NATIONAL COMPACT STELLARATOR PROJECT
Engineering Change Proposal (ECP)

COVER PAGE
(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)

Originator: Ron Strykowsky	**Date: June 13, 2006**
ECP No: 045	**ECP Title: May 2006 PMB Update**

Required Reviewers

Required Reviewers for this ECP: Hutch Neilson, Wayne Reiersen, Brad Nelson, Larry Dudek, Mike Williams

ECP Approval Level

Expedited ECP? ☐ **Yes** ☒ **No**
Change Level: 2 Federal Project Director
Approving Official: 2 Federal Project Director

Actions

Update PMB

APPROVALS
(TO BE COMPLETED BY APPROVING OFFICIALS)

Change Level	Approving Official	Approval?	Signature
3	NCSX Project Manager	☒ Yes ☐ No	Hutch Neilson Digitally signed by Hutch Neilson DN: CN = Hutch Neilson, C = US, O = PPPL Date: 2006.06.13 11:59:25 -04'00'
3a (Expedited ECP)	NCSX Engineering Manager	☐ Yes ☐ No	
2	NCSX Federal Project Director	☒ Yes ☐ No	Jeffrey Makiel Digitally signed by Jeffrey Makiel DN: cn=Jeffrey Makiel, c=US, o=Princeton Site Office, ou=USDOE-SC, email=jmakiel@pppl.gov Reason: I am approving this document Date: 2006.06.13 14:45:46 -04'00'
1	Associate Director OFES	☐ Yes ☐ No	
0	Deputy Secretary of Energy	☐ Yes ☐ No	

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PART I
(TO BE COMPLETED BY ORIGINATOR)

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Overview of Change

Type of ECP: ☐ **EXPEDITED** ☒ **STANDARD**

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

(Check all that Apply)

Reason for Change: Update of costs to date plus update of estimate to complete.

Impacted WBS Elements: ALL WBS Elements

Impacts of Change (Briefly Describe): Re-align the project PMB (BCWS) by recognizing;

1) The additional cost incurred for retired risk ($510k);
2) Re-evaluated scope requirements including estimates for future scope (net +$39k); and
3) Realigning the project schedule consistent with estimated cost to complete.

This change requires the drawdown of $549k of contingency from $8,720k to $8,171k. It should be noted that while the Project expects a credit for FY2006 end-of-year rate changes, this has not been taken into account in this ECP.

This change does not impact Level I or II milestones. The project total float has increased from 5 to 6 month as a result of schedule optimizations.

Much of the cost increases documented in this ECP were offset by non-CD-4 scope reductions primarily in the I&C and electrical power systems. To ensure that the required safeguards and vigilance to the CD-4 deliverables is met the project has drafted a "Safe startup and Control" plan. This plan depicts those controls, actions, documents, sub-system procedures, ES&H requirements necessary to meet the CD-4 requirements for the Stellarator Acceptance Testing and Magnetic Configuration Studies phase of the NCSX Project.

Additionally, safety implications for both personnel and machine operations (including subsystems protection) will be addressed in subsequent design reviews for all subsystems. These reviews will include ES&H professionals as well as experienced PPPL machine operators to ensure the reliable and safe operability of the NCSX device.

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Detailed Description of the Change:
(Use Continuation Sheets and/or Attach Information/Sketches, As Needed)

Does this Change Impact Material Already Procured or Parts/Assemblies Already Assembled/Manufactured using this Material: ☐ **Yes** ☒ **No**

List Attachments, Impacted Documents, etc.
1) **Detailed resource loaded schedule**
2) **ECP-43 vs ECP-45 budget comparison table**

Description of Change:

WBS	**Unrecoverable Cost Variances**	**Total Change Estimate to Complete Change**
12 - Vacuum Vessel Systems Total		**$327**
	$154 Vac Vsl hardware design - Design of heater tape, cooling tubes and associated hardware	$173 Vac Vsl hardware design and hardwareCompletion of thermal insulation, heater tape and assembly drawings. Port Insulation increase. **Increase PPPL labor to support VVSA vacuum testing**
13 - Conventional Coils Total		**$565**
	$64 TF Fab Facility - TF Coil Hardware fabrication	$443 TF coil- fabricationIncrease in fabrication cost ($1,473 contract award) -
	$101 TF coil -PPPL oversight/title III - TF outsourcing efforts (documentation, travel, evaluation)	$185 TF coil -PPPL oversight/title IIIIncrease to oversee outsourcing of fabrication (average of 1 trip/week). Risk mitigation due to vendor history. -
		-$90 PF coil procurement & design-Estimate reduced in recognition of TF cost. -
		-$138 Central solenoid support structure design&fabrication-Simpler design to be fabricated by PPPL

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Continuation Sheet:

Description of Change:

WBS	Unrecoverable Cost Variances	Total Change Estimate to Complete Change
14 - Modular Coils Total		**$1,322**
	$53 Variance attributed to back overtime pay for recently reclassified technical staff consistent with state and federal laws.	$176 Cryogenic test facility (job 1414)Completion of test facility and testing of modular coil -
		$986 MC winding (materials and labor job 1408, 1451 & 1459) Estimate growth (including overtime, second shift differential, and **allowance for unplanned work**) into mid-FY07. -
	$22 Modular Coil Design -	-$90 Type C, A & B modular coil design. Elimination of redundant assembly and hardware drawings. -
		$106 Mod Coil interface design Additional analysis of joint and resultant design modifications -
		$70 Mod Coil interface hardwareShims, bolts, washers and bladder hardware. -
15 - Structures Total		**$3** Misc. rescheduling
16 - Coil Services		**$3** Misc. rescheduling
17 - Cryostat and Base Support Structure Total		**-$81**
		-$81 Base ,& coil support struct combine base ,& coil support struct into one procurement -

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Continuation Sheet:

Description of Change:

WBS	Total Change	
	Unrecoverable Cost Variances	Estimate to Complete Change
18 - Field Period Assembly Total		**$641**
	$79 WBS 18 Field period assy fuxtures & prep - Purchase of a third Romer arm and computer	$190 FP assy stage 1-Additional assembly steps and includes hands-on senior field supervisor. -
		$35 Metrology engr supervision (raftopolous) stage 1 FP assyIncrease to full time metrology engr to support completion of mod coil fabr plus field period assembly tasks thru FY07. -
		$185 FP assy tooling & fixtures-Fixtures re-estimate plus add'l stage 5 fixture. -
		$140 FP assy tooling & fixtures -engr& design increase-Additional engr and designer support to design field period assy fixtures. -
		$12 Metrology H/W maint and support (job 1804)Metrology hardware & software maintenance, replacement parts, calibration -
19 - Stellarator Core Management and Integr		**$4** Misc. rescheduling
2 - Heating,Fueling & Vac Systems		**-$306**
		-$306 Fueling and Vacuum Pumping - Simplified systems design using existing pumping system (tested on VVSA).

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Continuation Sheet:

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WBS	**Total Change**	
	Unrecoverable Cost Variances	**Estimate to Complete Change**
3 - Diagnostics	**-$216**	
	-$3	Magnetic Diagnostic design and fabrication -
	-$177	E-beam mapping diagnostic hardware - Use of collaration for e-beam mapping
	-$36	Edge & diverter diagnostics - Share camera from NSTX
4 - Electrical Power Systems	**-$353**	
	-$358	Controls and protection - eliminate DC shunts and simplify overload protection
	-$67	AC power - Minimal ex-test cell AC power and grounding
	$72	DC power - Power loop design and C-site rectifier maintenance\
5 - Central I&C Systems	**-$1,073**	
	-$130	TCP/IP network - Local TCP/IP network infrastructure
	-$392	Central Facilities I&C - Local Control
	-$179	Diagnostic Data Acquisition & computing - The NSTX infrastructure will be used where possible.
	-$114	Facility timing & synchronization - Use timing device designs in use on NSTX
	-$86	Real time plasma control - PC based "LabVIEW" will produce open-loop power supply commands.
	-$196	Central Safety & Interlokcs - Use of locks and physical barriers
	$24	Central I&C Integr and oversight - Oversight

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Continuation Sheet:

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WBS	Unrecoverable Cost Variances	Total Change Estimate to Complete Change
6 - Facility Systems		**-$79**
		-$79 Water systems - Once through potable water system for vacuum pumps only
7 - Test Cell Prep & Machine Assembly		**-$194**
	$37 Test Cell Preparations - NCSX test cell electrical power upgrades	-$231 Machine assy preparations - Eliminate TC floor resurface and completion of control rm floors. 2 shift ops on select tasks (reduced support crews
8 - ProjectOversight & Support		**-$16**
		-$53 Project management office
		$132 Proj Engr (Reierson,Dudek, Simmons) - Increased RLM oversight and Project engineering
		$61 Design Integration (brown, Designer) - Increase designer and engineer time for global design interface.
		$177 Systems Analysis (Brooks) - **Global machine modeling and analysis**
		$58 Dimensional Control (Stratton, Raftopolous) - Dimensional control supervision.
		-$391 wbs 85 PTP & ISTP startup - Reduced operational and startup procdures plus allocation of startup staff