

## NCSX Fabrication Project Cost and Schedule Estimating Form

### WBS 133 External Error Correction Coils

#### Labor

Activity Title	Manhours	FY2003 \$\$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
<b>Preliminary Design (Title I)</b>						
( 62% of design schedule)	230		<i>EAEM</i>	Jun-05	Aug-05	PPPL Engineer
	186		<i>EADM</i>	Jun-05	Aug-05	PPPL Designer
	51		<i>ORNL Eng</i>	Jun-05	Aug-05	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	Jun-05	Aug-05	Composite of ORNL Physics / scientific
	0		<i>PPPL Phys.</i>	Jun-05	Aug-05	PPPL Physics/scientific
<b>Final Design (Title II)</b>						
( 38% of design schedule)	141		<i>EAEM</i>	Aug-05	Oct-05	PPPL Engineer
	114		<i>EADM</i>	Aug-05	Oct-05	PPPL Designer
	31		<i>ORNL Eng</i>	Aug-05	Oct-05	Composite of ORNL Engineer / Designer
	0		<i>ORNL Phys.</i>	Aug-05	Oct-05	Composite of ORNL Physicist
	0		<i>PPPL Phys.</i>	Aug-05	Oct-05	PPPL Physics/scientific
<b>Lab R&amp;D labor</b>						
	0		<i>EAEM</i>	Jun-05	Aug-05	PPPL Engineer
	0		<i>EADM</i>	Jun-05	Aug-05	PPPL Designer
	0		<i>ORNL Eng</i>	Jun-05	Aug-05	Composite of ORNL Engineer / Designer
	0		<i>EASM</i>	Jun-05	Aug-05	PPPL monthly support
	0		<i>EMTB</i>	Jun-05	Aug-05	PPPL Technician
<b>Lab Fab/Assembly/Installation (Title III)</b>						
	232		<i>EAEM</i>	Oct-05	Jan-06	PPPL Engineer
	64		<i>EADM</i>	Oct-05	Jan-06	PPPL Designer
	30		<i>ORNL Eng</i>	Oct-05	Jan-06	Composite of ORNL Engineer / Designer
	0		<i>EASM</i>	Oct-05	Jan-06	PPPL monthly support
	0		<i>EMTB</i>	Oct-05	Jan-06	PPPL Technician

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*Manhours per fiscal year by labor category*

Level of Effort		FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	TOTAL
PPPL Engineer	<i>EAEM</i>	0	0	365	238	0	0	603
PPPL Designer	<i>EADM</i>	0	0	295	69	0	0	364
Composite of ORNL Engineer / Designer	<i>ORNL Eng</i>	0	0	80	31	0	0	112
PPPL monthly support	<i>EASM</i>	0	0	0	0	0	0	0
PPPL Technician	<i>EMTB</i>	0	0	0	0	0	0	0
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 133 External Error Correction Coils

#### M&S Costs

Activity Title	FY2003 \$\$	Comment
<b>Manufacturing Development (R&amp;D)</b>		
Purchased Design Services	\$0	
Procured Hardware/Material	\$0	
Profit	\$0	included in hardware estimate
<i>total, manf/dev (R&amp;D)</i>	\$0	w/o G&A
<b>Procured Hardware/Material</b>		
set of external error field correction coils	\$210,738	
Profit	\$0	included in hardware estimate
<i>total, procured hdwe/matl.</i>	\$210,738	w/o G&A
<b>Purchased Design Services</b>	\$0	no purchased services anticipated
<b>Procured Installation/Assembly Costs</b>	\$0	All installation and assembly costs are included in WBS 7

#### Other Costs

Activity Title	FY2003 \$\$	Comment
Travel	\$4,000	two trips are anticipated for this WBS

## NCSX Fabrication Project Cost and Schedule Estimating Form

### WBS 133 External Error Correction Coils

#### Summary Costs

Activity Title	Manhours	FY2003 \$\$	Comment
<b>Labor</b>			
PPPL Effort	967	\$128,651	<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	112	\$14,526	
subtotal, labor	1,079	\$143,177	
<b>M&amp;S, Other</b>			
Manufacturing Development (R&D)		\$0	
Procured Hardware/Material		\$210,738	
Purchased Design Services		\$0	
Procured Installation/Assembly Costs		\$0	
Travel		\$4,000	
subtotal, M&S		\$214,738	
<b>G&amp;A</b>		\$53,684	25% on all purchased materials, subcontracts, travel
<b>Subtotal without contingency</b>		\$411,599	
<b>Contingency</b>		\$164,640	40% Overall on this WBS
<b>Total cost</b>		\$576,239	



# NCSX Fabrication Project Cost and Schedule

## WBS 133 External Error Correction Coils

### Engineering, Title I, II and III

**Description:**

This effort covers all Title I, II, and III engineering for the external error field correction coils, which includes the top and bottom coils and the outer perimeter coils. The windings are procured via a fixed price contract. 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
<b>Title I, II design</b>																
Pro-E models (avg)	16	hrs/model	8	128	1.00	0.25	32	0.50	64	0.25	32	0.00	0	0.00	0	
assy dwgs	40	hrs/dwg	2	80	1.00	0.00	0	1.00	80	0.00	0	0.00	0	0.00	0	
Detail drawings	16	hrs/dwg	6	96	1.00	0.00	0	1.00	96	0.00	0	0.00	0	0.00	0	
installation dwg	40	hrs/dwg	0	0	1.00	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0	
cooling schematic	20	hrs/dwg	2	40	1.00	0.00	0	1.00	40	0.00	0	0.00	0	0.00	0	
electrical schematic	20	hrs/dwg	1	20	1.00	0.00	0	1.00	20	0.00	0	0.00	0	0.00	0	
I&C schematic	20	hrs/dwg	0	0	1.00	0.00	0	1.00	0	0.00	0	0.00	0	0.00	0	
stress analysis	40	hrs/calc	2	80	1.00	1.00	80	0.00	0	0.00	0	0.00	0	0.00	0	
thermal analysis	40	hrs/calc	2	80	1.00	1.00	80	0.00	0	0.00	0	0.00	0	0.00	0	
special analysis (electromagnetics)	40	hrs/calc	1	40	1.00	0.50	20	0.00	0	0.50	20	0.00	0	0.00	0	
procurement/fab specifications	40	hrs/spec	1	40	1.00	1.00	40	0.00	0	0.00	0	0.00	0	0.00	0	
preliminary and final design reviews	40	hrs/rev	2	80	1.00	0.80	64	0.00	0	0.20	16	0.00	0	0.00	0	
meetings/reporting/presentations	10%	% of tot	684	68	1.00	0.80	55	0.00	0	0.20	14	0.00	0	0.00	0	
<i>subtotal</i>				752			371		300		82		0		0	
<b>Title III</b>																
vendor oversight, inspection	8	hrs/wk	12	96	1.00	1.00	96	0.00	0	0.00	0	0.00	0			
Disposition of deviation requests and non-conformances	4	hrs/wk	38	150	1.00	0.80	120	0.00	0	0.00	0	0.20	30			
As-built drawings	8	hrs/dwg	10	80	1.00	0.20	16	0.00	0	0.80	64	0.00	0			
<i>subtotal</i>				326			232		0		64		30			

## NCSX Fabrication Project Cost and Schedule

### WBS 133 External Error Correction Coils

#### Engineering, Title I, II and III

Schedule assumptions	start	duration (weeks)	end
Title I Design	Jun-05	11	Aug-05
Title II Design	Aug-05	7	Oct-05
Procurement	Oct-05	12	Dec-05
In-house fab / sub-assy	Dec-05	0	Dec-05
Installation / final assembly	Jul-05	26	Jan-06

#### Notes and worksheets

#### External error field correction coils

	total	T&B, Outer per. coils	
Pro-E models	8	8	models of all parts
assy dwgs	2	2	windings, winding form
Detail drawings	6	6	windings, winding form, lead blocks
installation dwg	0		
cooling schematic	2	2	
electrical schematic	1	2	
I&C schematic	0		covered in WBS 184
stress analysis	2	2	global and local analysis of winding pack and lead regions
thermal analysis	2	2	global and local analysis of winding pack and lead regions
special analysis	1		em analysis of lead area, general analysis in WBS 171
procurement specifications	1		one procurement specification for external error field correction coils
preliminary and final design reviews	2		standard reviews
meetings/reporting/presentations	10%		