

Work Authorization Document

NSTX Upgrade Project

Control Account #:	7200	Title:	Center Stack Management
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WBS	1.7.1.2	Title:	Project Support and Integration
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Period of Performance: 02 November 2009 through 30 September 2014

Authorized Budget:	\$1,539	Control Account Manager:	Dudek
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Revision #:	0	Revision Date:	July-11
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Authorized Work Description:

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.

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	Dudek		
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
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NSTX Upgrade Project

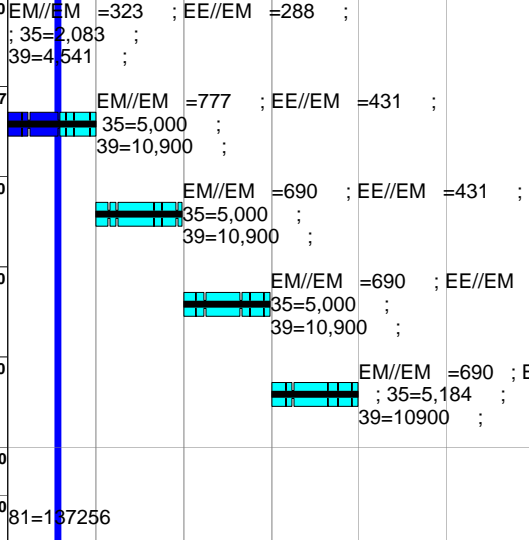
Subtotal		1,222	02NOV09A	02NOV09A	30SEP14	30SEP14	0	1,487	1,538,883.45		398,403.27	398,403.27						
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Job: 7200 - Center Stack Management-DUDEK

Subtotal		1,222	02NOV09A	02NOV09A	30SEP14	30SEP14	0	1,487	1,538,883.45		398,403.27	398,403.27						
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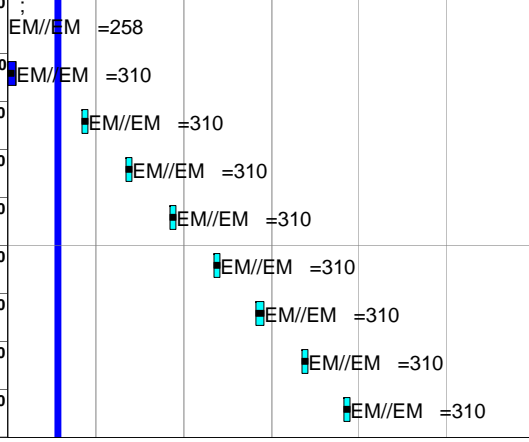
Project Management

7200-01	100FY2010 CSU Management	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00						
7200-02	FY2011 CSU Management	250*	01OCT10*	01OCT10A	30SEP11	30SEP11	0	1,494	222,274.76	LOE	127,141.17	127,141.17						
7200-03	FY2012 CSU Management	245	03OCT11*	03OCT11*	24SEP12	24SEP12	0	1,494	227,382.39			0.00						
7200-04	FY2013 CSU Management	245	01OCT12*	01OCT12*	25SEP13	25SEP13	0	1,490	215,496.25			0.00						
7200-05	FY2014 CSU Management	248	01OCT13*	01OCT13*	30SEP14	30SEP14	0	1,487	222,485.45			0.00						
FY107200	FY10 Actual Cost	123	02NOV09A	02NOV09A	30APR10A	30APR10A	0		84,961.00	100	84,961.00	84,961.00						
FY107200A	FY10 Actual Cost	130	01APR10A	01APR10A	30SEP10A	30SEP10A	0		137,256.00	100	137,256.00	137,256.00						



Project Reviews

7200-01R	FY2010 CSU Project Reviews	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00						
7200-02R	FY2011 CSU Project EIR Reviews	250*	01OCT10	01OCT10A	28OCT10	29OCT10A	-1		49,045.10	100	49,045.10	49,045.10						
7200-02S	FY2011 CSU Project OPA Reviews	20	01AUG11*	01AUG11*	26AUG11	26AUG11	0	2,256	49,045.10			0.00						
7200-03R	FY2012 CSU Project OPA Reviews	20	01FEB12*	01FEB12*	28FEB12	28FEB12	0	2,093	53,781.90			0.00						
7200-03S	FY2012 CSU Project OPA Reviews	20	01AUG12*	01AUG12*	28AUG12	28AUG12	0	1,965	53,781.90			0.00						
7200-04R	FY2013 CSU Project OPA Reviews	20	01FEB13*	01FEB13*	28FEB13	28FEB13	0	1,863	54,913.40			0.00						
7200-04S	FY2013 CSU Project OPA Reviews	20	01AUG13*	01AUG13*	28AUG13	28AUG13	0	1,737	54,913.40			0.00						
7200-05R	FY2014 CSU Project OPA Reviews	20	03FEB14*	03FEB14*	28FEB14	28FEB14	0	1,636	56,773.40			0.00						
7200-05S	FY2014 CSU Project OPA Reviews	20	01AUG14*	01AUG14*	28AUG14	28AUG14	0	1,509	56,773.40			0.00						



Data Date: 30APR11 1105
 Run Date: 20MAY11 11:03
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NSTX UPGRADES
 RESOURCE LOADED SCHEDULE
 CD-2 Schedule
 April 2011

Sheet 1 of 1

- Early Bar
- Progress Bar
- Critical Activity

7200 Center Stack Management (Dudek)	31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
BCWS	19	18	20	19	19	19	19	69	19	19	20	20
CUM BCWS	341	359	379	397	416	435	454	523	543	561	581	600
BCWP	19	18	20	19	0	0	0	0	0	0	0	0
CUM BCWP	341	359	379	397	397	397	397	397	397	397	397	397
ACWP	16	33	37	35	0	0	0	0	0	0	0	0
CUM ACWP	300	333	371	406	406	406	406	406	406	406	406	406
CV	41	25	8	-9	-9	-9	-9	-9	-9	-9	-9	-9
SV	.	.	.	.	-19.	-38.	-56.	-126.	-145.	-164.	-183.	-203.
CPI	1.14	1.08	1.02	.98	.98	.98	.98	.98	.98	.98	.98	.98
SPI	1	1	1	1	0.96	0.91	0.88	0.76	0.73	0.71	0.68	0.66

7200 Center Stack Management (Dudek)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	20	72	20	19	20	19	20	74	14	19	18	18
CUM BCWS	620	692	712	730	751	770	789	863	878	897	915	933
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	397	397	397	397	397	397	397	397	397	397	397	397
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	406	406	406	406	406	406	406	406	406	406	406	406
CV	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9
SV	-222.	-295.	-314.	-333.	-354.	-372.	-392.	-466.	-480.	-499.	-518.	-535.
CPI	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98
SPI	0.64	0.57	0.56	0.54	0.53	0.52	0.5	0.46	0.45	0.44	0.43	0.43

7200 Center Stack Management (Dudek)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	19	72	18	18	19	17	19	73	15	20	18	19
CUM BCWS	952	1,023	1,041	1,059	1,079	1,095	1,115	1,188	1,203	1,222	1,240	1,259
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	397	397	397	397	397	397	397	397	397	397	397	397
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	406	406	406	406	406	406	406	406	406	406	406	406
CV	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9
SV	-554.	-626.	-644.	-662.	-681.	-698.	-717.	-790.	-805.	-825.	-843.	-862.
CPI	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98
SPI	0.42	0.39	0.38	0.38	0.37	0.36	0.36	0.33	0.33	0.33	0.32	0.32

7200 Center Stack Management (Dudek)	31JAN2014	28FEB2014	31MAR2014	30APR2014	31MAY2014	30JUN2014	31JUL2014	31AUG2014	30SEP2014	31OCT2014	30NOV2014	31DEC2014
BCWS	20	74	18	19	19	18	20	75	19	0	0	0
CUM BCWS	1,279	1,353	1,370	1,389	1,408	1,426	1,445	1,520	1,539	1,539	1,539	1,539
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	397	397	397	397	397	397	397	397	397	397	397	397
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	406	406	406	406	406	406	406	406	406	406	406	406
CV	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9	-9
SV	-881.	-955.	-973.	-992.	-1011.	-1028.	-1048.	-1123.	-1141.	-1141.	-1141.	-1141.
CPI	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98	.98
SPI	0.31	0.29	0.29	0.29	0.28	0.28	0.27	0.26	0.26	0.26	0.26	0.26

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: 7200

Job Title: NSTX CSU Project Management

Job Manager: Larry Dudek


Description:

Level-of-Effort (LOE) job to cover the oversight of CSU work and to cover engineers time for project cost and schedule reviews.

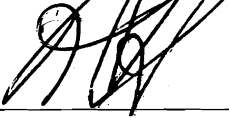
Schedule:

Refer to Primavera Data-Base

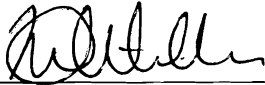
Approvals:

 7/26/2010

Job Manager

 8/3/10

Project Manager

 8/3/10

Engineering Department Head

Cost Center: 9417 Job Number: 7200 Job Title: NSTX CSU Project Management Job Manager: Larry Dudek									
	FY10	FY11	FY12	FY13	FTE Total	Cost k\$	Approximate Rate (\$k/FTE)	Contingency	
Manger - Dudek	0.45	0.45	0.4	0.4	1.7	\$504	\$296	13%	
P&C Officer - Guzman (covered in Upgrade Project Job)									
Project Engineering - Neumeyer	0.4	0.25	0.25	0.2	1.1	\$337	\$307	13%	
Systems Engineering* _ Simmons (covered in Upgrade Project Job)									
Bi-Annual Review Support for 4 RLMs**	0.36	0.36	0.36	0.36	1.45	\$431	\$296	13%	
Other Related Expenses (10%) - Clerical, travel , etc						\$127		13%	
					TOTAL	\$1,399			
CD1 Support	FY10								
CD2 Support	FY10								
CD3 Support		FY11							
6 month review		FY11							
6 month review			FY12						
6 month review			FY12						
CD4 Support				FY13					
6 month review				FY13					
*Systems Engineering covers - development & maintenance of the risk registry; Interface definition and documentation Requirements / documentation; design review-validation (whats required for each review and measure of success) Analysis and definition documentation									
** Titius, Chrzanowski, Viola, Ramakrishnan (each 1 week prep, 1 week followup per review)									

Design Maturity		Design Complexity			Design Maturity Definition	
Low	Medium	High	Low	High		
-15%	+25%	-20%	+40%	-30%	+60%	Final design available. All design features/requirements well known. No further design development or evolution expected that will impact estimate.
-10%	+15%	-15%	+25%	-20%	+40%	
-5%	+10%	-10%	+15%	-15%	+25%	
<p>Preliminary design available. Some additional design evolution likely. Further developments can be somewhat expected or anticipated and reflected in estimate.</p>						
<p>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.</p>						
Design Complexity Definition						
Low	Medium	High				
<p>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.</p>						
<p>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</p>						
<p>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</p>						