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Department of Energy
Washington, DC 20585

SEP 30 2008

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Dr. Robert Rosner
Director
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Dr. Ernest Moniz
Department of Physics
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139

Dear Drs. Rosner and Moniz:

Thank you for agreeing to organize and conduct an international workshop to examine the role of computing at the exa-scale in meeting the foremost challenges for the future of nuclear energy. A key goal for the workshop is to present the nuclear energy community with the opportunity to shape the appropriate role for exa-scale scientific computing in the quest to advance these scientific frontiers.

As you know, the United States and the world are likely in the early stages of a nuclear renaissance in which nuclear fission energy, along with many other forms of energy, is being developed and deployed to provide abundant "carbon-free" power. If this leads to multi-terawatt deployment of nuclear power in this century, new nuclear reactor, fuel, and fuel cycle technologies will be needed. Furthermore, these technologies will call for new levels of system integration. Development of the new technologies and associated analytical tools is an expensive multi-decadal proposition, and we must embark on program development expeditiously if we are to meet the needs in a timely way. The question for this workshop is: What is the role of exa-scale modeling and simulations in accelerating the development and deployment of these new reactor, fuel and fuel cycle technologies? What are the DOE program requirements for developing and implementing the essential tools? We believe this workshop can play a seminal role in understanding the issues and possible solutions.

This workshop will build on a series of workshops the Office of Science sponsored in the summer of 2006 to explore the role of modeling and simulation in advancing the research needs of advanced nuclear energy systems. The output from these workshops, published in the following documents: Basic Research Needs for Advanced Nuclear Energy Systems, July 31 – August 3; Report on the Nuclear Physics and Related Computational Science R&D for Advanced Fuel Cycles Workshop, August 10-12, and Workshop on

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Simulation and Modeling for Advanced Nuclear Energy Systems, August 15-17, represents a roadmap for a strong modeling and simulation effort for advanced nuclear energy systems. We expect your workshop will develop a report that builds on the results of these previous workshops.

The report from your workshop is expected to be a document that should not exceed 100 pages and should be completed by the end of April 2009, if at all possible. I would like to stress that this is to be a collaborative effort between NE, NP, NNSA and ASCR. I would also welcome any other recommendations on program content, emphasis, or balance. This effort, I realize, is a large undertaking. However, nuclear energy systems are likely to play an important role in our nation's energy future well into the later half of this century and it is the responsibility of DOE and the scientific community to develop the key technology options.

A desired outcome of these meetings, and as a step in preparing for the final workshop and subsequent report, is to develop a short list of "global challenge" computational problems. Solving these problems should have the potential to transform our understanding of science and its impacts and to improve our ability to apply knowledge in applications important to science, engineering, industry, and society. This list should include:

Physics Issues Surrounding Nuclear Energy: These issues include but are not restricted to reactor core and safety simulations, nuclear fuel performance simulations, separations and safeguard simulations, waste forms and repository simulations, and materials simulations.

Systems Integration: The use of modeling and simulation to understand the interactions between complex nuclear systems from the energy source itself up to and including the entire fuel cycle.

Verification, Validation, and Uncertainty and Risk Quantification: This topic should discuss the challenges of verification, validation and uncertainty quantification for large exa-scale level simulations of fission nuclear energy systems. It should explore possible methods for understanding the contribution to overall risk quantification of nuclear energy systems.

Computational Technologies: The topic should address the computation resources and software development necessary to support exa-scale modeling and simulation for nuclear systems.

An effort should be made to identify the scope of the funding required to achieve success.

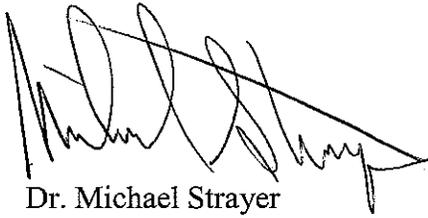
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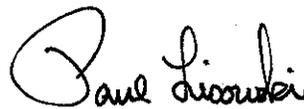
Mr. Alex Larzelere of the Office of Nuclear Engineering Research and Dr. Walt Polansky of the Office of Advanced Scientific Computing Research are the program managers responsible for this workshop. Alex and Walt will be contacting you shortly to discuss the schedule, deliverables, logistics and administrative needs.

If, at any time, you have questions about current plans, priorities and strategies, please feel free to contact us. Many thanks for your willingness to lead what we hope will be a landmark workshop in the field.

Sincerely,



Dr. Michael Strayer
Associate Director of Science
Office of Advanced Scientific Computing
Research



Dr. Paul Lisowski
Deputy Assistant Secretary
Office of Nuclear Energy, Fuel Cycle
Management