November 5, 2011

MEMORANDUM TO: Michael E. Mayfield, Director
Division of Advanced Reactor Program
Office of New Reactors

Thomas A. Bergman, Director
Division of Engineering
Office of New Reactors

FROM: Michael J. Case, Director ***/RA/***
Division of Engineering
Office of Nuclear Regulatory Research

SUBJECT: ISSUANCE OF TECHNICAL LETTER REPORT, "A REVIEW OF STORED ENERGY RELEASE OF IRRADIATED GRAPHITE"

Consistent with the information provided in the section on "Plan for Graphite Performance", p. 37 of the High-Temperature Gas-Cooled Reactor (HTGR) U.S. Nuclear Regulatory Research (NRC) Research Plan (ML110310182), the staff has initiated a research program at Oak Ridge National Laboratory (ORNL) to study the causes and effects of energy stored in irradiated nuclear graphite on HTGR reactor operation. In HTGR, the graphite core components are subjected to very high irradiation fluence resulting in damage to graphite crystal structure. Such damage stores energy ("Wigner energy") in the graphite component, which could be released as heat on subsequent heating, for example in an accident. Because this research is relevant to both the staff and potential licensees, the Department of Energy (DOE) is funding the contractor.

As a first step in this research, ORNL has completed a review of published literature on the stored energy of irradiated graphite and has published the enclosed report (ML112920196). The available data suggests that, most likely, only small amounts of stored energy will accumulate at HTGR-relevant operating temperatures. Should this energy be released at higher annealing temperatures, it is probable that the rate of release would be small. However, there are no experimental data for stored energy release rate at high temperatures from graphite irradiated at HTGR-relevant temperatures (400 – 1100 °C). Thus, additional experiments are needed to gain an improved understanding of the nature of the Wigner energy release. If DOE funding continues, ORNL will perform such experiments using their previously irradiated and archived samples, which were irradiated under temperature and fluence conditions typical of Next Generation Nuclear Plant HTGR.

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We wish to acknowledge the support provided by Dr. Neil Ray and Dr. Donald Carlson of your staffs for reviewing the draft. Their comments and suggestions have been addressed in the final report.

Enclosure:
As Stated

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Enclosure:
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