	NCSX Work Approval	Form (V	VAF)
Job Numb Job Title: \	Vacuum Pumping System		
Description:	The MIE project scope is limited to one TMP Is pump system. Design, fabrication, installation to implement the vacuum pumping system. In System will use as much as possible of the ex hardware where it is cost effective to implement	, and system t the future, N kisting PBX-M	testing of equipment needed CSX Vacuum Pumping
Schedule:	See Attached		
Approvals:			
	Job Manager	-	Date
	Responsible Line Manager	-	Date
	Project Manager	Ī	Date
	Engineering Department Head	-	Date

NCSX June 2007 ETC TABLE I - DESIGN LABOR

WBS Number: 22 WBS Title: Vacuum Pumping System Job Number: 2201 Job Title: Vacuum Pumping System Job Manager: Bill Blanchard

Description:

The proposed design consists of a high vacuum system which is manually operated and includes an isolation valve, a vertical pumpduct on a lower P12 port cover and one 1500 //s TMP. The TMP will be backed by an existing booster mechanical pump system. The system will also contain one unshielded RGA and one ion gauge with and a valved access port for initially roughing down the vacuum vessel.

	<u>K\$</u>					Hou	rs				
	M&S	EMEM	EMSM	EMSB	EMTB	EAEM	EASB	EEEM	EESM	EESB	EETB
Task ID	M8	N N N	N	N	≥ Ш	EA	EA	Ш	Ш	Ш	E
Title I and II Design											
Preliminary Design											
AC Power / Instrumentation											
Backing System							16	16			
Instrumentation Rack							20	16			
Rack to Instrumentation							16		16		
VPS (Mechanical)							24				
Design / Management / Admin		64		24							
Drafting											
Final Design											
AC Power / Instrumentation							32				
Backing System Instrumentation Rack							32 36				
Rack to Instrumentation							24		32		
VPS (Mechanical)							24		02		
Design / Management / Admin		88		32							
Drafting		00		02			40				
Subtotal Title I & II Design		152	0	56	0	0	208	32	48	0	0
Title III											
AC Power / Instrumentation											
Backing System / Procurement	\$3.0K						8				
Instrumentation Rack / Procurement	\$3.0K						8				
Rack to Instrumentation / Procurement	\$1.5K						8		8		
Backing System / Procedure / Installation							16				96
Instrumentation Rack / Procedure / Installation							16				128
Rack to Instrumentation / Procedure / Installation							16		40		96
VPS (Mechanical)											
Oversight / Admin		16									
Procurement	\$10.0K	4		8							
Fabrication					144						
Procedure and Installation		16		40	80						
Procedure and Testing		12		8							
Subtotal Title III	\$17.5K	48	0	56	224	0	72	0	48	0	320

This is a relatively simple vacuum pumping system that will utilize major components (TMP, isolation valves, booster and mechnical pump) already at PPL. Estimate based on prior experience on similar systems (e.g., NSTX), adjusted for the simplicity of this system. Input from experienced engineers/personnel familiar with specific parts of this scope was used for estimates. Includes design activities, some P&ID drawings, weld drawings, fab drawings, calculations, two reviews (PDR & FDR), oversight and purchasing of components. The system should have an approximate pumping speed of 700 l/s for attaining 4e-7 Torr or less after the vacuum vessel has been baked out and the surfaces well conditioned.

This effort includes procurement, fabrication/welding/assembly, installation, oversight, leak checking of the subsystems, installation procedures, refurbishment of legacy equipment as required and initial operation and testing.

Includes standard cabling, raceways, conduits and miscellaneous items

Includes piping and other miscellaneous items. Major components available from legacy equipment.

NCSX June 2007 ETC TABLE II - Materials and Subcontracts

WBS Number: 22 WBS Title: Torus Vacuum Pumping Systems Job Number: 2201 Job Title: Vacuum Pumping Systems Job Manager: Bill Blanchard

Materials and Subcontracts (M&S)

Description:

Included in Table I

Basis of Estimate

NCSX June 2007 ETC TABLE III - Fabrication and Installation

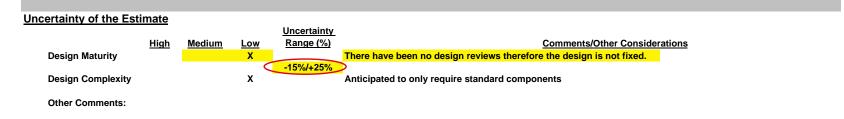
WBS Number: 22 WBS Title: Torus Vacuum Pumping Systems Job Number: 2201 Job Title: Vacuum Pumping Systems Job Manager: Bill Blanchard

In-house Fabrication and Assembly and Installation

Included in Table I

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

WBS Number: 22 WBS Title: Torus Vacuum Pumping Systems Job Number: 2201 Job Title: Vacuum Pumping Systems Job Manager: Bill Blanchard



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 Impact Schedule Impact
Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Low High Low High
NONE					

Notes:

 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
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
The schedule impact 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.
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%)