September 8, 2011

Dr. Mohamad Al-Sheikhly,
Professor and Director
Radiation Facilities and Nuclear Reactor
Chemical and Nuclear Engineering Building 090
University of Maryland
College Park, MD 20742

SUBJECT: UNIVERSITY OF MARYLAND, REQUEST FOR ADDITIONAL INFORMATION REGARDING THE LICENSE RENEWAL FOR THE MARYLAND UNIVERSITY TRAINING REACTOR (TAC NO. ME1592)

Dear Dr. Al-Sheikhly:

The U. S. Nuclear Regulatory Commission (NRC) is continuing the review of your application for renewal of Facility Operating License No. R-70, Docket No. 50-166 for the Maryland University Training Reactor dated May 12, 2000, as supplemented by letters dated June 7, August 4, September 17, and October 7, 2004; April 18, 2005, April 25 (two letters), August 28 (two letters), November 9, and December 18, 2006; May 27, August 27, September 22, and December 14, 2010; January 31, February 2, March 17, May 2, July 5, and July 29, 2011. During our review of enclosure 2 of your letter dated July 5, 2011, questions have arisen for which we require additional information and clarification. Please provide responses to the enclosed requests for additional information by October 12, 2011. If you are unable to respond within this timeframe, submit a written request for an extension that explains the reason for the extension request.

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. Your response must be submitted in accordance with 10 CFR 50.4, "Written Communications." Information included in your response that is considered security, 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."

If you have any questions please contact Spyros A. Traiforos at 301-415-3965 or by electronic mail at Spyros.Traiforos@nrc.gov or me at 301-415-2784 or by electronic mail at William.Kennedy@nrc.gov.

Sincerely,

**/RA/**

William B. Kennedy, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-166
License No. R-70

cc: See next page

cc:

Director, Dept. of Natural Resources
Power Plant Siting Program
Energy & Coastal Zone Administration
Tawes State Office Building
Annapolis, MD 21401

Mr. Roland G. Fletcher, Program Manager IV
Radiological Health Program
Maryland Department of Environment
1800 Washington Blvd., Suite 750
Baltimore, MD 21230

Mr. Vincent G. Adams
Facility Coordinator
Chemical and Nuclear Engineering Building 090
University of Maryland
College Park, MD 20742

Tom O'Brien
Radiation Safety Officer
Department of Environmental Safety
3115 Chesapeake Building 338
University of Maryland
College Park, MD 20742

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

**OFFICE OF NUCLEAR REACTOR REGULATION**

**REQUEST FOR ADDITIONAL INFORMATION**

**REGARDING LICENSE RENEWAL FOR**

**THE MARYLAND UNIVERSITY TRAINING REACTOR**

**LICENSE NO. R-70; DOCKET NO. 50-166**

The following requests for additional information (RAIs) relate to the dose calculations submitted as Enclosure 2 to the University of Maryland (UMD) letter dated July 5, 2011. The Enclosure addressed RAIs 8, 10, and 12 sent to you by letter dated January 31, 2011. The dose calculations in Enclosure 2 addressed the occupational dose to workers, the dose to a member of the public in the Nuclear and Chemical Engineering Building next to the Maryland University Training Reactor (MUTR), and the dose at the nearest residence during a maximum hypothetical accident (MHA) and normal operations. In the calculations, UMD considered two operational modes of the ventilation system, namely ventilation "on" and ventilation "off". The purpose of these calculations was to demonstrate that the occupational doses to workers and doses to the members of the public would not exceed the limits of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection Against Radiation."

Maximum Hypothetical Accident:

NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors; Format and Content," provides guidance for analyzing accident consequences including radiation dose limits generally found acceptable by the NRC. NUREG-1537, Part 1, Section 13.2, suggests a step-by-step process for determining the consequences of accidents. The following four questions address your analysis of the consequences of the MHA.

1. NUREG-1537, Part 1, Section 13.2 states that the radiological consequences should include external and internal exposures. From the review of your responses it was not clear whether both the external and internal contributions to the dose were included. Please discuss whether the dose analyses include contributions from external (submersion or shine) and internal (inhalation) exposures from radioactive material released from the MHA at each of the following locations addressed in your analyses:

   a) Reactor building (occupational dose)
   b) Chemical and Nuclear Engineering Building (the area housing classrooms, offices and nuclear engineering laboratories) at the reactor bay door (public dose)
   c) Nearest residence (public dose)

   If the analyses don't include both external and internal exposures, explain why the analyses exclude the dose contributions from external or internal exposures, or revise the analyses to include both exposures.

2. Please clarify whether the dose conversion factors used in your analyses are as conservative as the dose conversion factors in 10 CFR Part 20, Appendix B, “Annual limits on intake (ALIs) and derived air concentrations (DACs) of radionuclides for occupational exposure; effluent concentrations; concentrations for release to sewerage.”

3. Please clarify whether the Table at the bottom of page 13 of Enclosure 2 is the internal dose due to inhalation. Also provide the isotopes included in this Table.

4. NUREG 1537, Part 1, Section 13.2 states that exposure conditions used in determining the consequences of the MHA should account for the most exposed member of the public in the unrestricted environment until the accident conditions are terminated or the person is moved. Enclosure 2 provides dose rates to a member of the public at the reactor door and the total dose to a member of the public at the nearest residence. However it is unclear why either of these locations corresponds to the location of the most exposed member of the public. Please provide an analysis of the total dose to the most exposed member of the public in the unrestricted area. Include justifications for all assumptions regarding the duration of the exposure and an explanation of why the analysis represents the most exposed member of the public.

<u>Normal Operation - Ar-41 releases</u>

5. As discussed in our previous communications, you plan to conduct a series of measurements to determine the Ar-41 release in the reactor bay during normal operation and use the data to revise the calculations of doses due to Ar-41 releases provided on page 14 of Enclosure 2. Please use this data to re-evaluate all dose calculations due to Ar-41 release at all selected locations. As we discussed, please provide the revised dose calculations by October 21, 2011.

September 8, 2011

Dr. Mohamad Al-Sheikhly,
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Sincerely,
**/RA/**
William B. Kennedy, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
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Docket No. 50-166
License No. R-70
cc: See next page

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