## Labor

Activity TitleManhoursFY2003 \$\$Labor TypeStart Dafe Month/YrEnd Date Month/YrCommentsPreliminary Design (Title I) (44% of design schedule)0555 <td< th=""><th>Labor</th><th></th><th></th><th></th><th></th><th></th><th></th></td<>	Labor						
Preliminary Design (Title I) (44% of design schedule)       0       EAEM       Apr-03       Nov-03       PPPL Engineer         0       0       0       ORNL Eng       Apr-03       Nov-03       PPPL Designer         0       0       ORNL Eng       Apr-03       Nov-03       PPPL Designer         0       0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Physics / scientific         Final Design (Title II)       0       EAEM       Nov-03       Aug-04       PPPL Physics/scientific         (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       0       ORNL Eng       Nov-03       Aug-04       PPPL Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Phys.       Nov-03       Aug-04       Composite of ORNL Physics/scientific         Lab R&D labor       0       EAEM       Apr-03       Nov-03       PPPL Physics/scientific         0       0       CARDM       Apr-03       Nov-03       PPPL Engineer       Designe	Activity Title	Manhours	FY2003 \$\$	Labor Type	Start Date Month/Yr	End Date Month/Yr	Comments
Preliminary Design (Title I) (44% of design schedule) 0 EAEM Apr-03 Nov-03 PPPL Engineer 0 ORNL Eng Apr-03 Nov-03 Composite of ORNL Engineer / Designer 0 ORNL Eng Apr-03 Nov-03 Composite of ORNL Engineer / Designer 0 ORNL Phys. Apr-03 Nov-03 PPPL Physics/scientific Final Design (Title II) (56% of design schedule) 0 EAEM Nov-03 Aug-04 PPPL Engineer 0 ORNL Eng Nov-03 Aug-04 OC Composite of ORNL Engineer / Designer 0 ORNL Eng Nov-03 Aug-04 PPPL Engineer 0 ORNL Eng Nov-03 Aug-04 Composite of ORNL Engineer / Designer 0 ORNL Phys. Nov-03 Aug-04 Composite of ORNL Engineer / Designer 0 ORNL Phys. Nov-03 Aug-04 Composite of ORNL Engineer / Designer 0 ORNL Phys. Nov-03 Aug-04 Composite of ORNL Engineer / Designer 0 ORNL Phys. Nov-03 Aug-04 Composite of ORNL Physics/scientific Lab R&D labor 0 EAEM Apr-03 Nov-03 PPPL Engineer 0 EAEM Apr-03 Nov-03 PPPL Engineer 0 CRNL Eng Apr-03 Nov-03 PPPL Designer 0 CRNL Eng Apr-03 Nov-03 PPPL Engineer 0 CRNL Eng Apr-03 Nov-03 PPPL Designer 0 CRNL Eng Apr-03 Nov-03 PPPL Engineer 1 EAEM Jul-04 Oct-06 PPPL Engineer 1 EAEM Jul-04 Oct-06 PPPL Designer 1 EAEM Jul-04 Oct-06 Composite of ORNL Engineer / Designer 1 EADM Jul-04 Oct-06 PPPL Designer 1 EADM Jul-04 Oct-06 PPPL Designer 1 EADM Jul-04 Oct-06 PPPL Designer 1 EADM Jul-04 Oct-06 Composite of ORNL Engineer / Designer 1 EADM Jul-04 Oct-06 PPPL Designer 1 EADM							
(44% of design schedule)       0       EAEM       Apr-03       Nov-03       PPPL Engineer         0       EADM       Apr-03       Nov-03       PPPL Designer         0       ORNL Eng       Apr-03       Nov-03       Composite of ORNL Engineer / Designer         0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Engineer / Designer         0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Physics / scientific         Final Design (Title II)       0       EAEM       Nov-03       Aug-04       PPPL Physics/scientific         (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       ORNL Eng       Nov-03       Aug-04       PPPL Designer       Designer         0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       ORNL Phys.       Nov-03       Aug-04       Composite of ORNL Physicist         0       ORNL Phys.       Nov-03       Aug-04       PPPL Physics/scientific         1       0       EAEM       Apr-03       Nov-03       PPPL Physics/scientific         1       0       EAEM       Apr-03       Nov-03       PPPL Physics/scientific	Preliminary Design (Title I)						
0       EADM       Apr-03       Nov-03       PPPL Designer         0       ORNL Eng       Apr-03       Nov-03       Composite of ORNL Engineer / Designer         0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Physics / scientific         0       PPPL Phys.       Apr-03       Nov-03       PPPL Physics/scientific         1       (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       ORNL Eng       Nov-03       Aug-04       PPPL Designer       Designer         0       ORNL Eng       Nov-03       Aug-04       PPPL Designer         0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       ORNL Eng       Nov-03       Aug-04       POPL Physics/scientific         Lab R&D labor       EAEM       Apr-03       Nov-03       PPL Designer         0       CRNL Eng       Apr-03       Nov-03       PPL Designer         0       ORNL Eng       Apr-03       Nov-03       PPL Designer         0       ORNL Eng       Apr-03       Nov-03       PP	( 44% of design schedule)	0		EAEM	Apr-03	Nov-03	PPPL Engineer
0       ORNL Eng       Apr-03       Nov-03       Composite of ORNL Engineer / Designer         0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Physics / scientific         Final Design (Title II)        Apr-03       Nov-03       PPPL Physics/scientific         (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Engineer         0       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       0       ORNL Eng       Nov-03       Aug-04       OPPL Engineer / Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       CRNL Phys.       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       CRNL Phys.       Nov-03       Aug-04       PPPL Physics/scientific         Lab R&D labor       0       EAEM       Apr-03       Nov-03       PPL Engineer         0       CRNL Eng       Apr-03       No		0		EADM	Apr-03	Nov-03	PPPL Designer
0       ORNL Phys.       Apr-03       Nov-03       Composite of ORNL Physics / scientific         Final Design (Title II)       0       PPPL Phys.       Apr-03       Nov-03       PPPL Physics/scientific         (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       0       CORNL Eng       Nov-03       Aug-04       PPPL Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Phys.       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Phys.       Nov-03       Aug-04       PPPL Physics/scientific         Lab R&D labor       0       EAEM       Apr-03       Nov-03       PPPL Engineer         0       EAEM       Apr-03       Nov-03       PPPL Designer       ORNL Eng       ORNL Eng       Nov-03       PPPL Designer         0       ORNL Eng       Apr-03       Nov-03       PPPL Designer       Designer       Designer       Designer         0       ORNL Eng       Apr-03       Nov-03       PPPL monthly support       Designer       Designer       Designer       Designer       Designer       Designe		0		ORNL Eng	Apr-03	Nov-03	Composite of ORNL Engineer / Designer
Image: constraint of the light of the l		0		ORNL Phys.	Apr-03	Nov-03	Composite of ORNL Physics / scientific
Final Design (Title II) (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Engineer         Composite of ORNL Engineer       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         Composite of ORNL Phys.       Nov-03       Aug-04       PPPL Designer       Oendesite of ORNL Engineer / Designer         Lab R&D labor       EAEM       Apr-03       Nov-03       Aug-04       Composite of ORNL Engineer         0       EAEM       Apr-03       Nov-03       PPL Physics/scientific         0       Composite of ORNL Engineer       EAEM       Apr-03       Nov-03       PPL Engineer         0       Composite of ORNL Engineer       Composite of ORNL Engineer       Designer         0       Composite of ORNL Engineer       Composite of ORNL Engineer / Designer         0       Composite of ORNL Engineer       Designer       Composite of ORNL Engineer / Designer         0       Composite of ORNL Engineer       Designer       Composite of ORNL Engineer         0       Composite of ORNL Engineer       Designer       Designer         0       Composite of ORNL Engineer       Composite of ORNL Engineer       Designer         0       Composite of ORNL Engineer       Composite of ORNL Engineer       Designer </td <td></td> <td>0</td> <td></td> <td>PPPL Phys.</td> <td>Apr-03</td> <td>Nov-03</td> <td>PPPL Physics/scientific</td>		0		PPPL Phys.	Apr-03	Nov-03	PPPL Physics/scientific
Image Design (Title III)       EAEM       Nov-03       Aug-04       PPPL Engineer         (56% of design schedule)       0       EAEM       Nov-03       Aug-04       PPPL Designer         0       0       ORNL Eng       Nov-03       Aug-04       Composite of ORNL Engineer / Designer         0       0       ORNL Phys.       Nov-03       Aug-04       Composite of ORNL Physicist         0       0       PPPL Phys.       Nov-03       Aug-04       PPPL Physics/scientific         Lab R&D labor       EAEM       Apr-03       Nov-03       PPPL Engineer         0       0       EAEM       Apr-03       Nov-03       PPPL Designer         0       0       EAEM       Apr-03       Nov-03       PPPL Designer         0       0       Connosite of ORNL Engineer / Designer       ORNL Eng       Apr-03       Nov-03       PPPL Designer         0       ORNL Eng       Apr-03       Nov-03       PPPL monthly support       Designer       Designer         0       EASM       Apr-03       Nov-03       PPPL Technician       EAEM       Jul-04       Oct-06       PPPL Designer         0       Connosite of ORNL Engineer / Designer       Composite of ORNL Engineer / Designer       Designer       <	Final Design (Title II)						
(000000000000000000000000000000000000	(56% of design schedule)	0		FAFM	Nov-03	Aug_04	PPPI Engineer
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Lab R&D labor 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0		ORNI Eng	Nov-03	Aug-04	Composite of ORNI Engineer / Designer
Lab R&D labor $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0		ORNI Phys	Nov-03	Aug-04	Composite of ORNL Physicist
Lab R&D labor Constrained Lab R&D labor Constrained		0		PPPI Phys	Nov-03	Aug-04	PPPI Physics/scientific
Lab R&D labor 0 0 0 0 1 1 1 1 1 1		0		TTTETTYS.	100 00	/ tug 0+	
Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Carbon Contemposite of ORNL Engineer Carbon Contemposite of ORNL Engineer / Designer Carbon Contemposite of ORNL Engineer Carbon Contemposite of ORNL Engineer Carbon Contemposite of ORNL Engineer Carbon Contemposite ORNL Engineer	Lab R&D labor						
Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III) Lab Fab/Assembly/Installation (Title III)		0		EAEM	Apr-03	Nov-03	PPPL Engineer
0       ORNL Eng       Apr-03       Nov-03       Composite of ORNL Engineer / Designer         0       EASM       Apr-03       Nov-03       PPPL monthly support         0       EMTB       Apr-03       Nov-03       PPPL Technician         Lab Fab/Assembly/Installation (Title III)       EAEM       Jul-04       Oct-06       PPPL Engineer         0       EAEM       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       PPPL monthly support         4152       EASM       Jul-04       Oct-06       PPPL monthly support         10750       EMTB       Jul-04       Oct-06       PPPL monthly support		0		EADM	Apr-03	Nov-03	PPPL Designer
0       EASM       Apr-03       Nov-03       PPPL monthly support         0       EMTB       Apr-03       Nov-03       PPPL Technician         Lab Fab/Assembly/Installation (Title III)       0       EAEM       Jul-04       Oct-06       PPPL Engineer         0       EADM       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       Composite of ORNL Engineer / Designer         0       ORNL Eng       Jul-04       Oct-06       PPPL monthly support         4152       EASM       Jul-04       Oct-06       PPPL monthly support		0		ORNL Eng	Apr-03	Nov-03	Composite of ORNL Engineer / Designer
0       EMTB       Apr-03       Nov-03       PPPL Technician         Lab Fab/Assembly/Installation (Title III)       0       EAEM       Jul-04       Oct-06       PPPL Engineer         0       EADM       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       Composite of ORNL Engineer / Designer         4152       EASM       Jul-04       Oct-06       PPPL monthly support		0		EASM	Apr-03	Nov-03	PPPL monthly support
Lab Fab/Assembly/Installation (Title III)  0 EAEM Jul-04 Oct-06 PPPL Engineer 0 EADM Jul-04 Oct-06 PPPL Designer 0 ORNL Eng Jul-04 Oct-06 Composite of ORNL Engineer / Designer 4152 EASM Jul-04 Oct-06 PPPL monthly support 10752 EMTR Jul-04 Oct-06 PPPL monthly support		0		EMTB	Apr-03	Nov-03	PPPL Technician
Lab Fab/Assembly/instantion (File in)         0       EAEM       Jul-04       Oct-06       PPPL Engineer         0       EADM       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       Composite of ORNL Engineer / Designer         4152       EASM       Jul-04       Oct-06       PPPL monthly support         10752       EMTR       Jul-04       Oct-06       PPPL monthly support	l ab Fab/Assembly/Installation (Title III)						
0       EADM       Jul-04       Oct-06       PPPL Designer         0       ORNL Eng       Jul-04       Oct-06       Composite of ORNL Engineer / Designer         4152       EASM       Jul-04       Oct-06       PPPL monthly support         10752       EMTR       Jul-04       Oct-06       PPPL monthly support		0		EAEM	lul_04	Oct-06	DDDI Engineer
0 ORNL Eng Jul-04 Oct-06 Composite of ORNL Engineer / Designer 4152 EASM Jul-04 Oct-06 PPPL monthly support 10752 EMTR Jul-04 Oct-06 PPPL monthly support		0				Oct-00	
4152 EASM Jul-04 Oct-06 PPPL monthly support		0		ORNI Eng		Oct-00	Composite of ORNI Engineer / Designer
		4152		FASM		Oct-00	PPPI monthly support
		10752		EMTR		Oct-00	PPPI Technician

# Labor

	Manhours per fiscal year by labor category										
Level of Effort		FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	TOTAL			
PPPL Engineer	EAEM	0	0	0	0	0	0	0			
PPPL Designer	EADM	0	0	0	0	0	0	0			
Composite of ORNL Engineer / Designer	ORNL Eng	0	0	0	0	0	0	0			
PPPL monthly support	EASM	0	465	1844	1844	0	0	4152			
PPPL Technician	EMTB	0	1203	4774	4774	0	0	10752			
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			

# M&S Costs

Activity Title	FY2003 \$\$	Comment
Manufacturing Development (R&D)		
Purchased Design Services	\$0	
Procured Hardware/Material	\$0	
Profit	<u>\$0</u>	profit already included in these items
total, manf/dev (R&D)	\$0	w/o G&A
Procured Hardware/Material		
0	\$0	
0	\$0	
0	\$0	
0	\$0	
0	\$0	
0	\$0	
subtotal, purchased parts	\$0	
Profit at 10%	<u>\$0</u>	
total, procured hdwe/matl.	\$0	w/o G&A
Purchased Design Services	\$0	no purchased services anticipated
	<b>A</b> 2	
Procured Installation/Assembly Costs	\$0	All installation and assembly costs are included in WBS 7

# Other Costs

	Comment
Travel \$0 travel related to this task is in WBS 1	travel related to this task is in WBS 181

# NCSX Fabrication Project Cost and Schedule Estimating Form

WBS 185 Assembly	of Field	Periods
Summary Costs		

Activity Title	Manhours	FY2003 \$\$	Comment
<b>Labor</b> PPPL Effort ORNL effort	14,904 0	\$1,200,096 \$0	Assumed rates: EASM 100 \$/hr EAEM 153 \$/hr EMTB 73 \$/hr
subtotal, labor	14,904	\$1,200,096	EADM 100 \$/hr PPPL Phys 141 \$/hr
M&S, Other Manufacturing Development (R&D) Procured Hardware/Material Purchased Design Services Procured Installation/Assembly Costs Travel subtotal, M&S		\$0 \$0 \$0 \$0 \$0 \$0	ORINE ENG 130 \$/NI ORINE PHYS 160 \$/NI
G&A		\$0	25% on all purchased materials, subcontracts, travel
Subtotal without contingency		\$1,200,096	
Contingency		\$480,038	40% Overall on this WBS
Total cost		\$1,680,134	

WBS 1	85 Assembly of Field Periods														
In-hous	a Fabrication and Assembly														
	Description: This effort covers all PPPL effort involved with actual assembly modular colls and TF colls into partial field periods, assembly	ly of the fie	ld periods, in VV. welding	cluding sub-a	ssembly of the densions, etc.				i ahoor	, where	~				
						total fraction	Ð	EN	EAS EMD	an. Sini	EM	19	EAC	M	
	Sub-assembly TF Colls. 3 coll assy - ar tech	multiplier	unit	4	480	1.00	fract.	hns	fract.	ARD .	fract.	hes	fad.	hrs.	
	TF Colls. 3 coll assy- tech Mod Colls. 3 coll assy, at tech. machinist, first assy Mod colls. 3 coll assy, at tech. first assy	320 168	per assy	1	1920	1.00	0.00	0	0.00	168	1.00	1920	0.00	0	
	Mod Colls, 3 coll assy, at tech, machinist Mod colls, 3 coll assy, at tech	144	per assy	÷.	720	1.00	0.00	8	1.00	720	0.00	<u></u>	0.00	8	
	authotal				5088			٥		1368		3720		0	
	Pold and a sample					total traction		EN.	EAS	SM SM	EM	19	EAC	M	
	assemble mod colls to W, sr. tech, machinist assemble mod colls to W, tech	240 800	per assy per assy	3	720 2400	1.00	0.00		1.00	720	0.00	2400	0.00	8	
	assembly TF colls to W, sr tech, machinist assembly TF colls to W, tech wald W, not assemblias ar fach machinist	136 384 940	per assy per assy	1	408 1152 730	1.00	0.00	0	1.00	408	1.00	1152	0.00	0	
	wild VV port assembles, tech Bakeout and leak check, st tech, machinist	240	per assy per assy	1	720	1.00	0.00	00	0.00	384	1.00	720	0.00	0	
	Bakeout and leak check, tech install external tim colls, at tech, machinist install external tim colls. Ach	204 120 360	per assy per assy	1	912 300	1.00	0.00	0	1.00	жŝ	1.00	912 0	0.00	0	
	ship to test cell, ar tech, machinist ship to test cell, tech	64 256	per anny per anny	1	192 768	1.00	0.00	ő	1.00	192	0.00	768	0.00	0	
	1. cross				9010			ő		2784		/022		0	
	Schedule assumptions	start Dec/11	duration (weaks)	end											
	Title II Design Procurement	Jul-04 Apr-05	29 22	Apr-05 Sep-05											
	in-house fab / sub-assy installation / final assembly	Sep-05 Mar-05	28 67	Jun-06 Jun-06											
	Notes and worksheets														
	Feed Period Assembly Area Preparation														
	This proposal includes the costs associated with the fabrication	on of (10) N	lodular colls	for the NCSX	Machine.										
Astrony	The includes inspection of the conductor and castings, coll w	Deaties	and resting	End	NP Labor		90	EACH.	EADH	INCH	ENEM	DATE:	MAX	865	
	Antivity Description	Days			here here	hears	hears	E-pr	hears	In Lab	heart	Tesh		*244	
	Notes: A number of activities can be performed in parallel an	d are not													
	series activities during the field period assemblies. a) The TF coll sub-assembly b) The mohammenha of the modular colls														
	c) Preparation of the vacuum vessel for assembly														
XXXX	Sub-assembly of TF Colls														
	<ol> <li>Task involves assemblying together (3) TF coils and shuch a TF coil set</li> <li>TE coil sets are required ner Eaid Period Accession</li> </ol>	ure to form													
P1-7	Assemble (3) TF colls and structure- Right side Field Perior	10								80		320			
P1-7	Assembles (1) TE colle and shurbles. Dobt side Each Deriv-	10								80		320			
P1-7	Assemble (2) TF colls and structure- Left side Field Period : Assemble (2) TF colls and structure - Disbitishing Field Period :	10								80		220			
P1-7 P1-7	Assemble / 1) TE mile and shurture. Last side East Derivi-	10								80		320			
XXXX	Sub-assembly of Nodular Colls 11 Task involution the mountion and allowing of (1) modular of accel and M1 M2 M1	la in Dave													
	To Tase convolute coll ands and saminard part convolute Eadel De-	rind dame													
P1-77	Install first M1 coll in frame	10 2	21.Aug-06	21.dep-84						16 64	24	48 192			
	Install M3 coll and align to M1 and M2 Ready for installation	5	15.5ay 05							40	24	120			
P1-77	EDMI Meant and alive laft side modular role is subcased for install first M1 coil in frame	12 2	28.8ap.05	13-044-08						16		40			
	Install M2 coil and align to M1 Install M3 coil and align to M1 and M2 Dearty for installation	5	7.04.05							40	24	120			
P1-77	EDBP Means and alive risks aids modular rolls is advance f	12	20-Ont-05	4 New OI											
	Install M2 coil and align to M1 Install M2 coil and align to M1 Install M3 coil and align to M1 and M2	5	31-Oxe 05							49	24	48 120 120			
P1-77	Ready for installation EDM2 Mount and align right side modular colls in sub-assort f		11.00-01	10 Aug 11											
	Install first M1 coll in frame Install M2 coll and align to M1	1		A MICH						16 40	24	48 120			
	Instant AG cost and align to M1 and M2 Ready for installation	5	20 Nor 05							40	24	120			
P1-77	EDW1 Meson and allow right side modular rolls is sub-assort Install first M1 coll in frame basis M2 will end often in M4	12 2	7.0m-88	22 Oct 05						16	~	48			
	Install M3 coil and align to M1 and M2 Ready for installation	ŝ	16.Dm 05							40	24	120			
P1-77	EDWS Mount and alice right side moduler cells is sub-asso f install first M1 cell is frame.	12 .	t in th	20 Jan 06						15		43			
	Install M2 coil and align to M1 Install M3 coil and align to M1 and M2	5	10.Jan 00							40	24 24	120 120			
105	Assemble Field Periods														
	<ol> <li>Task involves assemblying the VV, Modular colls, TF colls colls together to complete a Field Period Assembly</li> <li>In bolic the different field and the di</li></ol>	and Trim													
	seting adivities														
P1-777	Assemble Field Period #1 Assemble and alice tobt side modular colls to vacuum user Assemble and alice left side modular colls to vacuum users	37 10 15	22-8ep-04 22-8ep-05 14-Cet-05	18.0m.08						80 120	40	220 480			
	Position and align right side TF colls to FP #1 Position and align left side TF colls to FP#1	5	15 Nor 05 26 Nor 05							40 56	40	160 224			
P1-191	Position and weld port assemblies	15	7.0m-88	3 Jan 16						240		240			
P1-201	Bakeout vessel segment to 150 degrees C	۰ 	6.3m86	than 66						40		544			
P1-777	Install external Trim colls	15	to Jan Bi	in can bi						-		-00			
	roter or pay rinm colls mounted to Modular coll shell Install [2] upper colls Install [2] Mid colls	5								40 22		120 95			
DI 27.	install [2] lower colls	, i								40		544			
P1-221 P1-231	Ship tat. Field Period	5	16.Peb.05	22 Peb 08						40 24		160 95			
P1-241	Field period ready for installation	1	28746.05	2743											
P1-777	Assemble Field Period #2 Assemble and alien tidel side modular colls to variour uses	45 10	7.0m-08 7.0m-05	6746-05						80		320			
	Position and align right side TF colls to FP #2 Position and align left side TF colls to FP#2	15 7	21 Dec 05 18 Jan 05 27 Jan 05							398	40	400 160 224			
P1-191	Position and weld port assemblies	15	7.546.05	27448						240		240			
P1-201	Bakeout vessel segment to 150 degrees C	6	26.Peb-05	7.Mar 06						40		544			
P1-777	Install external Trim colls	15	20 Mar 06	11.8pr 05						-		-00			
	Total of [8] Trim colls mounted to Modular coll shell Install [3] upper colls Install [3] Mid colls.	ş								40 22		120 96			
DI 37.	install [3] lower cols	, 1								4		544 107			
P1-221	ship 2nd. Field Period	3	-2.dar-86 18.dar-86	-8.8pr06 21.8pr06						40 24		95			
P1-241	2nd. Field period ready for installation	1	26 April 8	26.89-05											
P1-777	Assemble Field Period #3 Assemble and allow tobs side moduler role to carcum case Assemble and allow left side moduler role to carcum	37 10	7.Feb.05	21.Mar 08 20.Pek-05						80	~	320			
	Position and align right side TF colls to FP #3 Position and align left side TF colls to FP#3	10	14 Marchi 25 Marchi	22 Aler 05 21 Aler 05						98	40	150			
P1-191	Position and weld port assemblies	15	2.Apr 86	21.Apr 06						240		240			
P1-201	Bakeout vessel segment to 150 degrees C	5	26 April 8	28.Apr 04						40		144			
P1-211 P1-777	renoves secure reak check of welded assemblies	10 15	1.May 05	C May 06						80		160			
	Total of [8] Trim colls mounted to Modular coll shell Install [3] upper colls Install [3] Mid colls.	5								40 32		120 94			
DI 27.	instal [2] lower colls	, 7								4		544			
P1-221	Ship Ind. Field Period	2	10.Jun 66	to Jan B								-20 95			

NCSX Fabrication Project Cost and Schedule

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# **NCSX Fabrication Project Cost and Schedule**

# **WBS 185 Assembly of Field Periods**

## Materials and Subcontracts (M&S)

#### **Description:**

No additional materials or supplies are required for this WBS. They are included in WBS 12, 13, 14, 15, etc.

#### **Assumptions:**

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

#### **Purchased parts:**

subtotal, purchased parts \$0

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

subtotal purchased materials \$0

#### Worksheet:

1

#### WBS 185 Assembly of Field Periods

#### R&D

Description: No R&D is anticipated for this element

Summary

#### Purchased Design Services

\$0 w/o G&A subtotal Procured Hardware/Material

\$0 w/o G&A subtotal Subcontractor labor rates: design rate: fab rate inspection/technician rate \$120 per hour \$60 per hour \$80 per hour

									Labor	catego	v				
R&D design					fraction	EAB	EM	EAI	ОМ	ORNL	Ena	EAS	SM	Ven	dor
		unit	no.	hours		fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	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
assy dwgs	20	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	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
installation dwg	0	hrs/dwg	0	0	1.00	0.00	0	0.00	0	1.00	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
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	0	hrs/dwg	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	1.00	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
vendor shop drawings	0	hrs/dwg	0	0	1.00									1.00	0
vendor part programming	0	hrs/model	0	0	1.00									1.00	0
vendor misc engineering	0%	% of tot	0	0	1.00									1.00	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
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
subtotal				0			0		0		0		0		0
												FAS	м		
					total	EAB	EM	EAI	DM	ORNL	Ena	EMS	SM	EM	TB
					fraction	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
R&D Tasks and Title III (see notes)															
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	0	hrs	1	0	0.00	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	hrs/setup	1	0	0.00	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	hrs	1	0	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
subtotal				0			0		0		0		0		0
		duration													
Schedule assumptions															
	start	(weeks)	end												
R&D planning	start Nov-02	(weeks) 4	end Dec-02												
R&D planning Bid and award	start Nov-02 Dec-02	(weeks) 4 2	end Dec-02 Dec-02												
R&D planning Bid and award R&D procurement / in-house fab.	start Nov-02 Dec-02 Dec-02	(weeks) 4 2 4	end Dec-02 Dec-02 Jan-03												

#### Notes and worksheets Engineering Design

Pro-E models
assy dwgs
Detail drawings
installation dwg
cooling schematic
electrical schematic
I&C schematic
special analysis
procurement specifications
vendor shop drawings
vendor part programming
vendor misc engineering
preliminary and final design reviews
meetings/reporting/presentations

10%

Labor category

# WBS 185 Assembly of Field Periods

## Engineering, Title I, II and III

#### Description:

Engineering for this effort is covered under WBS 181

					total						<b>F</b> ac			וחחח	
				houro	fraction	EAt		EAL		URNL	Eng	URINL I	Physics	PPPL F	nysics
	multiplier	unit	no.	nours		tract.	nrs	fract.	nrs	tract.	nrs	tract.	nrs	fract.	nrs
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
subtotal				0			0		0		0		0		0
					total										

				fraction				EAS	SM	EADM		ORNL Eng	
Title III						fract.	hrs	fract.	hrs	fract.	hrs	fract.	hrs
vendor oversight, inspection Disposition of deviation requests and	0	hrs/wk	22	0	1.00	0.50	0	0.00	0	0.00	0	0.50	0
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
subtotal				0			0		0		0		0

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

## 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%