Building Consensus in the Formation of Science Strategy: Reflections on the U.S. Fusion Science Program

UFA Annual Meeting
November 11, 2013
Mike Mauel
Senate Energy-Water FY2014

• “The Committee is concerned by the lack of a strategic vision, which includes research and future facility needs, to advance the domestic fusion energy sciences program. The Committee directs the Secretary to submit a 10-year plan, not later than 12 months after enactment of this act, on the Department’s proposed research and development activities in magnetic fusion. The report shall (1) identify specific areas of fusion energy research and enabling technology development in which the United States can and should establish or solidify a lead in the global fusion energy development effort and (2) identify priorities for facility construction and facility decommissioning."

House Energy-Water FY2014

• “Looking forward, the increasing requirements for ITER will continue to pose challenges within the Science budget, and the Committee believes that long-term policy decisions for the Fusion Energy Sciences should be guided by impartial analysis of scientific needs and opportunities and with an eye on American competitiveness and leadership. The Committee therefore reiterates the importance of the ten-year plan for Fusion Energy Sciences directed in the fiscal year 2012 appropriations conference report; that plan’s timely delivery to Congress; and the inclusion of priorities across domestic and international fusion facilities, projects, and programs."
Outline

• Importance of the University Fusion Science Community

• Examples of UFA action: facilitating consensus and promoting a university perspective

• UFA’s role today
Importance of the University Fusion Science Community

• Universities, through education, are responsible for the longevity of the field

• Universities create valuable national partnerships between DOE/Federal and state & private institutions

• Connect fusion with related science and technology

• Independence

• Convening power: facilitates building consensus
Examples of UFA Action: Facilitating Consensus through Letters and Forums

• U.S. fusion science funding has been variable, increasing in response to large construction projects

• Example UFA actions:
  
  • *Letters*. Responding to the International Fusion Energy Act of 1993
  
  • *Workshops, Forums*. Responding to U.S. failure to renew ITER-EDA and building consensus for burning plasma physics

• Promotion of university perspective: science focus, broad access to opportunities, discovery and new ideas
Variable U.S. Fusion Funding Shows Impact of Major Fusion Research Construction

U.S. Fusion Research Funding (M$ 2012)

- MFE ($2012)
- IFE ($2012)

Events:
- Yom Kippur War
- OPEC Oil Crisis
- Congress Hears Climate Change Testimony
- Peak U.S. Energy Imports at 30%
- DOE Approves LNG Export from Cove Point
- U.S. Energy Imports Decline to 16%
- ITER Construction
- ITER IO
- ITER EDA
- CTBT
- 500 TW/192 Beams NIF
- TFTR 1st Shot
- MFTF-B Construction
- TFTR Construction
- 6 MW D-T Construction

Energy Supply & Security
Variable U.S. Fusion Funding Shows Impact of Major Fusion Research Construction

Big Science Challenges

- SSC Cancelled after $3.2 billion
- House moves to cancel Webb Telescope after $3 billion
- Congress Caps Webb costs to + $8 billion
UFA Actions 20 Years Ago: Informing Congress

U.S. Magnetic Fusion Research Funding (M$ 2012)

- 6 MW D-T
- NRC Plasma
- John Kaisch House Budget Cmt
- Sen. Johnson Internat Fusion Energy Act
- Penny-Kaisch Task Force
- Swett Amendment Cut Fusion & TPX
- PCAST
- FEAC FES

http://fire.pppl.gov.
It is customary at the end of the year to communicate the UFA membership general information on fusion programmatic and budgetary issues (filtered through the subjective lens of the UFA), a summary of recent UFA business activities, and specific UFA business matters that follow. (Prepared by S. Prager and M. Maus.)

GENERAL FUSION MATTERS

The Budget

The Department of Energy has requested a FY94 budget of $372,563.00 for Fusion Energy. The budget request is shown below along with an adjusted budget for FY94. According to the scientific and technical issues that must be addressed in the program, funding is needed to support the necessary program technologies, research, and development activities. The U.S. has a high degree of collaboration with international partners and the number of international joint FIPs is growing. The FY94 budget request is expected to meet these challenges and support the experimental and research programs.

Attached is a letter to the seven committee members and the Secretary of the UFA. Please send your comments and suggestions by May 6th.

UFA Goes Electronic

We are updating our membership list to include E-mail addresses. This will allow us to maintain a more accurate and up-to-date list of members and potential members. Please send in your E-mail address to the UFA Secretary/Treasurer.

Membership Drive

The effectiveness of the UFA depends on strong, broad-based support from a large number of members. We have been successful in raising funds for various projects, and we are looking to continue this trend. Members may contribute to the membership drive by sending in a check for $15.00 payable to the University of Wisconsin, Madison, Department of Physics. Please make a donation to support the activities of the UFA.
S.646: International Fusion Energy Act of 1993

• Budget pressures motivate calls to narrow fusion research and force an “either energy/or science” decision...

• S.646: “… redirect and refocus the Department's magnetic fusion energy program in a way that will lead to ITER by 2005...and operation of a fusion DEMO by 2025.... Eliminate those components not directly contributing to ITER or to DEMO. Provide for reducing the program to $50M/year in the event that the [ITER] program is terminated.”

• Dr. Martha Krebs (Science, 1994): “The fusion program is in a period of major transition from a program focused on research to one focused on engineering development, from a laboratory and university base to an industry base, from a domestic program to an international program.”
UFA and Community Response

- Overwhelming community response against S.646: UFA, Fusion Coalition, ..., calling for a balanced fusion program.

- **Prager/UFA**: “We wish to sound a clear alarm... The proposed [energy] restructuring would severely retard progress in fusion.”

  *The famous three points*: “(1) ITER is a major milestone, but it will likely not by itself provide sufficient information to proceed to a practical reactor. (2) Additional research of equal importance is essential. (3) The time scale for fusion demands a strong and innovative research effort in addition to ITER.”

- **1995 NRC Plasma Report** calls for reinvigoration of plasma science, for coordinated support of basic plasma science, and for aggressive support of academic research.

- **1995 PCAST** strongly supports fusion and defines key priorities as
  - Strong core program in plasma science and fusion technology (domestic)
  - Ignition and burn experiment (international)
  - Low activation materials program (international)

- **1996 FEAC Strategy**: Science and Innovation (Domestic) and Energy (International)
1998-2003 UFA Actions: Building Consensus after failure to renew ITER-EDA
The 2002 Fusion Summer Study will be a forum for the critical assessment of major next-steps in the fusion energy sciences program, and will provide crucial community input to the long range planning activities undertaken by the DOE and the FESAC. It will be an ideal place for a broad community of scientists to examine goals and proposed initiatives in burning plasma science in magnetic fusion energy and integrated research experiments in inertial fusion energy.

This meeting is open to every member of the fusion energy science community and significant international participation is encouraged.

Objectives of the Fusion Summer Study:

- Review scientific issues in burning plasmas to establish the basis for the following two objectives. Address the relation of burning plasma in tokamaks to innovative MFE confinement concepts and of ignition in IFE to integrated research facilities.
- Provide a forum for critical discussion and review of proposed MFE burning plasma experiments (e.g. IGNITOR, FIRE, and ITER) and assess the scientific and technological research opportunities and prospective benefits of these approaches to the study of burning plasmas.
- Provide a forum for the IFE community to present plans for prospective integrated research facilities, assess present status of the technical base for each, and establish a timetable and technical progress necessary to proceed for each.

Background: The 2002 Summer Study will build on earlier planning activity at the 1999 Fusion Summer Study and the scientific assessments at the UFA sponsored Burning Plasma Science Workshops (Austin, Dec 2000; San Diego, May 2001). The scientific views of the participants developed during the 2002 Summer Study preparation activities and during the 2002 Summer Study itself, will provide critical fusion community input to the decision process of FESAC and DOE in 2002-2003, and to the review of burning plasma science by the National Academy of Sciences called for by FESAC and Energy Legislation which was passed by the House of Representatives [H. R. 4].

Output of the Fusion Summer Study: An executive summary based on summary reports from each of the working groups will be prepared as well as a comprehensive proceedings of plenary and contributed presentations.

Program Committee Co-Chairs:
Roger Bangerter, Lawrence Berkeley National Laboratory
Gerald Navratil, Columbia University
Ned Sauthoff, Princeton University

1998-2003 UFA Actions: Building Consensus after failure to renew ITER-EDA

Informing Independent NRC Review: Support from Related Science Disciplines

U.S. Magnetic Fusion Research Funding (M$ 2012)

http://fire.pppl.gov.
UFA Actions: Are they needed today?

U.S. Magnetic Fusion Research Funding (M$ 2012)


6 MW D-T
ITER-FEAT Design
ITER-EDA Expires
NRC Plasma
ITER IO
UFA Sponsors U.S. ITER Forum
USBPO U.S. ITER Plan
NRC FusSci
NRC BP
Energy Policy Act 2005
NRC ITER
DOE Low Temp Plasma
ITER IO
DOE ReNeW
FESAC Priorities
FESAC Internat
FESAC Materials
FESAC HEDLP
FESAC PP
FESAC TAP
UFA Burning Plasma Workshops
UFA Co-Sponsors Snowmass 2002
UFA Co-Sponsors Snowmass 1999
UFA Madison Forum
UFA Co-Sponsors Snowmass 2002
UFA Co-Sponsors Snowmass 1999
PCAST
FEAC FES
University Presidents write to Sec Energy
Pres. G. W. Bush Rejoins ITER
ITER-EDA Expires
TFTR Ends
John Kaisch House Budget Cmt
Sen. Johnson Internat Fusion Energy Act
NRC Plasma

http://fire.pppl.gov.
Today’s the Right Time for the UFA to Help Facilitate Broad Consensus for the Proper Strategy for U.S. Fusion Science During the Long ITER Construction Period

• **FES 2012**: -37% cut in Exp Plasma Res with “new emphasis on the science needed for ITER”

• **FES 2013**: terminate C-Mod to “offset increases for ITER and allow capturing new higher priority scientific opportunities”

• **How do we achieve the PROPER BALANCE in the U.S. fusion research program during the growth of international expenditures?**

• **A successful fusion strategy will require broad support within and beyond fusion science**

• **We need an active UFA voice:**
  • Science focus
  • Broad access to opportunities
  • Discovery and new ideas
  • Independent convening power
  • …

![Graph showing U.S. International, U.S. MFE Science, and Total FES expenditures from FY2004 to FY2014.](image)
The UFA gives voice to the University Perspective in Fusion Science Research

- Universities, through education, are responsible for the longevity of the field
- Universities create valuable national partnerships between DOE/Federal and state & private institutions
- Connect fusion with related science and technology
- Independence
- Convening power: facilitates building consensus