

Report of NSTX Program Advisory Committee (PAC-32 – Conference Call)

August 1, 2012

Committee Members Present:

Clemente Angioni (IPP, Garching, Germany)
Ted Biewer (Oak Ridge National Laboratory)
Paul Bonoli (Massachusetts Institute of Technology)
Chuck Greenfield (General Atomics)
Houyang Guo (Tri Alpha Energy, Inc. and IPP, Hefei, China)
Hendrik Meyer (Culham Centre for Fusion Energy, UK)
George Sips (EFDA Close Support Unit, Culham Science Center, UK)
John S. Sarff (University of Wisconsin) – Chair
Randy Wilson (Princeton Plasma Physics Laboratory)

Ex-officio:

Steve Eckstrand (DOE Office of Fusion Energy Sciences)
Stan Kaye (Princeton Plasma Physics Laboratory)
Jon Menard (Princeton Plasma Physics Laboratory)
Masayuki Ono (Princeton Plasma Physics Laboratory)

Committee Members Absent:

Jean Paul Allain (Purdue University)
Nobuyuki Asakura (Japan Atomic Energy Agency)
Donald L. Hillis (Oak Ridge National Laboratory)
Michael E. Mauel (Columbia University)
Tom Roglien (Lawrence Livermore National Laboratory)
François Waelbroeck (University of Texas)
Dennis Whyte (Massachusetts Institute of Technology)

The NSTX Program Advisory Committee (PAC) held its 32nd meeting via teleconference on August 1, 2012. The primary purpose of the meeting was to give advice and comment on the NSTX Upgrade Program Letter for Research Collaboration by National Laboratories for FY 2013-2016. Additionally during the conference call, Jon Menard and Masayuki Ono updated the PAC on recent NSTX activities and events.

A Lehman Review of the NSTX Upgrade project was conducted May 2-3, 2012, which concluded that progress is good in terms of both cost and schedule. The review noted that budget uncertainties threaten to delay project completion to mid-2015. Nevertheless, the present plan is to continue the accelerated upgrade schedule with a target for completion of April 2014. The plan and schedule for the preparation of the 2014-2018 five-year research proposals was also described. This plan calls for the next PAC meeting to occur in early 2013 in order to provide feedback in sufficient time before the proposal's submission due date of April 1, 2013.

The Program Letter describes opportunities for collaborative research on NSTX-U involving national laboratories (other than PPPL). As for the previous year's solicitation on diagnostics, four-year proposals are requested, recognizing that NSTX-U operation will not commence earlier than April 2014.

The Letter consists of two main parts: (1) an introduction to the NSTX mission and summary of the opportunities for collaboration, and (2) a description of research priorities and key collaboration opportunities within each of six topical research areas. This format follows closely that used for analogous letters in previous years. Overall, the PAC considers the Letter to be well written and finds that it includes necessary information for those preparing proposals by covering a wide range of important research areas. The possibility for the involvement of many collaborators is encouraged by this approach. The PAC offers several recommendations intended to improve the Letter and add greater clarity, as described below:

1. It will be important for potential collaborators to anticipate the timeframe for each of the new capabilities that are included in the NSTX-U upgrade. Indicate in the Letter the staging of these capabilities, and include an external link to more detailed information summarizing them (higher toroidal magnetic field, second beam, divertor configurations, etc). It will likely be most helpful if the capabilities are concisely summarized in a new document specific for this purpose (rather than a general link to PAC presentations, for example). In the discussion of opportunities topic-by-topic, it might also help to re-emphasize the staging of new capabilities as it pertains to the topical areas, e.g., specify the divertor configuration for 2015/16 in the section on PWI. The description of the staging should include opportunities for analysis of existing NSTX data, especially where such analysis would be high leverage and high priority for the ongoing research program. This effort might naturally appear most prominently at the beginning of a proposal's anticipated research timeline.
2. The present situation is unique with the combination of a substantial upgrade, long shutdown, and budget uncertainty. Stronger steering of opportunities could be achieved by further clarification of the high-level research priorities during this transition period. Because of the uncertainty in the budget and duration of the shutdown, a more explicit separation of the theory and modeling, diagnostic development, and experimental research opportunities may be warranted.
3. Indicate specifically the opportunity for collaborative research that takes advantage of the ST's differences relative to other configurations and devices. The description of the NSTX-U mission is complete in terms of the ST's potential to investigate the plasma-material interface, fusion nuclear science, etc., but the opportunity for science gained in coordination with other devices and programs is understated. While this Call for Proposals is directed at NSTX-U research, it is likely that national lab collaborators will also be involved in research for other programs. Proposals that emphasize cross-device comparison could be very compelling.
4. Structure the bullets summarizing the collaborative opportunities in a way that makes priorities clearer. Almost all of these bullets contain multiple components, and there is

danger that the most important opportunities will be difficult to glean. A possible approach is to use sub-bullets that isolate key components, ordered to indicate relative priority.

5. Macro-Stability topic: Rewrite the first bullet summarizing the key research opportunities. As written, it reads more as a high-level programmatic goal, rather than a clear statement of opportunity for collaboration.
6. Multi-scale Transport Physics topic: The PAC recommends including momentum transport and residual stress within the opportunities for collaboration, and emphasizing the importance of determining possible sources of anomalous transport at low-to-intermediate wave number for momentum, heat, and particle transport. We also recommend that the discussion of energy, particle, and momentum transport issues use more precise descriptions. For example, avoid using “effective angular momentum diffusivity” in a context where this can lead to possible confusion.
7. Plasma Boundary Interfaces topic: The PAC recommends making the listed priorities clearer by placing them in a rank order if applicable, and partly reorganizing the topics under the different bullets. For example Priority III-1 discusses heat-flux width studies to develop methods for mitigation, while III-3 is also about methods of heat-flux mitigation. Also, the mixture of heat-flux studies and particle control (cryo pumping) in the first topic is a bit confusing. If the intent is to have both be high priority, why not just have separate topics following one another. Finally, in the bulleted list of "Collaboration Opportunities," three of the four include “simulation”, but the third item does not. Consider adding “simulation” to the third bullet as “Implementing diagnostics, perform experiments, and simulations aimed at reducing divertor heat-flux...”.
8. Include links and/or references that describe details of the design activities that are indicated in the Letter.
9. Lastly, the PAC members would appreciate being sent a copy of the final version of the Program Letter for our reference. However, we do not need to review the final draft before it is posted for the public.