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To: Thadani, RES

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NRR  
NMSS

AFFILIATION: MIT

ADDRESSEE: Richard Meserve

SUBJECT: Concerns the PBMR project and the Massachusetts Institute of Technology's (MIT) support of a reactor research/demonstration plant.....

ACTION: Appropriate

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May 3, 2002

Dr. Richard A. Meserve  
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Mr. Spencer Abraham  
Secretary of Energy  
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Dear Dr. Meserve and Secretary Abraham:

In light of Exelon's withdrawal from the PBMR project in South Africa, I would like to reassure you that the work that we are carrying on at MIT is continuing. Our project is independent of the South African or Exelon initiative. It is our hope at some point in the near future that a consortium of universities, industry and national labs with DOE leadership will build a full-scale reactor research/demonstration plant at a national laboratory site somewhere in the United States.

As you know, we have been working on this project for approximately four years. We have been trying to identify the significant technical issues that need to be addressed to bring this technology forward. Our research and development programs include developing a new state-of-the-art fuel performance model with irradiation testing of new fuels; safety analysis including air ingress which includes a collaboration with the Jülich Research Center in their upcoming experiments at the NACOK facility; development of a balance-of-plant design that uses a dramatically different approach to the power conversion unit by employing an indirect cycle with an intermediate helium-to-helium heat exchanger; core physics analysis using advanced Monte Carlo techniques which is presently being expanded by the installation of a Beowulf cluster of 30 PCs that will allow us to do Monte Carlo core physics calculations including depletion and with online refueling capabilities.

We've done scoping work on non-proliferation and safeguards, waste disposal studies, power distribution monitoring of the pebble bed reactor using tomographic imaging techniques, and we are now completing pebble flow studies to experimentally assess the condition of the annular central column that has been proposed for the PBMR.

Our future work can be summarized by proposals that we have recently submitted to the DOE as part of their Nuclear Energy Research Initiative (NERI). We are collaborating with several industrial firms to design and develop an advanced instrumentation and control

system that could have generic applications that would allow for hands-free start-up of the reactor in a modern control room environment. We have submitted a NERI on a computational fluid dynamics analysis of helium flow in a pebble bed reactor under normal and accident conditions that will be experimentally benchmarked. This flow methodology will be used to better understand temperatures in pebble bed reactors. A proposal has also been submitted to test the oxidation rate of graphite used in fuel and reflectors for high temperature gas reactors and to develop advanced coatings to eliminate or reduce the consequences of air ingress. This work has been proposed in collaboration with MIT's Plasma Science and Fusion Center, Battelle Pacific Northwest Laboratories and Jülich Research Center. We have also proposed a series of graphite irradiation tests at the MIT Research Reactor.

We're also proposing to study the spent fuel waste form for repositories. This is of particular interest since at present no such detailed studies have been made to our knowledge. This project is being proposed as a collaboration with the Jülich Research Center in Germany. We are also hoping to study process heat applications in a collocation scenario with a hydrogen production facility. We are interested in the safety implications of such collocation and whether such a combination is practical from the regulatory standpoint.

We are also, as you know, keenly interested in establishing a new licensing process that would allow for a technology-neutral research and demonstration plant that would make it feasible to introduce new technologies using risk information in a more timely and effective manner. We hope to develop this process jointly with the Department of Energy and the Nuclear Regulatory Commission by establishing a path forward in which a research/demonstration plant can be built as a DOE project with industry, university and national laboratory support. The research and testing phase would be conducted with the Nuclear Regulatory Commission. Once completed, the plant design could be certified through a demonstration process. It is my hope that this project could be included in DOE's Nuclear Power 2010 initiative.

These are just but a few of the ongoing and proposed efforts that we have at MIT. We hope that as you consider your future research activities and licensing plans that you will keep this in mind. Exelon's departure from the PBMR project although unfortunate offers the NRC and DOE, each in their respective roles, more time to understand the technology, and hopefully participate in its research and development.

If I can be of any further assistance to explain our activities, please do not hesitate to contact me.

Sincerely yours,



Andrew C. Kadak  
Professor of the Practice

cc: Bob Card, Under Secretary, DOE  
William Magwood, Director, Nuclear Energy, Science & Technology, DOE  
Commissioner Jeffrey S. Merrifield, NRC  
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