

# 21st Century FESAC

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## What is FESAC?

- one of six advisory committees, each advising a branch of DOE's Office of Science (SC): ASCAC, BERAC, BESAC, FESAC, HEPAP, NSAC

—the six committees have much in common (such as non-existence)

- about 15 members, mostly scientists, mostly in fusion program

—appointed by OFES to 2-year (renewable) terms.

- about three public meetings each year, attended by OFES, among others, and usually addressed by SC director.

## Who is (was) FESAC?

Professor Riccardo Betti, Rochester

Dr. Charles C. Baker, Sandia (Vice Chair)

Dr. Jill P. Dahlburg, NRL

Professor Jeffrey P. Freidberg, MIT

Dr. Martin J. Greenwald, MIT

Professor Richard Hazeltine, U Texas (Chair)

Dr. Joseph J. Hoagland, TVA

Professor Joseph A. Johnson, III, Florida A&M

Dr. Rulon K. Linford, LLNL

Dr. Kathryn McCarthy, INEL

Professor George Morales, UCLA

Professor Gerald A. Navratil, Columbia

Dr. Ned R. Sauthoff, PPPL

Dr. John Sheffield, JIEE

Dr. Ronald D. Stambaugh, GA

Professor Edward Thomas, Jr., Auburn

## How does FESAC work?

- FESAC responds to charges from SC Director
  - sub-panels appointed, with wide membership
  - sub-panel report is examined, discussed, sometimes revised by FESAC, before submission to SC
- FESAC appoints Committees of Visitors, to study OFES management
- FESAC gives occasional unsolicited advice to OFES and SC

## Key role: window between DOE and fusion community

- FESAC hears and disseminates comments of SC, OFES
- FESAC discussion is heard by OFES staff, among others.
  - discussion is candid, often heated
  - a conduit for community influence on DOE policy
- FESAC reports are read (!) by
  - people in SC, OSTP, OMB...
  - Congressional staff
  - fusion scientists and **students**

## FESAC Reports

Four main categories (omitting COV's and brief letters):

1. Strategy documents (IPPA, Priorities. . . )
2. Responses to external reports (SEAB, NRC. . . )
3. Physics reviews (IFE, integrated modeling. . . )
4. Special topics (Non-electric applications, Workforce. . . .)

About three FESAC are generated in a typical (recent) year.

## Strategy documents

- demand enormous effort, especially from Sub-panel Chair
- focus community concerns; reveal community differences
- admirable, largely successful, attempts to
  - transcend turf defense
  - build consensus
- reports are long and detailed, with “exquisitely” worded executive summaries
  - often influential, but may benefit panelists most of all

## **Example: FESAC and burning plasma physics**

Five relevant reports:

1. Response to NRC (2001)
2. Review of Burning Plasma Physics (2001)
3. Burning Plasma Program Strategy (2002)
4. Plan for the Development of Fusion Energy (2003)
5. Scientific Priorities for the US FES Program (2004)

## Response to NRC report

“We strongly agree with the NRC Panel that **the goal of developing scientific understanding** of fusion-relevant plasma physics should play a role comparable to that of progress in fusion performance in setting program priorities. . .

“A healthy program in fusion energy science requires a pyramid of research: smaller-scale projects at the basic research level contribute to the scientific base for the larger scale, more integrated levels of research needed for the exploration of fusion-grade plasmas.”

## Review of Burning Plasma Physics

Thorough yet readable technical discussion of physics issues in fusion plasmas, leading to key conclusions:

“NOW is the time for the US Fusion Energy Sciences Program to take the steps leading to the expeditious construction of a burning plasma experiment. . .

“Funds for a burning plasma experiment should arise as an addition to the base fusion energy sciences budget.”

## Burning Plasma Program Strategy

“ITER and FIRE are each attractive options for the study of burning plasma science....a strategy that allows for the possibility of either burning plasma option is appropriate...”

“The desired role is that the US participates [in ITER] as a partner in the full range of activities...We anticipate that this level of effort will likely require additional funding of approximately \$100M/yr.

“**A strong core science and technology program** is essential to the success of the burning plasma effort, as well as [to] the overall development of fusion energy. Hence the core program should be increased in parallel with the burning plasma initiative...”

## A Plan for the Development of Fusion Energy

“This report presents a plan for the deployment of a fusion demonstration power plant within 35 years, leading to commercial application of fusion energy by mid-century.”

“Recent advances in the science and technology of fusion energy have dramatically improved the prospect for practical fusion power.”

“To develop fusion energy...it is imperative to have a **strong, balanced program** that develops fusion science and technology in parallel...”

## Scientific Priorities for the US FES Program

A ranked selection of key scientific issues, with detailed discussion of how to attack them.

“The first overarching theme of the FES program is to **understand matter in the high temperature plasma state**... The second overarching theme of the program is to **create a star on earth.**”

“...the scientific challenges of fusion energy and the opportunities for discovery in plasma physics should be addressed by a research program that encompasses **a broad range of key scientific questions.**”

## Funding alarms

- FESAC letter (2003) regarding 2004 budget: “FESAC is puzzled by the elimination...of funding for fusion technology. This loss will seriously compromise US participation in ITER...”  
“FESAC recommendations regarding the burning plasma initiative have emphasized the importance of maintaining **scientific and technological breadth** in the program...Yet funding for FIRE...has been eliminated. ”
- FESAC’s submittal letter (2005) for Priorities Report: “FESAC is deeply troubled by the Presidents proposed budget for FY 2006 and its implications for later years. **In particular, the core [fusion] program cannot shoulder a significant portion of the ITER construction costs without dismantling the fusion scientific enterprise.**”

## An unfunded ITER?

No one doubts that ITER (assuming it goes forward with US participation) will become the centerpiece of US fusion research—an exciting, welcome centerpiece.

But there are real doubts about the *survival* of US fusion research, if ITER is funded from the present research budget.

Without a strong domestic scientific program, the US will be able neither to contribute effectively to ITER nor to benefit from the science that ITER will uncover.

## Informal “Committee” of Chairs

- Annual or bi-annual meetings of the six Advisory Committee Chairs, with visits to Congressional and Executive offices.
- Traditional message: magnitude and importance of DOE science, and of physical science in general.
- Recent meetings have emphasized the value, and the fragility, of the six **scientific communities** they represent. With its own culture, standards and lore, a scientific community can be immensely productive—far beyond the sum of individual efforts.

But now more than ever, the Chairs consider their communities to be endangered.

## Comments

1. FESAC is a mechanism for distilling the scientific judgment of the fusion community and making it available to policy makers. By fulfilling this role FESAC has become part of the leadership of the community.
2. At its best, FESAC evaluates scientific programs accurately, sniffing out strengths and weaknesses, and recommending sensible changes. Its conclusions are not ignored.
3. But the weight of scientific input on funding decisions is modest and unreliable. Influencing policy makers  $\neq$  making policy.

*Advice to reconstituted FESAC: (i) avoid unrealistic expectation; (ii) avoid discouragement; (iii) tell your story!*