

NCSX Project Overview

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NCSX Project Meeting
March 23, 2000

The NCSX Program is on Track to Meet Its Goals

Goal for FY-2000: An updated NCSX machine configuration (reference plasma, coils, machine concept) that meets all physics requirements.

To go beyond the PAC-3 (June-1999) configuration, first steps were...

- **Improve tools** to fold additional requirements into design process.
- Explore **alternatives** (e.g., tools, coil topologies) more broadly.

**Milestone deliverables completed March 1 have provided both of these
⇒ greater understanding and freedom ⇒ greater design capability.**

Next steps: update the design...

- Updated reference plasma configuration (June 1)
- Updated stellarator configuration (Sept. 1)

Substantial Gains in Design Capability Have Been Made

Highlights of March 1 Accomplishments

- Plasma configuration design.
 - New optimizer modules for targeting transport and good surfaces.
 - Initial upgrades to VMEC, PIES: improved physics, efficiency.
- Coil design.
 - Several new coil topology alternatives defined.
 - Engineering limits of cabled conductor: better understanding.
 - Improved coil optimization tools.
 - Flexibility: candidate profiles; tools for startup, flexibility evaluation.
- Access for heating, diagnostics, and pumping.
 - Requirements defined.
 - Concepts for accommodating requirements developed.
- Reactors.
 - Adaptation and first application of tools for sensitivity/scoping studies.

March 1 Accomplishments Summary

Detailed documentation available in project memos:

Engineering*

G. Neilson, Milestone Report to DOE
M. Cole, Draft Access Study Status
B. Nelson, Draft Design Criteria for Cabled Conductor
W. Reiersen, Requirements and Design Constraints
W. Reiersen, Topology Options

Physics**

G. Neilson, Milestone Report to DOE
D. Johnson, Preliminary Assessment of Diagnostic Access Needs on NCSX
H. Kugel, Port Access Requirements
J. Lyon, Compact Stellarators as Reactors
D. Mikkelsen, Standard Profiles for NCSX Flexibility Studies
M. Redi, Benchmarking of NEO Code Against Other Measures of Transport
I. Zatz, ORBIT Code Application for Stellarator Optimizer
M. Zarnstorff and C. Hegna - Analytic Island Estimates

*<http://www.pppl.gov/ncsx/ncsxfss/Engineering/engineering.html>

**<http://www.pppl.gov/ncsx/ncsxfss/Physics/physics.html>

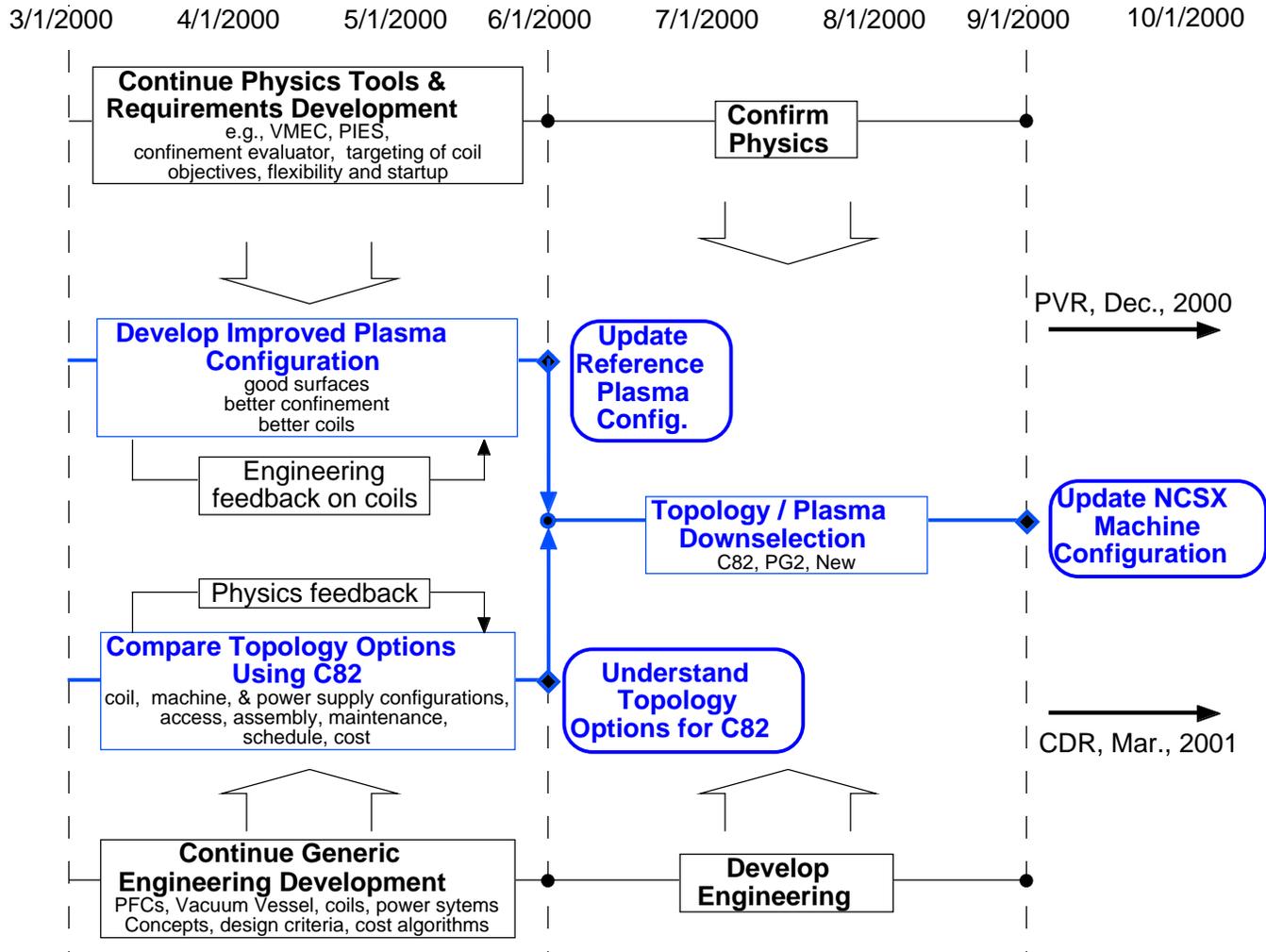
Formula for success so far:

- Quality physics and engineering.
- Careful planning and tracking.
- Hard work.

NCSX Design Schedule

Sub-Phase	Accomplishments	Completion Date
Configuration Update (Phase II)		
IIa	<ul style="list-style-type: none"> • Improved physics tools to implement new requirements. • Candidate machine topology options for subsequent evaluation. 	3/1/2000 Complete
IIb	<ul style="list-style-type: none"> • Updated reference plasma configuration meeting all requirements. • Understand machine topology options for C82. 	6/1/2000
IIc	<ul style="list-style-type: none"> • Updated stellarator configuration based on new reference plasma and best machine topology. 	9/1/2000
Conceptual Design (Phase III) and Beyond		
III	Physics Validation Review	12/2000
III	Conceptual Design Review	3/2001
III	Project Validation	5/2001
IV	Advanced conceptual design and R&D (mid-FY-2001 through FY-2002)	
	Construction Start	10/2002

Critical NCSX Task for Remainder of FY-2000: Develop Plasma & Topology Options, Downselect



This Meeting

- Progress toward project goals for FY-2000.
- Strategies and plans for updating the design.

Sessions

- NCSX Overviews
- Plasma Configuration Design and Transport
- Equilibrium Codes (VMEC, PIES)
- QOS
- Compact Stellarator Reactors
- Coil Design to Meet Physics Requirements
- Machine Design

Calendar

Mar. 27-29	Sherwood Meeting, Los Angeles, CA.
Apr. 4-6	DOE/OFES Budget Meeting, Germantown, MD.
May 18-19	Next NCSX Project Meeting.
June 1	Milestone, "Update Reference Plasma Configuration."
June 12-16	EPS Meeting, Budapest. (S. Hirshman, M. Redi)
July t.b.d.	NCSX Project Meeting.
Aug. 1-2	Next NCSX PAC Meeting (PAC-4).
Sept. 1	Milestone, "Update NCSX Machine Configuration."
Sept. 11-15	Symp. on Fusion Technology (SOFT), Madrid. (Abstracts: 3/31)
Oct. 4-10	IAEA Meeting, Sorrento. (M. Zarnstorff, D. Spong, G. Fu, J. Lyon, N. Pomphrey proposed by U.S.)
Oct. 12-16	Varenna Alternates Conference, Italy.
Oct. 23-27	APS-DPP Meeting, Quebec City. (Nomin.: 5/17; Abstracts: 7/12)
Dec. t.b.d.	Physics Validation Review.

Announcements

- Meeting Procedures: presenters submit electronic presentations to Autumn Percival (apercival@pppl.gov, 609-243-2653) for posting on web site by noon the day before talk.
- NCSX home page, new address: <http://www.pppl.gov/ncsx/>
- For publications list, follow [Compact Stellarator Publications](#) link on home page. Provide corrections and updates to Autumn.