NCSX Engineering Plans

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NCSX Project Meeting

PPPL

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Plans for engineering developed for balance of FY99

- Plans key off top-level project milestones
  - Select reference plasma configuration (3/30)
  - Establish reference (filament) coil design (4/30)
  - Select design concept for stellarator core (4/30)
  - Release GRD for conceptual design (4/30)
  - Complete validation of reference coil design (5/30)
  - Provide an attractive and affordable plasma configuration and machine design for Snowmass (6/30)
  - Conduct Physics Validation Review (9/15)

- The schedule is tight but does it mean anything?

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Engineering activities in FY99

- Requirements development
- Configuration development
- Stellarator core design
  - VV/PFCs
  - Cryostat/HF
- Project engineering and control
- FY99 work in other areas limited to
  - updating work scope inputs to WBS dictionary
  - preparing bottoms-up cost/schedule estimates for PVR

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Requirements (Zarnstorff, Reiersen)

- GRD to be released for Conceptual Design by 4/30/99
- Physics requirements finalized and validated at PVR in 9/99
- Engineering requirements finalized and validated at CDR in 4/00

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Configuration development
(Cole, Brown)

- Major milestone is to have a workable configuration developed for Snowmass
  - Model of coils, structure, and vacuum vessel complete by 6/30/99
  - Requires early completion of TF coil study (4/30/99)
    - Do field errors require 3-fold symmetry in TF? (Brooks)
    - What are the pros/cons of 18 v. 20 coils? (Cole)
      - NB tangency radius
      - port size
      - ripple
      - port allocations
    - What is the feasibility , scope, and cost/schedule of 18 coils? (Heitzenroeder)

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Configuration development proceeding in parallel with stellarator core design

- **Issues include:**
  - **Integration of stellarator core with PBX systems**
  - **Pro/E modeling of PBX systems**
  - **NBI, RF, and diagnostic access**
  - **Port allocations**
  - **Assembly and maintainability**

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Stellarator core design

(Nelson, Williamson, Goranson, et al)

- The design of the stellarator core is THE key issue in engineering design -- it is the riskiest and costliest element
- Ongoing work focused on developing designs for the vacuum vessel, shell, and conductor that are fabricable and affordable
  - Based on model developed for c10 coils
  - MIT will assess the feasibility of using SC for the HF coils
  - Target date is 4/30
  - Requires early (5/30) verification that shell time constant is OK (Brooks)
- Once the concept is selected, design work will switch to the reference plasma configuration

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Stellarator core design (2)

- A modest R&D effort will be conducted this FY to establish the mechanical properties of the cabled conductor and assess the degree of thermal expansion that can be tolerated (7/30 completion date)

- An assessment of the structural adequacy of the design will be conducted this summer (8/30 completion date)

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Project engineering and control
(Simmons, Reiersen)

- WBS Dictionary
  - Work scopes for each WBS are defined in the WBS dictionary
  - WBS dictionary will be updated based on upcoming decisions on plsma configuration, coil design, and machine configuration
  - To be issued prior to PVR
- Cost and schedule integration
  - Initial bottoms-up cost and schedule estimates will be prepared for the PVR