliminate regulations not applicable to research reactors
- 2) Perform confirmatory steps to compare determinations made in Step 1 to:
  - i. NRC's response to Kairos TR, which includes exclusion distinctions based on non-LWR technology or test reactor.
  - ii. against the unofficial NRC staff draft white paper
  - iii. list of regulations applicable to research reactors as noted in Appendix A of NUREG-1537
- 3) Reconcile differences
- 4) Review other NRC guidance and licensing actions pertaining to existing research reactors for guidance on the remaining few determinations.

- 1) Clarify how the information in Section 5.4 of TR, “Exclusion vs. Exemption – Entry Conditions Obviate Exemptions” was used to determine an exclusion based on regulation entry conditions.

## UIUC Response:

Section 5.4 was not used to determine an exclusion based on regulation entry conditions. The exclusion step is included in the process summarized in Table 5-1. The purpose of Section 5.4 is to provide background information that discusses the drawbacks of regulating by exemption.



- 2) Clarify how the categorization process was applied to the following regulations that include entry conditions of “power reactors” to determine applicability.

## UIUC Response:

The categorization process is summarized in Table 5.1 of the TR. Applicability to specific regulations that were questioned by NRC follows.

- a) 10 CFR 50.49, Environmental qualification of electric equipment important to safety for nuclear power plants

## UIUC Response:

The requirements in 10 CFR 50.49 include entry conditions that would exclude the UIUC research reactor from applicability. The TR will be revised to indicate the proper determination of *2 N/A to NPUF*.

- b) 10 CFR 50.65, Requirements for monitoring the effectiveness of maintenance at nuclear power plants

## UIUC Response:

The requirements in 10 CFR 50.65 contain entry conditions that would exclude the UIUC research reactor from applicability. The TR will be revised to indicate the proper determination of 2 *N/A to NPUF*.

- c) 10 CFR 50.68, Criticality accident requirements, paragraph (b)(7)

## UIUC Response:

The requirements in 10 CFR 50.68 includes entry conditions that are specifically applicable to nuclear power reactors. However, the requirements in 10 CFR 70.24 are applicable to the UIUC research reactor. 10 CFR 70.24(d) states that 70.24(a) to (c) do not apply if the power reactor licensee complies with 10 CFR 50.68. UIUC is considering an exemption from 10 CFR 70.24 or 10 CFR 50.68 to allow use of fuel above 5% enrichment without implementing criticality accident requirements. Therefore, the determination was made in the TR that an exemption from these requirements (i.e., Group 4) may be needed by the UIUC research reactor.



- d) 10 CFR 50.60, Acceptance criteria for fracture prevention measures of light-water nuclear power reactors for normal operation

## UIUC Response:

The requirements in 10 CFR 50.60 include entry conditions that would exclude the UIUC research reactor from applicability. The TR will be revised to indicate the proper determination of *2 N/A to NPUF*.

- 3) Clarify how the process described in Section 4 of the TR was used to determine applicability for the regulations in 10 CFR 50.34(f) Additional TMI-related requirements.

## UIUC Response:

The requirements in 10 CFR 50.34(f) contain entry conditions that are specific to LWR construction permit and manufacturing license applicants. The TR will be revised to indicate the proper determination of *2 N/A to NPUF* for 10 CFR 50.34(f) and all its subparts.



- 4) Clarify how the process described in Section 4 of the TR was used to determine applicability for the regulations in 10 CFR 50.34(a)(3)(i) on principal design criteria.

## UIUC Response:

The requirements in 10 CFR 50.34(a)(3)(i) do not contain entry conditions that would exclude the UIUC research reactor. The TR will be revised to indicate the proper determination of applicable as-is (i.e., Group 3). Based on RG 1.232, 10 CFR 50, Appendix A, is not applicable to non-LWRs and, therefore, is not applicable to the UIUC research reactor.

- 5) Clarify how the category of “3B Meet intent” was assigned to 10 CFR 50.34(g) and the category of “2 N/A to NPUF” was assigned to 10 CFR 50.44 using process described in Section 4 of TR.

## UIUC Response:

The requirements in 10 CFR 50.34(g), Combustible Gas Control, do not contain any entry conditions that would exclude the UIUC research reactor. The TR will be revised to indicate a proper determination of applicable as-is (i.e., Group 3).

The requirements of 10 CFR 50.44, Combustible Gas Control for Nuclear Power Plants, contain entry conditions in the title of regulation that would exclude the UIUC research reactor, however, subparts (a) and (d) are determined to be applicable as-is (i.e., Group 3). The TR will be revised to indicate a proper determination of partial applicability as-is (i.e., Group 3), as noted above.



- 6) Clarify how the process described in Section 4 of the TR was used to determine applicability of "2 N/A to NPUF" as shown in Attachment 1 to the TR for the regulation at 10 CFR 50.48.

## UIUC Response:

10 CFR 50.48, Fire Protection, does not contain entry conditions that would exclude the UIUC research reactor. Therefore, the TR will be revised to indicate the proper determination of applicable as-is (i.e., Group 3). UIUC intends to follow the applicable guidance in NUREG-1537 to develop its fire protection program.

- 7) Clarify how the categorization basis under “3B Meets intent” is distinct from the effect of an exemption under 10 CFR 50.12 when the special circumstance of compliance not being necessary to meet the underlying purpose of the rule applies. Please also address consistency with the NRC staff white paper regarding the treatment of the requirement for an LCO addressing Criterion 1 of 10 CFR 50.36(c)(2)(ii).

## UIUC Response:

10 CFR 50.36, Technical Specifications, does not contain entry conditions that would exclude the UIUC research reactor. Therefore, the TR will be revised to indicate a proper determination of applicable as-is (i.e., Group 3). UIUC also intends to further consider the NRC’s guidance regarding 10 CFR 50.36(c)(2)(ii) for some non-LWRs using functional containment and the expectation of an exemption from this specific requirement.

8) Please clarify the purpose of the proposed request for exemption from the requirements of 10 CFR 50.109 and its applicability to UIUC.

## UIUC Response:

The requirements in 10 CFR 50.109, Backfitting, are specifically applicable to NRC action. Therefore, the TR will be revised to indicate the proper determination of NRC requirement, not applicant (i.e., Group 3D).



9) Clarify the categorization of 10 CFR 55.5(b)(3) as not applicable.

## UIUC Response:

Except for 10 CFR 55.5(b)(3), the requirements in 10 CFR 55.5(b) include entry conditions that would exclude the UIUC research reactor from applicability. The TR will be revised to properly indicate that 10 CFR 55.5(b)(3) is applicable as-is (i.e., Group 3) to the UIUC research reactor.

10) Clarify the categorization of the definitions in 10 CFR 21.3 for basic component, commercial grade item and dedication as well as the alternate applicability of 10 CFR 50.2 under the definition of basic component.

## UIUC Response:

UIUC would welcome the opportunity for further discussion on the applicability of 10 CFR Part 21 and its subparts for research reactors.

# Summary of Preliminary UIUC Responses to NRC Questions



NRC Question	Regulation	Preliminary UIUC Response
1	Exclusion vs. Exemption	Section 5.4 not used to determine exclusion
2a	10 CFR 50.49	Revised to Group 2 (N/A to NPUF)
2b	10 CFR 50.65	Revised to Group 2 (N/A to NPUF)
2c	10 CFR 50.68/10 CFR 70.24	Revised to Group 4 (exemption needed)
2d	10 CFR 50.60	Revised to Group 2 (N/A to NPUF)
3	10 CFR 50.34(f)	Revised to Group 2 (N/A to NPUF)
4	10 CFR 50.34(a)(3)(i)	Revised to Group 3 (applicable as-is)
5	10 CFR 50.34(g)	Revised to Group 3 (applicable as-is)
	10 CFR 50.44	Revised to Group 3 (partial applicable as-is)
6	10 CFR 50.48	Revised to Group 3 (applicable as-is)
7	10 CFR 50.36(c)(2)(ii)	Revised to Group 3 (applicable as-is) <i>(further consideration for exemption)</i>
8	10 CFR 50.109	Revised to Group 4 (NRC required/not applicant)
9	10 CFR 55.5(b)(3)	Revised to Group 3 (applicable as-is)
10	10 CFR 21.3	Further discussion welcomed