

QUARTERLY REPORT FORM

Report Date: **December, 2003**
 Project Number: **MIE-02**
 Report Period: **1st Quarter FY2004**

U. S. DOE Project Manager's Progress Report
 Title: **National Compact Stellarator Experiment**
 Location: **Princeton Plasma Physics Laboratory**

Office of Science
 Program: **FE**
 Project Office: **CH**

SUMMARY ASSESSMENT

	<u>Current Quarter</u>	<u>Previous Quarter</u>
Cost:	Satisfactory	Satisfactory
Schedule:	Satisfactory	Satisfactory
Technical:	Satisfactory	Satisfactory
Overall:	Satisfactory	Satisfactory

PROJECT MANAGEMENT

DOE Program Manager:	Gene Nardella
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DOE Project Director:	Greg Pitonak
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COST/FUNDING (\$K)

	<u>Baseline</u>	<u>Current Estimate</u>	<u>Funding Received</u>
DOE TEC:	86,300	86,300	
DOE TPC:	N/A	N/A	N/A
NON DOE:	0	0	0

CRITICAL DECISIONS

<u>Number</u>	<u>Baseline</u>	<u>Actual/Forecast</u>
1	Aug, 2002	Nov, 2002 (A)
2	Jan, 2004	Feb, 2004 (A)
3	Sept, 2004	
4	May, 2008	

FUNDING PROFILE (KS)

Per Latest Approved Budget in \$M (as-spent)

	<u>FY03</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	<u>FY07</u>	<u>FY08</u>	<u>Total</u>
TEC:	7.9	15.9	15.9	22.1	19.4	5.1	86.3
OPC:	N/A						
TPC:	N/A						
	N/A						

Cumulative Costing through end of Dec, 2003

	<u>TEC (\$K)</u>	<u>TPC (\$K)</u>
Costs Accrued:	\$8,182	N/A
Uncosted Commitments:	\$1,381	
Remaining Uncommitted	\$76,737	

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SCHEDULE SUMMARY

	Start Date		Completion Date		Percent Complete	
	<u>Baseline</u>	<u>Forecast/Actual</u>	<u>Baseline</u>	<u>Forecast/Actual</u>	<u>Baseline</u>	<u>Actual</u>
Title I & II Design:	10/02	04/03 (A)	12/06 ⁽²⁾		30%	30%
Procurement:	3/03 ⁽³⁾	03/03 (A)	09/06 ⁽⁴⁾		6%	6%
Fab & Assembly	1/05 ⁽⁵⁾		12/07 ⁽⁶⁾			
Start-up & Operation	04/07 ⁽⁷⁾		05/08 ⁽⁸⁾			

<u>Key Milestones</u> <u>(LEVEL)</u>	<u>Completed Since Last Report</u>	<u>Baseline Date (PEP)</u>	<u>Actual Date</u>
Joule 04-1	Authorize Vac Vessel Prototype Fab	August 2003	August 2003
Joule 04-1	Authorize Modular Coil Prototype Fab	December 2003	October 2003
NCSX III	Conduct Preliminary Design review	October 2003	October 2003
DOE II	External Independent Review & SC Baseline Review	November 2003	November 2003

<u>Key Milestones</u> <u>(LEVEL)</u>	<u>Upcoming (Next Three Months)</u>	<u>Baseline Date(PEP)</u>	<u>Forecast Date</u>
DOE I	Complete CD-2 Milestone	February 2004	February 2004(A)
DOE II	Initiate 3D MC Winding Process	March 2004	February 2004(A)

(2) Last WBS 1 FDR

(3) Award Prototype MCWF

(4) Delivery of Cryostat

(5) Begin MC winding effort

(6) Complete Installation of Cryostat

(7) Begin Startup testing WBS 85

(8) First Plasma

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NARRATIVE HIGHLIGHTS (Oct. 1 – Dec. 31, 2003)

Technical: R&D

- Final design drawings and specifications for the prototype modular coil winding form and vessel segment were issued to the suppliers, with authorization to proceed with fabrication (Q1 Joule milestone).
- Progress on the prototype vacuum vessel fabrication: tooling has been fabricated, panels have been formed.
- Progress on the prototype modular coil winding form fabrication: Suppliers have succeeded in importing the project's CAD model into their system and are using it to model the casting and machining processes and to design tooling and fixtures.
- Progress on the coil fabrication program:
 - Cooldown and pulsed heating tests of the simple racetrack demonstration coil showed predictable behavior and no signs of degradation during subsequent inspection.
 - Fabrication of tooling started including the autoclave (a vacuum oven needed for the epoxy impregnation process) and handling fixtures.
 - The coil power testing facility was designed and fabrication began.
 - Fabrication of the closed twisted tee winding form was completed. It is needed for the first 3D winding trials.
 - A contract for fabrication of the twisted racetrack winding form was awarded to Energy Industries of Ohio.

Technical: Design

- Plenary paper on compact stellarator design challenges by W. Reiersen, NCSX Engineering Manager, was presented at 20th SOFE in San Diego. Several contributed papers were also presented.
- Project technical baseline was updated in response to PDR and PBR recommendations. Highlights:
 - Vacuum vessel requirements modified to be bakeable to 350C.
 - Second winding line was added to benefit schedule.
 - Cold testing of all modular coils was added to reduce risk.
 - Added flux surface mapping and cryogenic operation to project scope to satisfy expanded CD-4 criteria.
 - Augmented plans for R&D, e.g., conductor properties tests, coil fabrication development, vacuum vessel spool piece.
 - Augmented plans for component evaluation and fit-up tests.
- A new CAD model of the modular coil winding forms was developed, overcoming difficulties experienced by the suppliers in working with earlier models.

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NARRATIVE HIGHLIGHTS (Oct. 1 – Dec. 31, 2003), continued

Management & Administrative

- Completed three reviews required for CD-2: PDR by PPPL, PBR by SC, and EIR by OECM. Reviews unanimously concluded project was ready for CD-2.
- Developed disposition / corrective action plans for all three reviews and incorporated impacts into the baseline for CD-2. These included technical changes (see above) and changes to the funding profile and contingency distribution. Another contributing factor to the changes in the project TEC was the reduced FY2005 funding guidance provided by DOE following the reviews.
- The project has prepared the following documentation as part of CD-2 readiness
 - Project Execution Plan
 - Acquisition Strategy
 - Integrated Project Team
 - Resource Loaded Schedule
 - Detailed Project Cost and Schedule Estimates
 - NEPA Documentation
 - Risk Analysis & Risk Management Plan
 - Preliminary Design and Design Review Report
 - System Functions and Requirements
 - Hazards Analysis
 - Value Management/Engineering
 - Project Controls/Earned Value Management System
- Engineering Change Proposal (ECP) 04-004 has been submitted to PAO for review. This ECP establishes the Project Performance Baseline as approved in CD2. It will be forwarded to OFES for approval as a Level 1 change.
- Performance metrics as of 12/31/2003
 - SPI = .95
 - CPI = .96

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WBS Cost Summary (\$K)

Scope Item	<u>FY03 Actual</u>	<u>FY04 Plan</u>	<u>FY05 Plan</u>	<u>FY06 Plan</u>	<u>FY07 Plan</u>	<u>FY08 Plan</u>	<u>Total</u>
WBS-1 Core Systems	\$4,005	\$12,596	\$11,596	\$11,745	\$2,205	\$290	\$42,356
WBS-2 Heating, Fueling	\$ 204	\$ 87	\$ 79	\$ 480	\$ 752		\$ 1,627
WBS-3 Diagnostics	\$ 155	\$ 75	\$ 273	\$ 622	\$ 572	\$ 38	\$ 1,681
WBS-4 Power Systems	\$ 115	\$ 936	\$ 354	\$ 2,859	\$ 1,024	\$ 3	\$ 5,318
WBS-5 Central I&C	\$ 12	\$ 13	\$ 13	\$ 427	\$ 2,128		\$ 2,580
WBS-6 Facilities	\$ 9	\$ 13	\$ 13	\$ 318	\$ 1,684		\$ 2,038
WBS-7 Assembly	\$ 164	\$ 351	\$ 238	\$ 1,071	\$ 1,659	\$ 652	\$ 4,254
WBS-8 Project Mgmt	\$1,277	\$ 2,209	\$ 1,868	\$ 1,853	\$ 2,527	\$ 895	\$10,567
Contingency	<u>\$ 0</u>	<u>\$ 1,623</u>	<u>\$ 1,466</u>	<u>\$ 2,725</u>	<u>\$ 6,885</u>	<u>\$ 3,210</u>	<u>\$15,909</u>
Total	\$5,941	\$17,903	\$15,900	\$22,100	\$19,391	\$ 5,088	\$86,323