NCSX Work Approval Form (WAF)

WBS Number: 21
WBS Title: Gas Fueling System
Job Number: 2101
Job Title: Fueling System
Job Manager: Bill Blanchard

Description:

The MIE project scope for the Gas Fueling System (WBS 211) is limited to a single gas injector system capable of injecting any one of the species of interest, H2, D2, or He gas, into the plasma at a time. The proposed fueling system consists of a gas delivery from a single gas cylinder and a gas injection portion consisting of one piezo electric pulse valve, one manual interface valve located at one of the upper P12 port covers. The pulse valve will be operated by a valve driver controlled by the NCSX computer system (greater than 50 T-l/sec fueling rate). In its final configuration, the system will have 2 to 4 injector systems capable of injecting H2, D2, or He gas into the plasma. The controls will be upgraded with a modern PLC controlling this and other systems.

Schedule:

See Attached

Approvals:

_____	_____
Job Manager	Date
_____	_____
Responsible Line Manager	Date
_____	_____
Project Manager	Date
_____	_____
Engineering Department Head	Date

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TABLE I - DESIGN LABOR

WBS Number: 21
WBS Title: Gas Fueling System
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Description:

The proposed fueling system consists of a gas delivery from a single gas cylinder and a gas injection portion consisting of one piezo electric pulse valve, one manual interface valve located at one of the upper P12 port covers. The pulse valve will be operated by a valve driver controlled by the NCSX computer system (greater than 50 T-l/sec fueling rate).

Task ID	K$	Hours									Basis of Estimate
	M&S	EMEM	EMSM	EMSB	EMTB	EASB	EEEM	EESM	EESB	EETB	
Title I and II Design											This is a relatively simple system that utilizes some existing parts/components already at PPPL. Estimate based on prior experience on similar systems (e.g., NSTX), adjusted for the simplicity of this system. Includes some P&ID drawings, weld drawings, fabrication drawings, two reviews (PDR & FDR) and installation and test procedures. Input from experienced engineers/personnel familiar with specific parts of this scope was used for estimates. Includes overall design and oversight, design activities (dwgs, support and bracket design, overall configuration of the system) and purchasing of components.
Preliminary Design / Management / Admin		32		24				24			
Drafting						8					
Final Design / Management / Admin		48		32				40			
Detail drawings						24					
Subtotal Title I & II Design		***80***	***0***	***56***		***32***	***0***	***64***	***0***	***0***	
Title III											This effort includes procurement, fabrication/welding/assembly, installation, oversight, leak checking of the subsystems, procedures, refurbishment of legacy equipment as required and initial operation and testing.
Oversight/Management	$5.0K	16									
Procurement				8				8			M&S included function generator/valve driver and miscellaneous
Fabrication				24	48						
Procedure and Installation		8		12	24			40			
Procedure and Testing		16		8				8			
Subtotal Title III	***$5.0K***	***40***	***0***	***52***	***72***	***0***	***0***	***56***	***0***	***0***	

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TABLE II - Materials and Subcontracts

WBS Number: 211
WBS Title: Gas Fueling Systems
Job Number: 2101
Job Title: Fueling Systems
Job Manager: Bill Blanchard

Materials and Subcontracts (M&S)	Basis of Estimate

Description:

See Table I

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TABLE III - Fabrication and Installation

WBS Number: 211
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In-house Fabrication and Assembly and Installation

Included in Table I

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 211
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Uncertainty of the Estimate

	High	Medium	Low	Uncertainty Range (%)	Comments/Other Considerations
Design Maturity			X	-15%/+25%	There have been no design reviews therefore the design is not fixed.
Design Complexity			X		Anticipated to only require standard components
Other Comments:					

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

Residual Impacts

Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Cost Impact Low	Cost Impact High	Schedule Impact Low	Schedule Impact High
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 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%