

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

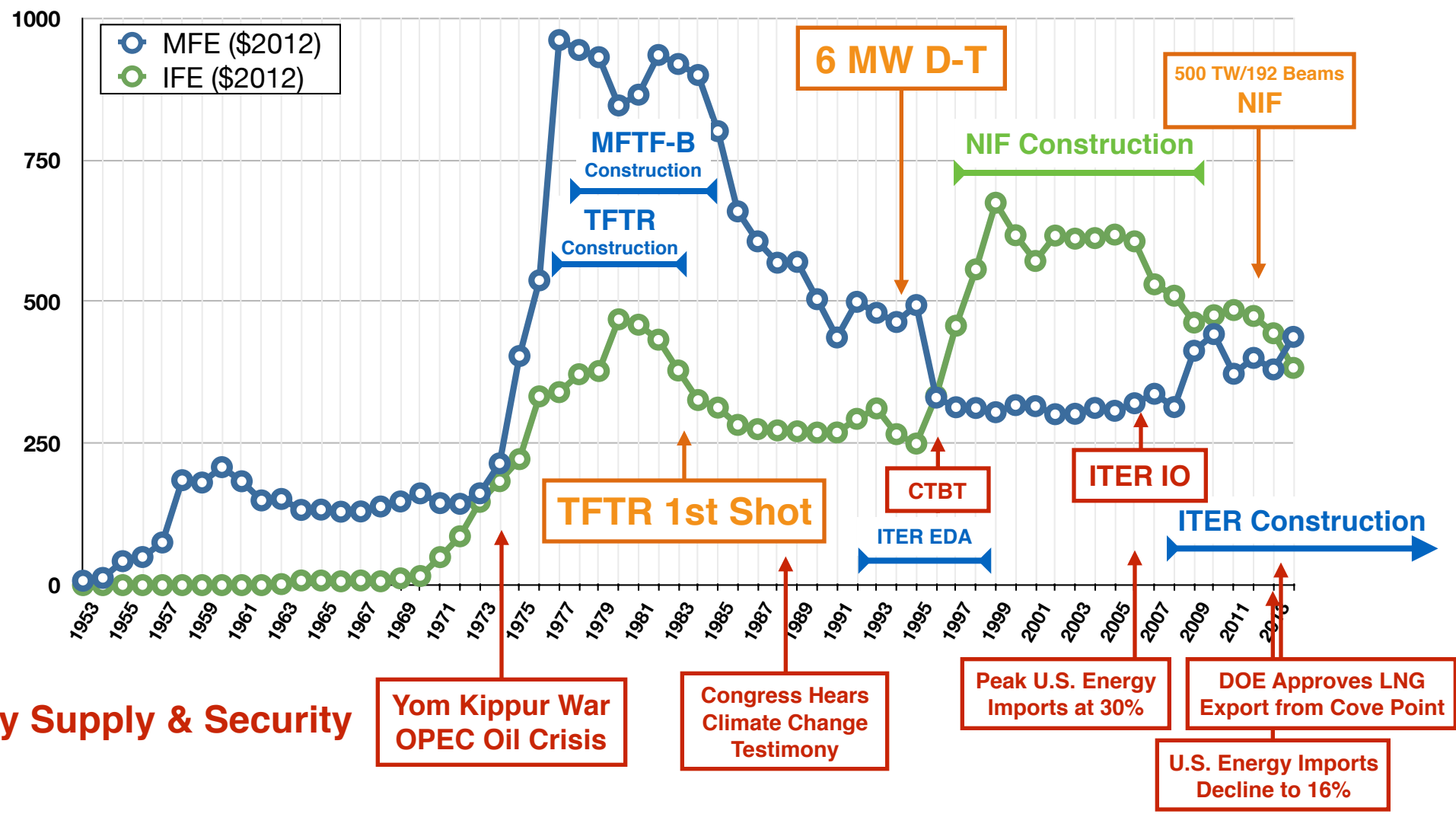
- Universities, through education, are responsible for the longevity of the field
- Universities create valuable national partnerships between DOE/Federal and state & private institutions
- Connect fusion with related science and technology
- Independence
- Convening power: facilitates building consensus

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)



Energy Supply & Security

Yom Kippur War
OPEC Oil Crisis

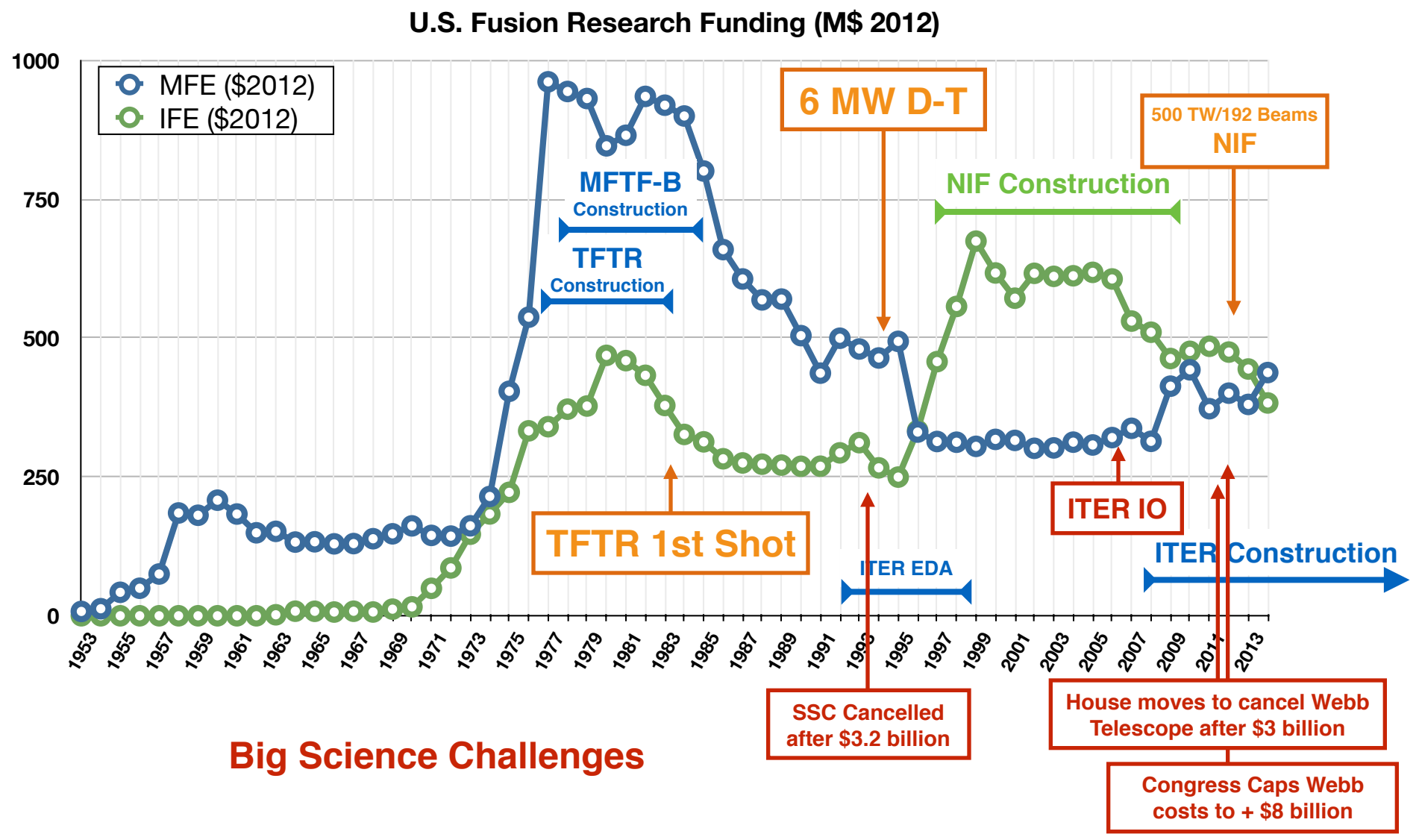
Congress Hears
Climate Change
Testimony

Peak U.S. Energy
Imports at 30%

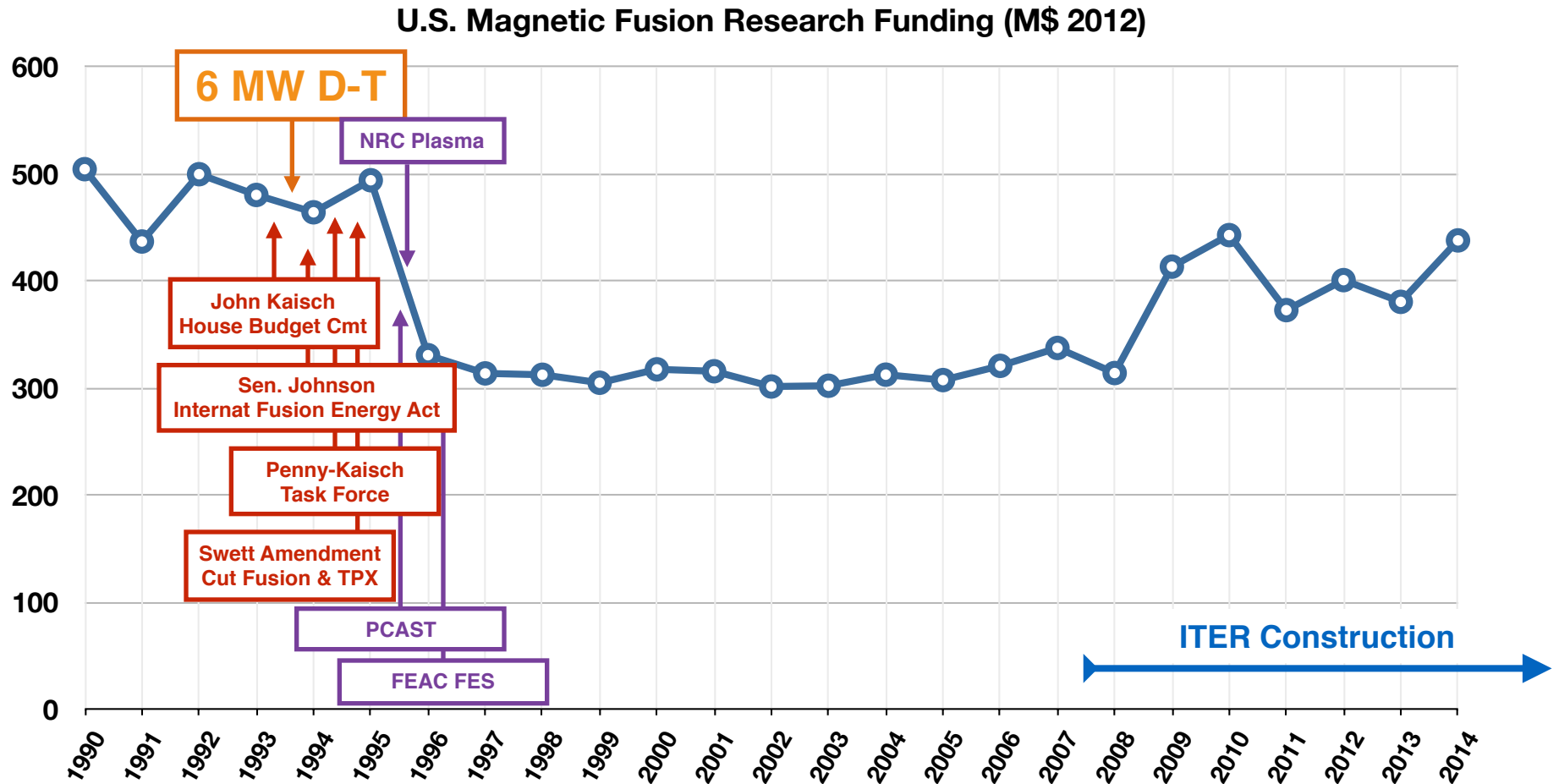
DOE Approves LNG
Export from Cove Point

U.S. Energy Imports
Decline to 16%

Variable U.S. Fusion Funding Shows Impact of Major Fusion Research Construction



UFA Actions 20 Years Ago: Informing Congress



UFA NEWS

It is customary at the end of the year to communicate to the UFA membership general information on fusion programmatic and budgetary issues (filtered through the subjective lens of the UFA), a summary of recent UFA activities, and specific UFA business matters, as follows. (Prepared by S. Prager and M. Mauel.)

I. GENERAL FUSION MATTERS

The Budget

The Department of Energy has requested \$372,563,000 for Fusion Energy in FY95. The budget request is shown below along with adjusted appropriated budget for FY94.

According to the budget document submitted to Congress, "The scientific and technological issues that must be addressed to achieve program's goals are ignition physics, nuclear technology, magnetic confinement configuration optimization and low cost materials development. The U.S. fusion committee is addressing these issues with the number of international collaborations exemplified by the joint ITER program. Additional issues of steady-state fusion and advanced plasma performance are addressed by the Tokamak Fusion Experimental Program. This is planned to be the main experimental tokamak program. There are four main magnetic fusion programs. The production of a fuel mixture in the TFTR... element is ITER

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April 20, 1993

Please forward this message

To: LFA Executive Committee
David A. Hammer
Stanley C. Luckhardt
Philip J. Morrison
W.A. Peebles
James F. Drake
Michael E. Mauel
Thomas R. Jarboe
Paul M. Bellan
D. Gary Swanson
Nathaniel J. Fisch
Harold Weitzner

From: S.C. Prager

Number of pages

Attached is a letter from seven committee members. We appreciate if you can forward this to the other members. Since the letter is longer than Har...

University Fusion Association News Update & Membership Update Request — April 26, 1993

UFA Action on Senate Bill S.646, "The International Fusion Energy Act of 1993"
On March 24th, Senator Bennett Johnston (D-LA) introduced a bill within the Committee on Energy and Natural Resources calling for restructuring the fusion program with a complete emphasis on ITER and a future fusion demonstration reactor. The bill applauds the past success and rapid progress of the fusion program and calls for a fusion budget increasing to \$475M by FY 96, the executive committee of UFA strongly opposed the narrow restructuring proposed by the bill.

For this reason, Stewart Prager (Univ. of Wisconsin, Prager@juno.physics.wisc.edu) UFA president, sent a letter to Senator Johnston and the Subcommittee on Water and Energy on April 21st. A copy of this letter is attached. Since this bill addresses the fundamental direction and emphasis of our research programs, the UFA executive committee encourages members to become aware of the issues involved with this proposed legislation. The Subcommittee will begin hearings on this bill on May 6th. A copy of the bill can be obtained by contacting any member of the UFA executive committee. Additionally, a copy can be sent electronically by request to any member indicating an EMail address on the enclosed membership update form.

UFA Recommends Greater University Representation on FEAC
On March 30, 1993, Stewart Prager, UFA president wrote to Dr. N. Anne Davies, Associate Director for Fusion Energy to "recommend that two university fusion experimentalists be appointed to the [Fusion Energy Advisory] Committee. This would give the committee a broader representation from the scientific community, would enlarge its scientific viewpoint, and would increase its credibility, especially in the university community."

UFA Goes Electronic
We are updating our membership list to include EMail addresses. This will allow relatively inexpensive and rapid communication between the executive committee and our members. Please take the time to complete the enclosed membership update form or send your current membership information electronically to Mike Mauel (Columbia University, Mauel@cuplvx.ap.columbia.edu), UFA Secretary/Treasurer.

Membership Drive
The effectiveness of the UFA depends on strong, broad-based support from a large membership. Please make an effort to recruit your colleagues by asking them to join the UFA. Membership dues are \$15.00 per year to cover our mailing and other small expenses.

Also for current members who have not yet paid your 1993 dues, there is a special offer. If you have not yet paid your dues, there is a special offer for you. You can pay your dues in the form of a check for \$15.00 payable to the University of Wisconsin. If you cannot pay by check, you can pay by credit card. If you cannot pay by check or credit card, you've paid your dues, just drop an EMail message to Mauel@cuplvx.ap.columbia.edu.

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.”

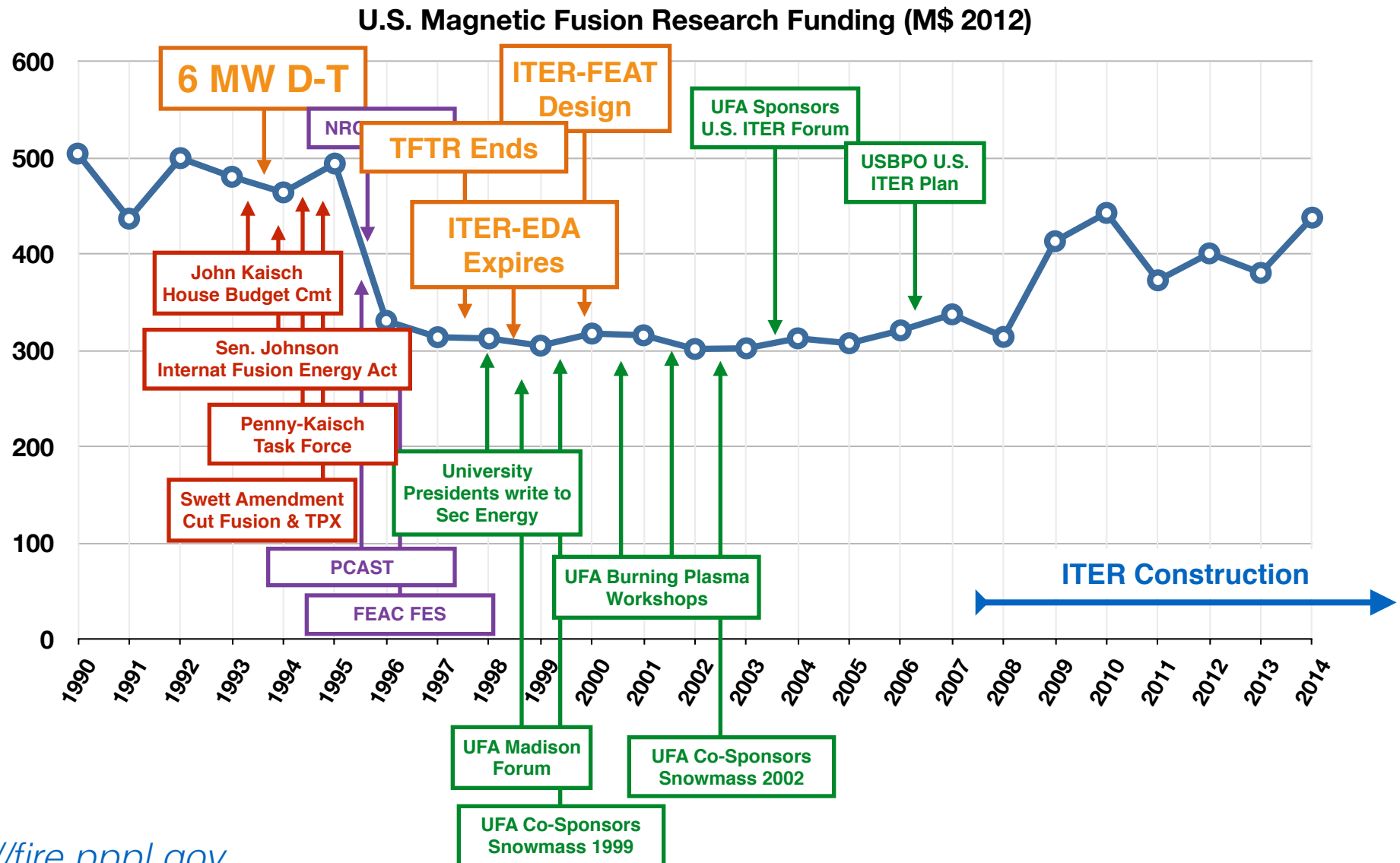
UFA and Community Response

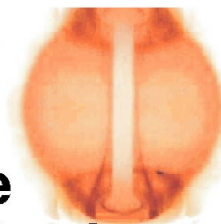
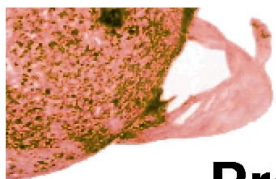
- Overwhelming community response against S.646: UFA, Fusion Coalition, ..., calling for a balanced fusion program.
- **Prager/UFA:** “We wish to sound a clear alarm... The proposed [energy] restructuring would severely retard progress in fusion.”

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





Proceedings of the 1999 Fusion Summer Study

Opportunities and Directions in Fusion Energy Science for the Next Decade

An Endorsed Workshop of

The American Physical Society and The American Nuclear Society – Fusion Energy Division

July 11-23, 1999 at Snowmass, CO

Sponsored by

DOE, PPPL, GA, LLNL, MIT/PSFC, LANL,
SNL, VTL, ORNL, FPA, and the UFA



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:

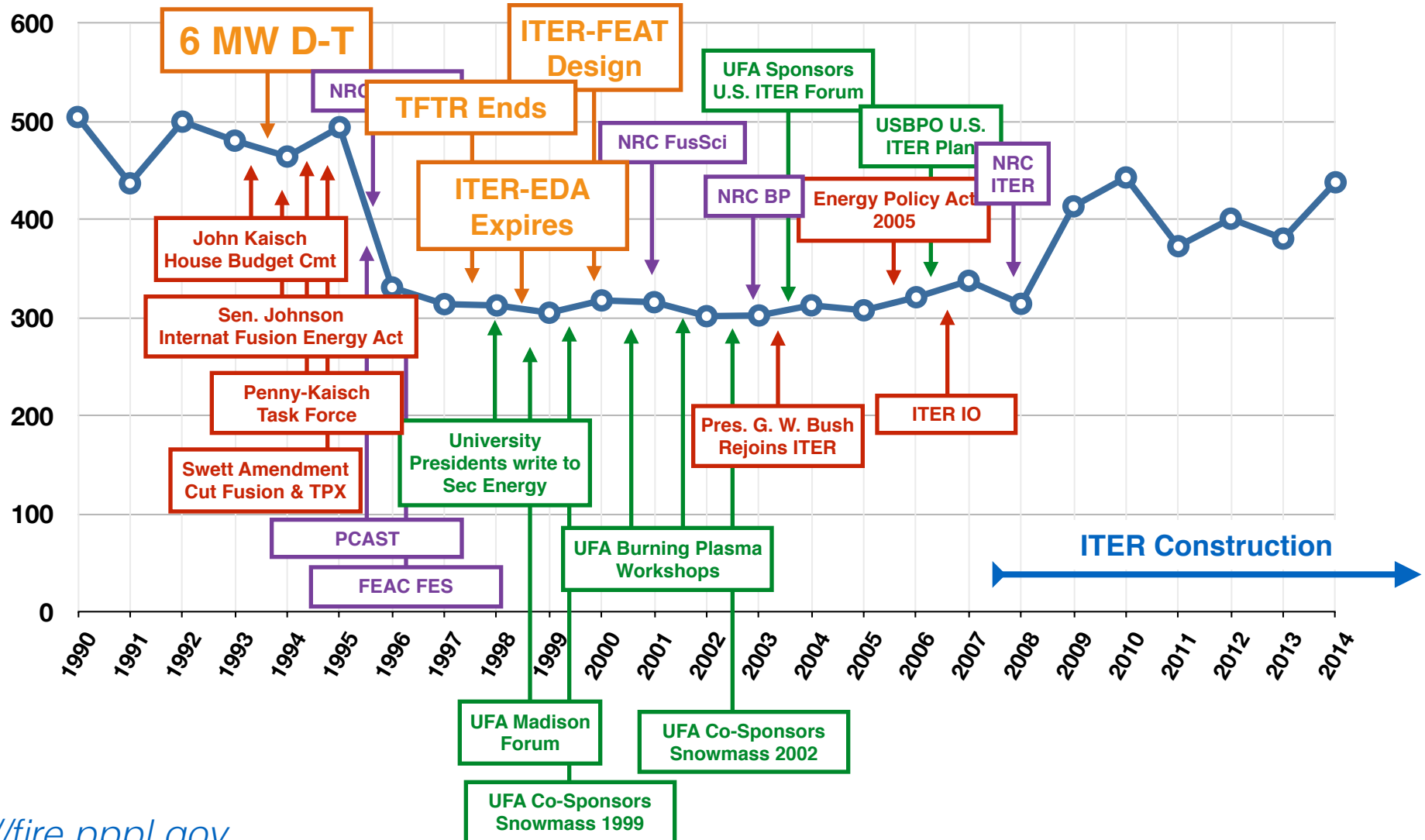
Roger Bangerter, *Lawrence Berkeley National Laboratory*
Gerald Navratil, *Columbia University*
Ned Sauthoff, *Princeton University*

For More Information: <http://lithos.gat.com/snowmass>

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

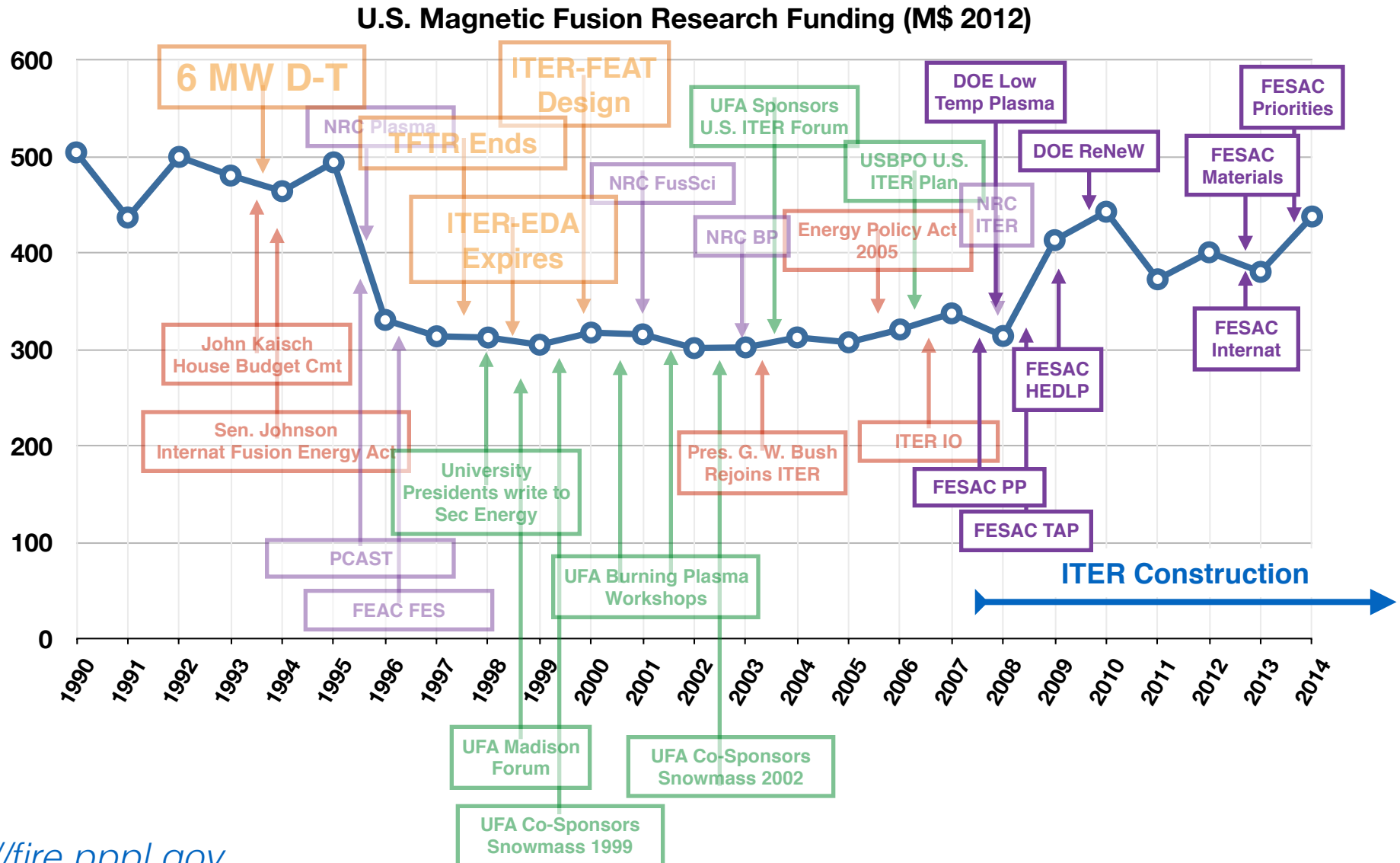
Informing Independent NRC Review: Support from Related Science Disciplines

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



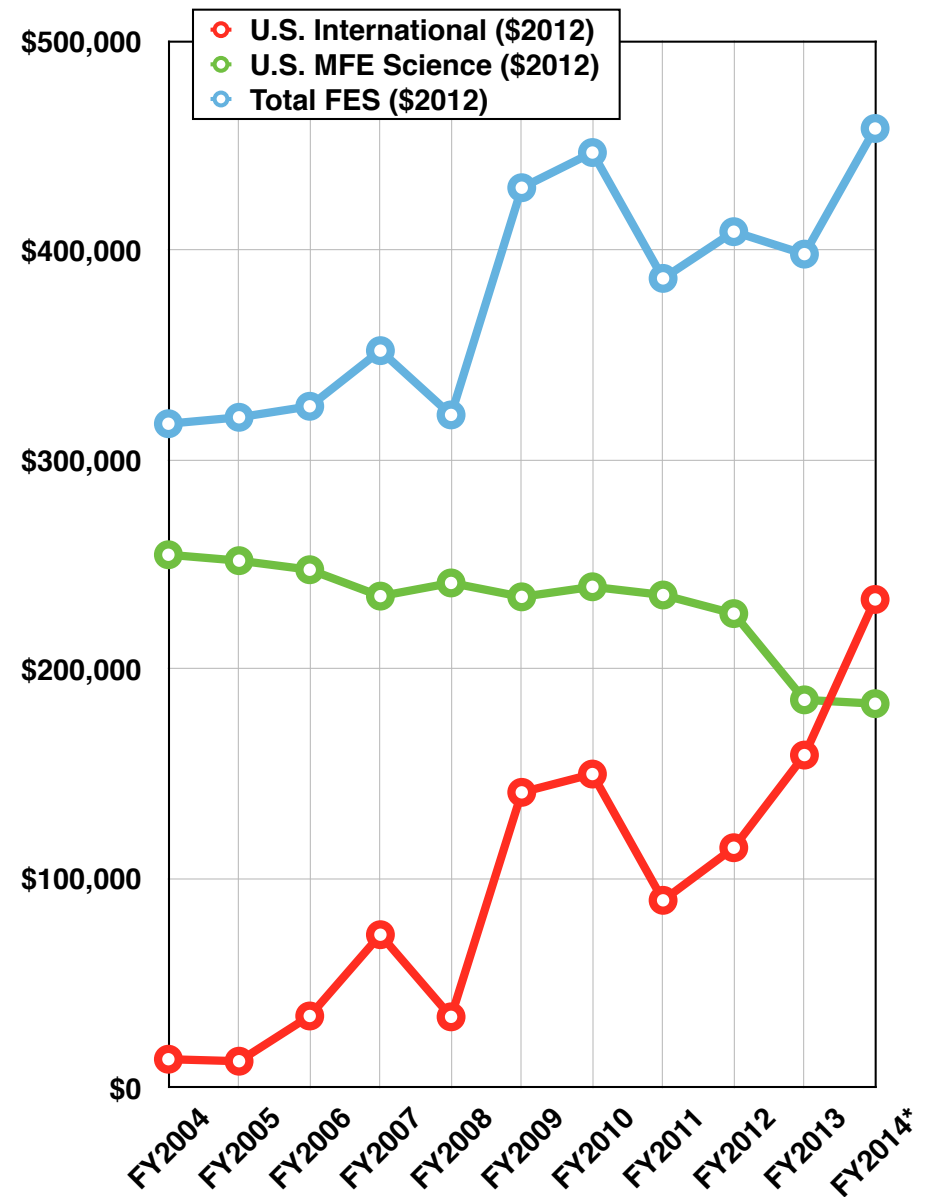
UFA Actions:

Are they needed today?



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
 - ...



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