NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 134 Conventional 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		*EAEM*	May-06	Jul-06	PPPL Engineer
	0		*EADM*	May-06	Jul-06	PPPL Designer
	92		*ORNL Eng*	May-06	Jul-06	Composite of ORNL Engineer / Designer
	0		*ORNL Phys.*	May-06	Jul-06	Composite of ORNL Physics / scientific
	0		*PPPL Phys.*	May-06	Jul-06	PPPL Physics/scientific
Final Design (Title II)						
(50% of design schedule)	0		*EAEM*	Jul-06	Aug-06	PPPL Engineer
	0		*EADM*	Jul-06	Aug-06	PPPL Designer
	92		*ORNL Eng*	Jul-06	Aug-06	Composite of ORNL Engineer / Designer
	0		*ORNL Phys.*	Jul-06	Aug-06	Composite of ORNL Physicist
	0		*PPPL Phys.*	Jul-06	Aug-06	PPPL Physics/scientific
Lab R&D labor						
	0		*EAEM*	May-06	Jul-06	PPPL Engineer
	0		*EADM*	May-06	Jul-06	PPPL Designer
	0		*ORNL Eng*	May-06	Jul-06	Composite of ORNL Engineer / Designer
	0		*EASM*	May-06	Jul-06	PPPL monthly support
	0		*EMTB*	May-06	Jul-06	PPPL Technician
Lab Fab/Assembly/Installation (Title III)						
	2		*EAEM*	Aug-06	Jan-07	PPPL Engineer
	0		*EADM*	Aug-06	Jan-07	PPPL Designer
	18		*ORNL Eng*	Aug-06	Jan-07	Composite of ORNL Engineer / Designer
	129		*EASM*	Aug-06	Jan-07	PPPL monthly support
	491		*EMTB*	Aug-06	Jan-07	PPPL Technician

WBS 134 Conventional Coil Local I&C

Labor

Manhours per fiscal year by labor category

Level of Effort		FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	TOTAL
PPPL Engineer	*EAEM*	0	0	0	1	1	0	*2*
PPPL Designer	*EADM*	0	0	0	0	0	0	*0*
Composite of ORNL Engineer / Designer	*ORNL Eng*	0	0	0	191	12	0	*203*
PPPL monthly support	*EASM*	0	0	0	44	85	0	*129*
PPPL Technician	*EMTB*	0	0	0	168	323	0	*491*
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*

WBS 134 Conventional Coil Local I&C

M&S Costs

Activity Title	FY2003 $$	Comment
Manufacturing Development (R&D)		
Purchased Design Services	$0	
Procured Hardware/Material	$0	
Profit at 10%	$0	
total, manf/dev (R&D)	$0	w/o G&A
Procured Hardware/Material		
RTDs	$5,750	
strain gages	$2,875	
Purchased parts	$8,625	
materials for in-house fab	$0	
subtotal, purchased parts	$8,625	
Profit at 10%	$575	
total, procured hdwe/matl.	$9,200	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

WBS 134 Conventional Coil Local I&C

Labor						
PPPL Effort	622	$49,044	*Assumed rates:*		*EASM*	100 $/hr
ORNL effort	203	$26,359	*EAEM*	153 $/hr	*EMTB*	73 $/hr
subtotal, labor	825	$75,403	*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		$9,200				
Purchased Design Services		$0				
Procured Installation/Assembly Costs		$0				
Travel		$0				
subtotal, M&S		$9,200				
G&A		$2,300	25%	on all purchased materials, subcontracts, travel		
Subtotal without contingency		$86,903				
Contingency		$17,381	20%	Overall on this WBS		
Total cost		$104,284				

WBS 134 Conventional Coil Local I&C

In-house Fabrication and Assembly

Description:
The only in-house fab and assembly work connected with the Conventional coil local I&C is associated with applying the sensors to the coils and applying the magnetic loops to the coils. The magnetic loops are furnished by WBS 3.

Labor category

	multiplier	unit	no.	hours	total fraction	EAEM fract.	EAEM hrs	EASM fract.	EASM hrs	EMTB fract.	EMTB hrs	ORNL Eng fract.	ORNL Eng hrs
Fab operations													
				0	0.00	0.00	0	0.00	0	0.00	0	0.00	0
none anticipated	0	hrs	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
subtotal				*0*			*0*		*0*		*0*		*0*

					total fraction	EAEM fract.	EAEM hrs	EASM fract.	EASM hrs	EMTB fract.	EMTB hrs	ORNL Eng fract.	ORNL Eng hrs
Assembly operations													
install sensors	1	hrs/sensor	230	230	1.00	0.00	0	0.20	46	0.80	184	0.00	0
install mag loops	8	hrs/loop	48	384	1.00	0.00	0	0.20	77	0.80	307	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
subtotal				*614*			*0*		*123*		*491*		*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.
TF Coils	18
PF Coils	12
External Trim Coils	18
total	48

WBS 134 Conventional Coil Local I&C

Materials and Subcontracts (M&S)

Description:
This effort covers sensors and connectors for the Conventional Coil I&C for Phases I, II, and III of NCSX operation. 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	$5,750
strain gages	$2,875
subtotal, purchased parts	$8,625

Purchased materials for in-house fabrication and sub-assembly

None required	$0
subtotal purchased materials	0

Worksheet:

RTDs	**no. per coil**	**no. coils**		
TF	2	18	36	
PF	2	12	24	
External trim	2	18	36	
spares (20%)			19	
Subtotal, number			115	
RTD cost each, with connector			50	$ each
total for RTDs			$5,750	
Strain gages				
TF	2	18	36	
PF	2	12	24	
External trim	2	18	36	
spares (20%)			19	
Subtotal, number	2	18	115	ea
strain gage cost each, with connector			25	$ each MTS gage w/ back-to-back elements to cancel EM field
total for strain gages				
total for thermocouples			$2,875	

WBS 134 Conventional Coil Local I&C

Engineering, Title I, II and III

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

						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	8	hrs/model	2	16	1.00	0.00	0	0.00	0	1.00	16	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	16	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	0	0.00	0	0.00	0
installation dwg	16	hrs/dwg	8	128	1.00	0.00	0	0.00	0	1.00	128	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	168	17	1.00	0.00	0	0.00	0	1.00	17	0.00	0	0.00	0
subtotal				*185*			*0*		*0*		*185*		*0*		*0*

					total fraction	EAEM		EASM		EADM		ORNL Eng	
Title III						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
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	0	hrs/wk	4	0	1.00	0.00	0	1.00	0	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	0	hrs/dwg	8	0	1.00	0.00	0	0.00	0	0.00	0	1.00	0
Installation oversight and inspection	2	hrs/wk	4	8	1.00	0.25	2	0.75	6	0.00	0	0.00	0
subtotal				*26*			*2*		*6*		*0*		*18*

WBS 134 Conventional Coil Local I&C

Engineering, Title I, II and III

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
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Notes and worksheets

Conventional Coil local I&C

	total	TF	PF1-2	PF3	PF4	PF5	PF6	External trim	
Pro-E models	2	1						1	
assy dwgs	0	0						0	
Detail drawings	0	0						0	typcial drawing for RTD and Strain gage installation
installation dwg	8	2	1.33	0.667	0.667	0.667	0.667	2	PF-1,2,3 share one drawing for RTDs, one for Strain g
cooling schematic	0	0						0	
electrical schematic	0	0						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 i
preliminary and final design reviews	0								one review for coil instr. Included in WBS 133
meetings/reporting/presentations	15%								