NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 192 Stellarator Core Integration and Global Analysis

Labor

Activity Title	Manhours	FY2003 $$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
Preliminary Design (Title I)						
(40% of design schedule)	1067		*EAEM*	Apr-03	Mar-04	PPPL Engineer
	0		*EADM*	Apr-03	Mar-04	PPPL Designer
	1193		*ORNL Eng*	Apr-03	Mar-04	Composite of ORNL Engineer / Designer
	0		*ORNL Phys.*	Apr-03	Mar-04	Composite of ORNL Physics / scientific
	0		*PPPL Phys.*	Apr-03	Mar-04	PPPL Physics/scientific
Final Design (Title II)						
(60% of design schedule)	1633		*EAEM*	Mar-04	Aug-05	PPPL Engineer
	0		*EADM*	Mar-04	Aug-05	PPPL Designer
	1827		*ORNL Eng*	Mar-04	Aug-05	Composite of ORNL Engineer / Designer
	0		*ORNL Phys.*	Mar-04	Aug-05	Composite of ORNL Physicist
	0		*PPPL Phys.*	Mar-04	Aug-05	PPPL Physics/scientific
Lab R&D labor						
	0		*EAEM*	Apr-03	Mar-04	PPPL Engineer
	0		*EADM*	Apr-03	Mar-04	PPPL Designer
	48		*ORNL Eng*	Apr-03	Mar-04	Composite of ORNL Engineer / Designer
	0		*EASM*	Apr-03	Mar-04	PPPL monthly support
	0		*EMTB*	Apr-03	Mar-04	PPPL Technician
Lab Fab/Assembly/Installation (Title III)						
	0		*EAEM*	Jul-04	Jun-07	PPPL Engineer
	0		*EADM*	Jul-04	Jun-07	PPPL Designer
	3538		*ORNL Eng*	Jul-04	Jun-07	Composite of ORNL Engineer / Designer
	0		*EASM*	Jul-04	Jun-07	PPPL monthly support
	0		*EMTB*	Jul-04	Jun-07	PPPL Technician

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Labor

Manhours per fiscal year by labor category

Level of Effort		FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	TOTAL
PPPL Engineer	*EAEM*	579	1158	962	0	0	0	*2700*
PPPL Designer	*EADM*	0	0	0	0	0	0	*0*
Composite of ORNL Engineer / Designer	*ORNL Eng*	674	1616	2260	1184	872	0	*6606*
PPPL monthly support	*EASM*	0	0	0	0	0	0	*0*
PPPL Technician	*EMTB*	0	0	0	0	0	0	*0*
Composite of ORNL Physics / scientific	*ORNL Phy*	0	0	0	0	0	0	*0*
PPPL Physics/scientific	*PPPL Phy*	0	0	0	0	0	0	*0*

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M&S Costs

Activity Title	FY2003 $$	Comment
Manufacturing Development (R&D)		
Purchased Design Services	$0	
Procured Hardware/Material	$0	
Profit	$0	
total, manf/dev (R&D)	$0	
Procured Hardware/Material		
0	$0	
0	$0	
0	$0	
software	$65,635	
hardware	$53,760	
0	$0	
subtotal, purchased parts	$119,395	
Profit at 10%	$0	profit already in numbers
total, procured hdwe/matl.	$119,395	w/o G&A
Purchased Design Services	$0	no purchased services anticipated
Procured Installation/Assembly Costs	$0	All installation and assembly costs are included in WBS 7

Other Costs

Activity Title	FY2003 $$	Comment
Travel	$10,000	assumes one trip every 6 months

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Summary Costs

Activity Title	Manhours	FY2003 $$	Comment
Labor			
PPPL Effort	2,700	$413,100	*Assumed rates:* *EASM* 100 $/hr
ORNL effort	6,606	$858,817	*EAEM* 153 $/hr *EMTB* 73 $/hr
subtotal, labor	9,306	$1,271,917	*EADM* 100 $/hr PPPL Phys 141 $/hr
			ORNL Eng 130 $/hr ORNL Phys 160 $/hr
M&S, Other			
Manufacturing Development (R&D)		$0	
Procured Hardware/Material		$119,395	
Purchased Design Services		$0	
Procured Installation/Assembly Costs		$0	
Travel		$10,000	
subtotal, M&S		$129,395	
G&A		$32,349	25% on all purchased materials, subcontracts, travel
Subtotal without contingency		$1,433,661	
Contingency		$143,366	10% Overall on this WBS
Total cost		$1,577,027	

WBS 192 Stellarator Core Integration and Global Analysis

Engineering, Title I, II and III

Description:
This effort covers design integration activities for the Stellarator Core, including global Pro-E models and drawings for the Stellarator Core, Pro-Intralink database maintenance of all drawings and CAD models, analyses common to all of WBS 1, and design criteria documents.

						Labor category									
					total fraction	EAEM		EADM		ORNL Eng		ORNL Physics		PPPL Physics	
	multiplier	**unit**	**no.**	**hours**		fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Title I, II design															
Pro-E models (avg)	40	hrs/model	30	1200	1.00	0.00	0	0.00	0	1.00	1200	0.00	0	0.00	0
assy dwgs	40	hrs/dwg	30	1200	1.00	0.00	0	0.00	0	1.00	1200	0.00	0	0.00	0
Detail drawings	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
installation dwg	40	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
cooling schematic	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
electrical schematic	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
I&C schematic	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
stress analysis	40	hrs/calc	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
thermal analysis	40	hrs/calc	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
special analysis (Brooks)	160	hrs/calc	15	2400	1.00	1.00	2400	0.00	0	0.00	0	0.00	0	0.00	0
design criteria (Zatz, Kugel)	200	hrs/spec	2	400	1.00	0.75	300	0.00	0	0.25	100	0.00	0	0.00	0
preliminary and final design reviews	80	hrs/rev	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
meetings/reporting/presentations	10%	% of tot	5200	520	1.00	0.00	0	0.00	0	1.00	520	0.00	0	0.00	0
subtotal				*5720*			*2700*		*0*		*3020*		*0*		*0*

					total fraction	EAEM		EASM		EADM		ORNL Eng	
Title III						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Pro-Intralink Maintenance	16	hrs/wk	221	3538	1.00	0.00	0	0.00	0	0.00	0	1.00	3538
Disposition of deviation requests and non-conformances	0	hrs/wk	186	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0
As-built drawings	0	hrs/dwg	30	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0
Installation oversight and inspection	0	hrs/wk	91	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0
subtotal				*3538*			*0*		*0*		*0*		*3538*

Schedule assumptions	**start**	**duration (weeks)**	**end**
Title I Design	Apr-03	48	Mar-04
Title II Design	Mar-04	74	Aug-05
Procurement	Jul-04	22	Dec-04

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Engineering, Title I, II and III

In-house fab / sub-assy	Jan-05	72	May-06
Installation / final assembly	Sep-05	91	Jun-07

Notes and worksheets

Coil Winding / Assembly Design and analysis

	total	Design integration	Pro-Intralink maintenance	Global EM analysis	Design Criteria	
Pro-E models	30	30				
assy dwgs	30	30				
Detail drawings	0					
installation dwg	0					
cooling schematic	0					
electrical schematic	0					
I&C schematic	0					
stress analysis	0					
thermal analysis	0					
special analysis	15			15	0	
design criteria	2				2	Structural design criteria, vacuum materials guidelines
preliminary and final design reviews	0					
meetings/reporting/presentations	15%					

WBS 192 Stellarator Core Integration and Global Analysis

Materials and Subcontracts (M&S)

Description:
This element covers the hardware and software required for WBS 1 activities at ORNL. These activities are not covered by overhead as they are at PPPL.

Assumptions:

outside engr rate =	120	$ per hour
outside fab rate =	60	$ per hour
outside inspection/technician rate =	80	$ per hour

Purchased parts:

subtotal, purchased parts	$0

Purchased materials for in-house fabrication and sub-assembly

software	$65,635
hardware	$53,760
subtotal purchased materials	$119,395

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In-house Fabrication and Assembly

Description:
There is no fabrication in this WBS element

Labor category

Fab operations summary	**multiplier**	**unit**	**no.**	**hours**	total fraction	EAEM		EASM, EMSM		EMTB		EADM	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
		hrs/lot	1	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0
		hrs/line	1	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0
		hrs / coil	18	0	1.00	0.00	0	1.00	0	0.00	0	0.00	0
subtotal				*0*			*0*		*0*		*0*		*0*

Assembly operations summary					total fraction	EAEM		EASM, EMSM		EMTB		EADM	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
		hr/lot	1	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0
		hr/lot	1	0	1.00	0.00	0	1.00	0	0.00	0	0.00	0
		hr/coil	18	0	1.00	0.00	0	1.00	0	0.00	0	0.00	0
		hours	1	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0
subtotal				*0*			*0*		*0*		*0*		*0*

Schedule assumptions	**start**	**duration (weeks)**	**end**
Title I Design, R&D	Aug-01	48	Jul-02
Title II Design	Jul-02	74	Dec-03
Procurement	Dec-03	22	May-04
In-house fab / sub-assy	May-04	72	Sep-05
Installation / final assembly	Sep-05	91	Jun-07

Notes and worksheets