FESAC FSP SUBCOMMITTEE: DISCUSSION OF CHARGE & PLANS

FUSION ENERGY SCIENCE ADVISORY COMMITTEE (FESAC) MEETING

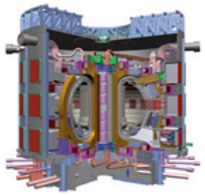
W. M. TANG
Princeton University

Gaithersburg, Maryland

16-17 July 2007

Unique Opportunity for US Leadership

- Critical need for reliable predictive simulation capability for ITER & DEMO
- LCF's moving rapidly toward petascale computing &beyond
- Knowledge and software assembled under truly interdisciplinary SciDAC Program & the OFES and OASCR base research programs



U.S. Simulation Needs for ITER

FSP

Petascale Computing Capability

Knowledge and Software Base

OFES Theory Program	OFES Experimental Program	OFES SciDAC	OASCR SciDAC	OASCR Math Program	OASCR CS Program

Realistic Integrated Modeling:
"New Fusion Simulation Project" (FSP)

- ***New Fusion Simulation Project* being formulated -- targeting world leading US role in this area with impact on ITER & beyond**
  - *Presentation from A. Kritz, co-chair of recent major FSP Workshop*
- **Must leverage results from *SciDAC Program* for improved physics foundations and for needed algorithms & computational science infrastructure**
- **Must leverage results from base OFES theory & experimental programs as well as OASCR's base program**
- **Major Verification & Validation Program essential for establishing reliable predictive simulation capability**

INITIAL IMPRESSIONS OF FSP INITIATIVE

• **Primary Objective**: "produce a ***world-leading realistic predictive simulation capability*** that will be of major benefit to the overall science and mission goals of the US Fusion Energy Science Program" (R. Orbach)

- *important to ITER, relevant to major current and planned toroidal fusion devices, and strategically vital to US interests in developing DEMO*

• **Major Challenge:** development of ***advanced software designed to use leadership class computers*** for carrying out ***unprecedented multi-scale physics simulations*** to provide information vital to delivering a ***realistic integrated fusion simulation model with high physics fidelity***

• **Budget Target:** ***15 year timeline with funding at around $20M to $25M per year*** primarily by OFES with significant support from OASCR

- *$50M per year over past decade for University Alliances Program within ASCI*

• **Roadmap:** FSP Workshop Report has deliverables targeted at end of 5, 10, and 15 years

- should be ***both challenging and achievable -- (e.g., integrated model in 5 yrs. with significantly improved predictive capabilities actually used to help interpret & design fusion experiments -- V & V should be prominent)***

- need to make clear ***connections to ongoing SciDAC FES Centers***

- may well need ***shift some priorities*** to broaden focus ***(e.g., materials studies beyond Carbon to liquid metals, etc.)***

FSP Charge Questions

- **Has the report identified key scientific issues and grand challenges that can be addressed by this approach to linking the scientific knowledge base for fusion energy?**

- **Have all the critical technical challenges for which predictive integrated simulation modeling has a unique potential for providing answers in a timely fashion, in a way that traditional theory or experiment by themselves cannot?**

- **Is there a clear plan to establish the fidelity of the advanced physics modules, including a sound plan for validation and verification?**

- **Does the FSP Workshop clearly identify the critical areas of computational science and infrastructure in which investments would likely produce the tools required for the FSP to achieve its goals?**

- **Have the issues associated with project structure and management of the proposed FSP been properly addressed?**

FESAC FSP SUBCOMMITTEE

* **William Tang (PPPL and Princeton U.) Chair**: Chief Scientist, PPPL and Associate Director for Princeton Institute for Computational Science and Engineering at Princeton U.

* **Miklos Porkolab (MIT)**: Professor of Physics and Director of PSFC at MIT

* **Jill Dahlburg (NRL):** Member of FESAC and Chair of ASCAC;
Dr. Dahlburg was lead author on the original FSP Plan from 5 years ago.

* **Riccardo Betti (U. Rochester)**: Member of FESAC and Professor of Physics at U. Rochester

* **Thom Dunning (U. Illinois)**: Director of NSF's NCSA (National Center for Supercomputing Applications) and Distinguished Professor of Computational Chemistry
Prof. Dunning was the first Director of DOE's SciDAC Program

FESAC FSP SUBCOMMITTEE

* **Rick Stevens (U. Chicago & Argonne National Lab)**: Professor of Computer Science at U. Chicago and Associate Director for Computational and Life Sciences at Argonne National Laboratory
Prof. Stevens is also a member of ASCAC

* **Michael Norman (UCSD)**: Professor of Physics and Center for Astrophysics & Space Sciences
Prof. Norman is a world-renowned computational astrophysicist

* **Brian Gross (GFDL)**: Deputy Director and Head of Computing at the Geophysical Fluid Dynamics Laboratory -- NOAA's National Laboratory for Climate Modelling

* **Chuck Greenfield (GA)**: Deputy Director of Experimental Science Division at General Atomics
Dr. Greenfield is also Deputy Director of the national Burning Plasma Organization (BPO) with focus on ITER-relevant physics issues

* **Jeffrey Brooks (ANL)**: Senior Computational Nuclear Engineer at ANL
Dr. Brooks is an expert on first-wall plasma boundary material science issues

TIMELINE FOR FESAC FSP SUBCOMMITTEE ACTIVITIES

- **MAY 16, 17 '07 -- FSP Workshop (some prospective FESAC Subcommittee members in attendance)**

- **JUNE 7, 8 '07 -- Briefing on FSP Workshop to Plasma Science Advanced Computing Institute (PSACI) (some prospective FESAC FSP Subcommittee members in attendance)**

- **JUNE 8 '07 -- Final Version of FSP Charge Letter to FESAC released**

- **JUNE 15 '07 -- Official Full Membership of FESAC FSP Subcommittee finalized**

- **JULY 3 '07 -- FSP Workshop Final Report distributed to FESAC FSP Subcommittee**

- **JULY 16 '07 -- FESAC FSP Subcommittee:** ***Discussion of Charge and Plans (TODAY)***

- **JULY 23 through OCTOBER 12 -- Series of FESAC FSP Subcommittee Teleconferences, Videoconferences, & Meetings (dates & times being developed)**

  -- Responsibility for development of written response to the Charge Questions will be distributed among panel members with two leads for each of the 5 questions

- **OCTOBER 19 --** ***FINAL REPORT from FESAC FSP Subcommittee submitted to full FESAC***

- **OCTOBER 24, 25 -- Discussion of FESAC FSP Subcommittee Final Report at the next scheduled FESAC Meeting**

  -- Associated discussion of formal final response of FESAC to Dr. Orbach's FSP Charge