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 l/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.

Task ID	K$	Hours											Basis of Estimate
	M&S	EMEM	EMSM	EMSB	EMTB	EAEM	EASB	EAS2	EEEM	EESM	EESB	EETB	
Title I and II Design													**This is a relatively simple vacuum pumping system that will utilize major components (TMP, isolation valves, booster and mechnical pump) already at PPPL. Estimate based on prior experience on similar systems (e.g., NSTX), adjusted for the simplicity of this system. Input from experienced engineers/personnel familar 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.**
AC Power / Instrumentation													
AC Power for Backing System	$3.1K							72	16				
AC Power for Instrumentation Rack	$3.1K							88	24				
Rack to Instrumentation	$1.5K							40		48		16	
VPS (Mechanical)	$10.0K	208		96			64			48			
Subtotal Title I & II Design	***$17.7K***	***208***	***0***	***96***	***0***	***0***	***64***	***200***	***40***	***96***	***0***	***16***	**M&S includes standard cabling, raceways, conduits, etc. For VPS M&S includes piping and other miscellaneous items. Major components available from legacy equipment.**
Title III													**This effort includes both fabrication/welding/assembly, installation, oversight, leak checking of the subsystems, installation procedure, refurbishmnet of legascy equipment as required and initial operation and testing.**
AC Power / Instrumentation													
AC Power for Backing System												104	
AC Power for Instrumentation Rack												144	
Rack to Instrumentation												112	
VPS (Mechanical)					232								
Subtotal Title III	***$0.0K***	***0***	***0***	***0***	***232***	***0***	***0***		***0***	***0***	***0***	***360***	