

NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 143 Modular Coil Local I&C

Labor

Activity Title	Manhours	FY2003 \$\$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
Preliminary Design (Title I)						
(50% of design schedule)	0		<i>EAEM</i>	May-06	Jul-06	PPPL Engineer
	0		<i>EADM</i>	May-06	Jul-06	PPPL Designer
	97		<i>ORNL Eng</i>	May-06	Jul-06	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	May-06	Jul-06	Composite of ORNL Physics / scientific
	0		<i>PPPL Phys.</i>	May-06	Jul-06	PPPL Physics/scientific
Final Design (Title II)						
(50% of design schedule)	0		<i>EAEM</i>	Jul-06	Aug-06	PPPL Engineer
	0		<i>EADM</i>	Jul-06	Aug-06	PPPL Designer
	97		<i>ORNL Eng</i>	Jul-06	Aug-06	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	Jul-06	Aug-06	Composite of ORNL Physicist
	0		<i>PPPL Phys.</i>	Jul-06	Aug-06	PPPL Physics/scientific
Lab R&D labor						
	0		<i>EAEM</i>	May-06	Jul-06	PPPL Engineer
	0		<i>EADM</i>	May-06	Jul-06	PPPL Designer
	0		<i>ORNL Eng</i>	May-06	Jul-06	Composite of ORNL Engineer / Designer
	0		<i>EASM</i>	May-06	Jul-06	PPPL monthly support
	0		<i>EMTB</i>	May-06	Jul-06	PPPL Technician
Lab Fab/Assembly/Installation (Title III)						
	0		<i>EAEM</i>	Aug-06	Jan-07	PPPL Engineer
	0		<i>EADM</i>	Aug-06	Jan-07	PPPL Designer
	26		<i>ORNL Eng</i>	Aug-06	Jan-07	Composite of ORNL Engineer / Designer
	188		<i>EASM</i>	Aug-06	Jan-07	PPPL monthly support
	576		<i>EMTB</i>	Aug-06	Jan-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	<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	203	17	0	220
PPPL monthly support	<i>EASM</i>	0	0	0	64	124	0	188
PPPL Technician	<i>EMTB</i>	0	0	0	197	379	0	576
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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M&S Costs

Activity Title	FY2003 \$\$	Comment
Manufacturing Development (R&D)		
Purchased Design Services	\$0	
Procured Hardware/Material	\$0	
Profit at 10%	\$0	
<i>total, manf/dev (R&D)</i>	\$0	w/o G&A
Procured Hardware/Material		
RTDs	\$4,300	
None required	\$0	
0	\$0	
materials for in-house fab	\$0	
subtotal, purchased parts	\$8,600	
Profit at 10%	\$430	
<i>total, procured hdwe/matl.</i>	\$9,030	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 anticipated for this WBS

Summary Costs

Activity Title	Manhours	FY2003 \$\$	Comment
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Labor

PPPL Effort	764	\$60,848
ORNL effort	220	\$28,548
subtotal, labor	984	\$89,396

<i>Assumed rates:</i>	
<i>EAEM</i> 153 \$/hr	<i>EASM</i> 100 \$/hr
<i>EADM</i> 100 \$/hr	<i>EMTB</i> 73 \$/hr
<i>ORNL Eng</i> 130 \$/hr	PPPL Phys 141 \$/hr
	ORNL Phys 160 \$/hr

M&S, Other

Manufacturing Development (R&D)		\$0
Procured Hardware/Material		\$9,030
Purchased Design Services		\$0
Procured Installation/Assembly Costs		\$0
Travel		\$0
subtotal, M&S		\$9,030

G&A

\$2,258

25% on all purchased materials, subcontracts, travel

Subtotal without contingency

\$100,684

Contingency

\$24,164

24% Overall on this WBS

Total cost

\$124,848

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WBS 143 Modular Coil Local I&C

In-house Fabrication and Assembly

Description:

The only assembly anticipated for the modular coil local I&C is the installation of the sensors and magnetic loops on the coils.

Labor category

	multiplier	unit	no.	hours	total fraction	EAEM		EASM		EMTB		ORNL Eng	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Fab operations													
none anticipated	0	hrs/tile	0	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0
				0	1.00	0.00	0	0.00	0	1.00	0	0.00	0
				0	0.00	0.00	0	0.00	0	0.00	0	0.00	0
				0	0.00	0.00	0	0.00	0	0.00	0	0.00	0
				0	0.00	0.00	0	0.00	0	0.00	0	0.00	0
<i>subtotal</i>				0			0		0		0		0

	multiplier	unit	no.	hours	total fraction	EAEM		EASM		EMTB		ORNL Eng	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Assembly operations													
install sensors	1	hrs/sensor	172	172	1.00	0.00	0	1.00	172	0.00	0	0.00	0
install mag loops	16	hrs/loop	36	576	1.00	0.00	0	0.00	0	1.00	576	0.00	0
					0.00	0.00	0	0.00	0	0.00	0	0.00	0
					0.00	0.00	0	0.00	0	0.00	0	0.00	0
					0.00	0.00	0	0.00	0	0.00	0	0.00	0
<i>subtotal</i>				748			0		172		576		0

Schedule assumptions	start	duration (weeks)	end
Title I Design, R&D	May-06	6	Jul-06
Title II Design	Jul-06	6	Aug-06
Procurement	Aug-06	12	Nov-06
In-house fab / sub-assy	Nov-06	4	Dec-06
Installation / final assembly	Dec-06	4	Jan-07

Notes and worksheets

magnetic loops

no. per coil	2
coils	18
total	36

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WBS 143 Modular Coil Local I&C

Materials and Subcontracts (M&S)

Description:

This effort covers sensors and connectors for the Modular Coil I&C. The sensors and connectors will be procured from a qualified vendor. All installation will be performed as part of WBS 7. All signal conditioning and data acquisition is part of WBS 5.

Assumptions:

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

Purchased parts:

RTDs	\$4,300
strain gages	\$4,300
<i>subtotal, purchased parts</i>	\$8,600

Purchased materials for in-house fabrication and sub-assembly

None required	\$0
<i>subtotal purchased materials</i>	0

Worksheet:**RTDs**

Number (4 per coil)	72 ea
spares (20%)	14
total number, RTDs	86
RTD cost each, with connector	50 \$ each
total for RTDs	\$4,300

Strain gages

Number (4 per coil)	72 ea	
spares (20%)	14	
total number, RTDs	86	
strain gage cost each	50 \$ each	MTS gage with back to back elements that cancel EM field
total for thermocouples	\$4,300	

NCSX Fabrication Project Cost and Schedule

WBS 143 Modular Coil Local I&C

Engineering, Title I, II and III

Description:

This effort covers all Title I, II, and III engineering for the modular coil local I&C. The sensors and wires will be procured from a qualified vendor. All installation oversight will be performed as part of WBS 7.

	multiplier	unit	no.	hours	Labor category											
					total		EAEM		EADM		ORNL Eng		ORNL Physics		PPPL Physics	
					fraction	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
Title I, II design																
Pro-E models	8	hrs/model	3	24	1.00	0.00	0	0.00	0	1.00	24	0.00	0	0.00	0	
assy dwgs	16	hrs/dwg	3	48	1.00	0.00	0	0.00	0	1.00	48	0.00	0	0.00	0	
Detail drawings	16	hrs/dwg	2	32	1.00	0.00	0	0.00	0	1.00	32	0.00	0	0.00	0	
installation dwg	16	hrs/dwg	3	48	1.00	0.00	0	0.00	0	1.00	48	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	
electrical schematic	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	
I&C schematic	8	hrs/dwg	3	24	1.00	0.00	0	0.00	0	1.00	24	0.00	0	0.00	0	
stress analysis	0	hrs/calc	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	
thermal analysis	0	hrs/calc	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	
special analysis	0	hrs/calc	0	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0	0.00	0	
procurement specifications	16	hrs/spec	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0	
preliminary and final design reviews	0	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	176	18	1.00	0.00	0	0.00	0	1.00	18	0.00	0	0.00	0	
<i>subtotal</i>				194			0		0		194		0		0	
Title III																
vendor oversight, inspection	8	hrs/lot	1	8	1.00	0.00	0	0.00	0	0.00	0	1.00	8			
in-house fab/assy oversight and inspection	4	hrs/wk	4	16	1.00	0.00	0	1.00	16	0.00	0	0.00	0			
Disposition of deviation requests and non-conformances	0.5	hrs/wk	20	10	1.00	0.00	0	0.00	0	0.00	0	1.00	10			
As-built drawings	1	hrs/dwg	8	8	1.00	0.00	0	0.00	0	0.00	0	1.00	8			
Installation oversight and inspection	0	hrs/wk	4	0	1.00	0.25	0	0.75	0	0.00	0	0.00	0			
<i>subtotal</i>				42			0		16		0		26			

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WBS 143 Modular Coil Local I&C

Engineering, Title I, II and III

Schedule assumptions	start	duration (weeks)	end
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Title II Design	Jul-06	6	Aug-06
Procurement	Aug-06	12	Nov-06
In-house fab / sub-assy	Nov-06	4	Dec-06
Installation / final assembly	Dec-06	4	Jan-07

Notes and worksheets

Modular Coil local I&C

	total	mod coil 1	mod coil 2	mod coil 3	
Pro-E models	3	1	1	1	
assy dwgs	3	1	1	1	
Detail drawings	2				
installation dwg	3	1	1	1	typcial drawing for RTD and Strain gage installation
cooling schematic	0				
electrical schematic	0				
I&C schematic	3	1	1	1	
stress analysis	0				
thermal analysis	0				
special analysis	0				
procurement specifications	0				one specification for RTDs, one for Strain gages incl in WBS 133
preliminary and final design reviews	0				one review for coil instr. Included in WBS 133
meetings/reporting/presentations	15%				