Work Authorization Document

NSTX Upgrade Project

Control Account #:	4500	**Title:**	MPTS VV Modification
WBS	1.4.1	**Title:**	Plasma Diagnostics
Period of Performance:	03 May 2010 through 15 November 2013		
Authorized Budget:	$949	**Control Account Manager:**	Labik
Revision #:	0	**Revision Date:**	July-11

Authorized Work Description:

The Plasma Diagnostics provide information on discharge parameters to characterize NSTX plasmas and guide its operation for optimized performance. The diagnostic subsystems included in this WBS are:

Attachments:

1- A detailed Control Account schedule showing all work packages and planning packages.

2- Budgeted Cost by month.

3- Original Work Authorization Form (WAF)

4- WBS Dictionary sheet that defines the scope of work for this WBS element.

Control Account History

ECP#	Implement Date	Prior Budget	New Budget	Signature

Approvals	Name	Signature	Date
NSTX-U Project Manager	R. Strykowsky		
Control Account Manager	Labik		
Functional Manager	M. Bell		

NSTX Upgrade Project

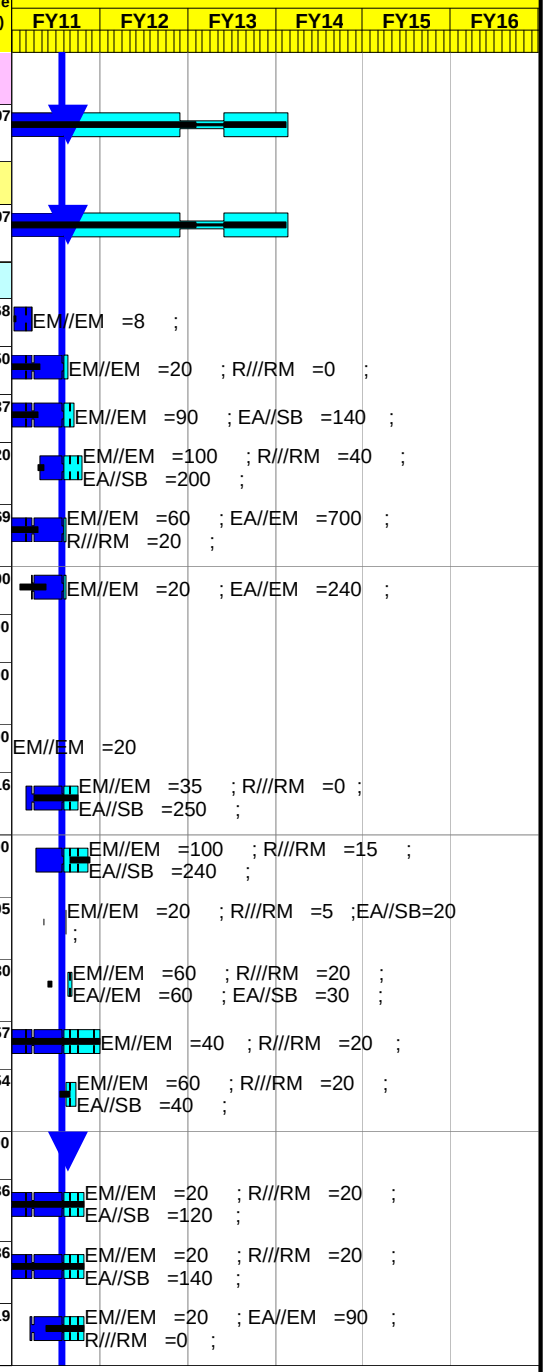
Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)
Subtotal		888	03MAY10A	03MAY10A	15NOV13	18NOV13	-1	1,700	952,113.18		348,872.08	383,224.97

Job: 4500 - MPTS VV Modification-Labik

Subtotal		888	03MAY10A	03MAY10A	15NOV13	18NOV13	-1	1,700	952,113.18		348,872.08	383,224.97

Design

MPTS-0003	PREPARE WORK PLANNING FORM	49*	11OCT10*	11OCT10A	12OCT10	20DEC10A	-47		1,265.68	100	1,265.68	1,265.68
MPTS-0004	Prep System Description	191*	16AUG10A	16AUG10A	25JAN11	20MAY11	-83	148	3,110.09	80	2,454.80	3,068.50
MPTS-0007	85Mechanical Design Bay L	175*	01SEP10A	01OCT10A	17JAN11	15JUN11	-106	169	31,726.30	85	26,413.21	31,074.37
MPTS-0008	Port Support Design Bay L	123*	18JAN11*	24JAN11A	10FEB11	15JUL11	-109	148	47,648.20	60	28,588.92	47,648.20
MPTS-0009	Stress Analysis - Bay L	186*	11AUG10A	11AUG10A	14JAN11	10MAY11	-82	148	144,672.59	95	135,103.01	142,213.69
MPTS-0009A	Stress Analysis - Bay F	93*	01NOV10*	23DEC10A	21FEB11	10MAY11	-56	148	52,830.00	95	50,188.50	52,830.00
MPTS-0010	N/A Technical Support (see 0021)	49	01SEP10A	01SEP10A	01SEP10A	01SEP10A	0		0.00	100	0.00	0.00
MPTS-0011	Conceptual Design presented at PDR	7	23AUG10A	23AUG10A	31AUG10A	31AUG10A	0		0.00	100	0.00	0.00
MPTS-0011A	Conceptual Design Chits	20	01SEP10A	01SEP10A	29SEP10A	29SEP10A	0		0.00	100	0.00	0.00
MPTS-0014	Mechanical Design Bay F	145*	03JAN11*	01DEC10A	30JUN11	30JUN11	0	562	36,764.85	70	25,735.40	24,414.16
MPTS-0015	Port Support Design Bay F	155*	02JUN11*	07JAN11A	16AUG11	15AUG11	1	531	48,366.35	85	41,111.40	0.00
MPTS-0020	CONDUCT PDR for MPTS	1	10FEB11*	09MAY11*	10FEB11	09MAY11	-62	143	6,518.05		0.00	6,518.05
MPTS-0020A	Input for Global FDR	11	01MAR11*	18MAY11*	15MAR11	02JUN11	-56	137	28,223.30		0.00	28,223.30
MPTS-0021	Technical Support General (LOE)	250*	01OCT10	01OCT10A	30SEP11	30SEP11	0	554	9,751.00	LOE	5,577.57	5,577.57
MPTS-0023	Disposition PDR Chits	33	15APR11*	10MAY11*	01JUN11	24JUN11	-17	548	17,911.60		0.00	5,970.54
MPTS-0023A	Center Stack - Peer Review	0				18MAY11*	0	574	0.00		0.00	0.00
MPTS-0025	Design Pro E Model - (Bay L)	218*	15SEP10A	15SEP10A	29JUL11	29JUL11	0	587	10,737.36	80	8,589.88	7,634.36
MPTS-0025A	Design Pro E Model - (Bay F)	218*	15SEP10A	15SEP10A	29JUL11	29JUL11	0	587	10,737.36	90	9,663.63	7,634.36
MPTS-0026	Update Optic & Stress Analyses	155*	21FEB11*	15DEC10A	29JUL11	29JUL11	0	587	20,505.40	20	4,101.08	9,073.19



Data Date	30APR11	1105	NSTX UPGRADES RESOURCE LOADED SCHEDULE CD-2 Schedule April 2011
Run Date	20MAY11 11:01		

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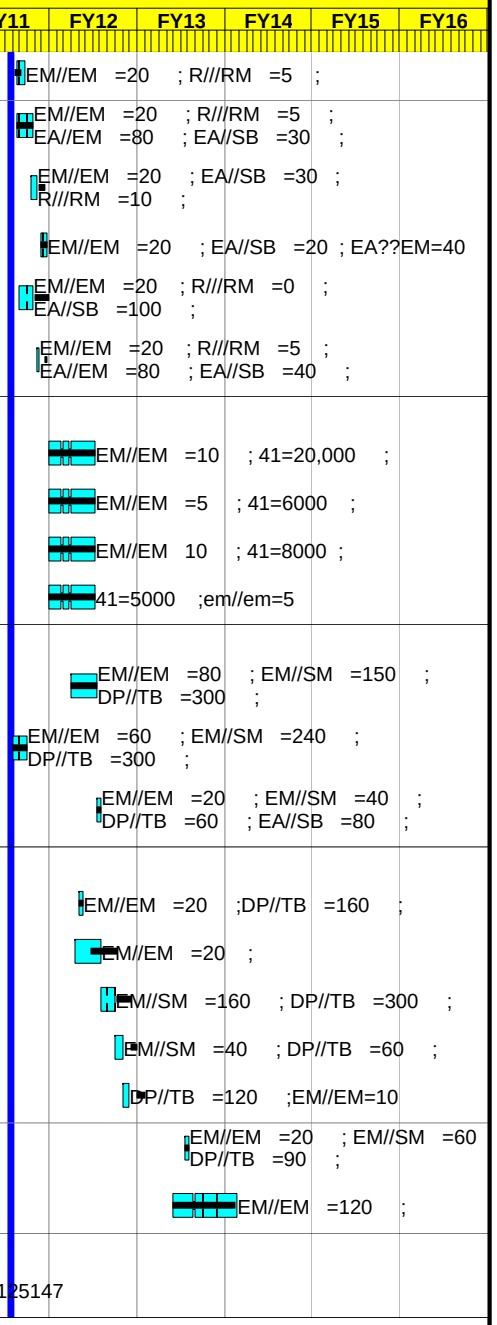
Early Bar
Progress Bar
Critical Activity

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)
MPTS-0027	Update Cost & Schedule Estimate	24	09MAY11*	19MAY11*	10JUN11	22JUN11	-8	574	4,019.85		0.00	0.00
MPTS-0028	Final Design Changes	48	23MAY11*	23MAY11*	29JUL11	29JUL11	0	572	23,181.55		0.00	0.00
MPTS-0028A	CONDUCT FDR MPTS VV interface	18	17AUG11*	21JUL11*	12SEP11	15AUG11	19	531	8,622.80		0.00	0.00
MPTS-0028C	CONDUCT FDR externals	18	30AUG11*	30AUG11*	23SEP11	23SEP11	0	508	13,369.60		0.00	0.00
MPTS-0029	Detail Drawings	43	01AUG11*	31MAY11*	29SEP11	29JUL11	43	567	15,655.20		0.00	0.00
MPTS-0030	FDR Chit Response	5	13SEP11	16AUG11	19SEP11	22AUG11	19	531	24,430.65		0.00	0.00
Procurement												
MPTS-0032	Bay L Wire Seal Flange & Nozzle w/Weld Prep	130	03OCT11*	03OCT11*	11APR12	11APR12	0	503	27,534.90		0.00	0.00
MPTS-0033	Bay L Port Cover	130	03OCT11*	03OCT11*	11APR12	11APR12	0	503	8,607.45		0.00	0.00
MPTS-0035	Misc Materials	130	03OCT11*	03OCT11*	11APR12	11APR12	0	503	12,054.90		0.00	0.00
MPTS-0036	Tooling	130	03OCT11*	03OCT11*	11APR12	11APR12	0	503	7,317.45		0.00	0.00
Fabrication												
MPTS-0038	Fabricate Tooling & New Port Support Assemblies	76	03JAN12*	03JAN12*	17APR12	17APR12	0	445	70,390.20		0.00	0.00
MPTS-0039	POP Vessel Wall Plate and Nozzle Mockup	42	03MAY11*	03MAY11*	30JUN11	30JUN11	0	646	75,190.80		0.00	0.00
MPTS-0041	Low Power Laser Holder for Bay L , F and F/G	15	18APR12	18APR12	08MAY12	08MAY12	0	445	27,456.20		0.00	0.00
Installation												
MPTS-0043A	Protective Enclosure Cutting Debris	12	01FEB12*	01FEB12*	16FEB12	16FEB12	0	503	19,802.60		0.00	0.00
MPTS-0044	Installation Procedure	79	21MAR12*	19JAN12	11JUL12	08MAY12	44	445	3,469.80		0.00	0.00
MPTS-0045	SetUp Cutting Device Supp/Machine Penetr B-L/F/G	40	12JUL12	09MAY12	06SEP12	05JUL12	44	445	58,236.80		0.00	0.00
MPTS-0046	Set Up New Ports Support Bays L&F	18	07SEP12	06JUL12	02OCT12	31JUL12	44	445	13,028.00		0.00	0.00
MPTS-0047	Weld New Ports	23	03OCT12	01AUG12	02NOV12	31AUG12	44	445	13,984.50		0.00	0.00
MPTS-0048	Set up and Machine Bay F Edge	13	24APR13*	24APR13*	10MAY13	10MAY13	0	164	23,518.30		0.00	0.00
MPTS-0050	Metrology Support & leak check ports	183	28FEB13*	01MAR13*	15NOV13	18NOV13	-1	1,700	21,394.50		0.00	0.00
FY104500A	FY10 Actuals Cost	110	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		10,079.00	100	10,079.00	10,079.00



4500 MPTS VV Modification (Labik)		START	28FEB2009	31MAR2009	30APR2009	31MAY2009	30JUN2009	31JUL2009	31AUG2009	30SEP2009	31OCT2009	30NOV2009	31DEC2009
	BCWS	0	0	0	0	0	0	0	0	0	0	0	0
	CUM BCWS	0	0	0	0	0	0	0	0	0	0	0	0
	BCWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM BCWP	0	0	0	0	0	0	0	0	0	0	0	0
	ACWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM ACWP	0	0	0	0	0	0	0	0	0	0	0	0
	CV	0	0	0	0	0	0	0	0	0	0	0	0
	SV	.	.	.	.	.	.	.	.	.	.	.	.
	CPI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SPI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4500 MPTS VV Modification (Labik)		31JAN2010	28FEB2010	31MAR2010	30APR2010	31MAY2010	30JUN2010	31JUL2010	31AUG2010	30SEP2010	31OCT2010	30NOV2010	31DEC2010
	BCWS	0	0	0	0	2	2	2	21	37	42	53	45
	CUM BCWS	0	0	0	0	2	4	6	27	64	106	160	205
	BCWP	0	0	0	0	0	0	0	0	0	0	0	210
	CUM BCWP	0	0	0	0	0	0	0	0	0	0	0	210
	ACWP	0	0	0	0	0	0	0	0	0	0	0	223
	CUM ACWP	0	0	0	0	0	0	0	0	0	0	0	223
	CV	0	0	0	0	0	0	0	0	0	0	0	-14
	SV	.	.	.	.	-2.	-4.	-6.	-27.	-64.	-106.	-160.	5.
	CPI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	.94
	SPI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.02

4500 MPTS VV Modification (Labik)		31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
	BCWS	69	48	42	19	65	84	35	26	48	8	9	9
	CUM BCWS	274	322	364	383	448	532	568	594	642	651	659	668
	BCWP	65	30	32	12	0	0	0	0	0	0	0	0
	CUM BCWP	275	304	337	348	348	348	348	348	348	348	348	348
	ACWP	45	41	45	102	0	0	0	0	0	0	0	0
	CUM ACWP	268	309	354	457	457	457	457	457	457	457	457	457
	CV	6	-5	-17	-108	-108	-108	-108	-108	-108	-108	-108	-108
	SV	1.	-18.	-28.	-35.	-100.	-184.	-219.	-245.	-294.	-302.	-311.	-320.
	CPI	1.02	.99	.95	.76	.76	.76	.76	.76	.76	.76	.76	.76
	SPI	1	0.94	0.92	0.91	0.78	0.65	0.61	0.59	0.54	0.54	0.53	0.52

4500 MPTS VV Modification (Labik)		31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
	BCWS	28	48	30	32	12	1	20	33	17	15	1	0
	CUM BCWS	697	744	774	806	818	818	839	871	889	903	904	904
	BCWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM BCWP	348	348	348	348	348	348	348	348	348	348	348	348
	ACWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM ACWP	457	457	457	457	457	457	457	457	457	457	457	457
	CV	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108
	SV	-348.	-396.	-425.	-457.	-469.	-470.	-490.	-523.	-540.	-555.	-556.	-556.
	CPI	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76
	SPI	0.5	0.47	0.45	0.43	0.43	0.43	0.42	0.4	0.39	0.39	0.39	0.39

4500 MPTS VV Modification (Labik)		31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
	BCWS	0	0	2	12	17	2	3	3	2	3	1	0
	CUM BCWS	904	904	907	918	935	938	940	943	945	948	949	949
	BCWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM BCWP	348	348	348	348	348	348	348	348	348	348	348	348
	ACWP	0	0	0	0	0	0	0	0	0	0	0	0
	CUM ACWP	457	457	457	457	457	457	457	457	457	457	457	457
	CV	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108
	SV	-556.	-556.	-558.	-570.	-587.	-589.	-592.	-594.	-597.	-599.	-601.	-601.
	CPI	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76
	SPI	0.39	0.39	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37

Annex I – WBS Dictionary

This Work Breakdown Structure (WBS) organizes and defines the scope of the NSTX Upgrade using the WBS as established by the original NSTX project and modified to accommodate the NSTX Upgrade.

WBS L1	L2	L3	Description
1			**NSTX UPGRADE PROJECT**
	1.1		**Torus Systems**
		1.1.0	Project Integrated Model
		1.1.1	Plasma Facing Components
		1.1.2	Vacuum Vessel and Support Structure
		1.1.3	Magnet Systems
	1.2		**Plasma Heating and Current Drive Systems**
		1.2.1	High Harmonic Fast Wave (HHFW)
		1.2.2	Coaxial Helicity Injection (CHI) Current Drive
		1.2.3	Electron Cyclotron Heating (ECH)
		1.2.4	Neutral Beam Injection (NBI)
	1.3		**Auxiliary Systems**
		1.3.1	Vacuum Pumping System
		1.3.2	Coolant Systems
		1.3.3	Bakeout Heating System
		1.3.4	Gas Delivery System
		1.3.5	Glow Discharge Cleaning System
	1.4		**Plasma Diagnostics**
		1.4.1	Plasma Diagnostics
	1.5		**Power Systems**
		1.5.1	AC Power Systems
		1.5.2	AC/DC Converters
		1.5.3	DC Systems
		1.5.4	Control and Protection System
		1.5.5	General Power Systems and Integration
	1.6		**Central Instrumentation and Controls (I&C)**
		1.6.1	Control System
		1.6.2	Data Acquisition System
	1.7		**Project Support & Integration**
		1.7.1	Project Management and Integration
		1.7.2	Project Physics
		1.7.3	Integrated Systems Tests
	1.8		**Site Preparation and Assembly**
		1.8.1	Site Preparation
		1.8.2	Torus Assembly and Construction

Work Approval Form (WAF)

Cost Center: 9417
Job Number: 4500
Job Title: MPTS - CSU-Vacuum Vessel Modifications
Job Manager: George Labik
Rev 1 7/23/2010

Description:

The increased diameter of the Center Stack Upgrade requires changes to the laser path which requires a new laser input vessel penetration and plugging of the existing penetration, modification of the alignment probe, expansion of the South wall laser components enclosure, modification of the L port or new penetration for an external laser dump, a vacuum boundary extension for the laser dump, repositioning the RWM coil 'LA' vertical legs, special configuration of the PF coil support column near Bay G. repositioning of the Optics Box, possible reconfiguration of the Optics Box. Modifications are to anticipate a third laser in the future and accommodation of other diagnostics including CHERS background and FIDA

Schedule:

See Tab B or attached

Approvals:

George Labik 7/29/10
Job Manager

8/3/10
Project Manager

8/3/10
Engineering Department Head

	Cost Center:	9417
	Job Number:	4500
	Job Title:	MPTS - CSU-Vacuum Vessel Modifications
	Job Manager:	George Labik

USER INPUT TASKS AND DESCRIPTIONS — SCHEDULE (USER INPUT / Calculated) — Estimate (user input): FY10$K; HOURS (priced at FY10 rates)

task numb	TASK DESCRIPTION	Responsible	DURATION in WorkDays	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE	Actuals A	M&S (41) K$	CREDIT CARD (43)	OTHER (39)	TRAVEL (25)	OVERTIME (31)	Hours EA** EM (analysis engr)	Hours EA** (Designer)	Hours EC** EM (computing Engr)	Hours EC** SB (Computing Tech)	Hours EE** EM (Elctr Engr)	Hours EE** SM (Senior Electr Tech)	Hours EE** SB (Electr Tech)	Hours EE** TB (Electr Tech)	Hours EM** EM (FO&M Engr)	Hours EM** SM Senior Tech)	Hours EM** SB (FO&M Tech)	Hours EM** TB (FO&M Tech)	Hours OP** SB/TB (HP Tech)	Hours R*** RM (Researcher)	% COST CONTINGENCY %	% SCHED CONTINGENCY %	Name of req'd skills if known	Basis of Estimate Category
1	Physics Requirements	BL,AD,BS																													
2	**Conceptual Design**																														
3	PREPARE WORK PLANNING FORM	GL,BS																				10									2
4	Prep System Description	GL,BL,AD,BS																				40					80				2
	Laser input new penetration and port																														
	Plug existing penetration																														
	Machining Bay F edge																														
	Bay L Modify penetration & Install new port and port cover																														
5	Prep Requirements																														
6	Preliminary Optics Design																										40	30%	30%		2
7	Mechanical Design														120							80					40	30%	30%		2
8	Machine Tool Support Design														120							80						30%	30%		2
9	Stress Analysis													400								40					20	30%	30%		2
10	Technical Support																					20					20	30%	30%		2
12	**Preliminary Design**																														
13	Analysis													80								10					10	30%	30%		2
14	Mechanical Design														120							120					30	30%	30%		2
15	Machine Tool Support Design														200							100					5	30%	30%		2
16	Prepare NEPA Form																														
17	Update Cost & Schedule Estimate																														
18	Design Drawings																														
20	CONDUCT PDR													10	20							40					20	30%	30%		2
21	Technical Support																					20					20	30%	30%		2
22	**Final Design**																														
23	Disposition PDR Chits														20							40					20	30%	30%		2
24	Complete Optics Evaluation																										180	30%	30%		2
25	Design Drawings														160							40					20	30%	30%		2
26	Update Analyses													80								20					10	30%	30%		2
27	Update Cost & Schedule Estimate																					40					10	30%	30%		2
28	Final Design Changes													30	40							40					20	30%	30%		2
	CONDUCT FDR													10								40					20	30%	30%		2
29	Detail Drawings														300							60					10	30%	30%		2
30	FDR Chit Response													20	20							20					10	30%	30%		2
31	**Procurement**																														
32	1 Bay L Wire Seal Flange & Nozzle w/Weld Prep									$20												10						30%	30%		2
33	2 Bay L Port Cover									$12												10						30%	30%		2
34	3 Portable Milling Machine, Line Bore or Modified Bridgeport Head									$15												40						30%	30%		2
35	4 Misc Materials									$20												20						30%	30%		2
36	Tooling									$10																					
37	**Fab/Assembly**																														
38	Fabricate 3 Tooling Supports Assemblies																					20	100			200		30%	30%		2
39	POP Vessel Wall Plate and Nozzle Mockup																					60	240			300		30%	30%		2
40	Leak Check Fixture																									40		30%	30%		2
41	Low Power Laser Holder for Bay L , F and F/G														80							20	40			60		30%	30%		2

Job Number: 4500
Job Title: MPTS - CSU-Vacuum Vessel Modifications
Job Manager: George Labik

Estimate (user input)

42	**Installation**																								
43	Assume Center Stack Removed and Vessel Preped _No Charges to MPTS																								
44	Installation Procedure														60								30%	30%	2
45	Set Up Tooling Supports and Machine New Penetrations Bay L and F/G															160			300				30%	30%	2
46	Set Up New Ports Support															40			60				30%	30%	2
47	Weld New Ports																		120				30%	30%	2
48	Set up and Machine Bay F Edge														20	60			90				30%	30%	2
49	Laser Alignment of Ports and F Edge During Welding														24	10							30%	30%	2
	OTHER TASKS																								
50	Metrology Support														120								30%	30%	2
51	Reposition magnetics and glow discharge filaments							80							160	60			120				30%	30%	2
52	Modify CHERS Razor dump							40							60	20			20				30%	30%	2
53	Chgrs Background View to Bay L Modified Port							120							40										
54	Other Diagnostics Views to Bay L Modified Port							120							40										
	TOTALS	**$77**	**$0**	**$0**	**$0**	**$0**	**630**	**1560**	**0**	**0**	**0**	**0**	**0**	**0**	**1564**	**730**	**0**	**0**	**1310**	**585**	**0**	**0**			
	TOTAL Preliminary Cost Estimate ($k)= $1,056	$91	$0	$0	$0	$0	$122	$200	$0	$0	$0	$0	$0	$0	$258	$113	$0	$0	$171	$102	$0	$0			

Notes:

(1) Procurement lead time:	Weeks
Purchase orders-Commercial, off-the-shelf items	3
Purchase orders-Noncommercial items	5
Subcontracts (non construction)	8
Construction subcontracts	9

CATEGORIZATION CODES:

1 - National Standards
2 - Engineering Judgement/Experience
3 - Estimates/Data from External Sources (e.g., W7X, ATF, etc.)
4 - Previous PPPL/ORNL Experieince (e.g., TFTR, NSTX, PLT, etc.)
5 - Prototype Data/Test Results
6 - Catelogue Price/Vendor Quote
7 - Placed Contracts

Cost Center:	9417
Job Number:	4500
Job Title:	MPTS - CSU-Vacuum Vessel Modifications
Job Manager:	George Labik

Uncertainty of the Estimate

	High	Medium	Low	Uncertainty Range (%)	Comments/Other Considerations
Design Maturity		x		50	
Design Complexity		x		25	

Residual Impacts

	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Cost Impact Low ($K)	Cost Impact High ($K)	Schedule Impact Low (weeks)	Schedule Impact High (Weeks)
1	Stray light	Medium	1. Enlarge Bay L Port 2. Razor blade dump around Bay L	PPPL Experience	10	20	6	10
2	RWM Coils position change. Space available	Medium	Reconfigure coils. Possible impact to Bay JK cap	PPPL Experience	50	100	8	12
3	Bay F rework	Low	1.Modify the Optics Box and reposition 2. Light cut of Bay F Vessel ID interface	PPPL Experience	50	100	12	18
4								
5								

Notes:

(1) **Cost impacts should NOT include standing army costs which are separately calculated from the schedule impact**

(2) **The schedule impacts should be entered as the min and max impacts on the critical path.**

If there is no critical path impact then the schedule entries should be zero.

(3) **Likelihood of occurrence should be entered consistent with our risk classification methodology, i.e.**

VL= Very Likely (P>80%), L=Likely (80%>P>40%), U=Unlikley (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)

Design Maturity	Design Complexity					
	Low		Medium		High	
Low	-15%	+25%	-20%	+40%	-30%	+60%
Medium	-10%	+15%	-15%	+25%	-20%	+40%
High	-5%	+10%	-10%	+15%	-15%	+25%

Design Maturity Definition

High	Final design available. All design features/requirements well known. No further design development or evolution expected that will impact estimate.
Medium	Preliminary design available. Some additional design evolution likely. Further developments can be somewhat expected or anticipated and reflected in estimate.
Low	No better than conceptual design basis currently available. Design details, procedures, etc. still need much development and evolution of requirements beyond estimate basis is likely and expected.

Design Complexity Definition

Low	Work is fairly well understood -- either standard construction or repetition of activities performed in past. Little likelihood of estimate not being well understood and requirements not being well defined.
Medium	More complex work requirements that have potential to impact cost and schedule estimates. Limited experience performing similar tasks, so ability to estimate accurately is somewhat suspect
High	Extremely challenging tasks and/or requirements. Unique or firstof-a-kind assembly or work tasks. No good basis for estimating work exists so there is a high degree of estimate uncertainty.

Based on standard industry and DOE estimate classifications (Per AACEI Recommended

Cost Center: 9417
Job Number: 4500
Job Title: MPTS - CSU-Vacuum Vessel Modifications
Job Manager: George Labik

Materials and Subcontracts (M&S)

Basis of Estimate

Description:

CATEGORIZATION CODES:
1 - National Standards
2 - Engineering Judgement/Experience
3 - Estimates/Data from External Sources (e.g., W7X, ATF, etc.)
4 - Previous PPPL/ORNL Experieince (e.g., TFTR, NSTX, PLT, etc.)
5 - Prototype Data/Test Results
6 - Catelogue Price/Vendor Quote
7 - Placed Contracts
8 - Actual experience for NCSX Work
9 - Other

TOTALS