CLIC08 workshop

Cost requirements for CLIC

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Aim of the specification

- The present goal of the CLIC study is to have by 2010 a CDR and a cost estimate for machine versions with E_{CMS}=500 GeV and E_{CMS}=3 TeV.
- The CLIC estimates shall provide the cost by item of the PBS, but shall also allow extracting cost by type (i.e. commodities, labor, construction work …). Furthermore mechanisms to adjust for inflation and exchange rate variation shall be included. Those functionalities are essential for risk analysis. The possibility of parametric studies on machine design is desirable too, but is not of highest priority now, since all key machine parameters for the 2010 CLIC CDR are frozen.
- As input for the 2010 estimate we expect a total of about 500 system cost descriptions, contributed by about 25 persons.
- Presently the CLIC estimates are organized with EXCEL tables, but the CLIC cost study team wants to explore if the purchase or development of specialised software tools would be advantageous for the present purposes. Furthermore we would like to understand how such tools could integrate with a more general approach for project management tools for CLIC.
- **The CLIC cost estimate will be done in close consultation with ILC**. The ILC team so far also used Excel as main software tool. However, ILC has investigated the use of more specialised tools and works presently with a consultancy firm to define their future approach.

INPUT

- The CLIC project breakdown structure (PBS) is presently organized in a five level tree structure.

Level	0	1	2	3	4
Name	Project	Beam & Services	Area	Sub area	System

- The level 4 is repetitive for most level 3 entries, i.e. entries are vacuum, RF, magnets, … .
- After 2010 one or two more levels will need to be added to get description down to individual parts.
- Input for the cost study is requested for individual entries of the PBS using a standardized template. ➔ see next slide

Extract from PBS

ref: CLIC note 764

Last update:	*2008.07.04*	Main authors:	H. Braun, B. Jeanneret, J. Osborne,	
Version:	*1.1*		E. Tsesmelis	

level 0	level 1	level 2	level 3	level 4
Project	**Beam and Services**	**Area**	**Sub-area**	**Systen**
CLIC				
GR, 01.07.08	Main Beam			
		Injectors		
			Thermoionic gun unpolarized e-	
			Primary beam linac for e-	
			e-/e+ target	
			Pre-injector linac for e+	
			DC gun Polarised e-	
			Pre-injector l	
			Injector linac	
		Damping Rings		
			Pre-damping	
			Pre-damping	
			Damping Ring	
			Damping Ring	
		Beam transport		
			Bunch compr	
			Bunch compr	
			Booster linac	
			Transfer to tu	
			Transfer to tu	
			Long Transfer	
			Long Transfer	
			Turnaround e	
			Turnaround e	
			Bunch compr	
			Bunch compressor #2 e-	
		Linac Accelerators		
			Linac Accelerator e+	

level 3	level 4
Sub-area	**System**
Thermoionic gun unpolarized e-	
	rf system
	rf powering system
	vacuum system
	magnet system
	powering system
	cooling system
	beam instrumentation
	supporting system
	alignment system

TEMPLATE 1/2

PBS reference #	CLIC/Main and drive beam/linac accelerators
Element name	Two-beam module
EDMS link to element documentation	xxxx

Date of the estimate:	30.06.2008
Person in charge of the estimate	G. Riddone

CLIC Parameters set #n	3 TeV baseline			500 GeV baseline	Uncertainty
	3 TeV	1 TeV	500 GeV	500 GeV	
Tendering					
Fixed Costs	20	8	5	5	
Manpower	30	13	7.5	7.5	
Procurement					
Fixed Costs	500	208	125	125	
Manpower	50	21	12.5	12.5	
Manufacturing material costs	800	333	200	200	
Manufacturing labor	2500	1042	625	625	
Reception					
Fixed Costs	50	21	12.5	12.5	
Manpower	150	63	37.5	37.5	
Installation					
Fixed Costs	100	42	25	25	
Manpower	300	125	75	75	
Commissioning					
Fixed Costs	50	21	12.5	12.5	
Manpower	100	42	25	25	
Total per unit	0.222	0.278	1.333	1.333	MCHF
Number of units(two linacs)	20924	6975	3487	3487	
Total (two linacs)	4650	1937.5	1162.5	1162.5	MCHF

CLIC Parameters set #n	Date of estimate	Person in charge of estimate	

TEMPLATE 2/2

reference documents:

comments/remarks

Clarification

Tendering: design (single components and module), qualification tests prior to tech. specification, technical specification, tendering, contract adjudication

Procurement: fabrication, including assembly and QA, of main components: structures, quadrupoles , rf components, vacuum equipment, movers, girders, supports, instrumentation, sensors for alignment and stabilisation

Reception: activity done at CERN before the start of module assembly (component based)

Installation: assembly work at surface, preparation for transport, storage, transport, assembly work in the tunnel (module based)

Commissioning: tests in the tunnel before beam

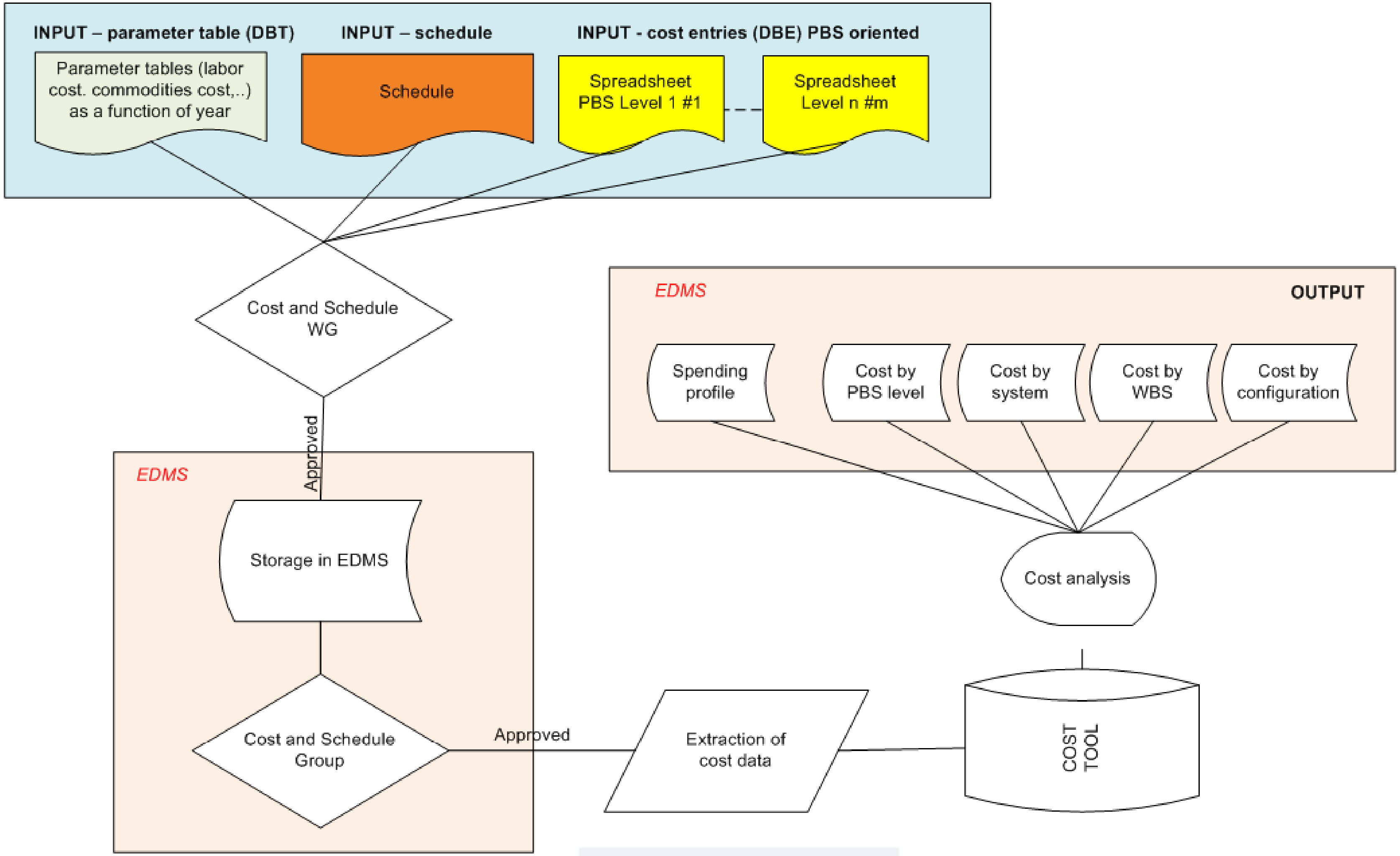
INPUT (cont.d)

- This template will be further developed to contain additional information like currency of estimate and assumptions for production schedule.
- The filled templates are the database entries (DBE) for the cost estimate. DBE input can be provided at all levels of the PBS, corresponding to different refinements of the cost estimate.
- One goal of the cost study is to load during the coming years all PBS entries with cost information.
- However, the CT has to be able to compute cost also for an incomplete database. For such a calculation the cost for a given entry of the PBS is computed by moving up the tree to the highest level with complete DBE information and summing all DBE entries at this level. ➔ see also FLOW DIAGRAM next slide
- The overall project schedule and the procurement schedule for each DBE has to be available to the CT in a yet to be defined format.
- Other inputs for the database are tables of currency exchange rates, cost of commodities and labor as function of time (DBT).
- Furthermore the CT has to take care of version management of the DBE, taking creation date and change history of each entry into account.

OUTPUT

- The CT has to be able to provide the summed cost estimate as well as the spending profile for each PBS entry with sufficient DBE information according to the algorithm described above. For these calculations the DBE input has to be computed with the parameters as provided by the DBT's.
- The CT shall allow analyzing the partition of cost at each PBS entry with sufficient DBE information according to the type of cost contribution as specified in the DBE template (i.e. manpower, material, design phase …).
  Again the cost shall be available either as summed cost or as a spending profile.
- The CT shall allow analyzing the partition of cost at each PBS entry of level lower than level 4 according to level 4 system type.

Model for cost management process



The cost for a given entry of the PBS is computed by moving up the tree to the highest level with complete DBE information and summing all DBE entries at this level

Future work

- Proposal for such a tool from CERN expert
- Investigation about possible industrial tool
- Understand how such tools could integrate with more general approach for project management tools