Input to Priorities Panel
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The Emperor of Fusion has no Clothes
Four Points

• ITER
• US Fusion program
• PPPL
• Management of US Fusion program
ITER

- At $5B \quad \text{ITER} = \text{Good idea}
- At $25B \quad \text{ITER} = \text{Bad idea}
- Why? Two reasons
ITER is sucking the life out of the base program
Cost is way too High

- Almost proves that tokamak fusion is uneconomical

- Comparison (1 GW Overnight cost)
  - Coal $3B
  - Gas $1B
  - Nuclear $4B
  - Wind $2B
  - Solar-T $3B
  - ITER $25B
Why is the cost so high?

• World’s most inefficient management structure
• Technological over-reach
  • R&D in real time
  • Drawn out schedule
Recommendation

• Provide convincing evidence that future costs will be much lower
• If the US continues with ITER
  • Pay your bills in full on time
  • Not at the expense of the base program
• If you can’t do this, pull out of ITER
The US Fusion Program

- Fusion Energy – science/engineering + economics
- Tokamaks and stellarators (high B)
  - Good science/engineering
  - Tough economics (large magnets)
- Other alternates (low B)
  - Better economics (smaller magnets)
  - Tough science
  - I doubt that physics can be beat
  - Still important – basic science, education
- Everybody has materials problems
My Assessment

• We are losing our leadership
• We need a next generation experiment
• Probably a tokamak
• D-T mission probably too expensive
• Steady state may be best mission
• Sending our scientists to Asia doesn’t cut it
Recommendation

• PPPL, GA, MIT, community design an AFFORDABLE experiment
• $2B - $4B too expensive
• If a good design and mission – pool resources and build it
• Invest in materials research
• Invest in magnet research
Our National Lab for fusion
Needs a strong program
Needs to be in a position of leadership
My concern:
  - Current direction (ST) is not a good option
  - Tough MHD, heating, current drive, transport
  - I doubt it will achieve its mission
Still, there are strong ST advocates
Recommendation

- NSTX-U and NCSX both on the table
- DoE may have a problem – get over it!
- Fusion scientists review dual PPPL proposals
- Let the best concept win
  Gunfight at the PPPL corral
Current decision making process

- SC
- OMB
- OFES
- HOUSE
- STATE

.flowchart

DECISION

US FUSION PROGRAM

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Recommendation

• Inform DoE that
  • Their decision making process is unacceptable
  • Directions and priorities should be set by the fusion science community