	NCSX Work Approval	l Form (WAF)	
WBS Nu	ımber: 38		
WBS Tit	tle: Electron Beam Mapping	g	
Job Nur	nber: 3801	_	
Job Title	e: Electron Beam Mapping	Systems	
	nager: Brent Stratton	-	
Description	-		
Description:	This WBS element consists of all EB mapp NCSX mission as defined in the General Req in the field-line mapping phase of operati Fabrication Project.	quirements. This equipment will be requi	ired
Schedule:	See Attached		
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: 38					
WBS Title: Electron Bean	n Mapping				
Job Number: 3801					
Job Title: Electron Beam	Mapping Systems				
Job Manager: Brent Strat	ton				

Description: E-beam mapping will be done with an electron gun and movable fluorescent wand borrowed from Auburn University. Will use same visible TV camera as in WBS 36. Need two port extensions for 10" diameter ports. Need data acquisition system to record wand position, electron gun bias voltage and emission current. Need control capability for wand, electron gun bias voltage and emission current.

	\$					Labor	Hours				Basis of Estimate
Task Description	M&S	Travel	EMEM	EMSM	EMTB	EEEM	EETB	EADM	ECEM	RM2	
Design System											
Design interface components - adapting			120								Engineering judgement - however standard design used before
flange sizes											
Physics-based modeling, work with		\$3,000								480	Engineering judgement - however standard design used before
Auburn personnel											
Pepare drawings (~6 drawings)								80			Based on conceptual design and PPPL design experience
Design software for control & data									300		Engineering judgement - however standard design used before
acquisition for H/W											
Fabricate System (Including welding)											
Fabricating & Welding Spool Pieces					16		16				Engineering judgement - however standard design used before
Fabricating other parts					80						Engineering judgement - however standard design used before
Install System					240						Engineering judgement - however standard design used before
Engineering Oversight			40								
Materials											
Port Extensions Material/Parts	\$4,000										Based on estimate provided by PPPL Construction Manager - see Table V
Data Acquisition Materials/Parts	\$10,000										Based on estimate provided by PPPL Computer Division - see Table V
Rack	\$28,600										Based on estimate provided by PPPL Electrical Engineer - see Table V
TOTAL	\$42,600	\$3,000	160	0	336	0	16	80	300	480	

NCSX June 2007 ETC TABLE II - Materials and Subcontracts

WBS Number: 38				
WBS Title: Electron Beam Map	ping			
Job Number: 3801				
Job Title: Electron Beam Mapp	ing Systems			
Job Manager: Brent Stratton				
Materials and Subcontracts (M&S)				Basis of Estimate
	Ма	aterial	Labor	
Description - inlcuded in Table I				

NCSX June 2007 ETC TABLE III - Fabrication/Assembly Installation

WBS Number: 38								
WBS Title: Electron	Beam M	apping	g					
Job Number: 3801								
Job Title: Electron B	eam Ma	pping	Syster	ns	 L	<u> </u>		 i
Job Manager: Brent	Strattor)						
In-house Fabrication ar	d Assen	hbly and	d Instal	lation				
Included in Table I								L
							1	

NCSX June 2007 ETC TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 38 WBS Title: Electron Beam Mapping Job Number: 3801 Job Title: Electron Beam Mapping Systems Job Manager: Brent Stratton

<u>u</u>	Incertainty of the Esti	mate				
					Uncertainty of	
		<u>High</u>	Medium	Low	Estimate (%)	Comments/Other Considerations
	Design Maturity		х			Similar designs done elswhere, but NCSX specific design still conceptual
					-15%/+25%	
	Design Complexity		х			Standard components, but interfaces could be somewhat complex
	Other Comments:					Leak checking not included in this estimate

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

Residual Impacts					Cost li	mpact	Schedule	Impact	
Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Low	High	Low	High	
NONE									

Notes:

[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 reponsible 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 Unlikely (P<10%), NC=Non-credible (P<1%)</p>

^[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

NCSX June 2007 ETC TABLE V - Basis of Estimate

Backup Information

Hardware requirements for e-beam mapping

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			I
	טן	ata Acquistion Hardware	
			1
Sichta M&S: \$10K	ard, d/a, a/d, motor controller, network].)	
hardware & software labor: 3			
frequirements/design/select			
Additional:			
EBEAM mapping tasklist.xls	post-acquisition software analysis & visualization.		

6

MILE-	Activity	Duration	Baseline	Baseline	Shifts	Total	%	Proposed								
tones level 2	Description	(work days	Start	Finish		Float	cmplt	Budgeted	FY07	FY08		FY09	FY10	FY11	F	Y12
& 3)																ШЦ
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ctror	1 Beam Mapping-STRATTON															
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	E-beam mapping-Final Design	40	28APR09*	23JUN09		114		56,544.80				E R	///RM2 =160h A//SB =40hr ;	r ; EM//EM = EC//EM =10	:50hr ; 0hr ;	
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	E-beam mapping-Procure Ports	65	01OCT09	13JAN10		46		5,728.00					 41=04\$	k ;		
	E-beam mapping-Procure Data Acquisition	65	01OCT09*	13JAN10		46		14,320.00					 41=10\$	k ;		
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n Date 18	8JUL07 07:31	ETCZ	NCSX Project Resource Loaded Schedule	Sheet 61 of 99
navera Sys	systems, Inc.		EAC	