October 9, 1998

Dr. John Sheffield, Chair
Fusion Energy Sciences Advisory Committee
Energy Technology Programs
Oak Ridge National Laboratory
Bethel Valley Road
Oak Ridge, TN 37831

Dear Dr. Sheffield:

When I arrived at DOE in 1993, I found a technically excellent fusion program focused on a long-term energy goal, but with a great deal of science yet to be done and funding requirements that exceeded the expectations of both the Congress and the Administration.

Three years ago, a new Congress, taking note of fusion's time scale and estimated development costs, reduced the funding for fusion research by one-third and called for a restructured science program with an emphasis on near-term progress. Since that time, the Department and the community have restructured the program, based on the Fusion Energy Advisory Committee's (FEAC) planning report.

We replaced FEAC with the Fusion Energy Sciences Advisory Committee, to reflect the scientific orientation of the program. We terminated work on the Tokamak Physics Experiment and shut down the Tokamak Fusion Test Reactor. We have redirected resources from the tokamak and technology elements of the program, including ITER, to alternate concepts and a small, clearly identified plasma science initiative. We are building the National Spherical Torus Experiment; we have conducted a grant competition for innovative confinement concepts and funded the highest ranked proposals; and we have increased funding for existing alternate concept experiments. We are now considering a set of proposals for proof-of-principle experiments.

The remaining tokamak experiments are becoming national user facilities with increasing operating efficiencies, and Program Advisory Committees have been established for DIII-D, Alcator C-Mod, and NSTX.

The Department has also assumed a leadership role for the field of plasma science. We are working with NSF on a Basic Plasma Science and Engineering Program initiative, and we have initiated a Plasma Science Junior Faculty Development program. The community is reaching out to other disciplines through the APS/DPP Speakers program, and PPPL recently hosted a workshop on magnetic reconnection, of interest to space plasma science as well as to fusion science.

We are restructuring our technology program, which had been almost entirely devoted to the needs of ITER over the last three years, to emphasize the needs of the U.S. domestic program. In FY 1999 we will suspend our ITER design efforts but still complete important and related technology research. At the same time we will work with our ITER partners to identify complementary international collaborations.

I am proud of Fusion Energy Sciences Program staff, the fusion research community, and the FESAC. All of these changes have been hard won in the

face of organizational and personal difficulty, if not trauma . They have maintained research progress, written and reviewed new proposals, sustained core team capability for the future while saying goodbye to deeply held goals and cherished colleagues and I believe we are through the darkest hours but not finished.

While the pace of the restructuring has been limited by funding constraints, the Department and the community are focused on continuing the program shifts begun three years ago. However, fusion will never be simply a science program; it must have an energy vision, as well. This dual nature of the program will always cause tension within the community. The continued call for clearly defined progress toward energy application, from Congress and others, will highlight that tension.

Constrained budgets also naturally result in increasing competition for resources within the community without necessarily increasing program participants' appreciation for each others' work. This makes it difficult to develop consensus within the community and, ultimately, to sustain support within the Administration and the Congress. I am pleased that the community is planning a workshop for next summer to address the technical issues of fusion energy science and contribute to the development of a community-wide consensus on scientific status.

In addition, we need to make final a program plan for the fusion energy science program by the end of 1999. Such a program plan needs to include paths for both energy and science goals taking into account the expected overlap between them. The plan must also address the needs for both magnetic and inertial confinement options. It will have to be specific as to how the U.S. program will address the various overlaps, as well as international collaboration and funding constraints. Finally, this program plan must be based on a "working" consensus (not unanimity) of the community, otherwise we can't move forward. Thus I am turning, once again, to FESAC.

I would like to ask FESAC's help in two steps. First, please prepare a report on the opportunities and the requirements of a fusion energy science program, including the technical requirements of fusion energy. In preparing the report, please consider three timescales: near-term, e.g. 5 years; mid-term, e.g. 20 years; and the longer term. It would also be useful to have an assessment of the technical status of the various elements of the existing program. This document should not exceed 70 pages and should be completed by the end of December 1998, if at all possible. I would expect to use this work, as it progresses, as input for the upcoming SEAB review of the Magnetic and Inertial Fusion Energy programs.

Using this effort as a starting point, I would like FESAC to lead a community assessment of the restructured program thus far, including recommendations for further redirection given projected flat budgets for fusion. With this assessment as background, I would like your recommendations as to the proof-of-principle experiments now under review, as well as your recommendations regarding the balance of the program between tokamak and non-tokamak physics, and between magnetic and inertial fusion energy. Working with the Office of Fusion Energy Sciences, please develop goals and metrics to use in making your recommendations. I would also welcome any other recommendations on program content, emphasis, or balance.

This effort, I realize, is a large undertaking. I believe it will be helped by the community workshop planned for next summer, by the SEAB review, and

by the National Research Council review of the scientific quality of the program. I would like to receive this second report by September 1999, so that we can use it to prepare a program plan/roadmap for submission to Congress with our FY 2001 budget.

Sincerely,

Martha A. Krebs
Director
Office of Energy Research