

Work Authorization Document

NSTX Upgrade Project

Control Account #: 6100	Title: Control Sys Data Acquisition
WBS 1.6	Title: Control System & Data Acq. System

Period of Performance: 01 January 2010 through 08 September 2014

Authorized Budget: \$918	Control Account Manager: Sichta
Revision #: 0	Revision Date: July-11

Authorized Work Description:

The scope of this WBS element is to develop a Central Instrumentation and Control (I&C) System that will provide remote control, monitoring, data acquisition and data management for the NSTX subsystems during machine operation. The Central I&C System will be developed, to varying degrees, in conjunction with all other WBS elements and will consist of two major elements: the Control System and the Data Acquisition System. Local I&C system controllers, field instrumentation and wiring are included in the individual subsystems.

The NSTX Upgrade will be capable of producing plasmas on the order of 10 seconds; to-date they are less than two seconds. This WBS element includes the modifications to the Central I&C System to support the NSTX Upgrade. For dozens of CAMAC and PC-based data acquisition systems this will require an upgrade, and in some cases replacement. The 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.

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
2	6/8/2011	\$918	\$918	

Approvals	Name	Signature	Date
NSTX-U Project Manager	R. Strykowski		
Control Account Manager	Sichta		
Functional Manager	S. Baumgartner		

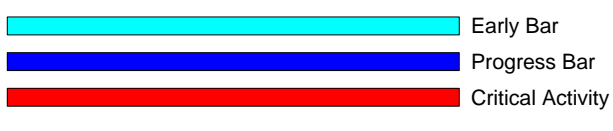
Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	FY11	FY12	FY13	FY14	FY15
NSTX Upgrade Project																
Subtotal		1,170	01JAN10A	01JAN10A	08SEP14	08SEP14	0	1,503	924,581.83		91,209.70					
Job: 6100 - Control Sys Data Acquisition -SICHTA																
Subtotal		1,170	01JAN10A	01JAN10A	08SEP14	08SEP14	0	1,503	924,581.83		91,209.70					
6100-0000	Oversight & Coordination	1,055*	03MAY10A	03MAY10A	25JUL14	25JUL14	0	1,533	28,873.99	LOE	7,362.87					EC//EM =200
6100-0026	Update System documents - PDR	27	03MAY10A	03MAY10A	09JUN10A	09JUN10A	0		0.00	100	0.00					
6100-0027	PDR Prep	10	10JUN10A	10JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00					
6100-0032	Disposition PDR Chits - FDR	30	24JUN10A	24JUN10A	05AUG10A	05AUG10A	0		0.00	100	0.00					
6100-0033	Assess workscope changes/Peer Revw	10	07DEC10*	20MAY13	20DEC10	03JUN13*	-610	1,817	4,798.40		0.00					EC//EM =32 ;
6100-0034	Delay design for NSTX run support	1	21DEC10*	01OCT10A	21DEC10	29OCT10A	35		133.93	100	133.93					EC//EM =01 ;
6100-0035B	PCS Software design analysis	51*	22DEC10	07MAR11A	09FEB11	29APR11A	-57		10,714.40	100	10,714.40					EC//EM =80 ;
6100-0036	CAMAC Memory PCB design	94*	22DEC10	21DEC10A	09FEB11	09MAY11A	-63		7,455.10	100	7,455.10					EC//EM =10 ; EC//SB =60 ;
6100-0037	CAMAC Replacement selection	60*	22DEC10	21DEC10A	23MAR11	22MAR11A	1		4,285.76	100	4,285.76					EC//EM =32 ;
6100-0038	Cntr Stk diags data acq design	55*	22DEC10	21DEC10A	12JAN11	15MAR11A	-44		6,212.16	100	6,212.16					EA//SB =24 ; EC//EM =24 ;
6100-0039	DAS upgrade for NSTX diagnostics	55*	22DEC10	21DEC10A	02FEB11	15MAR11A	-29		3,214.32	100	3,214.32					EC//EM =24 ;
6100-0040	I&C effort due to NTC GIS rack move (REINSTALTN)	25	22DEC10	16APR14	02FEB11	20MAY14	-822	76	9,032.96	0	0.00					EC//EM =40 ; EC//SB=24
6100-0041	ECN & new drawings	28	12APR12	12APR12	07JUN12	21MAY12	12	571	54,357.60		0.00					EC//SB =80 ; EC//EM =160 ; EA//SB =160 ;
6100-0042	Update System documents	10	23MAY11*	06JUN11	06JUN11	17JUN11	-9	126	8,035.80		0.00					EC//EM =60 ;
6100-0043	FDR Prep 6100	64*	28APR11*	21MAR11A	09JUN11	17JUN11	-6	126	10,714.40	70	7,500.08					EC//EM =80 ;
6100-0043A	Center Stack - Peer review	0				18MAY11A	0		0.00		0.00					
6100-0043B	FDR	0				22JUN11*	0	591	0.00	50	0.00					
6100-0044	Disposition FDR Chits	27*	17JUN11*	23JUN11	29JUL11	01AUG11	-1	591	2,142.88		0.00					EC//EM =16 ;
6100-0045	Network Design	30	31MAR11*	07MAR11A	11MAY11	28MAR11A	32		6,220.08	100	6,220.08					EC//EM =16 ; EC//SB =40 ;
6100-0048	Wait for I&C Procurement Start	1	01AUG13*	01AUG13*	01AUG13	01AUG13	0	93	149.95		0.00					EC//EM =01 ;
6100-0049C	CAMAC Replacement proto	60	01OCT13*	01OCT13*	06JAN14	06JAN14	0	112	37,360.96		0.00					41=16,000 ; EC//EM =32 ; 43=8,000 ;
6100-0049D	CAMAC Replacement equipment	60	07JAN14*	07JAN14*	31MAR14	31MAR14	0	112	195,201.20		0.00					41=120,000 ; EC//EM =40 ; 43=20,000 ;

Data Date 31MAY11 1106
Run Date 25JUL11 14:46

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

Sheet 1 of 3



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)	FY					
												FY11	FY12	FY13	FY14	FY15	
6100-0050	CAMAC Memory module	90	02OCT13*	02OCT13*	18FEB14	18FEB14	0	51	25,672.00		0.00	41=1,000 ; EC//EM =08 ; EC//SB =24 ; 43=5,000 ;					
6100-0051	Networking equipment & fiber optics	40	01OCT13*	01OCT13*	25NOV13	25NOV13	0	192	51,212.24		0.00	41=28,000 ; EC//EM =16 ; EC//SB =24 ; 43=6,000 ;					
6100-0052	GIS rack-move I&C fiber optics & equip.	30	16APR14*	16APR14*	28MAY14	28MAY14	0	1	23,048.80		0.00	41=8,000 ; EC//SB =16 ; EC//EM =32 ; 43=4,000 ;					
6100-0055	Wait for I&C Fabrication Start (per	1	02JAN13*	02JAN13*	02JAN13	02JAN13	0	101	149.95		0.00	41=00 ; EC//EM =01 ;					
6100-0056	I&C Peer Review	5	01MAY13*	01MAY13*	07MAY13	07MAY13	0	62	4,055.28		0.00	41=00 ; EC//SB =04 ; EC//EM =24 ;					
6100-0057C	PCS Infrastructure code & debug	60	08JUL13*	08JUL13*	30SEP13	30SEP13	0	22	5,998.00		0.00	EC//EM =40 ;					
6100-0058	PSRTC code & debug	60	01OCT13	01OCT13	06JAN14	06JAN14	0	22	24,804.80		0.00	EC//EM =160 ;					
6100-0059	Update PSRTC Simulation models	30	07JAN14	07JAN14	17FEB14	17FEB14	0	22	15,140.64		0.00	EC//TB =16 ; EC//EM =32 ; EA//EM =40 ;					
6100-0060	PCS code & debug	60	18FEB14	18FEB14	12MAY14	12MAY14	0	22	9,301.80		0.00	EC//EM =60 ;					
6100-0061A	CAMAC replacement proto	120	01MAY13*	01MAY13*	21OCT13	21OCT13	0	17	18,070.20		0.00	EC//EM =120 ;					
6100-0061B	CAMAC replacement - local software	120	22OCT13	22OCT13	21APR14	21APR14	0	17	46,509.00		0.00	EC//EM =300 ;					
6100-0062	CAMAC replacement - MDSplus changes	20	22APR14	22APR14	19MAY14	19MAY14	0	17	15,503.00		0.00	EC//EM =100 ;					
6100-0063	Cntr Stk diags data acq changes	10	01OCT13*	01OCT13*	14OCT13	14OCT13	0	132	2,480.48		0.00	EC//EM =16 ;					
6100-0064	F CAMAC Replacement systems fab.	90	15OCT13*	15OCT13*	03MAR14	03MAR14	0	132	30,984.48		0.00	EC//EM =72 ; EC//SB =168 ;					
6100-0065	CAMAC Memory module fab.	60	01OCT13*	01OCT13*	06JAN14	06JAN14	0	162	21,955.28		0.00	41=5,000 ; EC//EM =40 ; EE//EM =40 ;					
6100-0067	DAS programming for NSTX diags upgd	60	20MAY14	20MAY14	13AUG14	13AUG14	0	17	3,720.72		0.00	EC//EM =24 ;					
6100-0070	Wait for I&C Installation Start (per NSTX	1	01OCT13*	01OCT13*	01OCT13	01OCT13	0	111	155.03		0.00	EC//EM =01 ;					
6100-0071	CAMAC Replacement systems install	60	02OCT13	02OCT13	07JAN14	07JAN14	0	111	31,285.65		0.00	EC//TB =30 ; EC//EM =45 ; EC//SB =40 ;					
6100-0072	CAMAC Memory install	10	08OCT13*	08OCT13*	21OCT13	21OCT13	0	217	2,656.12		0.00	EC//EM =08 ; EC//SB =40 ;					
6100-0073A	NTC/DARM fiber & network install	30	19FEB14	19FEB14	01APR14	01APR14	0	51	2,208.08		0.00	EC//EM =4 ; EA//SB =3 ; EE//SB =8 ;					
6100-0074	install I&C Thermocouple equipment	5	02OCT13*	02OCT13*	08OCT13	08OCT13	0	211	3,128.08		0.00	EC//EM =08 ; EC//SB =40 ;					
6100-0075	Install I&C due to NTC GIS rack relocation	60	29MAY14*	29MAY14*	21AUG14	21AUG14	0	1	37,617.24		0.00	EA//SB =40 ; EC//EM =48 ; EC//SB =60 ; EE//SB =120 ;					
6100-0081	CS Infrastructure tests	30	13MAY14*	13MAY14*	24JUN14	24JUN14	0	27	13,835.36		0.00	EC//SB =08 ; EC//TB =24 ; EE//EM =24 ; EC//EM =40 ;					
6100-0082	PSRTC Simulation PTP-034	5	25JUN14	25JUN14	01JUL14	01JUL14	0	27	13,882.56		0.00	EC//EM =32 ; EA//EM =40 ;					
6100-0083	PSRTC PTP-035	5	02JUL14	02JUL14	09JUL14	09JUL14	0	27	13,441.28		0.00	EA//EM =24 ; EC//TB =24 ; EC//EM =40 ;					
6100-0084B	PCS tesing	10	10JUL14	10JUL14	23JUL14	23JUL14	0	27	6,201.20		0.00	EC//EM =40 ;					
6100-0085	Support ISTEP-001	5	29AUG14	29AUG14	05SEP14	05SEP14	0	1	10,960.80		0.00	EA//EM =24 ; EC//EM =24 ; EC//TB =24 ;					

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)					
												FY11	FY12	FY13	FY14	FY15
6100-0086	CAMAC Replacement system tests	60	20MAY14	20MAY14	13AUG14	13AUG14	0	17	34,244.00		0.00	EC//SB =80 ; EC//EM =160				
6100-0087	CAMAC Memory bench tests	5	07JAN14	07JAN14	13JAN14	13JAN14	0	162	5,959.84		0.00	EC//EM =08 ; EC//SB =40				
6100-0088	CAMAC Memory field tests	5	14JAN14	14JAN14	20JAN14	20JAN14	0	162	3,600.04		0.00	EC//EM =08 ; EC//SB =20				
6100-0089	Cntr Stk diags testing	5	09OCT13*	09OCT13*	15OCT13	15OCT13	0	211	5,608.56		0.00					
6100-0090	test relocated I&C GIS rack systems	5	22AUG14	22AUG14	28AUG14	28AUG14	0	1	14,021.40		0.00	EC//SB =40 ; EC//EM =60				
6100-0092	Project Ready for ISTP Target	1	08SEP14*	08SEP14*	08SEP14	08SEP14	0	1	155.03		0.00					
FY106100	FY10 Actual Cost	85	01JAN10A	01JAN10A	30APR10A	30APR10A	0		14,551.00	100	14,551.00					
FY106100A	FY10 Actual Cost	110	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		23,560.00	100	23,560.00	81=26009				

6100 Control Sys Data Acquisition (Sichta)	31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
BCWS	29	29	29	6	14	7	2	1	1	1	1	1
CUM BCWS	79	108	137	143	158	165	166	167	168	168	169	169
BCWP	1	5	27	9	0	0	0	0	0	0	0	0
CUM BCWP	47	52	79	88	88	88	88	88	88	88	88	88
ACWP	0	6	13	13	0	0	0	0	0	0	0	0
CUM ACWP	45	52	64	78	78	78	78	78	78	78	78	78
CV	2	0	15	11	11	11	11	11	11	11	11	11
SV	-32.	-56.	-59.	-55.	-69.	-76.	-78.	-79.	-79.	-80.	-80.	-81.
CPI	1.04	1.01	1.23	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
SPI	0.59	0.48	0.57	0.62	0.56	0.54	0.53	0.53	0.53	0.53	0.52	0.52

6100 Control Sys Data Acquisition (Sichta)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	1	1	1	1	1	1	1	1	1	1	1	1
CUM BCWS	170	170	171	172	172	173	173	174	175	175	176	176
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	88	88	88	88	88	88	88	88	88	88	88	88
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	78	78	78	78	78	78	78	78	78	78	78	78
CV	11	11	11	11	11	11	11	11	11	11	11	11
SV	-82.	-82.	-83.	-83.	-84.	-85.	-85.	-86.	-86.	-87.	-88.	-88.
CPI	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
SPI	0.52	0.52	0.52	0.51	0.51	0.51	0.51	0.51	0.51	0.5	0.5	0.5

6100 Control Sys Data Acquisition (Sichta)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	1	1	1	1	8	3	6	6	6	96	76	57
CUM BCWS	177	178	178	179	187	190	196	202	208	304	381	438
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	88	88	88	88	88	88	88	88	88	88	88	88
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	78	78	78	78	78	78	78	78	78	78	78	78
CV	11	11	11	11	11	11	11	11	11	11	11	11
SV	-89.	-89.	-90.	-91.	-99.	-102.	-108.	-114.	-120.	-216.	-292.	-350.
CPI	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
SPI	0.5	0.5	0.5	0.49	0.47	0.46	0.45	0.44	0.42	0.29	0.23	0.2

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

includes power cabling changes, DC Reactor changes, associated raceway changes, and changes required in the Power Cable Termination Structure (PCTS) inside the NSTX Test Cell.

WBS Element: 1.5.4

WBS Level: 3

WBS Title: Control and Protection System

Definition: The scope of the Control and Protection System WBS element is to control and protect the power loop components for all magnet circuits. This includes the design of hardwired interlock system, kirk-keys, real time controls, the PC Link, Firing Generator, and Fault Detector changes, measurement of signals, changes to existing coil protection devices and design of a new digital coil protection system.

WBS Element: 1.5.5

WBS Level: 3

WBS Title: General Power Systems and Integration

Definition: This WBS element covers general power systems activities including interaction with the designers of other WBS elements, design review support and procedure preparations as well as the administrative and supervisory efforts for the NSTX Power Systems.

The Center stack upgrade entails the TF feed to be 1kV, 129.8kA for 7.45 seconds every 2400 seconds. Design shall be such that the pulse period can be reduced to 1200 seconds. This requires complete redesign of the TF power system. Replacement of the fault detector (FD) and the Firing generator (FG) is required for fast and reliable response to fault conditions. The HCS will be upgraded with a PLC. The OH power supply will be also redesigned to have the capability of 8kV, +/-24kA; the FD and FG of the OH system will also be changed. OH CLR's will be replaced with calculated optimum requirements. A Digital Coil Protection (DCP) System will be designed and implemented.

{NSTX Center Stack Upgrade Power Systems (Job 5000)}

WBS Element: 1.6

WBS Level: 2

WBS Title: Central Instrumentation and Controls (I&C)

Definition: The scope of this WBS element is to develop a Central Instrumentation and Control (I&C) System that will provide remote control, monitoring, data acquisition and data management for the NSTX subsystems during machine operation. The Central I&C System will be developed, to varying degrees, in conjunction with all other WBS elements and will consist of two major elements: the Control System and the Data Acquisition System. Local I&C system controllers, field instrumentation and wiring are included in the individual subsystems.

The NSTX Upgrade will be capable of producing plasmas on the order of 10 seconds; to-date they are less than two seconds. This WBS element includes the modifications to the Central I&C System to support the NSTX Upgrade. For dozens of CAMAC and PC-based data acquisition systems this will require an upgrade, and in some cases replacement. The

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: 6100
Job Title: Central I&C and Data Acquisition
Job Manager: Paul Sichta
Rev 1 7/2/2010


Description:


This upgrade will be capable of producing plasmas on the order of 6.5 seconds; to-date they are less than two seconds. Some CAMAC and PC based data acquisition systems will require an upgrade and in some cases replacement. The Test Cell network will need more drops to accommodate new data acquisition systems. The real-time plasma control system will require a software upgrade to accommodate additional input/output signals, control loops, and a longer control period. 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. There are numerous other IT improvements required; these will be funded by NSTX Operations since they would occur regardless of the upgrade effort.

Schedule:

Approvals:

 7/23/10
Job Manager

 8/3/10
Project Manager

 8/3/10
Engineering Department Head

Cost Center: 9417
Job Number: 6100
Job Title: Central I&C and Data Acquisition
Job Manager: Paul Sichta

USER INPUT TASKS AND DESCRIPTIONS		SCHEDULE	
USER INPUT		USER INPUT	
TASK	TASK DESCRIPTION	Duration in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)
91	Project Ready for ISTEP Target	1	Resp
92			Sichta
1142			

TOTALS
 TOTAL Preliminary Cost Estimate (\$K) = \$8.36

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

Estimate (user input)

FY10\$K	HOURS (priced at FY10 rates)											
\$1	169	156.5	128.59	108	78.33	78.3	78.3	181				
M&S (41)												
CREDIT CARD (43)												
OTHER (39)												
TRAVEL (35)												
OVERTIME (31)												
EA** EM (analysis engr)												
EA** (Designer)												
EC** EM (computing Engr)	1											
EC** SB (Computing Tech)												
EC** TB (Computing Tech)												
EE** EM (Eictr Engr)												
EE** SM (Senior Electr Tech)												
EE** SB (Eictr Tech)												
EE** TB (Eictr Tech)												
EM** EM (FO&M Engr)												
EM** SM (Senior Tech)												
EM** SB (FO&M Tech)												
EM** TB (FO&M Tech)												
FC** AM (P&C Officer)												

Contingency 10%
 Names of req'd skills if known
 Basis of Estimate Category 4

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

Cost Center:			9417											
Job Number:			6100											
Job Title:			Central I&C and Data Acquisition											
Job Manager:			Paul Sichte											
Uncertainty of the Estimate														
			<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty Range (%)</u>								
				X		-15% / +25%								
					X									
Residual Impacts														
Risk Description														
							Likelihood of Occurring		Mitigation Plan	Basis of estimate	Cost Impact	Schedule Impact		
											Low (\$K)	High (\$K)	Low (weeks)	High (Weeks)
1							U		hire replacement and assess schedule impact	Estimated impact is < 1 months on the critical path. Impact on cost because untrained personnel will be less effective.	10	50	0	4
2							VU		Upgrade additional data acq systems and/or networks, revise software	Estimated impact is 0 months on the critical path. Costs will be due to upgrading additional CAMAC systems.	5	25	0	2
3							U		Additional workscope for upgrade	Estimated impact is < 1 months on the critical path. Impact on cost due to additional workscope.	50	300	0	4
(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.													
(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=Likely (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)													

Design Complexity		Design Maturity		Design Maturity Definition			
Low	Medium	High	High				
Low	-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.
Medium	-10%	+15%	-15%	+25%	-20%	+40%	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%	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 Maturity		Design Complexity Definition			
Low	Medium	High	Low				
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 AAACEI Recommended	

Tab C Risk and uncertainty

Cost Center:	9417				
Job Number:	6100				
Job Title:	Central I&C and Data Acquisition				
Job Manager:	Paul Sichta				

Materials and Subcontracts (M&S)	QTY	Cost Each (\$K)	Total(\$K)	Basis of Estimate
Description:				
CAMAC replacement Transient Digitizers (for proto)	2	\$12.0	\$24	4
LabVIEW software, PC, & Adhaco	4	\$5.0	\$20	4
CAMAC replacement systems & spares	8	\$15.0	\$120	4
CAMAC memory board (Lawson unit assembled)	10	\$1.0	\$10	4
CAMAC memory Carrier board PCB	1	\$2.0	\$2	4
CAMAC memory Carrier board parts	10	\$4	\$4	4
Memory Module off-site fabrication	1	\$5.0	\$5	4
NTC/DARM Fiber & Conduit	1	\$16.0	\$16	4
NTC/DARM Network Equip.	1	\$18.0	\$18	4
Fiber Optic Cable set for GIS rack move	1	\$10.0	\$10	4
Cables/conn/box set for GIS rack move	1	\$2.0	\$2	4
			\$231	

CATEGORIZATION CODES:				
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