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March 21, 1994

Mr. Marvin M. Mendonca, Senior Project Manager
Non-Power Reactors and Decommissioning Project Directorate
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Mendonca:

This is in response to your letter dated March 3, 1994, concerning the conversion of the GTRR from High-to Low-enriched uranium fuel. The answers to the questions follow. The answer to Question #1 is answered by me. The answers to the other Questions were provided by Dr. Woodruff of ANL.

Question #1:

In reference to letter of January 21, 1993, Attachment 2, Section 2.b.,

A. Described the bases for the 760 gallons per minute (GPM) limit. Explain how the orifice limits minimum flow in the core to 760 GPM. Describe how this and other flow rates are used in the analyses and how these flow rates are ensured.

B. In order to ensure that the information used in the analysis is in docketed material, reference "1a" should be:

Letter, R. A. Karam to Director, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, January 21, 1993, Attachment 1 "Analyses for Conversion of the Georgia Tech Research Reactor from HEU to LEU Fuel," J. M. Matos, S.C. Mo, and W. L Woodruff, Argonne National Lab., September 1992.

Answer.

A. The GTRR has two primary coolant pumps: one is a 1800 GPM pump that is used in Mode 2 operation ($\geq$ one MW) and another pump rated at 1000 GPM that is used in Mode 1

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operation (≤ one MW). The analysis that was made in 1967,in the original SAR, arbitrarily constrained the flow to 760 GPM as a conservative measure. It was found that even at a flow of 760 GPM, no departure from nucleate boiling would occur until the power reached 5.5 MW (Figure II-1-Technical Specifications).

The flow trip set point for Mode 1 operation is 1000 GPM. The flow trip set point for Mode 2 operation is 1625 GPM. Normal flow rates obtained from the two pumps are 1800 GPM and 1100 GPM respectively.

B. Reference "1a" has been changed to read as recommended.

<u>The Answers to Questions 2, 3, and 4</u>

Our response to questions 2, 3 and 4 are contained in a letter from Dr. William L. Woodruff to me. This letter is appended as Attachment 1.

Should you have additional questions, please let me know.

Sincerely,

R. A. Karam

R.A. Karam, Ph.D., Director
Neely Nuclear Research Center

RAK/ccg
Enclosures-2

Argonne National Laboratory

TECHNOLOGY DEVELOPMENT DIV.
9700 South Cass Avenue, B207
Argonne, IL 60439-4841

March 11, 1994

Dr. Ratib A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
Atlanta, GA 30332

Dear Ratib,

We are assuming that you can address Item 1 and thus will address only Items 2 - 4 of the NRC's request for additional information (FAX of March 3, 1994 letter from the NRC with attachment).

In Item 2A, both numbers are correct. The number from page 6 in NUREG-1313 is for silicide fuel with a volume fraction of 0.45, while the LEU fuel specified for the GTRR has a volume fraction of only 0.31. A figure is enclosed from Appendix A of NUREG-1313 that shows that at 31% the thermal conductivity is about 100 W/mK (a more conservative number of 90 W/mK was used to allow for uncertainties). In Item 2B, the clading material is not pure Al but rather a 6061 alloy whose conductivity is about 180 W/mK (104 Btu/hr-ft-F).

In Item 3, the range of meat dimensions quoted in the table represents the tolerances in the specification for fabrication of the fuel. For the neutronics analysis an average value has been used. In the safety analyses of the hot channel these uncertainties are assumed to be included in the engineering uncertainty factors introduced (see Attachment 2 of the ANL report - Engineering Uncertainty Factors).

For Item 4, I am just enclosing copies of one page from ANL-6675 and a plot from the JANUS analysis for the Weatherhead DNB correlation and two pages from IAEA-TECDOC-233 for the Whittle and Forgan flow instability correlation. These both cover the range of operating conditions in the GTRR. The main reason for using the Weatherhead correlation was to maintain consistency with earlier analyses of the GTRR. These data are taken from the references listed in the ANL report. By the way I spotted a typo in reference 24 of that report it has ANL-6674, and this should be ANL-6675 as shown above and in the enclosure.

I hope this information will be sufficient for your response to the NRC. If there are still questions please let me know what more can be done.

Sincerely,

Bill

William L. Woodruff, RERTR Program

enclosure: documentation

cc: J. E. Matos, J. L. Snelgrove, A. Travelli

NUREG-1313

Safety Evaluation Report
related to the Evaluation of Low-Enriched Uranium Silicide-Aluminum Dispersion Fuel for Use in Non-Power Reactors

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

July 1988

ORNL-DWG 85-16551

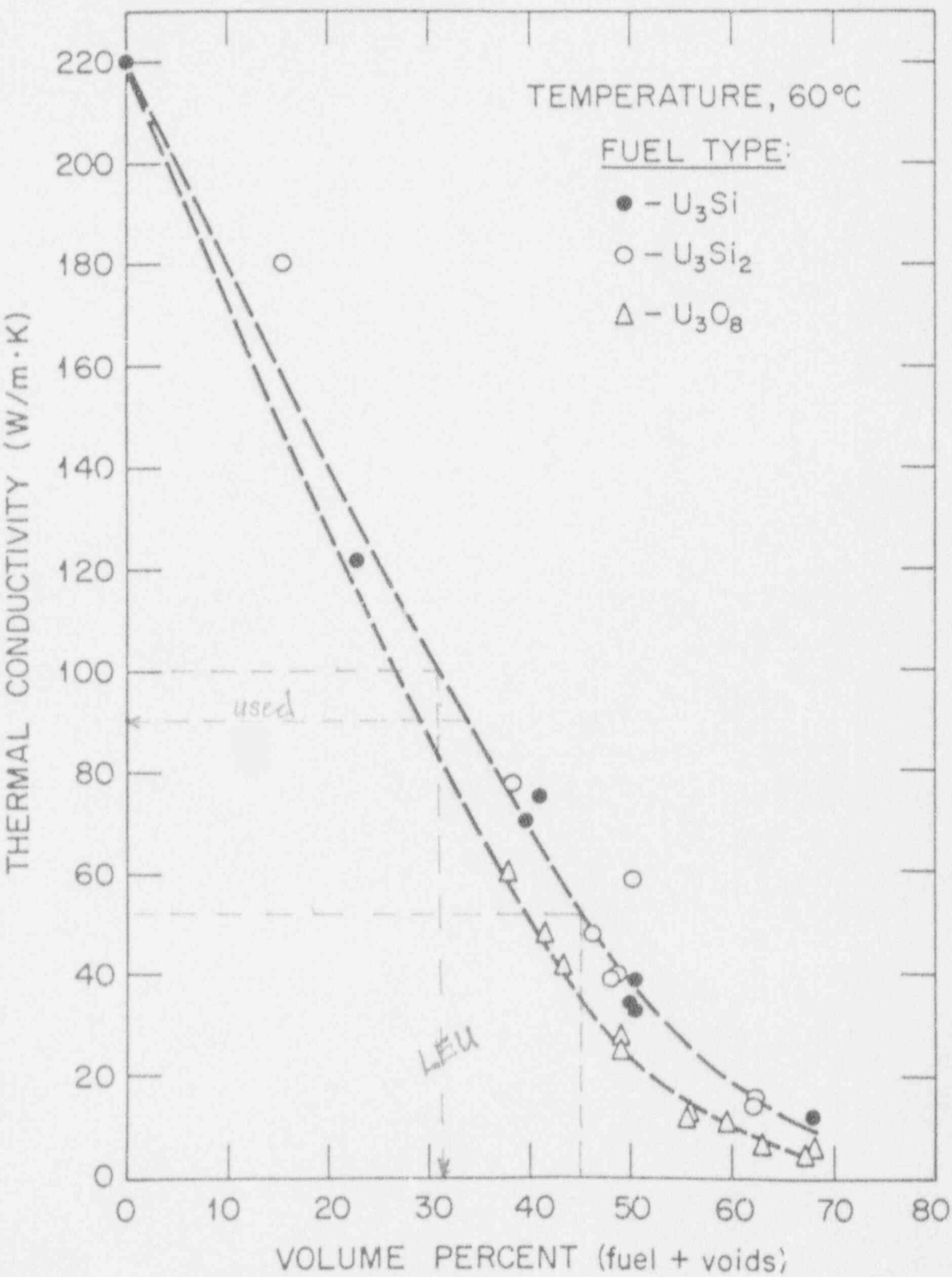

Fig. 6. Thermal Conductivities of Uranium Silicide- and U_3O_8-Aluminum Dispersion Fuels as a Function of Volume Fraction of Fuel Plus Voids (Porosity).