UNIVERSITY OF WISCONSIN
NUCLEAR REACTOR
LICENSE NO. R-74
DOCKET NO. 50-156

RESPONSE TO REQUEST FOR CLARIFICATION REGARDING HEU/LEU CONVERSION

REDACTED VERSION

SECURITY-RELATED INFORMATION REMOVED

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May 1, 2009 RSC 1008

Mr. William Schuster
Project Engineer, Research and Test Reactors
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Docket 50-156, License R-74
Response to Request for Clarification
for Amendment No. 17 to Facility License No. R-74
University of Wisconsin Nuclear Reactor
TAC No. MD9592

Dear Mr. Schuster:

By telephone conference, on April 30, 2009, you requested clarifying information to our April 10, 2009 response to the Commission's request for additional information, dated February 26, 2009. Specifically, you requested clarification to the responses to questions 52 and 55. In question 52 we indicate the calculated drain time of represents the time to drain to the during a postulated reduction in cooling accident, which is analyzed in section 13.3 of our safety analysis report (SAR), submitted to the Commission on August 25, 2008. In question 55 we supplied the analysis that demonstrates a complete loss of coolant accident (LOCA) is more limiting than a partial LOCA.

The analyses in section 13.3 of the SAR and in response to question 55 may not be bounding since the air cooled transients begin at ; however, using the assumptions in section 13.3.1 of the SAR, it would only takes to drain to . This reduction in time before the air cooled transients begin results in a 5.6% higher initial decay heat power of 19.6kW, as compared to the assumed power of 18.6kW and therefore, slightly higher rod temperatures.

However the drain time calculated in section 13.3.1 is based on nominal dimensions of the reactor pool and beam ports. Using

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as-built measurements for the reactor pool surface area, accounting for beam port tube wall thickness and the actual low reactor pool water level SCRAM set point, a more accurate drain time can be calculated using equation 13.3.1 from the SAR as follows:

$$t_d = \sqrt{\frac{2}{g}}\frac{A_P}{A_0 C_d}\sqrt{h_0}\left[1-\sqrt{\frac{h}{h_0}}\right] \quad \text{Equation 13.3.1}$$

where:

t_d = Time to drain pool from the low reactor pool water level SCRAM set point to , a height of , in seconds.

g = Acceleration due to gravity given as 32.174 ft/s^2.

A_P = Actual area of pool surface measured as .

A_0 = True open area of beam port tube is .

NOTE: Section 13.3.1 of the SAR incorrectly reports the nominal dimension of the beam port tube, of 0.5ft, as the inside diameter.

C_d = Discharge coefficient assumed to be 0.6.

h_0 = Height of water from the low reactor pool water level SCRAM set point to ; determined to be .

h = Height of water from the to ; determined to be

The actual drain time to from an assumed sheared open beam port accident would be , which is greater than the assumed drain time of . As a result, the decay heat at is 18.5kW and the analyses of section 13.3.3 of the SAR and question 55 are bounding.

It should be noted however, that the analyses of SAR section 13.3.3 and question 55 neglect several mitigating measures that minimize the occurrence and consequence of this type of

accident. Specifically, it is assumed the reactor has operated continuously for 50 days, but the facility is not staffed for round-the-clock operations. Additionally, the beam ports are filled with beam stop plugs when no experiment is inserted and the beam port can not be opened during reactor operations due to hazardous radiation levels. To limit the release of Ar-41 to the environment, administratively, beam ports can not be opened any earlier than 8 hours following reactor operations. When experiments are inserted into the reactor beam port they must incorporate a flanged end that seals the experiment in the beam port and provide an air tight and water tight seal. Finally, the beam port incorporates a lead shutter internal to the biological shield, that is normally closed, and could easily reduce the flow out of a postulated sheared open beam port. Therefore, true drain time from a damaged beam port would be considerably longer and actual decay heat much lower than assumed in the foregoing analyses.

If you should have any further questions, please do not hesitate to contact me.

Sincerely,

Robert J. Agasie
Reactor Director