

NCSX Work Approval Form (WAF)

WBS Number: 45

WBS Title: Power Systems Design Integration

Job Number: 4501

Job Title: Power Systems Design Integration

Job Manager: Raki Ramkrishnan

Description:

This WBS element consists of the electrical system engineering and design/drafting, which includes the design and analysis of the overall electrical system, its documentation, and the conduct of design reviews. It also includes the T effort to ensure overall project coordination of electrical systems by providing electrical systems support to other systems, including diagnostics, which provides the engineering, design/drafting, and installation of diagnostic cabling. It also includes the the effort to conduct all systems-related preoperational testing.

Schedule:

Approvals:

Job Manager

Date

Responsible Line Manager

Date

Project Manager

Date

Engineering Department Head

Date

**NCSX June 2007 ETC
TABLE I - DESIGN LABOR**

WBS Number: 45									
WBS Title: Power Systems Design Integration									
Job Number: 4501									
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Job Manager: Raki Ramkrishnan									
Develop SRD	451-0-2					40			Needed before FDR on WBS4
Calculations-Dsn	451-1-2			8		40			Needed before FDR on WBS4
PDR Prep Power system -Dsn	451-2-2			128		96			Needed before power Cable installation
FDR C-Site	451-2-2.1			120		80			Needed before power Cable installation
PDR Power system -Dsn	451-2-3								Needed before power Cable installation
Dwgs,asbuilts -Elect Dsn	451-3-2			320		320			Needed before coil energization
FDR AC auxiliaries & grounding-Dsn	451-4-2			40		40			Needed before coil energization
FDR C-Site -Cabling	451-6-2			120		80			Needed before power Cable installation
WBS 452 - Electrical Systems Support									
Diagnostics AC Power Distr-Dsn	452-1-2			160		80			
Diagnostics AC Power Distr-Procure	452-1-4	\$1K		8					
Diagnostics AC Power Distr-Install	452-1-6			80		24	80	640	
Diagnostics AC Power Distr-Commission	452-1-8					24	80	160	Needed before first plasma
Diagnostics sensor cabling-Dsn	452-2-2			160		24			
Diagnostics sensor cabling-Procure	452-2-4	\$2K							
Diagnostics sensor cabling-Install	452-2-6					16	32	160	
Diagnostics sensor cabling-Commission	452-2-8					8	16	32	Needed before first plasma
WBS 453 - System Testing (PTP's)									
New Procedures	453-1-2			160		24			Needed before FDR on WBS4
Preop Testing-Procure test equipt	453-1-3	\$20K							Needed before coil energization
TF Coil Test	453-1-4	\$1K		8		32	40	54	Needed before first plasma
PF5 Coil Test	453-1-5	\$1K		8		32	40	54	Needed before first plasma
Trim Coil Test (per coil)	453-1-6	\$1K		8		32	40	54	Needed before first plasma
Testing PTPs, ISTPs	453-1-7	\$10K		160		240	320	376	Needed before first plasma
Totals									
		\$36K	\$0K	1488	0	1232	648	1530	
Notes on the Basis of Estimate									
(1) Design and Fabrication/Installation									
Estimate based on estensive experience of engineer performing similar tasks at PPPL and EBASCO - e.g. recent experience on NSTX. This is basically a job modifying existing PPPL systems and re-installing for NCSX. Design and engineering estimates developed based on assesments of the number of drawings needed (new or modified), the effort to reconfigure existing designs, interfaces with other systems, supervision of on-site contractors, and all necessary re-activation and pre-operational testing needed.									
(2) M&S									
M&S estimated based on similar recent procurements and needed interfaces with installation contractors - this will be Davis-Bacon covered, except tor those activities within the Test Cell.									

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

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Uncertainty of the Estimate

	<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty of Estimate (%)</u>	<u>Comments/Other Considerations</u>
Design Maturity	X				Do not anticipate major changes in the design
Design Complexity			X	-5%/+10%	Known technologies

Note: High/Medium/Low uncertainty assessment from Job Manager. Uncertainty range based on AACEI recommended practice 18R-97 as amended for NCSX.

Residual Impacts

<u>Job</u>	<u>Risk Description</u>	<u>Likelihood of Occurring</u>	<u>Mitigation Plan</u>	<u>Basis of estimate</u>	<u>Cost Impact</u>		<u>Schedule Impact</u>	
					<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>

NONE

Notes:

- [1] Low cost and schedule impacts are considered the minimum (0-percentile) impacts should the event occur.
 High cost and schedule impacts are considered the maximum (100-percentile) impacts should the event occur
- [2] Cost impacts should be entered as man-hours (by demographic) and M&S direct cost under basis of estimate.
 Cost impacts should NOT include standing army costs which are separately calculated from the schedule impact
 Project control is responsible for quantifying the low and high cost impacts based on the labor hours and M&S identified
- [3] 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.
- [4] 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 Unlikley (P<10%), NC=Non-credible (P<1%)

Activity ID	MILE-stones (level 2 & 3)	Activity Description	Duration (work days)	Baseline Start	Baseline Finish	Shifts	Total Float	% cmlpt	Proposed Budgeted							
										FY07	FY08	FY09	FY10	FY11	FY12	
45 - Power System Design and Integration																
Job: 4501 - Power Sys Dsn & Integr-RAMAKRISHNAN																
451 - System Design & Interfaces																
451-0-2		Develop SRD	15	01OCT08*	21OCT08		146		7,143.20	■ EE//EM =40hr ;						
451-3-2		Dwgs,asbuilts -Elect Dsn	245	08OCT08*	01OCT09		259		96,653.42	■ EA//SB =320hr ; EE//EM =320hr ;						
451-2-2		PDR Prep Power system -Dsn	40	22OCT08	18DEC08		146		32,941.44	■ EA//SB =128hr ; EE//EM =96hr ;						
451-2-3	2	PDR Power system -Dsn	0		18DEC08		146		0.00	▼						
451-6-2	2	Final design C-Site -Cabling	149	19DEC08	28JUL09		146		29,096.80	■ EA//SB =120hr ; EE//EM =80hr ;						
451-2-2.1		Final Design C-Site	149	19DEC08	28JUL09		146		29,096.80	■ EA//SB =120hr ; EE//EM =80hr ;						
451-1-2		Calculations-Dsn	149	22OCT08*	01JUN09		186		8,130.56	■ EA//SB =08hr ; EE//EM =40hr ;						
451-202.2		FDR C-Site	0		28JUL09		146		0.00	▼						
451-4-2		Final Dsn AC auxiliaries & grounding-Dsn	45	15JUN09	17AUG09		37		12,080.00	■ EA//SB =40hr ; EE//EM =40hr ;						
451-402.1		FDR AC auxiliaries & grounding-Dsn	0		17AUG09		37		0.00	▼						
452 - Electrical Systems Support																
452-1-2		Diagnostics AC Power Distr-Dsn	40	02MAR09*	24APR09		170		34,033.60	■ EA//SB =160hr ; EE//EM =80hr ;						
452-1-4		Diagnostics AC Power Distr-Procure	40	27APR09	22JUN09		170		2,384.36	■ 41=01\$K ; EA//SB =08hr ;						
452-1-6		Diagnostics AC Power Distr-Install	130	23JUN09	06JAN10		170		78,393.29	■ EE//EM =24hr ; EE//SM =80hr ; ■ EE//TB =640hr ; EA//SB =80hr ;						
452-1-8		Diagnostics AC Power Distr-Commission	30	07JAN10	17FEB10		170		29,816.40	■ EE//EM =24hr ; EE//SM =80hr ; ■ EE//TB =160hr ;						
452-2-2		Diagnostics sensor cabling-Dsn	43	01MAY09*	01JUL09		205		24,033.12	■ EA//SB =160hr ; EE//EM =24hr ;						
452-2-4		Diagnostics sensor cabling-Procure	65	02JUL09	02OCT09		205		2,796.15	■ 41=02\$K ;						
452-2-6		Diagnostics sensor cabling-Install	43	05OCT09	04DEC09		205		21,064.80	■ EE//EM =16hr ; EE//SM =32hr ; ■ EE//TB =160hr ;						
452-2-8		Diagnostics sensor cabling-Commission	10	07DEC09	18DEC09		205		6,554.16	■ EE//EM =08hr ; EE//SM =16hr ; ■ EE//TB =32hr ;						
453 - System Testing (PTP's)																
453-1-2		New Procedures	90	01JUL09*	05NOV09		134		24,269.34	■ EA//SB =160hr ; EE//EM =24hr ;						
453-1-3		Preop Testing-Procure test equipt	65	03AUG09*	02NOV09		217		28,187.69	■ 41=20\$K ;						
453-1-4		TF Coil Test	20	21SEP10*	18OCT10		0		19,276.93	41=01\$K ; EA//SB =08hr ; EE//EM =32hr ; EE//SM =40hr ; ■ EE//TB =54hr ;						
453-1-5		PF Coil Test	20	21SEP10*	18OCT10		0		19,276.93	41=01\$K ; EA//SB =08hr ; EE//EM =32hr ; EE//SM =40hr ; ■ EE//TB =54hr ;						
453-1-6		Trim Coil Coil Test	20	21SEP10*	18OCT10		0		18,550.13	41=01\$K ; EA//SB =08hr ; EE//EM =32hr ; EE//SM =40hr ; ■ EE//TB =54hr ;						
453-1-8		Testing PTPs, ISTPs	100	27MAY10*	18OCT10		0		159,346.02	41=10\$K ; EE//EM =240hr ; EE//SM =320hr ; EE//TB =376hr ; ■ ■ ■ EA//SB =160hr ;						
Subtotal			509	01OCT08	18OCT10		0		683,125.14	▼ ▼ ▼						