Under Secretary for Science
Washington, DC 20585

August 9, 2007

Professor Stewart C. Prager, Chair
Fusion Energy Sciences Advisory Committee
Department of Physics
University of Wisconsin
1150 University Avenue
Madison, Wisconsin 53706

Dear Professor Prager:

The National Compact Stellarator Experiment (NCSX) project, which is being built at the Princeton Plasma Physics Laboratory (PPPL), is projecting substantial cost (~$40 million) and schedule (~2 year delay) overruns. These overruns are large enough to add new burdens on the limited resources of the U.S. fusion energy sciences program, as well as undermine confidence of the Administration and Congress in the ability of the Office of Fusion Energy Sciences and the Office of Science to manage large and technically challenging construction projects. Given the magnitude of the increases projected for NCSX, all options, including termination of the project, must be considered. In that context, we would like the Fusion Energy Sciences Advisory Committee (FESAC) to conduct a scientific and programmatic review focused on evaluating the NCSX program and its potential effect on the U.S. fusion energy sciences program. Below is a list of questions that we believe must be answered in order to allow us to make a decision on the best course of action for the U.S fusion energy sciences program. This review will comprise part of the set of reviews that will be conducted to inform a decision.

Questions for Scientific and Programmatic Review of NCSX:

1. Critical scientific issues for the U.S. compact stellarator program:
    a. What unique toroidal fusion science and technology issues can a compact stellarator program address, independent of its potential for a reactor concept?
    b. What are the advantages and disadvantages of the quasi-symmetric stellarator as a potential fusion system concept? What unique features does the compact stellarator offer in this regard?
    c. What scientific and technical issues need to be resolved to evaluate the compact stellarator as a viable concept for a fusion energy system?

2. Role of NCSX in the international context:
    a. What critical, unique contributions does NCSX potentially offer for addressing the issues identified in (1)?
    b. Given PPPL's proposed plans for operation of the National Spherical Torus Experiment and NCSX, what would be the timetable for resolving relevant issues identified in (1) above?

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c. What are the differences of the current NCSX design compared to other stellarators operating or being built abroad? What is the significance of these differences? Does NCSX fill a critical void in the development of the stellarator concept as a viable fusion energy system?

3. Options for the U.S. stellarator program:
   a. If the NCSX program were not continued, what options would exist or would be possible to address the key issues of the quasi-symmetric stellarator in general and the compact stellarator in particular?
   b. Assuming NCSX is not available, what program elements would be required to maintain the U.S. as a significant participant in the international stellarator program?
      i. Identify potential opportunities for U.S. leadership
      ii. Include more international collaboration as appropriate.

4. Role of the stellarator and NCSX in the long-term U.S. fusion energy sciences program:
   a. For a compact stellarator to be a viable reactor concept, what other experimental facilities would be required to develop the required knowledge base?
   b. For the cases with and without NCSX in the program, how can results from the U.S. stellarator program impact the direction and/or risk level of the development of the knowledge-base needed for a fusion energy system:
      i. On the timescale for a first-generation DEMO after ITER?
      ii. Longer-term, beyond a first-generation DEMO?

In summary, FESAC should answer all of these questions and provide their responses so we can evaluate the situation and choose the most appropriate course of action. Given the urgency of the situation, we would appreciate it if your answers could be provided by the scheduled FESAC meeting in October 2007. I very much appreciate your assistance in addressing these questions on such an expedited basis.

Sincerely,

Raymond L. Orbach

Raymond L. Orbach
Under Secretary for Science