

Work Authorization Document

NSTX Upgrade Project

Control Account #:	7100	Title:	Project Mgt & Integration
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WBS	1.7.1.1	Title:	Project Support and Integration
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Period of Performance: 23 February 2009 through 30 September 2014

Authorized Budget:	\$5,812	Control Account Manager: Strykowski
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Revision #: 0	Revision Date: July-11
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Authorized Work Description:

This WBS element includes overall management; a Project Manager, Deputy Project Manager, and Project Controls support to manage, monitor, integrate, control, and report on the progress on the NSTX Upgrade. Also included in this WBS element is System Engineering support and support for updating of the General Arrangement Drawings for the NSTX Test Cell as well as funds for independent reviewers as necessary.

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

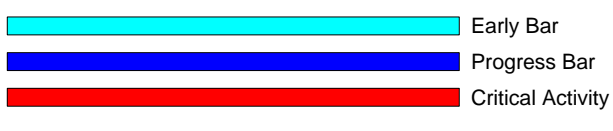
ECP#	Implement Date	Prior Budget	New Budget	Signature

Approvals	Name	Signature	Date
NSTX-U Project Manager	R. Strykowski		
Control Account Manager	Strykowski		
Functional Manager	M. Williams		

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)	FY11	FY12	FY13	FY14	FY15	FY16					
NSTX Upgrade Project																							
Subtotal		1,401	23FEB09A	23FEB09A	30SEP14	30SEP14	0	1,487	5,811,973.24		888,371.07	1,888,371.07											
Job: 7100 - Project Mgt & Integration-STRYKOWSKY																							
Subtotal		1,401	23FEB09A	23FEB09A	30SEP14	30SEP14	0	1,487	5,811,973.24		888,371.07	1,888,371.07											
General Arrangement Drawings																							
CS7000020G	FY2010 General Arrangement Drawings	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00	EA//ES =144 ;										
CS7000031G	FY2011 General Arrangement Drawings	250*	01OCT10*	01OCT10A	30SEP11	30SEP11	0	1,487	75,098.26	LOE	42,956.20	42,956.20	EA//ES =863 ;										
CS7000041G	FY2012 General Arrangement Drawings	249	03OCT11*	03OCT11*	28SEP12	28SEP12	0	1,487	82,045.41		0.00	0.00	EA//ES =863 ;										
CS7000053G	FY2013 General Arrangement Drawings	248	01OCT12*	01OCT12*	30SEP13	30SEP13	0	1,487	83,452.10		0.00	0.00	EA//ES =863;										
CS7000054G	FY2014 General Arrangement Drawings	248	01OCT13*	01OCT13*	30SEP14	30SEP14	0	1,487	42,828.00		0.00	0.00	EA//ES =430										
Project Management																							
CS7000020	FY2010 Project Management	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00	EM//EM =144 ; e//AM =718 ; EA//EM =215 ; FC//AC =355 35=6,000 ; 41=20,000 ; FC//AM =144 ;										
CS7000031	FY2011 Project Management	250*	01OCT10*	01OCT10A	30SEP11	30SEP11	0	1,487	741,305.01	LOE	424,026.47	424,026.47	EM//EM =517 ; e//AM =1,726 ; EA//EM =517 FC//AC =863 35=6,000 ; EM//SM =00 ; 41=30,000 ; FC//AM =690 ;										
CS7000041	FY2012 Project Mangement	249	03OCT11*	03OCT11*	28SEP12	28SEP12	0	1,487	752,945.42		0.00	0.00	EM//EM =863 ; e//AM =1,726 ; EA//EM =345 FC//AM =863 35=6,000 41=25,000 ; FC//AM =173 ;										
CS7000053	FY2013 Project Management	248	01OCT12*	01OCT12*	30SEP13	30SEP13	0	1,487	844,226.78		0.00	0.00	EM//EM =1,726 ; EA//EM E//AM =1,726 ; FC//AC 35=6,000 41=5,000 ;										
CS7000054	FY2014 Project Management	248	01OCT13*	01OCT13*	30SEP14	30SEP14	0	1,487	826,245.96		0.00	0.00	EM//EM =17261 FC//AC =863 ; 35=6000 ; 41=50000 ;										
FY097100	FY09 Actual Cost	22*	23FEB09A	23FEB09A	30SEP09A	30SEP09A	0		625,829.00	100	625,829.00	625,829.00											
FY107100	FY10 Actual Cost	143	01OCT09A	01OCT09A	30APR10A	30APR10A	0		554,759.00	100	554,759.00	554,759.00											

Data Date 30APR11 1105
Run Date 20MAY11 11:04
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**NSTX UPGRADES
RESOURCE LOADED SCHEDULE
CD-2 Schedule
April 2011**



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)						
													FY11	FY12	FY13	FY14	FY15	FY16
FY107100A	FY10 Actual Cost	130	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		226,386.00	100	226,386.00	226,386.00	81=226386					
Project Reviews																		
CS7000020R	FY2010 Project Reviews	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00	; 41=20,000 ;					
CS7000031R	FY2011 Project Reviews	250*	01OCT10*	01OCT10A	30SEP11	30SEP11	0	1,735	25,200.00	LOE	14,414.40	14,414.40	Reviews=20,000 ;					
CS7000041R	FY2012 Project Reviews	249	03OCT11*	03OCT11*	28SEP12	28SEP12	0	1,735	25,800.00		0.00	0.00	reviews = 20,000					
CS7000052	ORA support	43	01APR14*	01APR14*	30MAY14	30MAY14	0	85	111,296.00		0.00	0.00	EA//EC =480 ; 35=20,000 ;					
CS7000053R	FY2013 Project Reviews	248	01OCT12*	01OCT12*	30SEP13	30SEP13	0	1,735	26,400.00		0.00	0.00	reviews=20,000					
Work Control Center																		
CS7000041W	FY2012 WCC	249	03OCT11*	03OCT11*	28SEP12	28SEP12	0	1,487	148,936.54		0.00	0.00	EM//SM =863 ;					
CS7000053W	FY2013 WCC	248	01OCT12*	01OCT12*	30SEP13	30SEP13	0	1,487	304,777.08		0.00	0.00	EM//SM =1,726 ;					
CS7000054W	FY2014 WCC	248	01OCT13*	01OCT13*	30SEP14	30SEP14	0	1,487	314,442.68		0.00	0.00	EM//SM =1726 ;					

7100 Project Management & Integration (Strykowsky)	31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
BCWS	70	67	77	70	70	73	70	77	73	82	85	85
CUM BCWS	1,671	1,738	1,814	1,885	1,955	2,028	2,098	2,175	2,249	2,330	2,416	2,501
BCWP	70	67	77	70	0	0	0	0	0	0	0	0
CUM BCWP	1,671	1,738	1,814	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885
ACWP	58	51	77	87	0	0	0	0	0	0	0	0
CUM ACWP	1,605	1,656	1,733	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
CV	66	82	82	65	65	65	65	65	65	65	65	65
SV	.	.	.	.	-70.	-144.	-214.	-291.	-364.	-446.	-531.	-616.
CPI	1.04	1.05	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
SPI	1	1	1	1	0.96	0.93	0.9	0.87	0.84	0.81	0.78	0.75

7100 Project Management & Integration (Strykowsky)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	85	82	85	82	89	82	85	89	78	111	106	101
CUM BCWS	2,586	2,668	2,753	2,835	2,924	3,006	3,091	3,181	3,258	3,369	3,475	3,577
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
CV	65	65	65	65	65	65	65	65	65	65	65	65
SV	-702.	-783.	-869.	-950.	-1040.	-1121.	-1207.	-1296.	-1374.	-1485.	-1591.	-1692.
CPI	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
SPI	0.73	0.71	0.68	0.66	0.64	0.63	0.61	0.59	0.58	0.56	0.54	0.53

7100 Project Management & Integration (Strykowsky)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	111	96	101	106	111	96	111	106	101	104	95	100
CUM BCWS	3,688	3,784	3,885	3,991	4,102	4,199	4,310	4,416	4,517	4,621	4,717	4,816
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
CV	65	65	65	65	65	65	65	65	65	65	65	65
SV	-1803.	-1899.	-2001.	-2107.	-2218.	-2314.	-2425.	-2531.	-2633.	-2737.	-2832.	-2932.
CPI	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
SPI	0.51	0.5	0.49	0.47	0.46	0.45	0.44	0.43	0.42	0.41	0.4	0.39

7100 Project Management & Integration (Strykowsky)	31JAN2014	28FEB2014	31MAR2014	30APR2014	31MAY2014	30JUN2014	31JUL2014	31AUG2014	30SEP2014	31OCT2014	30NOV2014	31DEC2014
BCWS	104	91	95	155	155	95	104	95	100	0	0	0
CUM BCWS	4,921	5,011	5,107	5,262	5,417	5,513	5,617	5,712	5,812	5,812	5,812	5,812
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
CV	65	65	65	65	65	65	65	65	65	65	65	65
SV	-3036.	-3127.	-3222.	-3378.	-3533.	-3628.	-3732.	-3828.	-3927.	-3927.	-3927.	-3927.
CPI	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
SPI	0.38	0.38	0.37	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.32	0.32

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.

<u>WBS</u>			
<u>L1</u>	<u>L2</u>	<u>L3</u>	<u>Description</u>
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

Annex I – WBS Dictionary

real-time plasma control system may require an upgrade to accommodate additional input/output signals, control loops, and a longer control period. The networks, back-end compute servers, and data storage systems will need to be upgraded to achieve reasonable performance for time-sensitive functions. Some test cell racks will be relocated; there will be a modest effort required to route the control, timing, and communication cabling and qualify the systems.

{Central I&C and Data Acquisition (Job 6100)}

WBS Element: 1.7 **WBS Level: 2**

WBS Title: Project Support & Integration

Definition: Project support and integration includes the non-hardware related subsystems such as overall Project Management and Administration, Project Physics as well as Integrated Systems Testing support.

WBS Element: 1.7.1 **WBS Level: 3**

WBS Title: Project Management and Integration

Definition: The project management and integration WBS element consists of all the activities necessary to plan, monitor, integrate and control, and report on the progress of the NSTX Upgrade Project which includes technical, business, and administrative planning and support; organizing, directing, coordinating, controlling, reviewing and approving project actions.

WBS Element: 1.7.1.1 **WBS Level: 4**

WBS Title: Project Management & Integration

This WBS element includes overall management; a Project Manager, Deputy Project Manager, and Project Controls support to manage, monitor, integrate, control, and report on the progress on the NSTX Upgrade. Also included in this WBS element is System Engineering support and support for updating of the General Arrangement Drawings for the NSTX Test Cell as well as funds for independent reviewers as necessary.

{Project Management and Integration (Job 7100)}

WBS Element: 1.7.1.2 **WBS Level: 4**

WBS Title: Center Stack Upgrade Management

Definition: Level of Effort job to cover the oversight of Center Stack Upgrade work which includes a Manager, Project Engineering support and support and to cover Center Stack engineer's time to prepare for and participate in project cost and schedule reviews.

{NSTX CSU Project Management (Job 7200)}

WBS Element: 1.7.1.3 **WBS Level: 4**

WBS Title: Neutral Beam Upgrade Management

Definition: Level of Effort job to cover the oversight of the 2nd Neutral Beam Upgrade work which includes a Manager, Engineering support and support and to

Work Approval Form (WAF)

Cost Center: 9417
Job Number: 7100
Job Title: Project Management and Integration
Job Manager: Ron Strykowski
Rev 2 6/7/2010

Description:

Management and engineering oversight of the NSTX Upgrade Project. Scope of this job includes the following;

- Project Manager
- Deputy Project Manager
- Project Controls Manager
- Planner/Scheduler & project control support
- Systems Engineering Support
- Independent reviewers to support ORA during last two months of project
- Updating of General Arrangement drawings
- Cost of 2 independent review/year
- Work Control Center
- Misc purchases (ie computers, supplies)

Staff and cost for the management and supervision of the CS stack scope and Neutral Beam are not included in this job rather they are shown in jobs 7200 and 7300 respectively.

Schedule:

Refer to Primavera Data-Base

Approvals:

Job Manager

Project Manager

Engineering Department Head

Handwritten signatures and dates for Job Manager, Project Manager, and Engineering Department Head. The Job Manager signature is dated 7/20/2010. The Project Manager signature is dated 7/20/2010. The Engineering Department Head signature is dated 8/3/10.

Design Complexity		Design Maturity Definition						
Low	Medium	High						
Low	-15%	+25%	-20%	+40%	-30%	+60%	High	Final design available. All design features/requirements well known. No further design development or evolution expected that will impact estimate.
Medium	-10%	+15%	-15%	+25%	-20%	+40%	Medium	Preliminary design available. Some additional design evolution likely. Further developments can be somewhat expected or anticipated and reflected in estimate.
High	-5%	+10%	-10%	+15%	-15%	+25%	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		Design Complexity Definition						
Low	Medium	High						
				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.				
				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				
				Extremely challenging tasks and/or requirements. Unique or first-of-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: 7100
Job Title: Project Management and Integration
Job Manager: Ron Strykowski

Materials and Subcontracts (M&S)

FY10&K

Description:
see Tab B for reviewer funds required

n/a

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