

NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 182 Field Period Assembly Area Preparation

Labor

Activity Title	Manhours	FY2003 \$\$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
Preliminary Design (Title I)						
(44% of design schedule)	0		<i>EAEM</i>	Apr-03	Nov-03	PPPL Engineer
	0		<i>EADM</i>	Apr-03	Nov-03	PPPL Designer
	0		<i>ORNL Eng</i>	Apr-03	Nov-03	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	Apr-03	Nov-03	Composite of ORNL Physics / scientific
	0		<i>PPPL Phys.</i>	Apr-03	Nov-03	PPPL Physics/scientific
Final Design (Title II)						
(56% of design schedule)	0		<i>EAEM</i>	Nov-03	Aug-04	PPPL Engineer
	0		<i>EADM</i>	Nov-03	Aug-04	PPPL Designer
	0		<i>ORNL Eng</i>	Nov-03	Aug-04	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	Nov-03	Aug-04	Composite of ORNL Physicist
	0		<i>PPPL Phys.</i>	Nov-03	Aug-04	PPPL Physics/scientific
Lab R&D labor						
	0		<i>EAEM</i>	Apr-03	Nov-03	PPPL Engineer
	0		<i>EADM</i>	Apr-03	Nov-03	PPPL Designer
	0		<i>ORNL Eng</i>	Apr-03	Nov-03	Composite of ORNL Engineer / Designer
	0		<i>EASM</i>	Apr-03	Nov-03	PPPL monthly support
	0		<i>EMTB</i>	Apr-03	Nov-03	PPPL Technician
Lab Fab/Assembly/Installation (Title III)						
	0		<i>EAEM</i>	Jul-04	Oct-06	PPPL Engineer
	0		<i>EADM</i>	Jul-04	Oct-06	PPPL Designer
	0		<i>ORNL Eng</i>	Jul-04	Oct-06	Composite of ORNL Engineer / Designer
	144		<i>EASM</i>	Jul-04	Oct-06	PPPL monthly support
	960		<i>EMTB</i>	Jul-04	Oct-06	PPPL Technician

NCSX Fabrication Project Cost and Schedule

WBS 182 Field Period Assembly Area Preparation

Engineering, Title I, II and III

Title II Design	Nov-03	39	Aug-04
Procurement	Jul-04	22	Dec-04
In-house fab / sub-assy	Jan-05	72	May-06
Installation / final assembly	Sep-05	53	Oct-06

Notes and worksheets

	total	
Pro-E models		0
assy dwgs		0
Detail drawings		0
installation dwg		0
cooling schematic		0
electrical schematic		0
I&C schematic		0
stress analysis		0
thermal analysis		0
special analysis		0
procurement specifications		0
preliminary and final design reviews		0
meetings/reporting/presentations		15%

WBS 182 Field Period Assembly Area Preparation

R&D

Description:
No R&D is anticipated for this element

Summary

Purchased Design Services

subtotal \$0 w/o G&A

Procured Hardware/Material

subtotal \$0 w/o G&A

Subcontractor labor rates:

design rate: \$120 per hour
fab rate \$80 per hour
inspection/technician rate \$90 per hour

R&D design	unit	no.	hours	Labor category													
				total		EAEM		EADM		ORNL Enq		EASM		Vendor			
				fraction	hrs	fraction	hrs	fraction	hrs	fraction	hrs	fraction	hrs	fraction	hrs		
Task																	
Pro-E models	12	hrs/model	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
assy dwgs	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
Detail drawings	8	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
installation dwg	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
cooling schematic	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
electrical schematic	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
I&C schematic	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
special analysis	0	hrs/calc	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
procurement specifications	40	hrs/spec	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
vendor shop drawings	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
vendor part programming	0	hrs/model	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
vendor misc engineering	0%	% of tot	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
preliminary and final design reviews	40	hrs/rev	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
meetings/reporting/presentations	20%	% of tot	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0
subtotal			0	0			0		0			0		0			0

R&D Tasks and Title III (see notes)	unit	no.	hours	Labor category													
				total fraction	EAEM fraction	EADM fraction	ORNL Enq fraction	EASM, EMISM fraction	EMTB fraction								
0	hrs	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	
0	hrs/setup	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	
0	hrs/setup	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	
0	hrs / coil	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	
0	hrs	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	
subtotal			0			0		0		0		0		0			0

Schedule assumptions	start	duration (weeks)	end
R&D planning	Nov-02	4	Dec-02
Bid and award	Dec-02	2	Dec-02
R&D procurement / in-house fab.	Dec-02	4	Jan-03
R&D testing	Jan-03	52	Jan-04

Notes and worksheets

Engineering Design

Pro-E models	0
assy dwgs	0
Detail drawings	0
installation dwg	0
cooling schematic	0
electrical schematic	0
I&C schematic	0
special analysis	0
procurement specifications	0
Epoxy R&D contract	0
Tooling and fixtures	0
Clean room	0
Cable conductor	0
vendor shop drawings	0
vendor part programming	0
vendor misc engineering	0
preliminary and final design reviews	0
meetings/reporting/presentations	10%

NCSX Fabrication Project Cost and Schedule

WBS 182 Field Period Assembly Area Preparation

In-house Fabrication and Assembly

Description:

This effort covers all PPPL effort involved with preparing the facility space for field period assembly. There is very little area prep to do after the test cell is made ready for coil winding. This effort includes preparing the area for fixtures.

Labor category

	multiplier	unit	no.	hours	total		EAEM		EASM, EMSM		EMTB		EADM	
					fraction	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Fixture setup, area prep														
Sr. Lab tech	144	LOE	1	144	1.00	0.00	0	1.00	144	0.00	0	0.00	0	0
Tech	960	LOE	1	960	1.00	0.00	0	0.00	0	1.00	960	0.00	0	0
subtotal				1104			0		144		960			0
subtotal				0			0		0		0			0

Schedule assumptions

	start	duration (weeks)	end
Title I Design, R&D	Aug-02	31	Mar-03
Title II Design	Mar-03	39	Dec-03
Procurement	Dec-03	22	May-04
In-house fab / sub-assy	May-04	55	Jun-05
Installation / final assembly	Jun-05	67	Oct-06

Notes and worksheets

Field Period Assembly Area Preparation

Ref J. Chrzanowski spreadsheet, April 2003

This proposal includes the costs associated with the fabrication of (18) Modular coils for the NCSX Machine. This includes inspection of the conductor and castings, coil winding, VPI and Testing activities.

Activity	Duration	Start	End	HP	Safety	IH	QC	EAEM	EADM	EMSM	EMSM	EMTB	M&S	M&S
Activity Description	Days							Engr	Designer	Sr. Lab	machinist	Tech		
ID				hours	hours	hours	hours	hours	hours	hours	hours	hours	w/o G&A	w/G&A
<p>Notes: A number of activities can be performed in parallel and are not series activities during the field period assemblies.</p> <p>a) The TF coil sub-assembly</p> <p>b) The sub-assembly of the modular coils</p> <p>c) Preparation of the vacuum vessel for assembly</p>														
#	Prepare Field Period assembly area	60	6-Jun-05	29-Aug-05							144		960	
	Includes any initial fixture or area setup required prior to starting the assy activities										144	0	960	
				0	0	0	0	0	0	144	0	960		

NCSX Fabrication Project Cost and Schedule

WBS 182 Field Period Assembly Area Preparation

Engineering, Title I, II and III

Description:

Engineering for this task is covered under WBS 181

Labor category

	multiplier	unit	no.	hours	total fraction	EAEM		EADM		ORNL Eng		ORNL Physics		PPPL Physics	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Title I, II design															
Pro-E models (avg)	8	hrs/model	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
assy dwgs	40	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	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 (electromagnetics)	160	hrs/calc	0	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0	0.00	0
procurement/fab specifications	160	hrs/spec	0	0	1.00	0.75	0	0.00	0	0.25	0	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	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
<i>subtotal</i>				0			0		0		0		0		0

	multiplier	unit	no.	hours	total fraction	EAEM		EASM		EADM		ORNL Eng	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Title III													
vendor oversight, inspection	0	hrs/wk	22	0	1.00	0.50	0	0.00	0	0.00	0	0.50	0
Disposition of deviation requests and non-conformances	0	hrs/wk	147	0	1.00	0.20	0	0.00	0	0.00	0	0.80	0
As-built drawings	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0
Installation oversight and inspection	0	hrs/wk	53	0	1.00	0.25	0	0.75	0	0.00	0	0.00	0
<i>subtotal</i>				0			0		0		0		0

Schedule assumptions	start	duration (weeks)	end
Title I Design	Apr-03	31	Nov-03

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WBS 182 Field Period Assembly Area Preparation

Labor

Manhours per fiscal year by labor category

Level of Effort		FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	TOTAL
PPPL Engineer	<i>EAEM</i>	0	0	0	0	0	0	0
PPPL Designer	<i>EADM</i>	0	0	0	0	0	0	0
Composite of ORNL Engineer / Designer	<i>ORNL Eng</i>	0	0	0	0	0	0	0
PPPL monthly support	<i>EASM</i>	0	16	64	64	0	0	144
PPPL Technician	<i>EMTB</i>	0	107	426	426	0	0	960
Composite of ORNL Physics / scientific	<i>ORNL Phy</i>	0	0	0	0	0	0	0
PPPL Physics/scientific	<i>PPPL Phy</i>	0	0	0	0	0	0	0

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WBS 182 Field Period Assembly Area Preparation

M&S Costs

Activity Title	FY2003 \$\$	Comment
Manufacturing Development (R&D)		
Purchased Design Services	\$0	
Procured Hardware/Material	\$0	
Profit	\$0	profit already included in these items
<i>total, manf/dev (R&D)</i>	\$0	w/o G&A
Procured Hardware/Material		
0	\$0	
0	\$0	
0	\$0	
0	\$0	
0	\$0	
0	\$0	
0	\$0	
subtotal, purchased parts	\$0	
Profit at 10%	\$0	
<i>total, procured hdwe/matl.</i>	\$0	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	\$0	no travel is expected

NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 182 Field Period Assembly Area Preparation

Summary Costs

Activity Title	Manhours	FY2003 \$\$	Comment
Labor			
PPPL Effort	1,104	\$84,480	<i>Assumed rates:</i> <i>EAEM 153 \$/hr</i> <i>EADM 100 \$/hr</i> <i>ORNL Eng 130 \$/hr</i> <i>EASM 100 \$/hr</i> <i>EMTB 73 \$/hr</i> <i>PPPL Phys 141 \$/hr</i> <i>ORNL Phys 160 \$/hr</i>
ORNL effort	0	\$0	
subtotal, labor	1,104	\$84,480	
M&S, Other			
Manufacturing Development (R&D)		\$0	
Procured Hardware/Material		\$0	
Purchased Design Services		\$0	
Procured Installation/Assembly Costs		\$0	
Travel		\$0	
subtotal, M&S		\$0	
G&A		\$0	25% on all purchased materials, subcontracts, travel
Subtotal without contingency		\$84,480	
Contingency		\$16,896	20% Overall on this WBS
Total cost		\$101,376	