

NATIONAL COMPACT STELLARATOR PROJECT

Engineering Change Proposal (ECP)

COVER PAGE

(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)

Originator: Robert Simmons

Date: February 12, 2004

ECP No: ECP-04-004

ECP Title: Update from PDR to CD-2 Baseline

Required Reviewers

Required Reviewers for this ECP: Full CCB

ECP Approval Level

Expedited ECP? ☐ Yes ☒ No

Change Level: 1 Associate Director OFES

Approving Official: 1 Associate Director OFES

Actions

Incorporate recommendations from a series of DOE reviews (Preliminary Design Review and combined Performance Baseline Review/External Independent Review) and follow-on discussions with OFES concerning the funding constraints and the CD-4 scope. In addition, incorporate changes resulting from the updated information determined in the first quarter of FY2004.

APPROVALS

(TO BE COMPLETED BY APPROVING OFFICIALS)

Change Level	Approving Official	Approval?	Signature
3	NCSX Project Manager	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<i>J. A. Neilson</i>
3a (Expedited ECP)	NCSX Engineering Manager	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	NCSX Federal Project Director	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<i>[Signature]</i>
1	Associate Director OFES	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<i>[Signature]</i>
0	Under Secretary of Energy	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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PART I *(TO BE COMPLETED BY ORIGINATOR)*

Originator: Robert Simmons

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Overview of Change

Type of ECP: ☐ EXPEDITED ☒ STANDARD

Type of Change: ☒ TECHNICAL ☒ COST ☒ SCHEDULE ☐ EDITORIAL

The PDR baseline was reviewed by three review panels in October and November of 2003. The reviews established that the NCSX project was basically ready to establish its performance baseline, after making recommended changes to the PDR baseline, as explained below. This ECP documents the changes made in moving from the reviewed PDR Baseline to the approved CD-2 baseline.

Reason for Change:

- (1) Recommendations from PDR, PBR, and EIR resulted in reassessment of scope, cost, and schedule baselines. As a result of incorporating these recommendations, the project scope was increased.
- (2) The CD-4 project completion criteria were expanded per OFES direction, requiring additional equipment and testing scope in the baseline.
- (3) The funding profile was modified, per OFES guidance to reduce expected FY-05 funding by \$4.5M. This impact and the impact of Items #1 and #2, stretch out costs were incurred.
- (4) When significant deviations between the PDR and current plans were noted, updated estimates of tasks in progress were incorporated as a result of knowledge gained from design and R&D work in the first quarter of FY-04.

Items (1) through (4) resulted in an increase in TEC of \$5.3M and an extension of the project by 8 months, relative to the PDR baseline. As a result of these changes there was a net reduction of contingency of approximately \$630K.

Impacted WBS Elements: All elements

Impacts of Change (Briefly Describe):

- PDR recommendations – include additional winding R&D, adjustments to the coil services, adjustments to the cryogenics system estimates, incorporation of a 350°C vacuum vessel bakeout capability, project stretch-out of approximately 2 months for additional testing and mock-up activities, and several miscellaneous items that included:
 - WBS 12 (Vacuum Vessel) – redesign of port extensions & use of skip welds; results of the re-evaluation of viability of manual welds; results of the reassessment of planned vacuum vessel leak provisions; and results of the re-evaluation of the scope of the auxiliary utility lines inside the VV.
 - WBS 14 (Modular Coils) – results of the reassessment of access through the VV and the reassessment of the assembly tolerance budgets.
 - WBS 16 (Coil Services) - results from the reassessment of LN2 design details; results of the re-evaluation of scope of auxiliary utility lines inside the cryostat; results of the reassessment of impact the close confines of the cryostat on the routing of lines.

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- WBS 18 (Field period Assembly) – Provided additional time for pre-assembly and providing for a full size mockup.
- PBR/EIR Recommendations – included cold testing of all 18 modular coils, added a 2nd winding line, and the additional effort for field period assembly final alignment. In addition, the PBR/EIR team noted some inconsistencies/errors in the estimates for WBS 13 (Conventional Coils) and WBS 62 (Cryogenic Systems) and this ECP reflects the impact of these reassessing these items.
- Funding Constraints and CD-4 Scope Adjustments – as a result of follow-on discussions with OFES, a revised funding profile guidance with flat funding in FY2004 and FY2005 and redefinition of the CD-4 scope was provided.
 - As a result of the reduced funding guidance for FY2005, the project incurred an additional schedule stretch-out of approximately 2 months. In addition, several activities needed to be re-sequenced, resulting in a cost growth due to escalation.
 - As a result of CD-4 scope definition that added power testing and e-beam mapping; cryostat installation, testing, and cooldown; cold power testing, and a ground fault monitor, the schedule needed to be lengthened by an additional 4 months.
- Updated Estimates of Tasks in Progress – based on knowledge gained from design and R&D work in the first quarter of FY-04, several updated estimates were reflected in this ECP.
 - Revised estimates from vacuum vessel prototype vendors to reflect additional scope and greater complexity than originally estimated.
 - Revised estimates from modular coil prototype vendors to reflect additional scope and greater complexity than originally estimated.
 - Additional design and analysis for both vacuum vessel and modular coil final design effort.
 - Updated estimate of the twisted racetrack R&D.
 - Correction of omission in Project Physics estimate.

Assessment of Other Options:

Several options were considered during discussions with OFES as to how to address these recommendations. The resultant agreements are documented in this ECP and the PDR, PBR, and EIR Disposition Plans

Detailed Description of the Change:

List Attachments, Impacted Documents, etc. that provide the details.

- (1) Revised Funding Profile and Budget Totals
- (2) Revised DOE Project Milestones Table
- (3) Detailed breakdown of cost impacts
- (4) Primavera Database showing CD-2 project schedule and cost baseline
- (5) PDR Recommendations Disposition Plan
- (6) PBR Recommendations Disposition Plan
- (7) EIR Recommendations Corrective Action Plan