Some Strategic Thoughts

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What is the charge?

Prioritize MFE program elements in 3 scenarios:

1) FY2013 budgeted level of effort ($213M $FY2012)
focus on burning plasmas & AT, plasma-material interaction

2) FY2012 budgeted level of effort ($252M $FY2012)
focus on burning plasmas & AT, plasma-material interaction

3) 1.5x FY2013 budgeted level of effort ($320M $FY2012) FY2020-24
   (27% above 2012)
much of increase to material science, harnessing fusion power
This charge articulates some current realities

1) ITER & AT will continue to need support from domestic programs

2) The next big S&T issue is Plasma-Material Interaction

3) Moving on to harnessing the neutrons from fusion will require $$$

... but not some others

1) Major ITER & AT support will come from Asian S/C tokamaks in the future

2) No existing or planned machine can come close to FNSF or Demo PMI

3) To build FNSF will require an MFE program >> $320M/year
The situation could change

Perhaps by ~ 2017 there will be both:

1) A solution to the PMI problem that allows engineering design of FNSF

2) Enough money to begin engineering design and R&D for an FNSF

If not, we should look at partnering in a longer-term international Demo.

- Build a new US facility to provide leading support?
Near-term goals:

1) Resolve basic design options: ST vs. AT, Cu vs. S/C, through experiments and scoping studies.

2) Develop a viable PMI concept through experiments and modeling.
The International Demo Path

Near-term goals are similar to FNSF path:

1) Resolve basic design options: AT vs. ST vs. Stellarator through experiments and scoping studies (for the near term, LHD and W7-X will be the stellarator flagships)

2) Develop a viable PMI option through experiments and modeling.

Longer-term goal (post ~2017):
U.S. leadership in one or more key areas for Demo.
Options might include:

1) Stellarator physics, if Demo is going in this direction

2) Plasma-materials interaction

3) Neutron-interactive materials
Strategic Implications

1) We should maintain near-term support for core physics of ITER, ATs, STs and Stellarators (and Innovative Confinement Concepts).

2) The U.S. should use its existing facilities and international collaboration to advance FNSF- and Demo- relevant PMI. The issues are very similar: high power density, long pulse, hot walls.

3) We should now work with others to scope out longer-term FNSF and Demo options, including $Q_{\text{eng}} > 1$ Pilot Plants.

4) We should now scope out longer-term options for new U.S. facilities in
   - Stellarator physics: e.g., compact and/or quasi-symmetric
   - PMI S&T: e.g., confinement device to study solid & liquid surface PMI
   - Neutron-material interaction: e.g., U.S. accelerator-based options