

July 1, 2008

To: Review Panel Members

Subject: PPPL 5-Year Proposal for NSTX National Fusion Program Research and Facility Operation

Dear Colleagues:

Thank you for your willingness to participate in a technical review of the proposal from Princeton Plasma Physics Laboratory (PPPL) to continue the research on and operation of the National Spherical Torus Experiment (NSTX) for another 5 years, beginning on October 1, 2008.

As most of you are aware, the NSTX National Fusion Program involves a large and unique Magnetic Fusion Energy (MFE facility), and it includes collaborations from national laboratories (ORNL, LLNL, SNLA, and LANL) and several universities (UC Davis, UC Irvine, UCLA, UCSD, U. Colorado, Columbia U., U. Illinois; Johns Hopkins U.; MIT; Old Dominion U.; Purdue U.; and U. Washington). These collaborators receive their funding directly from the OFES, through independently reviewed proposals. Funding for collaborators makes up about one-third of the NSTX research budget. The NSTX program is also at the center of a large number of smaller scale collaborations with scientists from several other U.S. and foreign laboratories and universities. PPPL has the overall responsibility to lead the NSTX National Fusion Program, in close partnership with the collaborators.

The national team that plans and carries out the NSTX program has been working on a five-year plan (2009-2013) for NSTX for the past year. That plan will be provided to you in PPPL's proposal entitled "NSTX Research Program Plan for 2009-2013". Summary information on the plans of the current collaborators can be found in an appendix of the proposal. PPPL will also provide you with cost and schedule information for their proposal and summary cost information for the whole national program.

We are asking you to review the overall 5-year NSTX National Fusion Program and proposal by the entire NSTX team as it is described in the collection of documents referred to above and in the presentations that will be made to you during the on-site review on July 28-30. We are asking you to provide both a detailed evaluation of the technical content of the program and an overall assessment of how well the planned facility operation and diagnostic and facility upgrades supports the experimental program (a more detailed evaluation of facility operations is the subject of a separate review). We would like you to perform the following assessments:

1. Assess the **importance** and **relevance** of the proposed 5-year research program with respect to the goals of the U.S. fusion program as outlined in documents such as the Integrated Program Planning Activity, the 2005 FESAC report "Scientific Challenges, Opportunities and Priorities for the U.S. Fusion Energy Sciences Program", and the 2007 FESAC report "Priorities, Gaps, and Opportunities: Towards a Long-Range Strategic Plan for Magnetic Fusion Energy".

In particular, how well does the program 1) explore the potential of the ST to provide a high performance plasma for use in a future fusion research facility, 2) investigate key tokamak physics issues for ITER, and 3) take advantage of the unique plasma properties of the ST, including high beta values and field line topology, to understand a broad range of issues of importance to plasma science and fusion energy? Is the research likely to accomplish the objectives stated in the proposal? How well is the research integrated with other national and international fusion research activities, including the ITPA?

2. Assess the **scientific** and **technical merit** of the ongoing and planned research. Does the proposed research effectively address important issues in plasma and fusion energy science and technology at the forefront of the field (as outlined in the reports referenced above)? Compared to research in other U.S. and foreign tokamak facilities, both in terms of merit and originality, how well does it maintain a U. S. leadership position in key areas of fusion research? Is the research plan adequately developed and likely to lead to new or fundamental advances in fusion science and technology? Does the proposed research employ innovative concepts or methods, and are potential problems identified along with appropriate mitigation strategies? Assess the strengths of the program with respect to manpower development through graduate student training.
3. Evaluate the **competency** of the proposed senior **research personnel** and the **adequacy** of the proposed **research environment and resources**. Assess the program's governance practices and the performance of the direct program management as well as the support provided from the host institution. How well qualified are the applicant's personnel to carry out the proposed research? Does the proposed work provide for an adequate set of diagnostics, other necessary facility upgrades, interactions with theory and modeling, and collaborations involving a broad group of domestic and international users? Do the collaborative arrangements achieve the goal of an integrated research team taking advantage of unique facilities?
4. Assess the current level of **performance of facility operations at a top level**. Are milestones being met? Are planned operating, maintenance, repair and upgrade schedules being achieved? Are environment, safety, health and quality assurance matters being addressed appropriately?
5. Assess the **reasonableness** of the proposed **costs** for fusion research and operations. The cost review should be done at a summary type level, examining major items and using projections from ongoing operational experience. Does the technical proposal call for the equipment and components, labor skill mix and hours set forth in the cost proposal and are these reasonable? Are the overall proposed costs reasonable? Please provide comparisons with other facilities where possible.

As indicated above, these programs are carried out by collaborative national research teams. The proposed research plan from the national team should be reviewed for the relevance and quality of the proposed research and the adequacy of the proposed equipment to carry out that research. You are also welcome to comment on the relevance and quality of the research carried out by the three major collaborators, described in the companion documents.

Please provide cross comparison with other U.S. facilities wherever possible if you have participated in more than one review of U.S. facilities.

Please feel free to comment on any other issue relevant to the proposal.

John Sarff of the University of Wisconsin has kindly agreed to chair the panel. Jon Menard will provide you with copies of the proposal and any other material helpful for the review. I would like to receive individual written comments on your findings, in a brief draft outline at the conclusion of the review, and a written report by August 20, 2008. The Panel Chair will organize and run the meeting and will provide a brief oral summary reviewer's comments at the conclusion of the review. I will prepare an overall summary report from each of the individual reports.

The review will take place at PPPL on July 28-30, 2008. Please do not hesitate to contact me if you have any questions.

Sincerely,

Stephen Eckstrand
NSTX Program Manager
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Office of Science
U.S. Department of Energy