

Work Authorization Document

NSTX Upgrade Project

Control Account #:	2430	Title:	2nd NBI Decontamination
---------------------------	------	---------------	-------------------------

WBS	1.2.4	Title:	NB Injection
------------	-------	---------------	--------------

Period of Performance: 23 February 2009 through 30 September 2010

Authorized Budget:	\$2,057	Control Account Manager:	Stevenson
---------------------------	---------	---------------------------------	-----------

Revision #:	0	Revision Date:	CLOSED
--------------------	---	-----------------------	--------

Authorized Work Description:

This WBS element includes the disassembly and decontamination activities of a TFTR Neutral Beam beamline in preparation for beamline refurbishment and reuse as an NSTX upgrade.

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	Stevenson		
Functional Manager	A. vonHalle		

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		427	23FEB09A	23FEB09A	30SEP10A	29OCT10A	0		2,057,049.65	100	057,049.65	2,057,049.65											
Job: 2430 - 2nd NBI Decontamination-STEVENSON																							
Subtotal		427	23FEB09A	23FEB09A	30SEP10A	29OCT10A	0		2,057,049.65	100	057,049.65	2,057,049.65											
24300230	Decon Calorimeter	30	01OCT09A	01OCT09A	11NOV09A	11NOV09A	0		0.00	100	0.00	0.00											
24300240	Decon Ion Dump	42	03MAY10A	03MAY10A	30JUN10A	30JUN10A	0		0.00	100	0.00	0.00											
24300260	Decon Bending Magnet	25	26MAY10A	26MAY10A	30JUN10A	30JUN10A	0		0.00	100	0.00	0.00											
24300280	Decon 90 inch flange & neutralizer	63	03MAY10A	03MAY10A	30JUL10A	30JUL10A	0		0.00	100	0.00	0.00											
24300300	Decon Exit Spool Piece	36*	01SEP10A	01SEP10A	30SEP10A	30SEP10A	0		97,606.20	100	97,606.20	97,606.20	EE//SM =160			EE//TB =800							
24300310	Decon BL Lid	9	18JUN10A	18JUN10A	30JUN10A	30JUN10A	0		0.00	100	0.00	0.00											
24300370	Decon BL Box	11	13AUG10A	13AUG10A	27AUG10A	27AUG10A	0		0.00	100	0.00	0.00											
24300380	Decon BL exterior & accoutrements	49*	13AUG10A	13AUG10A	30SEP10A	30SEP10A	0		68,755.45	100	68,755.45	68,755.45	EE//SM =120			EE//TB =600							
24300390	Decon Program Evaluation/Operation Impact Report	10	01SEP10A	01SEP10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00	EM//EM =240										
24300399	DECON COMPLETE	0			21OCT10A	21OCT10A	0		0.00	100	0.00	0.00											
24300400	Decon Procurement Support - Material & Supplies	121*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		92,040.00	100	92,040.00	92,040.00	41=52,000			43=26,000							
FY092430	FY09 Actual Cost	22*	23FEB09A	23FEB09A	30SEP09A	30SEP09A	0		1,238,513.00	100	238,513.00	1,238,513.00											
FY102430	FY10 Actual Cost	143	01OCT09A	01OCT09A	30SEP10A	30SEP10A	0		542,135.00	100	542,135.00	542,135.00											
FY112430	FY10 Actual Cost	143	01OCT10A	01OCT10A	29OCT10A	29OCT10A	0		18,000.00	100	18,000.00	18,000.00											

Data Date 30APR11 1105
Run Date 20MAY11 10:54
© Primavera Systems, Inc.

**NSTX UPGRADES
RESOURCE LOADED SCHEDULE
CD-2 Schedule
April 2011**

 Early Bar
 Progress Bar
 Critical Activity

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

thermal loading. Disruption loads on the ECH waveguide will be evaluated for the Center Stack Upgrade Fields and field transients. Discussions with heating system experts regarding the performance of the ECH system for the higher Center Stack Upgrade fields indicate that no modification to the resonant frequency or other operational characteristic for the system will require upgrade. Only disruption qualification is planned. No previous qualification has been identified, so the resources include creation of a new calculation – not a review of an existing calculation as is the case for ICRH.

{Electron Cyclotron Heating (Job 2300)}

WBS Element: 1.2.4

WBS Level: 3

WBS Title: Neutral Beam Injection (NBI)

Definition: The Neutral Beam Injection System Upgrade provides a second Neutral Beam as part of the NSTX Upgrade Project. The second NBI is identical to the one already installed on NSTX. An existing TFTR beam will be decontaminated, refurbished, and installed on NSTX. This WBS element includes the NBI source refurbishment; the TFTR beamline decontamination, refurbishment and relocation to the NSTX Test Cell; the 2nd NBI Services; the NBI armor modifications; the 2nd NBI Power, Controls and Instrumentation; the 2nd NBI Duct and vacuum vessel modifications; and the NSTX Test Cell equipment removals and relocations necessary to accommodate the 2nd NBI. Vacuum Pumping System Modifications necessary to accommodate the 2nd NBI are included in WBS element 1.3. NBI Management and Health Physics support are included in element WBS 1.7.

WBS Element: 1.2.4.2

WBS Level: 4

WBS Title: NBI Source Refurbishment

Definition: This WBS element includes the activities to refurbish three neutral beam ion sources for the 2nd Neutral beamline, as currently being performed for the installed Neutral beamline 1.

{Source Refurbishment (Job 2420)}

WBS Element: 1.2.4.3

WBS Level: 4

WBS Title: NSTX Beamline 2 Decontamination

Definition: This WBS element includes the disassembly and decontamination activities of a TFTR Neutral Beam beamline in preparation for beamline refurbishment and reuse as an NSTX upgrade.

{NSTX Beamline 2 Decontamination (Job 2430)}

WBS Element: 1.2.4.4

WBS Level: 4

WBS Title: NBI Beamline Refurbishment and Relocation

Definition: This WBS element includes refurbishment of a TFTR NBI and its relocation to the NSTX test cell.

Included in this WBS element are the activities necessary to refurbish a TFTR Neutral Beam beamline for use on NSTX. This scope includes

Work Approval Form (WAF)

Cost Center: 9418
Job Number: 2430
Job Title: NSTX Beamline 2 Decontamination
Job Manager: Tim Stevenson

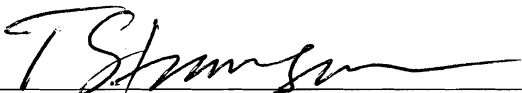
Description:

This job includes disassembly and decontamination activities of a TFTR Neutral Beam beamline in preparation for beamline refurbishment and reuse as an NSTX upgrade. Job includes a Peer Review to assess results. (Held 4/21/10). Job also includes post- Peer Review decon on targeted areas of box, lid, dump, and calorimeter. Dump, source platform and calorimeter will be disassembled such that obscured areas can receive decon attention. Primary Decon slated to conclude end of June 2010.

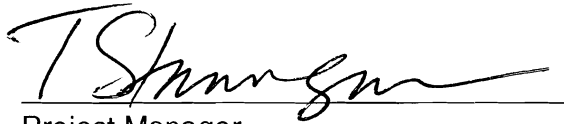
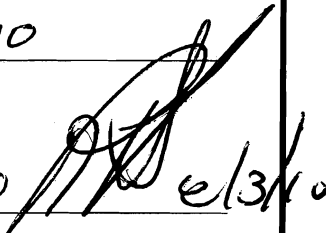
Schedule:

Refer to Primavera Data-Base

Approvals:

 7/20/10

Job Manager

 7/20/10  8/3/10

Project Manager

 8/3/10

Engineering Department Head



Cost Center: 9418
Job Number: 2430
Job Title: NSTX Beamline 2 Decontamination
Job Manager: Tim Stevenson

SCHEDULE

USER INPUT

task	FX cross	ref	TASK DESCRIPTION	Resp	Duration in WORK DAYS	Logical Pre-requisites (one task numbers in each column any order)	User Input Start Date (optional)	ESTIMATE (user input)	
								FY10\$K	HOURS (priced at FY10 rates)
1			Decon Calorimeter		30		10/1/09		
2			Decon Ion Dump		30				
3			Decon Bending Magnet		30				
4			Decon 90 inch flange and neutralizer		30				
5			Decon exit spool piece		20				
6			Decon BL Lid		45				
7			Decon BL Box		45				
8			Decon BL exterior and accoutrements		15				
9			Decon Program Evaluation / Operation Impact Report		10				
10			Hardware and tools						
11			Radiation PCs, boots, gloves, masks, etc.						
12			B-25 special sizes						
13			Decon supplies & consumables						
14			Post-Peer Review Decon (Box, Lid, Dump, Cal)		50		4/21/10		
15			Area maintenance		100		4/21/10		
16			Note: HP & ERWM coverage not included in this job.						
17			TOTALS					\$62	\$26
18			TOTAL Preliminary Cost Estimate (PCE)					\$61	\$31

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

Cost Center: 9418
Job Number: 2430
Job Title: NSTX Beamline 2 Decontamination
Job Manager: Tim Stevenson

SCHEDULE

USER INPUT

task	FX cross	ref	TASK DESCRIPTION	Resp	Duration in WORK DAYS	Logical Pre-requisites (one task numbers in each column any order)	User Input Start Date (optional)	ESTIMATE (user input)	
								FY10\$K	HOURS (priced at FY10 rates)
1			Decon Calorimeter		30		10/1/09		
2			Decon Ion Dump		30				
3			Decon Bending Magnet		30				
4			Decon 90 inch flange and neutralizer		30				
5			Decon exit spool piece		20				
6			Decon BL Lid		45				
7			Decon BL Box		45				
8			Decon BL exterior and accoutrements		15				
9			Decon Program Evaluation / Operation Impact Report		10				
10			Hardware and tools						
11			Radiation PCs, boots, gloves, masks, etc.						
12			B-25 special sizes						
13			Decon supplies & consumables						
14			Post-Peer Review Decon (Box, Lid, Dump, Cal)		50		4/21/10		
15			Area maintenance		100		4/21/10		
16			Note: HP & ERWM coverage not included in this job.						
17			TOTALS					\$62	\$26
18			TOTAL Preliminary Cost Estimate (PCE)					\$61	\$31

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

Cost Center: 9418
Job Number: 2430
Job Title: NSTX Beamline 2 Decontamination
Job Manager: Tim Stevenson

SCHEDULE

USER INPUT

task	FX cross	ref	TASK DESCRIPTION	Resp	Duration in WORK DAYS	Logical Pre-requisites (one task numbers in each column any order)	User Input Start Date (optional)	ESTIMATE (user input)	
								FY10\$K	HOURS (priced at FY10 rates)
1			Decon Calorimeter		30		10/1/09		
2			Decon Ion Dump		30				
3			Decon Bending Magnet		30				
4			Decon 90 inch flange and neutralizer		30				
5			Decon exit spool piece		20				
6			Decon BL Lid		45				
7			Decon BL Box		45				
8			Decon BL exterior and accoutrements		15				
9			Decon Program Evaluation / Operation Impact Report		10				
10			Hardware and tools						
11			Radiation PCs, boots, gloves, masks, etc.						
12			B-25 special sizes						
13			Decon supplies & consumables						
14			Post-Peer Review Decon (Box, Lid, Dump, Cal)		50		4/21/10		
15			Area maintenance		100		4/21/10		
16			Note: HP & ERWM coverage not included in this job.						
17			TOTALS					\$62	\$26
18			TOTAL Preliminary Cost Estimate (PCE)					\$61	\$31

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

Cost Center:	9418													
Job Number:	2430													
Job Title:	NSTX Beamline 2 Decontamination													
Job Manager:	Tim Stevenson													
Uncertainty of the Estimate														
		<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty Range (%)</u>									<u>Comments/Other Considerations</u>
Design Maturity	x													
Design Complexity			x											
Residual Impacts														
		Risk Description		Likelihood of Occurring		Mitigation Plan		Basis of estimate		Cost Impact		Schedule Impact		
1										Low (\$K)		High (\$K)		Low (weeks)
2										High (\$K)		High (Weeks)		
3														
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=Unlikely (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)														

Design Complexity										
Design Maturity	Low	Medium	High	Design Maturity Definition						
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 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 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 Recommendations)		

