



U.S. Burning Plasma Organization e-News
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Dear Burning Plasma Aficionados:

This newsletter provides a short update on U.S. Burning Plasma Organization activities. E-News is also available online at <http://burningplasma.org/enews.html>. Comments on articles in the newsletter may be sent to the editor (R. Nazikian mnazikian@pppl.gov) or assistant editor (Emily Hooks ehooks@mail.utexas.edu).

Thank you for your interest in Burning Plasma research in the U.S.!

Director's Corner by J. Van Dam

The main part of the ITER Design Review Activity is over—so said IO Principal Deputy Director General Norbert Holtkamp at the conclusion of the 26th ITER Technical Coordination Meeting following the 2nd Integrated Design Review Meeting, held September 17-19 in Cadarache. The Design Review is “over” in the sense that the eight working groups of the Design Review Activity had their second and final opportunity to recommend Design Change Requests (DCRs) for the 2007 Baseline Design. Ten of the DCRs were accepted. Five were dropped. One was designated as “completed” (i.e., integrated into the baseline). Many (28 to be exact) were put into the category of “in study.” The latter will continue to be investigated by experts of the various ITER partner countries, perhaps into next year. However, the objective of the ITER Organization is to be able to freeze the design for the long-lead items, such as the vacuum vessel, superconducting coil strand, etc.

Of course we all know that “It’s not over ‘til it’s over” (according to Yogi Berra). There are still ITER Issue Cards outstanding. An example is the choice of material for plasma-

facing components, which still requires quite a bit of research. There are new Design Change Requests under study. An example is pellet pacing for ELM control. There are also redefined/redirected Design Change Requests. As an example, installation of ELM control coils behind the blanket modules has been redirected into a study of port-plug coils for this purpose, if needed, although port-plug-mounted ELM coils may not be as efficient as blanket-mounted coils. Furthermore, there are still choices to be made for how to be able to make specific changes to the scope of the machine, while keeping the project within budget and on schedule. Certain items (e.g., in the areas of diagnostics and auxiliary heating) might have to be delayed from the construction phase into the operation phase. Also, these two phases are demarcated by the achievement of First Plasma, whose definition still needs to be clarified. But we should keep in mind that these kinds of decisions for ITER have also been encountered with the construction of other large scientific projects. Fortunately the ITER Organization has well-qualified leadership, and the same can be said for the various Domestic Agencies of the ITER partners.

The Science and Technology Advisory Committee (STAC) of the ITER Council will hold its second meeting November 5-7 in Cadarache. At that meeting the STAC will review the recommended actions on the Design Change Requests and the new Baseline Design. In preparation for that meeting, the USBPO will be involved in helping the US members of the STAC review the Project Scope documentation. Although the STAC is charged to review not only the scope of the project, but also the cost and schedule implications of any design changes, the latter information may not be available until mid-2008. The STAC report from its second meeting will be forwarded to the ITER Council when it meets on November 29 to decide on approval of the 2007 Baseline Design.

Last month, the USBPO described the US involvement in the ITER Design Review Activity in a presentation to the Technical Advisory Committee (TAC) of the ITER Project Office (IPO), at its meeting in Oak Ridge on September 25. One of the TAC members, by the way, is Mike Zarnstorff, vice chair of our USBPO Council. After hearing the USBPO presentation about Working Group 1 and a corresponding presentation by Brad Nelson (IPO Engineering Manager) about Working Groups 2-8, the TAC expressed its pleasure with the vitality, extent, and usefulness of the US community's involvement in the Design Review process. (This presentation is available on the USBPO web site.)

Also last month, the USBPO made a presentation to the Plasma Standing Committee of the National Research Council. The presentation, given by USBPO Deputy Director Chuck Greenfield, described the report that had been written by the USBPO last year in response to the 2005 Energy Policy Act of Congress. The presentation also described the busy involvement of the US fusion community in the ITER Design Review Activity. (This presentation is available on the USBPO web site.) Dr. Ray Fonck, OFES Associate Director, also gave a presentation, concerning the structure and strategy of the US fusion energy sciences program. The Plasma Standing Committee is in the process of setting up a panel to review the US plans for involvement in ITER; this review is congressionally mandated. The findings of the USBPO Council's special committee led by Earl Marmor,

which is discussing long-range burning plasma program strategy in relation to ITER, will also serve as input as to this NRC panel.

Next month, at the APS Division of Plasma Physics Annual Meeting in Orlando, Florida, the USBPO will sponsor a special Town Meeting about the ITER Design Review on Tuesday, November 13, 7:30-9:30 p.m., in the Junior Ballroom of the Rosen Center conference hotel. The design review process, the U.S. involvement in it, and the status of design changes will be described. The speakers will be:

- Dr. Guenter Janeschitz (Director of the Nuclear Fusion Program at Forschungszentrum Karlsruhe, who has served as the ITER Design Review Coordinator): “*Status of the ITER Baseline Design after the Design Review*”
- Dr. Richard Hawryluk (Deputy Director of Princeton Plasma Physics Laboratory, who served as a US member of Working Group 1 on Design Requirements and Physics Objectives for the ITER Design Review): “*BPO Participation in Studies on ELM and RWM Control, Disruption Mitigation and Pellet Pacing*”
- Dr. Ronald Stambaugh (Vice-President, Magnetic Fusion Energy Program, General Atomics, who also served as a US member of Working Group 1 on Design Requirements and Physics Objectives for the ITER Design Review): “*BPO Inputs to ITER Design Review Studies on In-Vessel Components and Discharge Evolution*”

With such excellent speakers, this should be a very interesting session. I encourage everyone who is interested in ITER and burning plasma physics to plan to attend.

📣 **Announcements**

Submit BPO-related announcements for next month’s eNews to Raffi Nazikian at rnazikian@pppl.gov.

Reports

Brief summary: ITER Integrated Modeling Workshop on Component Interfaces by Don Batchelor
Cadarache, France, 10-14 September 2007

ITER will need comprehensive modeling tools to develop self-consistent scenarios, which will place heavy demands on physics and computing. Integrated plasma control capability will be as much a modeling issue as an experimental issue. During experimental operation, a comprehensive modeling capability for burning plasmas will be an essential ITER “sub-system” to justify each experimental run, as well as to evaluate the results.

The ITER International Organization (ITER IO) recognizes the need to start working with the ITER community to develop the required tools now. Because the ITER IO will be seriously limited in size, it will necessarily rely heavily on the Parties' physics communities, which have an extensive reservoir of expertise and talent. The ITER IO would like to build on the integrated modeling initiatives in the Parties' fusion programs. Common data and software frameworks will be needed that provide low "threshold" for access of new contributors and users. The program of model development and integration should set priorities and timescales, allocate responsibilities and tasks, and identify adequate computing resources. It is also essential to establish an accompanying program of documentation, verification and validation for the simulation models. This recent workshop was meant to initiate this effort, which will continue through the entire operation of ITER.

The specific objective of the workshop was to address a limited range of technical issues that arise in establishing a component approach to integrated modeling, and to establish a stronger dialog between the ITER IO and the Parties. These technical issues were to:

- Discuss the establishment of standards for component interfaces and data structures for an in-house suite of codes for ITER Integrated Modeling (IM) including as components: MHD equilibrium and stability, particle, momentum, energy and current drive sources, transport models, coupling between core, edge, and SOL.
- Present and discuss specific examples that could be used as models, considering portability, robustness, costs of data transfer and storage, etc.
- Consider ways to facilitate integration of the ITER in-house IM codes with codes under development by the Parties.
- Identify any other technical issues that have arisen in the development process of the various integration projects.
- Initiate communications that will lead to fruitful collaboration among the Parties on IM.
- Begin to establish a program that will lead to effective planning for ITER operation using IM and eventually analyze the experimental results.
- Obtain feedback on the entire scope of ITER IM work, including: development schedule, ways to enhance the interaction between the ITER IO and the Parties, an administrative 'framework' to carry out the development.

The US contingent included representatives from each of the three SciDAC prototype FSP centers as well as the TRANSP/predictive-TRANSP projects. Three US computer scientists who have been working with the fusion simulation centers also attended. A number of European scientists working on the Integrated Tokamak Modeling (ITM) project participated. The ITM is a task force of EFDA (European Fusion Development Agreement), which consists of an Infrastructure and Software Integration Project and the following five physics Integrated Modeling Projects (IMP): (1) equilibrium reconstruction and linear MHD stability, (2) nonlinear MHD and disruptions, (3) transport code and discharge evolution, (4) transport processes and micro-stability, and (5) heating, current drive and fast particles. A representative of the Japanese TASK

project, a representative from the Russian Federation, and members of the ITER team also participated.

It was clear that the integrated modeling programs being developed by the ITER parties cover many of the needs relevant to ITER IM and that there are numerous opportunities for coordination and collaboration among the parties. Examples are the use of schemas for describing component data structures for codes integration and data analysis and visualization, review of the ITM Consistent Physics Object (CPO) structures by the other Parties that could be used as basis for ITER data structures and component interfaces, use of the Kepler workflow software, and additional physics modules from other parties to be brought into compliance with the CPOs.

Future topics needing to be addressed by this group (or a similar one) are enhanced coordination of scenario modeling between ITER and the ITER Parties, and verification and validation procedures. A detailed workshop summary is being prepared which will be posted on the BPO Modeling and Simulation forum when finalized.

BPO-Related Meetings

Nov 12-16

49th APS-DPP Meeting

Orlando, FL

<http://www.aps.org/meetings/unit/dpp/index.cfm>

Dec 4-5

Fusion Power Associates Annual Meeting

Fusion Energy: Preparing for the NIF and ITER Era

DoubleTree Hotel, Oak Ridge, TN

<http://fusionpower.org/>

Dec 10-14

13th International Conference on Fusion Reactor Materials

Nice, France

<http://www-fusion-magnetique.cea.fr/icfrm13/index.html>

Jan 7-10

ITPA SOL & Divertor Physics Meeting

Toledo, Spain

<http://itpa.ipp.mpg.de/>

For more Fusion Research-related events, visit the USBPO Upcoming Events page online at <http://burningplasma.org/events.html>.