US Fusion Materials Sciences Program

Strategic Planning Meeting

University of California at Santa Barbara

August 26-30, 2002

Overview and Charge

by Sam Berk
OFES/DOE

Meeting Goals

Primary Goal:
formulate basis of multi-year plans for program elements

Current multi-year plans are contained in the following documents:

- **VLT Program Plan**: Materials Science section of "US Fusion Enabling Technology Program Plan" (May 2001)

- **Theory/modeling white paper**: "A White paper Proposing an Integrated Program of Theoretical, Experimental, and Database Research for the Development of Advanced Fusion Materials" (November 1999)

- **Roadmap**: "Advanced Materials Program" roadmap document (January 1999)

Meeting Goals (continued)

Accomplishing primary goal will provide the key information needed to begin preparing an updated integrated program plan:

- mission, scope, and long-term goals
- strategic pathway
- technical objectives and implementation approaches
- roadmaps and deliverables
- key decision points
- relationship to other program elements
- role of international collaboration

Secondary goals:

- make additional progress toward integrating modeling and experiment activities
- evaluate results of seed investments in innovative materials studies
- address problematic programmatic issues (management, organization, policies, balances, interfaces, collaborations,...)

Meeting Approach

1. Identify Topical Areas for review/discussion:

- Irradiation Hardening and Embrittlement
- Constitutative Laws, Ductility, and Flow Localization
- Advanced and Innovative Materials
- Ceramic Composites
- Processing, Fabrication, and Joining
- Effects of Stress, Temperature, Irradiation, and Helium on Microstructural Evolution, Dimensional Stability, and Creep Rupture
- Coatings Corrosion, and Compatibility
- Materials Issues with IFE
- Materials-Design Interface

2. Establish teams and discussion leaders for Topical Areas

Meeting Approach
(continued)

3. For each Topical Area:

- identify key issues (challenges)
- review what is known (where we stand)
- determine major knowledge/tool gaps (where to go next)
- propose tasks (information/knowledge/tools to close gaps)
- prioritize tasks (fit budget constraints)
- formulate multi-year plan

4. Develop action plans for follow up work in each area

Generic Questions in Strategic Planning

- **What do we do and why do we do it? (mission, purpose)**
- **What is our situation and what is our likely future? (environment/trend analysis)**
- **Who are our customers?**
- **What are our planning assumptions?**
- **What are our strengths, weaknesses, opportunities, and threats?**
- **Where are we today?**
- **What do we hope to achieve in the future (vision and objectives)?**
- **How will we know when we get there (performance indicators)?**
- **What obstacles or barriers do we see (strategic issues)?**
- **What is the course of action to overcome barriers and accomplish objectives (strategies)?**
- **Who (roles and responsibilities) will do what (tasks), by when (schedule/milestones), and for how much (budgets)?**

Things to Consider in Strategic Plans

- Impacts of US participation in a burning plasma experiment
  - What would be the R&D support roles for the material program (e.g., radiation-hardening of components)?
- Impacts of US participation in other activities associated with fusion energy development
  - Participation in next phase of IFMIF (EVEDA)
  - Design and planned use of CTF (Component Test Facility)

Observations on Meeting Approach

- **Takes bottoms-up approach to strategic planning**

  - Focus on technical tasks at lower levels of Work Breakdown Structure
  - Assumes agreement/understanding of vision, mission, long-term goals, and tops levels of Work Breakdown Structure
  - Assumes environment/trend analysis is valid for next few years

- **Risk is that discussion may focus too much on technical progress and may miss seeing "the forest for the trees"**

- **May need to take top-down approach in future planning if changes in environment/trends require rethinking of vision, mission, ...**

US Fusion Materials Sciences Program

Where have we come from?
Where are we now?
Where should we be going?

Past (about 3 years ago):	**Pre-restructuring**
Present:	**<u>Restructured</u> Program**
Future: (about 3 years from now)	**Post-restructuring**

- **Program Scope and Balance**
- **Program Management and Organization**
- **Program Interfaces**
- **International Collaboration**

Program Scope and Balance

	Past	Present	Future
Labs vs Universities	5% of total funds to universities	12% of total funds to universities	>15% (closer to US fusion program average of 25%)
Experiments vs Theory/Modeling	8% of total funds to theory/modeling	20% of total funds to theory/modeling	Expand modeling effort in corrosion/compatibility/coatings
Institutional Breadth	7 directly funded performers	10 directly funded performers	Additional performers as needed in niche areas
Structural Material Class Funding Allocation	V alloys: 50% F/M Steels: 25% SiC comp.: 25%	V alloys: below 50% and declining F/M Steels: above 25%, with AFS and NCF research increasing SiC comp.: about steady at 25%	Reach new balance between V alloys and F/M steels depending on prospects for successful development and progress with V alloys insulator coatings

Program Management and Organization

	Past	Present	Future
Style of DOE Program Manager	Task-Oriented; Patriarchal?	Process-Oriented; Consensus Facilitation; Peer Review Based Decisions	Continue from present
Role of Community in Governance/ Decision-Making	DOE-Chaired FMPLG	Community-chaired MaSCO with expanded community membership	Increased community governance and decision-making; MaSCO evolution into Steering Committee
Organizational Approach	Project style: Lead labs and task groups focused on materials classes (FS, V, SiC)	Matrix style: National teams focused on cross-cutting issues (Theory/Experimental CG and 2 task groups)	Continue evolution of matrix style organization
Approach to Experiments	Designed to develop semi-empirical correlations	Designed to guide and validate theory/models	Continue to emphasizes needs of modelers
Institutional Interactions	Limited by vertical structure of task groups	Increased teaming with broad institutional involvement in all tasks	Continue to develop teaming approaches

SBIR		Updated solicitation to better reflect program interests	

Program Interfaces

(bridge-building)

	Past	Present	Future
Connections with fusion technology/design community	Limited by absence of Materials Engineer function	Materials Engineer function has been established; PFC Town Meeting; AFS Materials/Technology WS; FIRE design support	Continue to develop and improve on Materials Engineer function
Connections with plasma physics community	Limited (perceived by some as "cook and look" approach to science)	Seminars at Gaithersburg BPM and PPPL (much better appreciation of "good science" in program: visibility of computational sciences and nanoscience)	Additional seminars at other plasma physics labs
Connections with external communities	Strong ties with broad materials science communities	Continue to maintain strong ties; increased participation in ANS TOFE	Seek ways to enhance external interactions
Web Site	None	Established (but needs updating)	Update frequently

International Collaborations

	Past	Present	Future
US Style with Japan	Not strongly assertive about US interests; approached more as service to Japan	Much more assertive about US interests; trying to obtain equal benefits from equal cost-sharing	Become increasingly assertive about US interests (aggressive?)
Control over personnel assignee activities	Limited by lack of established guidelines	Increased with establishment of Personnel Assignment Guidelines	Vigorous enforcement of Personnel Assignment Guidelines