

NCSX Project Overview

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NCSX Project Manager

NCSX Project Meeting

Princeton Plasma Physics Laboratory

March 30, 1999

Review and *Update* of Plan

Plan for Establishing a Reference Configuration (*per February Meeting Wrap-Up by GHN*)

1. Engineering will continue to make judicious use of the C10 configuration for design concept development purposes. ***Still the plan.***
2. By March 25, adopt reference plasma and coil configuration. (2 weeks before the FWP meeting). ***Deferred our deadline to March 31. FWP is still 4/7.***
 - 2a. Between now and March 25, an effort will be made to develop a configuration that is better than C82. If no improvements are obtained, C82 will be adopted. **(Reiman)**
 - * Target fast ion confinement
 - * Stabilize the kink mode more benignly. Check sheet currents to monitor coil implications of plasma candidates.
 - * Work around bootstrap current uncertainties until code discrepancies are resolved.

***Progress: New configuration C85 has been developed; have two to chose from!!
This Meeting: How does C85 compare with C82?***

Review and *Update* of Plan, cont'd.

2b. Between now and March 25, an effort will be made to improve coil design.
(Hirshman, Engineering)

- * Improve coil spacing (examine both spreading and bunching)
- * Apply new coil-cutting algorithms (Pomphrey code)
- * Target current density reduction
- * Need quick turnaround on reconstructability assessments

***Progress: Improvements in coil discretization algorithms have been put forth.
This Meeting: How much do they benefit the (C82) design?***

3. By April 30, define a workable vacuum vessel concept and select the reference HF coil and structure concept. **(Nelson) *Still the plan.***

4. By Snowmass (starts July 11), scope reactor configurations:

- * Reactor plasma configuration (R/a scan). **(Reiman)**
- * Modular coils (Bcoil/B0) **(Hirshman)**

Still the plan, some progress already.

...plus well thought-out detailed plans presented in the various talks.

- “Key Issue Items” and “Action Items” from Feb. meeting: Updates were due 3/26. Provide status info to Simmons or in presentations at this meeting.

Date: Tue, 23 Mar 1999 08:32:08 -0500
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From: Hutch Neilson <hneilson@pppl.gov>
Subject: NCSX Key issues and action items

Please review the follow-up items identified at the February NCSX project meeting (reproduced below) and provide a status update. If the item will be addressed in detail at next week's meeting, so indicate. If not, please explain the status in a short reply message by Friday, Mar.26.

Example:

Action Item #9: Physics Validation Review is scheduled for Sept., 1999. Conceptual Design Review in March, 2000.

Thank you for your cooperation.
Hutch

Key Issue Items

1. Support structure time constant.

Engineering proposed that the support structure eddy current time constant be relaxed from <10ms to ~200ms. Action:

1a. Assess benefits of relaxing the requirement **(Nelson)**

1b. If substantial benefits are projected, undertake eddy-current analysis (SPARK) of physics implications to see if they are acceptable. (Resource issue) **(Neilson, Reiersen)**

2. Magnetic permeability

Welding and bending of stainless steel can produce localized zones of high permeability in the vacuum vessel. 350C bakeout exacerbates the problem. Plasma configuration perturbations may be difficult to quantify. Strategy:

1a. Consider inconel as a possible solution.

1b. Research stellarator (e.g., W7-AS, HSX) design practice, esp. analysis. Same as A.I. #6, below. **(Goranson)**

3. Bootstrap current

Recent calculations show factor ~4 reduction due to non-axisymmetric harmonics. But previous analyses saw no reductions. Codes are giving different results. Action: Experts resolve. **(Zarnstorff)**

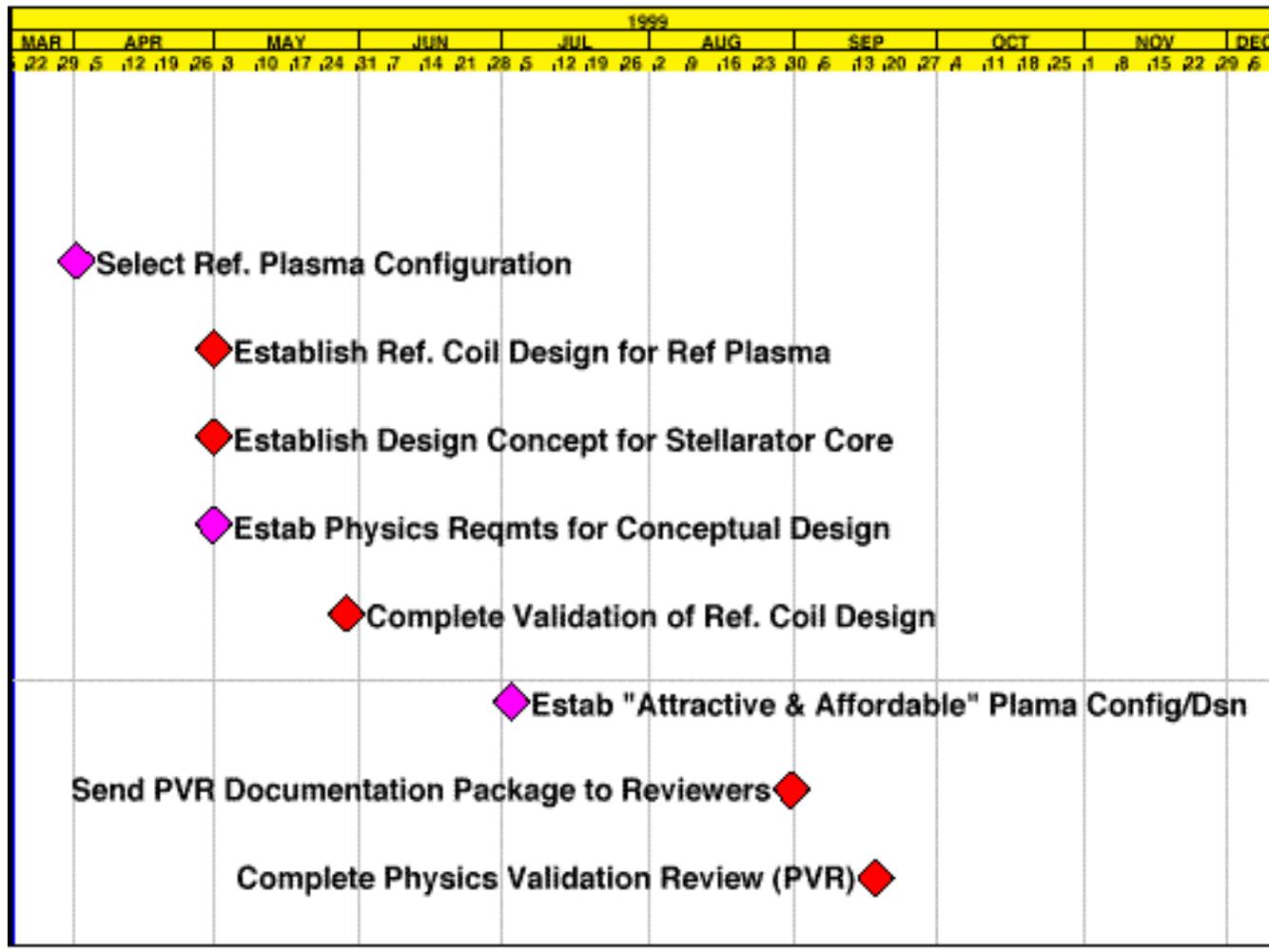
4. Vertical stability

Vertical stability is just starting to be analyzed and could affect the design. Action: Expedite the analysis as planned. **(Reiman)**

Action Items

1. Prepare a stellarator handout (e.g., a "5-pager") for FESAC. **(Lyon)**
2. Review stellarator experience with with non-ECH startup scenarios and identify possible requests for experiments. **(Zarnstorff)**
3. Check current ramp-rate requirements (2 MA/s?) **(Zarnstorff)**
4. Issue volt-second memo. **(Zarnstorff)**
5. Provide pointer to PLPLOT to make AVAC usable for reconstruction studies. **(Hirshman)** Contact D.K.Lee for AVAC improvements. **(Brooks)**
6. Research stellarator (e.g., W7-AS, HSX) design practice regarding localized permeability. **(Goranson)**
7. Include technical risk and schedule risk in assessment of options. **(Nelson)**
8. Scope edge physics requirements and analysis needs; determine power and particle handling strategy. **(Lyon/ORNL lead task force)**
9. Clarify NCSX milestone schedule. **(Neilson)**
10. Review NCSX "Schedule to Support PVR" and provide feedback to Simmons. **(Reiman, Hirshman, Zarnstorff, Reiersen)**

NCSX Design Schedule for Rest of FY-1999

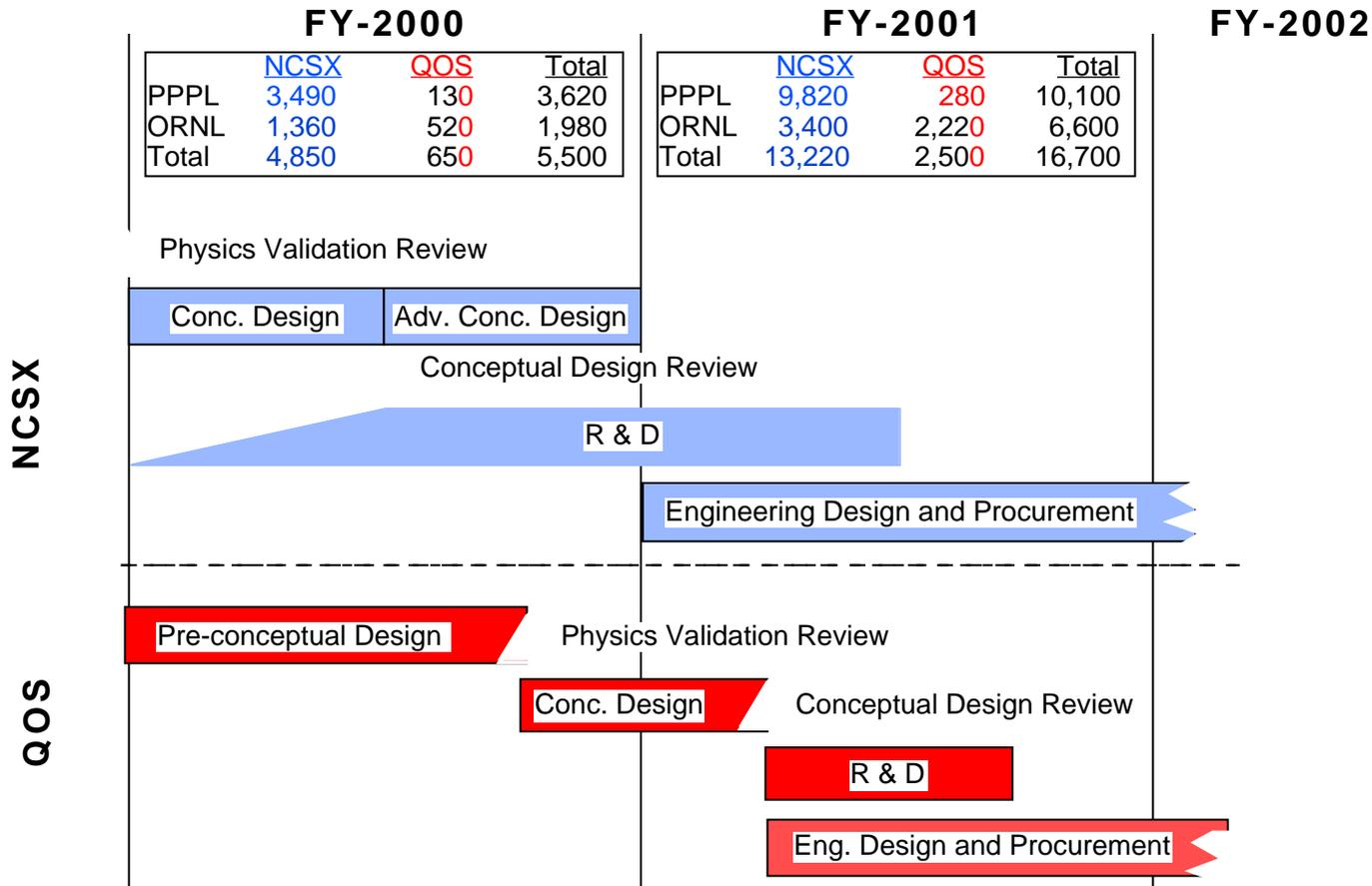


- Plan for Conceptual Design Review: March, 2000.

Goals for This Meeting

- Define NCSX Reference Plasma and Coil Configuration for Physics Validation Review Design.
- Review progress toward the Physics Validation Review (update plans developed at Feb. project meeting).

Proposed Plan is to Move NCSX and QOS into Construction in FY-2000-01



Budget increases to support this plan are being requested.

Calendar Update

April 7-9	OFES Budget Meeting, Germantown, MD
~April 12?	SEAB Meeting, PPPL
April 28-29	NCSX Project Meeting, ORNL
May 19-21	FESAC Meeting, w/focus on 3 PoP proposals, PPPL
June 14-18	EPS Meeting, Maastricht, Netherlands
July 11-23	Fusion Summer Study, Snowmass, CO.
Sept. 1-3	NCSX PAC Meeting (PAC-3), PPPL. (tentative, 2 days)
Sept. 13-17	NCSX Physics Validation Review, PPPL. (2-3 days)

Deliverables

- 5-page handout for FESAC (1st draft 4/26; final 5/14)
- White paper update for Snowmass (1st draft inputs 5/3; final 7/2)
- NCSX Design Documentation for PVR (1st drafts 8/16; final 8/27)

Register for SNOWMASS

by 4/9/99 at: <http://www.pppl.gov/snowmass/>

1999 Fusion Summer Study Opportunities and Directions in Fusion Energy Science for the Next Decade

July 11-23, 1999 at Snowmass, CO

The 1999 Fusion Summer Study will provide an opportunity for individuals involved with fusion research to interact with each other and develop a scientific and technical basis for consensus on:

- The key issues for plasma science, technology, and energy and environment for fusion energy development
- The opportunities and potential contributions of existing and possible future facilities and programs to reduce fusion development costs and achieve attractive economic and environmental features

[Details](#)



A Meeting Endorsed by the APS Division of Plasma Physics

Co-Chaired by Rich Hawryluk, Grant Logan, and Mike Manuel

Co-Sponsored by DOE, PPPL, GA, LLNL, MIT/PSFC, LANL

SNL, LBNL, VLT, ORNL, FPA, and UFA

Other Stuff

- Presenters:
 - Submit hardcopy to Bob, electronic file to Autumn (apercival@pppl.gov).
- Admin. Support, phone access: Autumn Percival, x2653, Room B-354.
- Team dinner: 7:00 at Little Szechuan, 2025 Old Trenton Rd., W. Windsor., Tel. 443-5023.
- Next Project Meeting: propose April 28-29 at ORNL (Coil & Core design milestones)