

## NCSX Fabrication Project Cost and Schedule Estimating Form

### WBS 153 Support Structure Local I&C

#### Labor

Activity Title	Manhours	FY2003 \$\$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
<b>Preliminary Design (Title I)</b>						
( 50% of design schedule)	48		<i>EAEM</i>	May-06	Jul-06	PPPL Engineer
	0		<i>EADM</i>	May-06	Jul-06	PPPL Designer
	5		<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
<b>Final Design (Title II)</b>						
( 50% of design schedule)	48		<i>EAEM</i>	Jul-06	Aug-06	PPPL Engineer
	0		<i>EADM</i>	Jul-06	Aug-06	PPPL Designer
	5		<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
<b>Lab R&amp;D labor</b>						
	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
<b>Lab Fab/Assembly/Installation (Title III)</b>						
	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
	20		<i>EASM</i>	Aug-06	Jan-07	PPPL monthly support
	48		<i>EMTB</i>	Aug-06	Jan-07	PPPL Technician

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#### Labor

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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	0	96	0	0	96
PPPL Designer	<i>EADM</i>	0	0	0	0	0	0	0
Composite of ORNL Engineer / Designer	<i>ORNL Eng</i>	0	0	0	19	17	0	36
PPPL monthly support	<i>EASM</i>	0	0	0	7	13	0	20
PPPL Technician	<i>EMTB</i>	0	0	0	16	32	0	48
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

## NCSX Fabrication Project Cost and Schedule Estimating Form

### WBS 153 Support Structure Local I&C

#### M&S Costs

Activity Title	FY2003 \$\$	Comment
<b>Manufacturing Development (R&amp;D)</b>		
Purchased Design Services	\$0	
Procured Hardware/Material	\$0	
Profit at 10%	\$0	
<i>total, manf/dev (R&amp;D)</i>	\$0	w/o G&A
<b>Procured Hardware/Material</b>		
RTDs	\$1,200	
strain gages	\$1,200	
0	\$0	
materials for in-house fab	\$0	
subtotal, purchased parts	\$2,400	
Profit at 10%	\$120	
<i>total, procured hdwe/matl.</i>	\$2,520	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	\$0	No travel is anticipated for this WBS

## NCSX Fabrication Project Cost and Schedule Estimating Form

### WBS 153 Support Structure Local I&C

#### Summary Costs

Activity Title	Manhours	FY2003 \$\$	Comment
<b>Labor</b>			
PPPL Effort	164	\$20,192	<i>Assumed rates:</i> <i>EAEM</i> 153 \$/hr <i>EADM</i> 100 \$/hr <i>ORNL Eng</i> 130 \$/hr <i>EASM</i> 100 \$/hr <i>EMTB</i> 73 \$/hr PPPL Phys 141 \$/hr ORNL Phys 160 \$/hr
ORNL effort	36	\$4,628	
subtotal, labor	200	\$24,820	
<b>M&amp;S, Other</b>			
Manufacturing Development (R&D)		\$0	
Procured Hardware/Material		\$2,520	
Purchased Design Services		\$0	
Procured Installation/Assembly Costs		\$0	
Travel		\$0	
subtotal, M&S		\$2,520	
<b>G&amp;A</b>		\$630	25% on all purchased materials, subcontracts, travel
<b>Subtotal without contingency</b>		\$27,970	
<b>Contingency</b>		\$5,594	20% Overall on this WBS
<b>Total cost</b>		\$33,564	

## NCSX Fabrication Project Cost and Schedule

### WBS 153 Support Structure Local I&C

#### In-house Fabrication and Assembly

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**Description:**

The only local assembly anticipated for the support structure local I&C is installation of the sensors. Connection of the sensors is part of WBS 7.

**Labor category**

	multiplier	unit	no.	hours	total fraction	EAEM		EASM		EMTB		ORNL Eng	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
<b>Fab operations</b>													
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
<b>Assembly operations</b>													
install	sensors	1	hrs/sensor	60	1.00	0.00	0	0.20	12	0.80	48	0.00	0
					1.00	0.00	0	0.00	0	1.00	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
					0.00	0.00	0	0.00	0	0.00	0	0.00	0
<i>subtotal</i>				60			0		12		48		0

<b>Schedule assumptions</b>	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**

# NCSX Fabrication Project Cost and Schedule

## WBS 153 Support Structure Local I&C

### Materials and Subcontracts (M&S)

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**Description:**

This effort covers sensors and connectors for the Support Structure local 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	\$1,200
strain gages	\$1,200
<i>subtotal, purchased parts</i>	\$2,400

**Purchased materials for in-house fabrication and sub-assembly**

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

**Worksheet:**

**RTDs**

Number (2*6*2)	24 ea
RTD cost each, with connector	50 \$ each
total for RTDs	\$1,200

**Strain gages**

Number (2*6*2)	36 ea	
strain gage cost each	50 \$ each	MTS gage with back to back elements that cancel EM field
total for thermocouples	\$1,800	

## NCSX Fabrication Project Cost and Schedule

### WBS 153 Support Structure Local I&C

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

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**Description:**

This effort covers all Title I, II, and III engineering for the support structure 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**

	multiplier	unit	no.	hours	total fraction	EAEM		EADM		ORNL Eng		ORNL Physics		PPPL Physics	
						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
<b>Title I, II design</b>															
Pro-E models	8	hrs/model	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
assy dwgs	40	hrs/dwg	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
Detail drawings	16	hrs/dwg	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
installation dwg	16	hrs/dwg	4	64	1.00	1.00	64	0.00	0	0.00	0	0.00	0	0.00	0
cooling schematic	0	hrs/dwg	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
electrical schematic	0	hrs/dwg	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
I&C schematic	8	hrs/dwg	4	32	1.00	1.00	32	0.00	0	0.00	0	0.00	0	0.00	0
stress analysis	0	hrs/calc	0	0	1.00	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0
thermal analysis	0	hrs/calc	0	0	1.00	1.00	0	0.00	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	0.00	0	1.00	0	0.00	0
procurement specifications	16	hrs/spec	0	0	1.00	1.00	0	0.00	0	0.00	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	96	10	1.00	0.00	0	0.00	0	1.00	10	0.00	0	0.00	0
<i>subtotal</i>				106			96		0		10		0		0
<b>Title III</b>															
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	2	hrs/wk	4	8	1.00	0.00	0	1.00	8	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	2	hrs/dwg	4	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>				34			0		8		0		26		

## NCSX Fabrication Project Cost and Schedule

### WBS 153 Support Structure 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

#### Support structure local I&C

	total	TF integrated structure	central solenoid structure	Mod coil interface structure	
Pro-E models	0				
assy dwgs	0				
Detail drawings	0				
installation dwg	4	1	2		typical drawing for RTD and Strain gage installation 1 PF-1,2,3 share one drawing for RTDs, one for Strain gages
cooling schematic	0				
electrical schematic	0				
I&C schematic	4	1	2	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 temp/strain instr. Included in WBS 133
meetings/reporting/presentations	15%				