

Next Step Options Program Advisory Committee Interim Report

To: Dr. Charles Baker, Director
Virtual Laboratory for Technology

Prof. Jeffrey Freidberg, Chair
VLT Program Advisory Committee

From Dr. Tony Taylor, Chair
NSO Program Advisory Committee

Date: February 28, 2003

Date and Place:

The Next Step Options Program Advisory Committee (NSO PAC) met Thursday and Friday, February 27 and February 28, 2003, at General Atomics, in San Diego, California. This was the PAC's fifth meeting (PAC-5).

PAC Members in Attendance:

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|------------------------|-----------------------|--------------------|
| Dr. Steve Allen | Prof. Tom Jarboe | Dr. Raffi Nazikian |
| Prof. Cary Forest | Dr. Earl Marmor | Dr. Richard Nygren |
| Dr. Charles Greenfield | Dr. T. K. Mau | Dr. Dave Petti |
| Dr. Wayne Houlberg | Prof. Gerald Navratil | Dr. Tony Taylor |

PAC Members not in Attendance

Dr. David Gates, Dr. Paul Thomas, and Dr. Mitsuru Kikuchi

This interim report addresses only Charges 3 and 4.

Charge 3: Given the likelihood of very limited fusion funding in FY 2004, what is the best approach for following the FESAC recommendations for maintaining the viability of a FIRE option as the ITER negotiations are pursued?

Recommendation: We strongly encourage developing a process for community-wide support and involvement in a national burning plasma effort. This process should be constructed to maintain the community consensus and program balance expressed at the 2002 Fusion Energy Science Summer Study at Snowmass and the FESAC/Austin report on a "Burning Plasma Program Strategy to Advance Fusion Energy," September 2002. The long-range goal of this effort should be to develop a national framework to most effectively use our limited resources in advancing a burning plasma experiment, either ITER or FIRE, in accordance with the strategy recommended in the FESAC/Austin Burning Plasma report. This recommendation reiterates a recommendation we made in the NSO PAC-3 report: "*We strongly*

encourage developing a process for community support and involvement in a burning plasma experiment. We recommend a more definitive proposal be developed as a basis for discussion and strongly support presenting the proposal to the larger community for discussion.”

The FESAC/Austin Burning Plasma strategy is to continue work on FIRE to allow initiation of a conceptual design project on FIRE if ITER does not go forward on terms acceptable to the US. After FIRE completes a PVR at the end of FY03, work on FIRE must continue until an ITER decision is made (expected in FY04) to follow the FESAC/Austin BP strategy. At a minimum, for FIRE to remain a viable project and a credible element in the FESAC/Austin BP strategy, progress must continue on key open issues identified at the PVR together with conceptual design preparation work. Continuing this post-PVR work on FIRE with a team of specialists capable of starting work on a FIRE conceptual design when needed is an essential element of maintaining FIRE as a viable BP option for the US. If the US fusion program is organized to pursue burning plasma experiment design and planning in a team that has dual responsibility for advancing both ITER and FIRE, it will be possible to maintain FIRE in the FESAC/Austin strategy while also carrying out essential work in support of the ITER negotiations.

While the specific charge to the NSO PAC deals with progress of FIRE as the ITER negotiations are pursued, the PAC feels compelled to make a broader statement with regard to an overall strategy for a burning plasma experiment.

The recent decision to join ITER negotiations brings an immediate need not only to muster technical support to address cost estimates for ITER but also to provide mechanisms through which the community can gain information about ITER and provide input on preferences and capabilities for areas of work. We feel this is a necessary continuation of the Snowmass process and is important to keep the community informed about and aligned with the decisions that will be considered as negotiations proceed. Specifically, we recommend that a broad-based and open national structure or leadership team be formed expeditiously to participate with OFES in decision-making regarding the US burning plasma program. Furthermore, the US ITER and FIRE efforts should be brought together within this structure. In the immediate future, outreach efforts, such as workshops, should be organized to encourage and expand the community involvement in the process and mobilize the needed technical support.

Charge 4: Should the vision for FIRE focus more strongly on AT? If so, what would be an attractive goal?

Recommendation: The primary mission for FIRE is to be a vehicle for studying the physics of burning plasmas. In order to maximize the probability that FIRE will be able to deliver the alpha-dominated conditions required to meet this mission, the capability for H-Mode operation at $B=10\text{T}$ with $Q\sim 10$, should be maintained in the design. AT operation, at lower field ($B\sim 6\text{ T}$), with $Q\sim 5$, will explore very important physics and technology, with the long-term aim of improving the tokamak as a fusion reactor; the development and assessment of options and requirements for AT operation on FIRE should continue. At the same time, the higher field capabilities should not be compromised.