

**The Official Pep Talk for Snowmass
2002**

Jeff Freidberg

MIT

July 2002

Why Are We Here?

- We passionately believe in the mission for fusion
- The need for clean, abundant energy is strong now and will be even stronger in the future
- The US and world fusion programs have made excellent scientific progress over the last 5 – 10 years
- The next scientific frontier in fusion research is burning plasma physics
- Are we ready for a burning plasma experiment?
- YES!!!
- Are we ready now?
- YES!!!
- Then what are we waiting for? Let's do it!
-

Which BPX Should We Build?

- The good news is that we have serious options
 - a. ITER
 - b. FIRE
 - c. IGNITOR
 - d. Various combinations and permutations of the above
- The bad news is that we cannot decide which is the best option
- We probably cannot even agree on the definition of “best”

How Should We Proceed?

- **The FESAC panel on burning plasmas envisioned a multistep process**
 - a. **Snowmass for scientific and technological credibility**
 - b. **High level FESAC panel to develop a US strategy**
 - c. **A parallel NRC study to get advice and buy-in from our non-fusion scientific colleagues**
 - d. **Recommendations go to DOE who carries the ball and makes it happen**

What Did the FESAC Burning Plasma Panel Want?

Recommendations

1. Planning and constructing a burning plasma experiment

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

- We have known the issues since the mid 80s
- We have carried out theoretical studies
- We have carried out limited experimental studies
- We have exploited the existing experimental facilities
- We are ready, NOW, to move on to the new frontier of burning plasma physics

Recommendations (continued)

2. Funding for a burning plasma experiment

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

- **A BPX will require substantial funding**
- **Likely \$100M/yr or more**
- **Funding should not be at the expense of the base program**
- **New funds are required**
- **The present base program is needed to advance plasma science**
- **The present base program provides the expertise to operate the BPX when construction is completed**
- **Premature termination of components of the base program would be shortsighted**

Recommendations (continued)

3. The US Plan

The US Fusion Energy Sciences Program should establish a proactive US plan on burning plasma experiments and should not assume a default position of waiting to see what the international community may or may not do regarding the construction of a burning plasma experiment. If the opportunity for international collaboration occurs, the US should be ready to act and take advantage of it, but should not be dependent upon it.

Recommendations (continued)

- **Hold a “Snowmass” workshop in Summer 2002**
 - a. **Critical community examination and input to FESAC planning activities**
 - b. **Re-confirm that we are ready NOW to proceed with a BPX**
 - c. **Examine the scientific and technological viability of FIRE, IGNITOR, and ITER-FEAT on a uniform basis**
 - d. **Show that some or all designs have a high probability of success**
 - e. **Input should be requested and welcomed from all members of the fusion community**
 - f. **Do not spend too much time on “general” burning plasma physics: been there, done that**
 - g. **Do not try to choose the “best” option. This will likely be impossible**
 - h. **Focus should be on credibility of success of each option with respect to mission, cost and schedule**

Recommendations (continued)

- The Office of Energy Sciences should direct FESAC to form a “high” level action panel in the Spring 2002
 - a. Chart the future course of action of the US BPX experiment – make the hard choices
 - b. Build FIRE as a US experiment?
 - c. Collaborate with the Italian government and build IGNITOR in Italy or the US?
 - d. Rejoin ITER-FEAT as a serious partner?
 - e. ...?
 - f. ...?
 - g. ...?
 - h. Consider political and financial issues as well as scientific and technological issues
 - i. Decision should be given to the Director of the Office of Energy Sciences by January 2003

Basic Goals of Snowmass

- Determine technically whether each machine
- can do what it says it can do
 - a. Will it be able to carry out its stated scientific mission?
 - b. Will it be able to do this for the stated cost?
 - c. Will it be built and operated on the proposed time scale?
 - d. How exciting is the mission and how far will it push the frontier?
- Let's go to work
 - a. Let's minimize politics
 - b. Let's minimize science for science's sake
 - c. Let's focus on a rigorous and fair assessment of the BPX options
 - d. Let's provide quality input for the high level FESAC panel

Late News

- **Members of the Fusion community met with Ray Orbach on June 28, 2002**

- **Fusion members**
 - a. **J. Callen**
 - b. **J. Freidberg**
 - c. **M. Mauel (organizer)**
 - d. **F. Najmabadi**
 - e. **G. Navratil**
 - f. **J. Willis**

- **OES members**
 - a. **R. Orbach**
 - b. **J. Decker**
 - c. **J. Metzler**
 - d. **J. Salmon**

- **Purpose – Discuss the future directions for the fusion program**

Main Points made by Ray Orbach

- **Ray is very knowledgeable about the fusion program**
- **He seemed to know about the FESAC burning plasma report**
- **He seemed to know about Snowmass**
- **He was most interested in obtaining the results from the Prager “high level action panel”**
- **He wants the results by the beginning of October**
- **Ray sees Fusion as being at a fork in the road**
 - a. The Prager panel can choose a science route**
 - b. The Prager panel can choose an energy route**
- **An energy route???**

We Were Speechless!!!

- **But we do science. We are not allowed to do energy. Congress made us do this. Blah, blah, blah...**
- **Ray said that things have changed – there is great interest at high levels in low CO₂ power**
- **Ray said the Fusion stars are aligned if we are ready for the energy route**
- **Ray Orbach likes Fusion**
- **John Marburger likes Fusion**
- **George Bush and Tony Blair like Fusion**
- **Congress likes Fusion**
- **Ray hopes the Prager Panel likes the energy route. However, he is really interested in the community's view on whether or not we are ready for the energy route**

The Situation as seen by Ray

(my interpretation)

- **Does the energy route imply ITER – Yes**
- **What is a major goal of the Prager Panel – Answer the following question**

What is the lowest cost, most efficient path to fusion power?

- **The answer could be the energy route or the science route. Ray just wants to know.**
- **What is the likelihood of participating in a BPX in the US or internationally if we choose the science route? Very low – budget would remain at about \$250M/yr**
- **What is the likelihood of participating in a BPX in the US or internationally if we choose the energy route? High – budget might increase to \$350M/yr**

**I can't wait to hear the results of the
Prager Panel.**