

NCSX Program Planning Update

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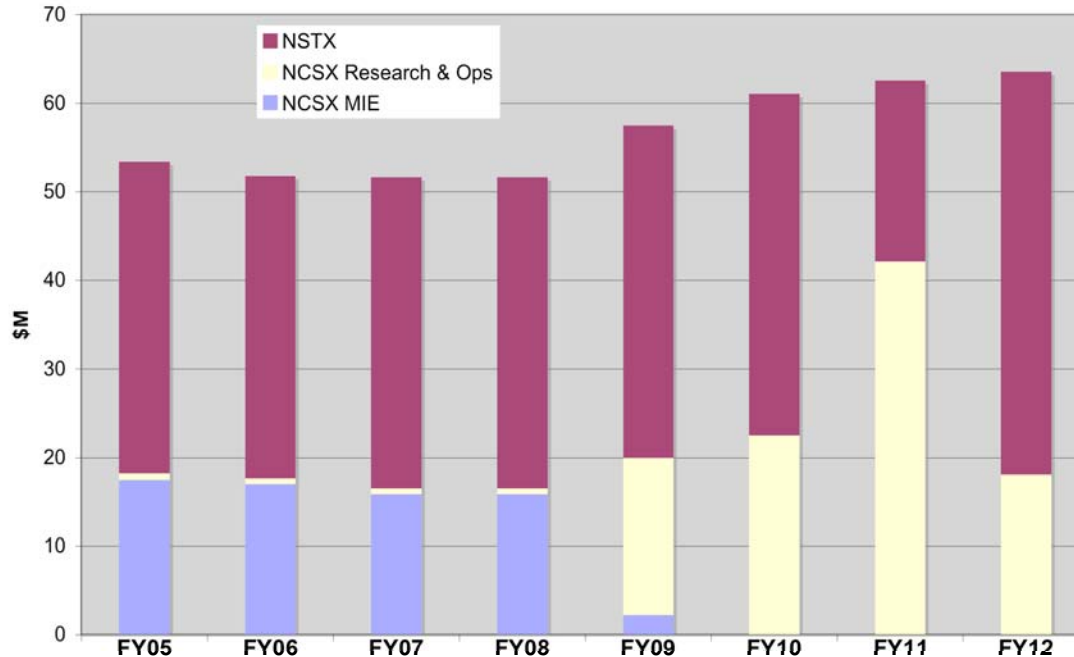
*Princeton Plasma Physics Laboratory
Oak Ridge National Laboratory*

**Briefing for Princeton Site Office
Princeton, NJ
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Planning Context: SC's Five-Year Plan (FY07-11)



NSTX - NCSX Program Budget Profile



NSTX-NCSX budgets presented to OFES in March, 2005 as input to 5-Year Plan

	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Comment
Run Weeks									
NCSX					6		24		Alternating, per 5-Year Plan
NSTX	17	11	12	12	12	17		24	
Budgets (\$M)									
NCSX MIE	17.5	17.0	15.9	15.9	2.3				Approved baseline & 5YP FWP & PPPL plan
NCSX Research & Ops	0.7	0.7	0.7	0.7	17.7	22.5	45.2	21.1	
NCSX Total	18.2	17.7	16.6	16.6	20.0	22.5	45.2	21.1	Thru FY-08: FWP From FY09: PPPL plan
NSTX	35.2	34.1	35.1	35.1	37.5	38.6	20.4	45.5	
NSTX+NCSX	53.4	51.8	51.7	51.7	57.5	61.1	65.6	66.6	
OFES Non-ITER	261.5	271.8	282.0	277.5	285.5	292.5	303.2		5-Year Plan
NSTX + NCSX Fraction	20%	19%	18%	19%	20%	21%	22%		

NCSX - NSTX Alternation Plan Maintains Portfolio Breadth and Maximizes Scientific Productivity within Essentially Flat Budgets

Agenda: Response to PSO Letter of 7/13/06



1. NCSX MIE Project, FY07-09– H. Neilson

Q1. Cost control

Q2. ETC update

Q3. Risk / Contingency Update

2. NCSX non-MIE Activities, FY09-11– M. Zarnstorff

Q4. Equipment Needed for Research Program

Cost Performance Has Improved in Recent Months



Metric #1: Monthly incremental cost variance.

Target: > -\$150k/month (Jan-Apr. average was < -\$300k/month)

	May	June	July	August	
Monthly CV (\$k)	+43	-224	-208	+2	Avg.: -97

Metric #2: Monthly incremental cost performance index

Target: > 0.90 (Jan-Apr. average was 0.82)

	May	June	July	August	
Monthly CPI	1.03	0.86	0.87	1.00	Avg.: 0.94

Improved Cost Performance in Component Procurements is Sustainable



Manufacturing R&D and Prototypes: Completed in FY-05.

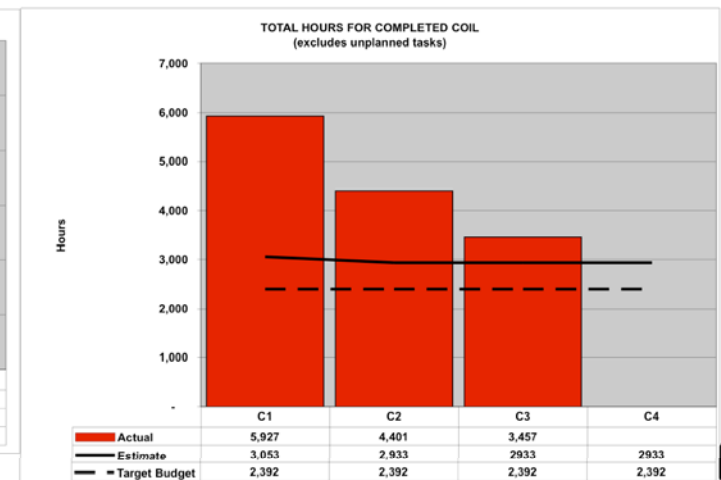
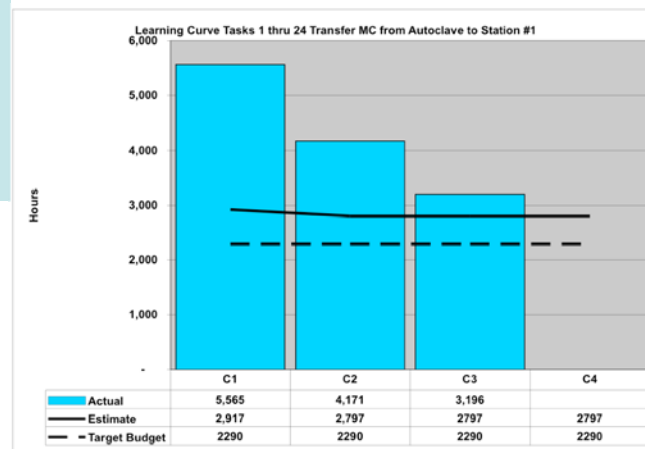
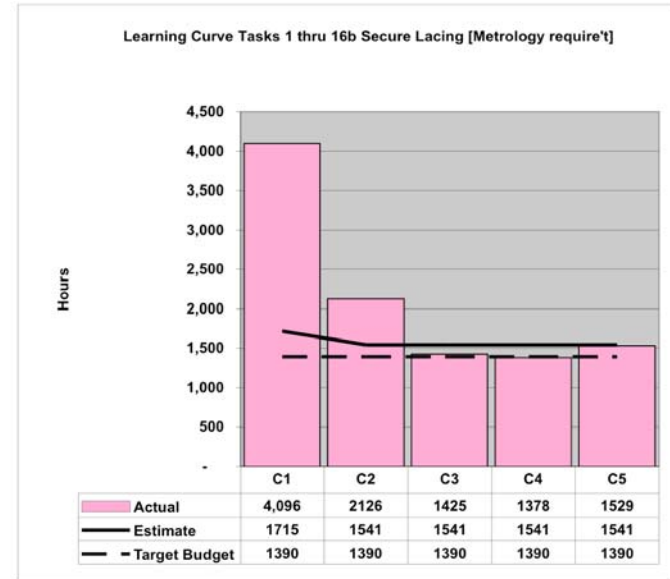
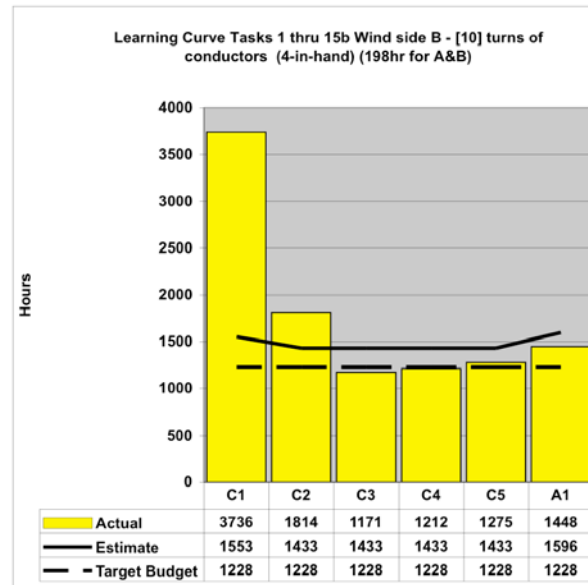
Production Contracts Have Minimal Financial Risk

- VVSA: Complete this month.
- MCWF: Producing reliably.
- TF: Off to a good start, and technically much less challenging.

Modular Coil Winding Cost Trends Are Favorable



- R&D and first-article cost penalty are behind us.
- We are constantly improving operations.
- Costs are improving.
- Target: get below original estimate.



Improved Cost Performance in Modular Coil Winding Activities is Sustainable



- Further improvements are expected based on recent trends and actions:
 - New winding fixture will improve operations, starting Dec., 2007.
 - New staff added this summer are now up to speed.
 - Type A and B coils are less complex, and could be cheaper, than C.
 - New source for Type A & B chill plates eliminates re-work.
 - Outside source reduces cost of autoclave cleanup.
- Metrology and data analysis risks are being addressed.
 - Identify & train more staff to increase depth.
 - More support for critical hardware and software.

Budget strategy

- Cover estimate growth (\$230k) due to new tasks, e.g. installation of I&C, lead boxes, insulation bats.
- Recognize cost risks (but continue efforts to drive costs down):
 - \$435k held back @ECP-045. Keep in contingency.
 - \$300k future CV growth if current winding ops CPI (~0.9) persists.

**Production activities are much more predictable than a year ago.
Improvement opportunities exist and are being pursued.**

Learning Phase Cost Penalties Can Be Avoided in Assembly Operations



Strategy: Build Field Period #1 as a production prototype.

- There will be problems the first time through.
 - Use a small crew possessing exceptional problem-solving skills to develop the process as cheaply as possible.
- Use VV component layout activity to optimize metrology strategies.
- Perform early modular coil fit-up trials to check for interferences.

We have this opportunity because:

- The VVSA is available to work on.
- The MCWF delivery sequence was optimized. We will soon have all 3 types.
- There is time in the schedule.
- The activity is under our direct control. We determine the resources.

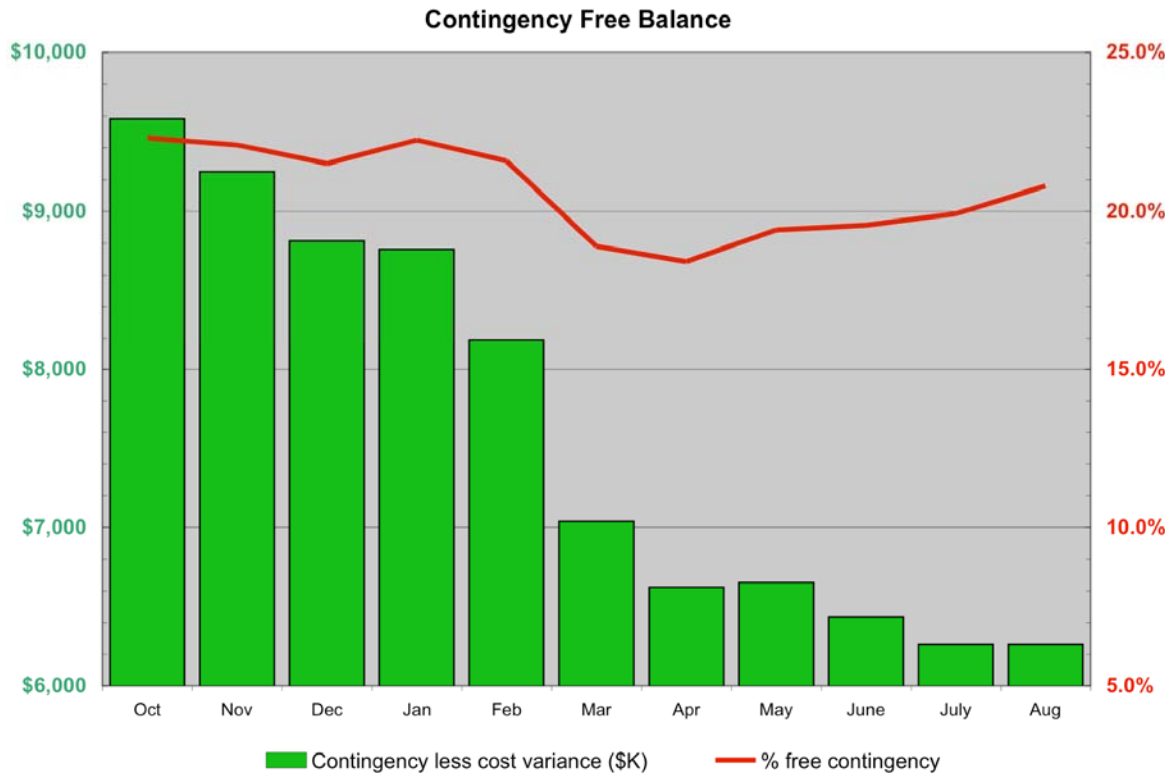
We did not have comparable advantages with the MC and VVSA.

The strategy is working so far.

- Progress: we have scanned VVSA#1 and laid out flux loops and tubing mounts.
- We have encountered and solved problems, with negligible cost variances.

We will status progress and update strategy at FY-07 Lehman reviews.

Contingency Utilization Trends Are Favorable



Rate of contingency drawdown, including cost variances, has slowed dramatically since March.

Avg. drawdown rates

Oct. – Mar. \$509K/mo.
 Mar. – Aug. \$155K/mo.

Target: > 20% at end of FY-06. (Metric #3)

Current trends reflect good cost performance but estimate growth for *future* work can cause drops.

New Plan Manages the Most Critical Risks within the Approved Baseline



- Made changes to reduce risks.
 - MC testing, MC winding fixture, MC fit-up trials; increased FY-07 contingency.
- Adjusted budgets and schedules to reflect trends and new developments.
 - MCWF, MC interfaces, Field Period Assembly.
- Made work reductions to offset growth.
- Identified future risks and opportunities.
- Updated risk / contingency analysis.
- Plan requires contingency drawdown of \$973K.

Summary of Budget Changes		(\$k)
Estimate growth		1,923
Work reductions		-950
Proposed contingency drawdown		-973
Contingency Status Changes		
Current balance (ECP-049)		7,874
Current CV @8/31/06		-1,609
Contingency drawdown		-973
New free balance	5,292	17.0% of BCWR from 8/31/06

Budget Increases and Reductions

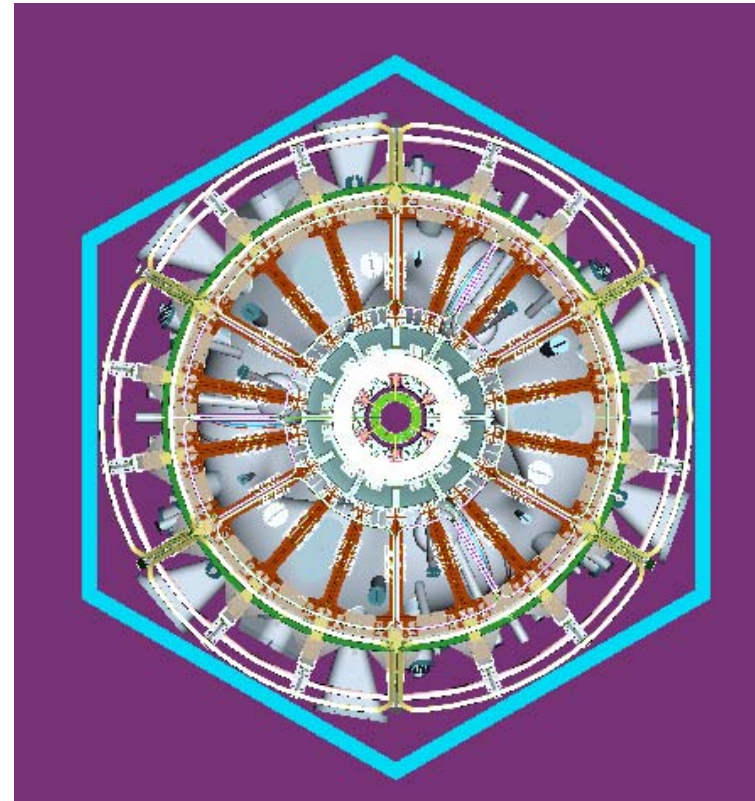


WBS Element	Δ (\$k)	Explanation
Increases		
14. MCWF	324	Additional incentives due to better than expected schedule performance.
14. MC Winding Ops	230	Add'l tasks, e.g., I&C, lead boxes, bat ins.
14. MC Facility	63	New fixture
14. MC Testing	278	Validate structural models, qualify strain gauges, improve cryostat cooling.
14. MC Design	207	Interface design, MCWF Title III
12. Vacuum Vessel	81	Cooling Hardware
18. FPA design & tooling	207	Better understanding
18. FPA operations	184	Better understanding & fit-up trials
82. System engineering	193	Construction support: analysis, design, mgt.
Rates & escalation	156	Schedule changes
Subtotal	1,923	
Reductions		
17. Cryostat	-278	Simpler design
7. Machine Assy.	-546	Tighten schedule; reduce support crew and oversight costs
18. FPA HP Support	-80	Perform Sta. 4 & 5 in NCSX test cell; move out of TFTR test cell sooner.
15. Coil Structures	-46	Procurement oversight
Subtotal	-950	
Total	973	

Cost-Saving Cryostat Concept Adopted



- Simple hexagonal cryostat built from foam core panels (similar to the MC test facility cryostat).
- 33 port openings.
- Saves \$278K.
- Other alternatives continue to be evaluated.



Cost Risks and Opportunities



Risks

- MC winding ops estimate retained in contingency: \$435K.
- MC cost growth if current CPI persists: \$300k

Continue to push costs down; re-assess at Lehman reviews.

A new cost reduction opportunity has been identified.

- Electron cyclotron heating (ECH @15 GHz) instead of Ohmic First Plasma.
 - Minimize ECH costs through collaboration and synergy with NSTX.
 - Eliminate several PF circuits.

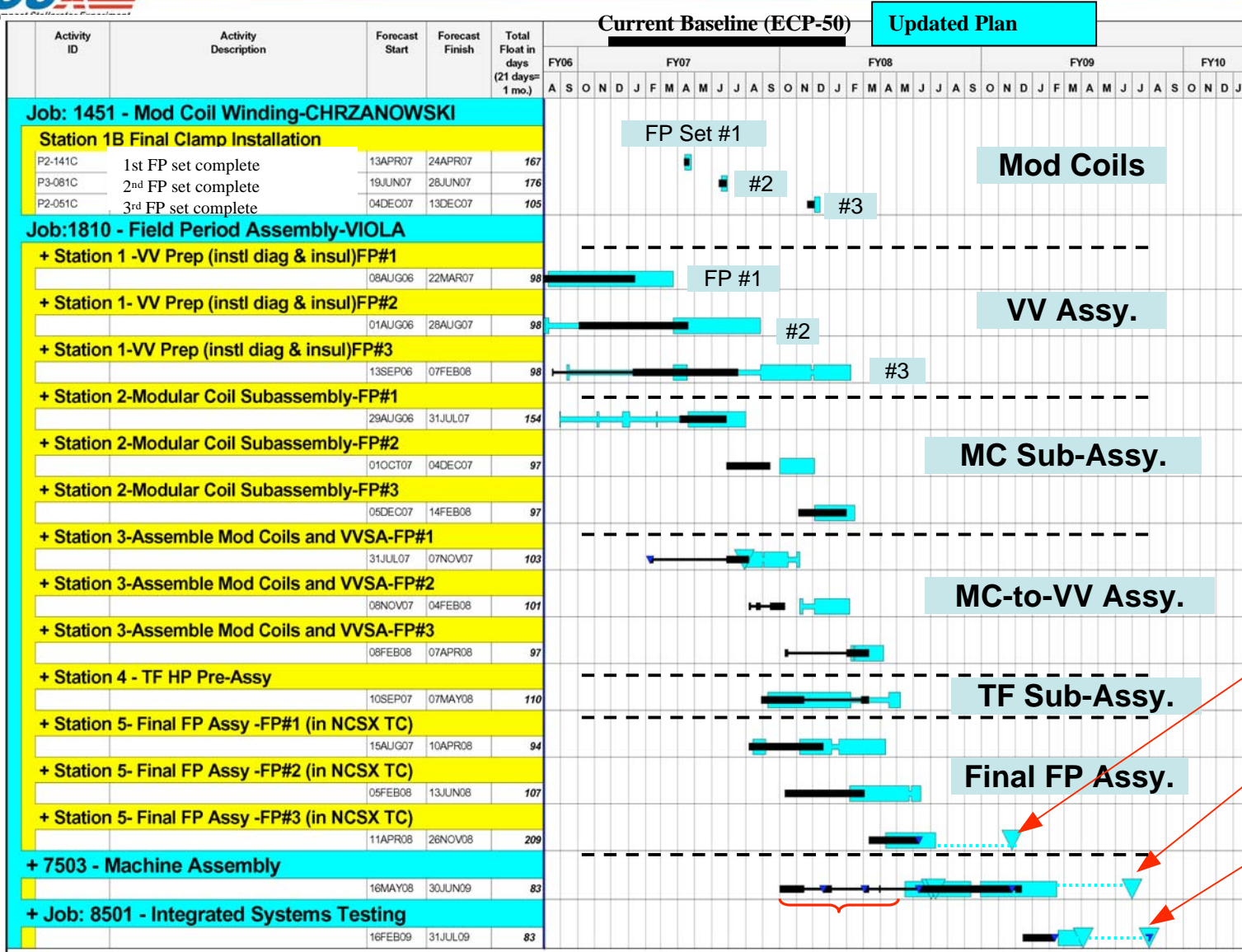
We will explore and quantify by December Lehman Review.

Contingency is Tight, But Sufficient to Manage the Most Critical Risks



	BCWR (\$k)	Conting. (\$k)	Conting (%)
MCWF & TF Contracts	3,776	189	5%
MC Winding Operations	4,297	878	20%
Field Period Assy Operations	2,466	863	35%
Balance of Stellarator Core Activities	9,423	1,979	21%
Machine Assembly	2,926	732	25%
Ancillary Systems	3,982	398	10%
Management & System Eng.	4,231	254	6%
	31,103	5,292	17%

Work Has Been Re-scheduled to Provide Adequate Budget Contingency in FY-07 & -08

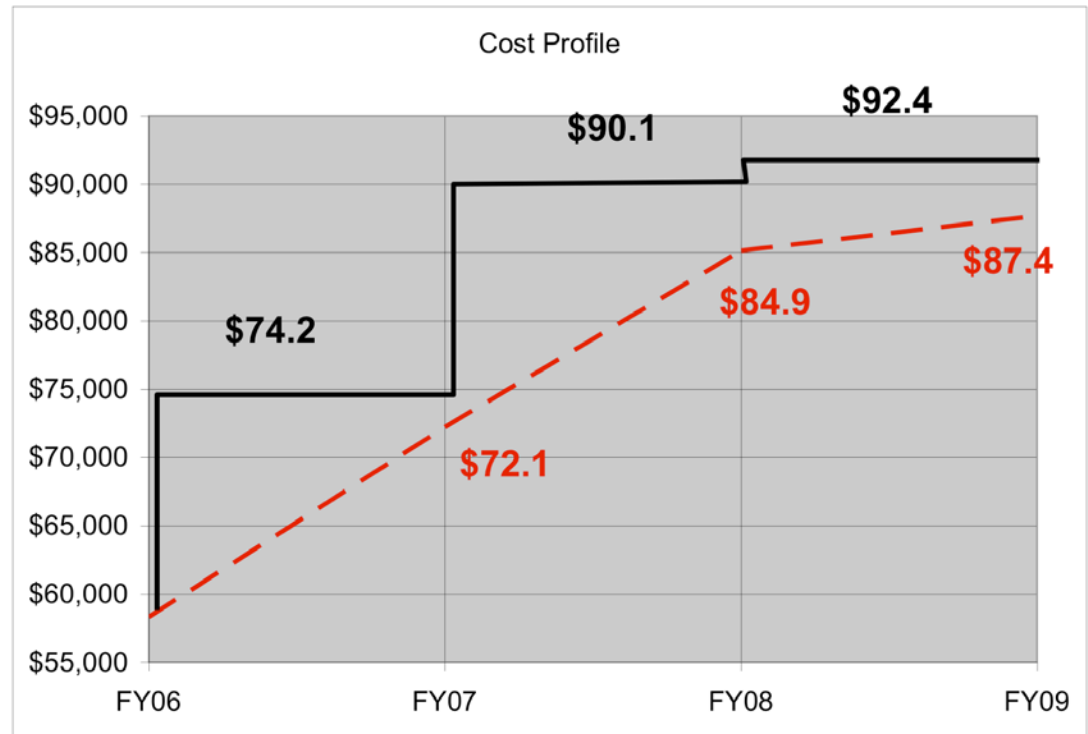


Schedule contingency is adequate: 4 months (vs. 5 months @CD-2).

Improved Contingency Profile Reduces Schedule Risk



- Contingency made available when needed to manage the critical risks.
- More BA (e.g., \$2M) in FY-07 would reduce risks:
 - Advance FPA operations, coil structure procurements, and some contingency.
 - Increase schedule contingency to 5 months.



	FY07	FY08	FY09	Total
BA	15.8	15.9	2.3	34.1
Work	13.7	12.8	2.5	29.0
Contingency	2.1	2.8	0.2	5.1

Summary



We have a sound plan for project completion, which manages the most critical risks within the approved baseline.

- Major component procurement risks are largely retired.
- Remaining component production work is relatively predictable.
- Field Period Assembly risks are significant but can be managed at relatively low cost. Status progress at Lehman reviews.
- Work is re-scheduled to make contingency available in FY07-08.
- Schedule contingency is slightly reduced, but still adequate.
- Budget contingency is tight but sufficient to manage the most critical risks.

Path forward: Continue to manage risks within the baseline, maintain tight cost controls, reduce work where possible.

Review progress and trends at Lehman reviews.