May 3, 2010

Mr. Robert J. Agasie
Reactor Director
Nuclear Reactor Laboratory
Room 130 Mechanical Engineering Building
1513 University Avenue
Madison, WI 53706-1572

SUBJECT: UNIVERSITY OF WISCONSIN - REQUEST FOR ADDITIONAL INFORMATION REGARDING THE LICENSE RENEWAL FOR THE UNIVERSITY OF WISCONSIN NUCLEAR REACTOR (TAC NO. ME1585)

Dear Mr. Agasie:

We are continuing our review of your application for renewal of Facility Operating License No. R-74, Docket No. 50-156 for the University of Wisconsin. The application was submitted on May 9, 2000, as supplemented on October 17, 2008.

During our review of the Safety Analysis Report for the application, questions have arisen for which we require additional information and clarification. Please provide responses to the enclosed request for additional information within 45 days of the date on this letter.

In accordance with Title 10 of the *Code of Federal Regulations* Section 50.30(b), your response must be executed in a signed original under oath or affirmation. Following receipt of the requested information we will continue our evaluation of your application. If you have any questions regarding this review, please contact me at 301-415-2758.

Sincerely,

/RA/
Christian B. Cowdrey, Project Manager
Research and Test Reactors Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-156

License No. R-95

Enclosure:
1. Request for Additional Information

cc: w/encl: See next page

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OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION

REGARDING FINANCIAL QUALIFICATIONS FOR THE RENEWED FACILITY OPERATING

LICENSE FOR UNIVERSITY OF WISCONSIN

LICENSE NO. R-74

DOCKET NO. 50-156

The U.S. Nuclear Regulatory Commission (NRC) staff is continuing the review of your application for renewal of Facility Operating License No. R-74, dated May 9, 2000, as supplemented on October 17, 2008. During our review, questions have arisen for which we require additional information and clarification. Our review conformed to the Interim Staff Guidance on the Streamlined Review Process for Research Reactors, NUREG 1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors". Please address and provide the requested information to the following:

1. NUREG 1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Part 1, Section 4.3, Reactor Tank or Pool states that the applicant should present all information about the pool necessary to ensure its integrity and should assess the possibility of uncontrolled leakage of contaminated primary water. Please discuss the pool leakage to the ground experienced at University of Wisconsin Nuclear Reactor (UWNR) in terms of the following:

    a. Please include in the discussion a description of the typical radioactivity content of the pool, the frequency with which the pool water is analyzed for radioactivity, the pathways known or expected to be contributing to the leakage, any trends associated with the leakage, and the physical means with which UWNR can detect small releases from the pool directly to the environment.

    b. With this information, please then discuss how current UWNR policies and procedures associated with the pool leakage meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1302(a) to monitor releases to the environment. Additionally, please discuss any plans for physically addressing the known leakage paths, including any leakage rates that will be used as a decision point for taking further action.

2. Regulation 10 CFR Part 20, Appendix B Table 2 lists the maximum allowable concentration value for Ar-41 at 1.0E-8 Ci/m^3 equivalent to the radionuclide concentrations which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 mrem. Section 11.1.1.1.2 of the UWNR Safety Analysis Report (SAR) estimates that in a typical year of operation the maximum concentration to which the public would be exposed would be about 3.31E-9 Ci/m^3 resulting in a maximum dose to the public of 0.6 mrem/yr. The estimated value of

3.31E-9 Ci/m^3 is about one-third lower than the 10 CFR 20 Appendix B Table 2 value and therefore the expected dose would be higher. Please discuss the dose conversion calculations.

3. NUREG-1537 Section 12.8 provides guidance for including a brief discussion of security planning in the SAR. The UWNR SAR Section 12.8 states, "The plan will require revision as a result of this Safety Analysis Report, since some figures from the previous Safety Analysis Report are included by reference." In a letter dated March 31, 2009, UWNR updated the Security Plan in accordance with 10 CFR 50.54(p)(2). Please verify that UWNR has no intention to further revise the UWNR Security Plan as a result of this license renewal; or submit a revised Security Plan for approval as a supplement to the License Renewal Application.

4. NUREG-1537 Chapter 13 states that non-power reactors should analyze events that could affect their safe operation or shutdown including evolution of scenarios and evaluating the consequences of postulated events. Section 13.1.3.3 describes the radiation levels in unrestricted areas due to the unshielded reactor core after a postulated large loss-of-coolant accident event and the consequent maximum dose rate to the member of the public in the Mechanical Engineering Building. One of the assumptions used in the model is that members of the public would evacuate in a specific amount of time. Please discuss whether there is a general evacuation procedure, how the members of the public are instructed to follow the plan, how it is insured that all members of the public actually evacuate the building, and whether there is any evacuation exercises practiced periodically.

5. Regulation 10 CFR 50.36(b) requires that technical specifications (TS) are derived from the analyses and evaluation included in the SAR, and amendments thereto. Section 14 of the 2008 SAR (Revision 2) includes the TS without incorporating the changes approved and implemented by Amendment 17, the HEU to LEU Conversion Order. Please discuss how you plan to incorporate Amendment 17 changes into the TS as part of the license renewal application.

6. NUREG-1537 states that the format and content of the TS follow that of American National Standards Institute/American Nuclear Society (ANSI/ANS) 15.1, "The Development of Technical Specifications for Research Reactors." ANSI/ANS-15.1-2007 provides a definition of "reactor secured." Please evaluate UWNR TS 1.3.1.2(a) against the standard definition of "reactor secured."

7. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007, Section 1.3 provides a definition of Reference Core Condition and Excess Reactivity. UWNR TS 1.3 defines "Cold Critical" at 125°F with no specific condition for Xenon reactivity. Please evaluate the definition of "Cold Critical" against the ANSI/ANS-15.1 standard definition for "Reference Core Condition" and consider developing a definition that can be included in the Limiting Condition for Operation (LCO) for Excess Reactivity and Shutdown Margin in TS 3.1.1 and TS 3.1.2 respectively, or justify the current definition.

8. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007, Section 1.3 provides definitions for key terminology utilized in TSs. Please include a definition of "Confinement, Excess Reactivity, Operating, Scram Time, and Shall, Should and May" in UWNR TS 1.3 or provide a basis for not defining these terms.

9. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007, Section 6.7.2 discusses special reporting requirements for operational occurrences. UWNR TS 1.3(6) lists a reportable occurrence as "Abnormal and significant degradation in reactor fuel or cladding which could result in exceeding prescribed radiation exposure limits of personnel or environment, or both." ANSI/ANS-15.1 Section 6.7.2 does not include the stipulation for exceeding exposure limits. Please consider removing the stipulation and including all instances of abnormal and significant fuel or cladding damage (excluding minor leaks) as reportable occurrences or provide a basis for including this stipulation.

10. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. UWNR TS 3.1 states an overall objective for TS in Section 3.1. TS 3.1.1, 3.1.2 and 3.1.3 do not have specific objectives. TS 3.1.4 and TS 3.1.6 have specific objectives. Please clarify which objectives are applicable to which TS in Section 3.1.

11. NUREG-1537 Part 1, Chapter 3, Section 3.1 Design Criteria for Structures, System and Components states that one of the design criteria to be considered should be the redundancy of reactor protective and safety features, so that any single failure will not prevent safe reactor shutdown. The Fuel Temperature channel specification in TS 3.2.4 and TS 3.2.8 discusses an exception related to the availability of replacement instrumented fuel elements (IFE). Specifically, the Setpoint and Function statement for the Fuel Temperature Safety Channel specification allows continued operation of an operational core in the absence of an operable IFE if the Linear Power Level scram setpoints are reduced to 110 percent full power.

    Please further discuss the basis and need for this exception, with regard to the reduction in redundancy and defense-in-depth with no Fuel Temperature safety channel and Linear Power Scram channels reduced to 110 percent full power. Additionally discuss how the exception, if utilized, would meet the requirements of TS 2.2 for measuring the fuel temperature at the IFE.

12. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.2(1) specifies that the operability for control elements be defined using Scram Times. Please discuss whether UWNR TS 3.2.1 is consistent with the standard guidance.

13. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.2(8) includes guidance on establishing permitted bypassing of channels for the purposes of calibrations and maintenance. Please discuss whether UWNR TS 3.2 should include acceptable conditions for bypassing channels for this purpose.

14. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.3 provides guidance for leak or loss of coolant detection. TS 3.3 specification 5 states pool level alarms if level drops “one foot or less.” Please consider revising to state “one foot or more.”

15. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.4 provides guidance for establishing a LCO on Confinement. Specifically, the standard includes discussion of conditions that require Confinement and equipment required for Confinement to be established. Please discuss whether UWNR TS 3.4 is consistent with the standard guidance.

16. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.5 provides guidance to ensure the minimum number of ventilation fans for normal operation is defined. Please evaluate TS 3.5 in relation to this standard to include an explanation of the basis and need for the exemption allowing two days of reactor operation with the ventilation system inoperable.

17. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 3.7.1 provides a time limit for alternate methods of radiation monitoring with a channel out of service. Please review the asterisk condition in TS 3.7.1 and consider adding a time limit consistent with the standard guidance or provide a basis for not including a time limit.

18. Regulation 10 CFR 50.36(c)2(ii)B, Criterion 2 states that a LCO must be established for process variable that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. In addition ANSI/ANS-15.1-2007 section 3.8.1(2) guidance includes establishing a LCO for the sum of the absolute values of the reactivity worth of all experiments. TS 3.8.1.1 and TS 3.8.1.2 establish limits for secured and non-secured single experiments respectively, but there is no reactivity limit specification for the sum of all experiments in the reactor. Please discuss whether there is a need for a LCO regarding the sum of all experiments in the reactor to ensure that the total maximum reactivity worth limit is not exceeded.

19. Regulatory Guide 2.2, “Development of Technical Specifications for Experiments in Research Reactors,” Section C.1.c.(3) states that the “materials of construction and fabrication and assembly techniques should be so specified and used that assurance is provided that no stress failure can occur at stresses twice those anticipated in the manipulation and conduct of the experiment or twice those which could occur as a result of unintended but credible changes of, or within, the experiment.” UWNR TS 3.8.2 allows explosive materials in quantities less than 25 mg to be irradiated in the reactor in a container “provided that the pressure produced upon detonation of the explosive has been calculated and/or experimentally demonstrated to be less than the design pressure of the container.” Please discuss how UWNR will ensure a safety factor of two in TS 3.8.2.

20. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 4.2 (5) provides guidance related to annual calibration

requirements for Scram channels. UWNR TS 4.2(5) discusses “channel tests” but does not mention calibration requirements. Please discuss whether UWNR TS 4.2(5) is consistent with the standard guidance.

21. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 4.2 (9) provides guidance related to annual surveillances of reactor safety system interlocks. Please discuss whether UWNR TS 4.2 is consistent with the standard guidance.

22. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 4.4 provides guidance for functional testing of Confinement. Please discuss the basis for determining UWNR TS 4.4 is not required.

23. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 4.5 provides guidance for surveillances on ventilation system filter efficiency measurements and an operability check of any emergency exhaust systems. Please discuss whether the UWNR TS 4.5 is consistent with the standard guidance.

24. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 4.7.2 (2) provides guidance for surveillance requirements covering environmental monitoring, specifically “sampling of soil, vegetation, or water in the vicinity of the facility.” Please discuss whether UWNR TS 4.7.2 is consistent with the standard guidance.

25. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 5.1 provides guidance for including a “description of the site and of the facility including location and exclusion or restricted areas.” Please discuss whether UWNR TS 5.1 is consistent with the standard guidance.

26. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 Section 6.1.1 provides guidance related to organizational structure. UWNR TS 6.1.1 states that the Radiation Safety Office reports to “both committees as well as to the Reactor Director.” However, the organizational chart has the Radiation Safety Office reporting to a level above the ANSI/ANS-15.4 Level 1 position. Please clarify the reporting structure for the Radiation Safety Office at UWNR.

27. NUREG 1537, Part 1, Section 12.1.3, Staffing, states that the applicant should discuss the availability of senior reactor operators during routine operation and should meet, at a minimum, the requirements of 10 CFR 50.54(m)(1). ANSI/ANS-15.1-2007, Section 6.1.3(1) specifies the minimum staffing when the reactor is not secured and specifically calls for a Senior Reactor Operator to be readily available on call. The standard further specifies “on call” as within 30 minutes or 15 miles of the facility. Please discuss whether UWNR TS 6.1.3(1) is consistent with the standard guidance.

28. NUREG-1537, Chapter 12.1 Conduct of Operations, Organizations states that the organization shall meet the non-power reactor standard ANSI/ANS 15.1-2007. ANSI/ANS 15.1.6.2.2, Review and Audit Groups, Quorums states not less than one-half

of the membership where operating staff does not constitute a majority is considered as quorums. TS 6.2.1 does not specify the composition of the Safety Review Committee (SRC), just the number of members. Please discuss the composition of the SRC and the number of members from operating staff.

29. NUREG-1537 states that the format and content of the TS follow that of ANSI/ANS 15.1. ANSI/ANS-15.1-2007 provides guidance for audit functions and states "In no case shall the individual immediately responsible for the area perform an audit in that area." TS 6.2.4 states "reactor staff shall perform annual reviews of the requalification program, the security plan, and the emergency plan and its implementing procedures." Please discuss the audit program at UWNR and how it meets the criteria of an independent review as outlined by the standard guidance.

30. Regulation 10 CFR 20.1101(a) requires that each licensee develop, document, and implement a radiation protection program. NUREG-1537, Chapter 12.1 Conduct of Operations, Organizations states that the organization shall meet the non-power reactor standard ANSI/ANS 15.1-2007. ANSI/ANS-15.1 Section 6.3 states that the facility shall implement a radiation protection program. Please discuss whether TS 6.3 meets the criteria in 10 CFR 20.1101(a) and ANSI/ANS-15.1 Section 6.3.

31. UWNR TS 6.8.2 specifies one cycle as retention time for operator qualification or requalification. Regulation 10 CFR 55.59(c)(5) requires that it be a training cycle. Please specify what cycle is being discussed.