

Report of NSTX Program Advisory Committee (PAC-30 – Conference Call)

August 1, 2011

Committee Members Present:

Paul Bonoli (Massachusetts Institute of Technology)
Donald L. Hillis (Oak Ridge National Laboratory)
Michael E. Mauel (Columbia University)
Tom Rognlien (Lawrence Livermore National Laboratory)
John S. Sarff (University of Wisconsin) – Chair
Mickey Wade (General Atomics)
Francois Waelbroeck (University of Texas)
Randy Wilson (Princeton Plasma Physics Laboratory)
Dennis Whyte (Massachusetts Institute of Technology)

Ex-officio:

Nirmol Podder (DOE Office of Fusion Energy Sciences)
Stan Kaye (Princeton Plasma Physics Laboratory)
Jon Menard (Princeton Plasma Physics Laboratory)
Masayuki Ono (Princeton Plasma Physics Laboratory)
Stewart Prager (Princeton Plasma Physics Laboratory)

Committee Members Absent:

Jean Paul Allain (Purdue University)
Nobuyuki Asakura (Japan Atomic Energy Agency)
Xavier Garbet (CEA Cadarache)
Houyang Guo (Tri Alpha Energy, Inc. and IPP, Hefei, China)
Hendrik Meyer (Culham Centre for Fusion Energy)
Hartmut Zohm (Max-Planck Institute for Plasma Physics)

1. Introduction

The NSTX Program Advisory Committee (PAC) held its 30th meeting via teleconference on August 1, 2011. The primary purpose of the meeting was to give advice and comment on the NSTX Program Letter for Research Collaboration Employing Innovative Diagnostics for FY 2012-2015. Additionally during the conference call, Jon Menard and Masayuki Ono updated the PAC on recent NSTX activities and events. The annual Research Forum generated many research proposals; more than can be accommodated with planned run time. A DOE OFES mid-term review of the NSTX program (and for other major facilities) was undertaken in June. The Final Design Review of the NSTX Upgrade was also successfully completed in June, clearing the way for a DOE CD-3 evaluation in September.

The PAC was also briefed on a failure of NSTX's toroidal field coil that occurred on July 20, 2011. A short circuit occurred in the TF winding during a full-field no-plasma shot, causing

visible damage to the coil. At the time of the PAC meeting, the central TF bundle had already been removed for close inspection, but the exact cause and extent of damage has not been determined. The NSTX team is carefully analyzing the situation and developing contingency scenarios. The impact on the run schedule is not yet clear, but it is possible that a repair would take too long to leave enough time for an effective run campaign in FY 2012 before the shutdown commences in March 2012 for upgrade activities. In this event, the option to start and thus finish the upgrade sooner may be feasible. The impact on NSTX research milestones was discussed. The preparations leading up to the FY 2011-12 run campaign appear to be inline with the high level recommendations of PAC-29. The PAC urges that experiments designed to inform the needed capabilities to attain stationary, long-pulse, high-performance discharges in NSTX-Upgrade remain high priority with whatever run time remains prior to the upgrade shutdown next year. The PAC commends the NSTX team for addressing this difficult situation aggressively to maximize NSTX's overall productivity. The PAC is also available for further consultation in the near term, if needed.

The Program Letter describes opportunities for collaborative research on NSTX employing innovative diagnostics. The solicitation is aimed primarily toward university and industry researchers. Unlike past solicitations for collaborative research on NSTX, four-year proposals for FY 2012-2015 are planned to allow collaborators one year of data collection following the start of NSTX-Upgrade operation. The letter consists of two main parts: (1) an introduction to the NSTX mission with references to background material, and (2) a description of research priorities and key collaboration opportunities within each of six topical research areas. Overall, the PAC considers the draft program letter to be very well written and finds that it offers necessary information to those preparing proposals. After a brief discussion, the PAC identified two recommendations for modest adjustments to the letter for even greater clarity.

1. In the forward part of the letter, the PAC recommends including a short description of key elements of the process that form the basis for the "record of contact" for potential collaborators. This will aid collaborators in crafting proposals that are most responsive to NSTX programmatic needs and lead to maximum scientific productivity and mutually rewarding collaborations. While NSTX contact persons are listed for each of the topical area, there are general considerations that will affect the proposal selection process. For example, both funding and physical space limitations on the NSTX device imply that the number of diagnostics that can be supported will be significantly less than represented in the combined list of opportunities from the six topical research areas. There will also be a need to maintain and enhance many existing diagnostic capabilities. Potential collaborators should have a clear sense of the highest research priorities and needs, which may not be uniform across the topical areas, and clearly must be focused on the NSTX-Upgrade. The letter's introduction could also emphasize the broad importance of research plans that encompass strong coupling to theory, modeling, and validation efforts. The PAC noted that the "Compare turbulence measurements with theory and simulation using a suite of microturbulence codes" opportunity listed under Multi-Scale Transport Physics represents a general need for full scientific analysis of diagnostic data that is important for all topical areas. Expressing this as a more common goal in the introductory part of the letter will likely improve the quality of all proposals in all topical areas, and stimulate strong collaborations.

2. In the Plasma Boundary Interfaces topical area, make it more explicit that a high priority goal in this area of research is to obtain the capability for stationary, high-performance, long-pulse plasmas in NSTX-Upgrade. A solution to particle control does not yet exist, and is critical to the programmatic goal of obtaining low collisionality in NSTX-Upgrade plasmas. The upgrade will initially use lithium coating as the main tool for particle control. There is a continuing need to understand how lithium interacts with various surfaces. The background descriptions and stated diagnostic opportunities are implicit in addressing this challenge, but collaborators should be aware that finding solutions to these problems are of utmost importance to the success of the NSTX-Upgrade research goals. If need be, consider lowering the priority on understanding the scrape-off layer and heat flux issues relative to understanding and controlling the particle inventory.