

# NCSX

## Physics Strategy Overview

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## Goals & Milestones

- Prepare for PVR - December
  - Including FESAC issue
- Improved Reference Plasma Configuration - June 1
- Improved Experiment Configuration - Sept. 1
- PAC meeting - Aug. 1
  - PAC issues

## PAC Comments (June 1999)

- 1) Critical next task for PVR is to develop & determine device flexibility
- 2) Need to clarify achievable physics program and required capabilities (pulse length, field strength, heating power)

### In addition:

- Confinement enhancement methods need to be explored and designed. Current indication is that 6MW is marginal to achieve  $\beta=4\%$
- Start development of a strategy to obtain good flux surfaces
- The design  $\beta=4\%$  is marginal. Explore ideas for configurations with higher stability limits.
- Plasma access requirements should get some attention

## FESAC PoP Evaluation (August 1999)

The design “must exhibit robustness of the equilibrium configuration throughout the plasma evolution.”

# Physics Task Plan Elements (1)

## Improved Plasma Configurations

- Beyond c82: improved transport, better flux surfaces, easier coils
- Improved optimizer

## 3D Equilibrium & Surface Quality

- Continue development of VMEC, PIES, M3D
  - VMEC: local force balance,  $J_{\parallel}$
  - PIES: neoclassical island effects
- Benchmark all available equilibrium codes

## Physics Task Plan Elements (2)

### Confinement, Performance, Enhanced Confinement

- Confinement & Performance evaluation with self-consistent profiles
  - Landscape surveyor (DKES based)
  - GTC, for direct losses and finite drift-orbit width effects
- Evaluate strategies and requirements for enhanced confinement, to ensure access to high- $\beta$
- Flow-damping evaluation & requirements

### Improved Coils

- Strategies to design flexible coils
- Methods to design coils to give good surfaces.

## Physics Task Plan Elements (3)

### Flexibility & Startup

- Model & develop startup scenarios
- Define flexibility required for Physics Program
- Start assessing candidate coil configurations

### Physics Requirements and Program

- Power and Particle Exhaust
- Required physics program, program context

## Summary

- We have a lot to do before the PVR !
  - Improved configurations and coils
  - Enhanced confinement
  - Flexibility
  - Good surface quality throughout evolution

In many cases, we are researching new areas  $\Rightarrow$  results will be exciting and uncertain.

- We need to focus on our main issues, to ensure completion
- The plan will continue to change as we learn more, as we have more good ideas