Attachment: ISOFS Charge Letter

February 22, 2002

Professor Richard D. Hazeltine, Chair
Fusion Energy Sciences Advisory Committee
Institute for Fusion Studies
University of Texas at Austin
Austin, TX 78712

Dear Professor Hazeltine:

This letter provides a charge to the Fusion Energy Sciences Advisory Committee (FESAC) to assist the Office of Fusion Energy Sciences (OFES) in preparing a roadmap for a joint initiative with the Office of Advanced Scientific Computing Research (OASCR). Recent reports, such as the FESAC report "Priorities and Balance within the Fusion Energy Sciences Program," the "Report of the Integrated Program Planning Activity" (IPPA), and the NRC report "An Assessment of the Department of Energy's Fusion Energy Sciences Program," have identified a predictive understanding as a measure of the quality of the science and the maturity of the knowledge base of a field. The IPPA report lists several challenging10-year objectives for the fusion program, including "develop fully integrated capability for predicting the performance of externally-controlled systems including turbulent transport, macroscopic stability, wave-particle physics, and multi-phase interfaces." This objective, as well as several other IPPA objectives related to innovative confinement configurations, will require significantly enhanced simulation and modeling capability. Therefore, the goal of this initiative should be to develop an improved capacity for **Integrated Simulation and Optimization of Fusion Systems**.

The initiative should be planned as a 5-6 year program, which would build on the improved computational models of fundamental processes in plasmas that are being developed in the base theory program and in the SciDAC program. Rough estimates are that an integrated simulation initiative would require a total funding level of about $20 million per year, with funding for the plasma scientists provided by OFES and funding for the applied mathematicians, computer scientists, and computational resources provided by OASCR. Thus, the roadmap should include not only human resources but also computer and network resources.

Please carry out the preparation of the roadmap using experts outside of FESAC membership, as necessary, including experts recommended by the Advanced Scientific Computing Advisory Committee. The sub-panel of experts should obtain community input through a series of workshops covering at least the following questions:

- What is the current status of integrated computational modeling and simulation?
- What should be the vision for integrated simulation of toroidal confinement fusion systems?

- What new theory and applied mathematics are required for simulation and optimization of fusion systems?
- What computer science is required for simulation and optimization of fusion systems?
- What are the computational infrastructure needs for integrated simulation of fusion systems?
- How should integrated simulation codes be validated, and how can they best be used to enable new scientific insights?

The ultimate product should be a roadmap document similar to the one developed for the Genomes to Life Initiative (http://www.doegenomestolife.org/roadmap/index.html). Please conduct a workshop on the first two questions above and provide a summary document with overall program goals and objectives, major program deliverables, and a brief description of the OFES and OASCR funded elements of the program by July 15, 2002, so that OFES would be able to include a description of the program in the FY 2004 OMB budget request. Please complete work on the final roadmap by December 1, 2002, in order to provide the detailed information needed by OFES and OASCR to develop detailed program plans, program announcements and grant solicitations.

I appreciate the time and energy that members of FESAC and FESAC sub-panels have provided to the continuing efforts to develop program plans and roadmaps for the OFES program. I am confident that the Committee's recommendations on a roadmap for **Integrated Simulation and Optimization of Fusion Systems** will form a sound basis for beginning a joint OFES/OASCR program.

Sincerely,

James F. Decker
Acting Director
Office of Science