Costing LDC

ILC to exist has to be properly fully costed.

It has to have an acceptable cost
and we have to be essentially sure to be able to build it
with the expected performances,
within the price we have announced
without corrections (full costing, contingency, escalation).

Costing is expected to be the main output from the concepts.

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Costing a la ITER

The costing a la ITER is built from the WBS following the scheme:
Express input data in common terms
Compare and revaluate estimates from the different parties
Compare and arbitrate between the parties
The joint team analyse the proposals from the points of view of tooling, materials, work hours for each item and establishes its own estimate called « estimated cost ».

The costing has to estimate the human and money needs for construction, assembly and running.

Each item has to be described in the form of a « procurement package » containing detailed informations on functional needs, design, specifications, interfaces, all what is needed for industry to do the production and divide the contracts. This defines the technical budget or « core » to which will be added provision for contingency.

To express the data in a common way:

use of a common monetary unit, the Iter Unit of Account (IUA)
= 1000$ January 1989.
A conversion table for the different currencies was established
taking into account the change rates in january 1989
and an analysis on 4 years of the local inflation factors.
For materials and fabrication, the international market prices
are used wherever possible.

« Unified labour costs » were established for the main categories of work
and expressed for each item in IUA/kh.
The labour costs take into account the salaries and the « support costs » :
ressources, equipment, supervision, management, ...
The mean salaries were calculated for the different levels of qualification
type of work, normalising between regions.

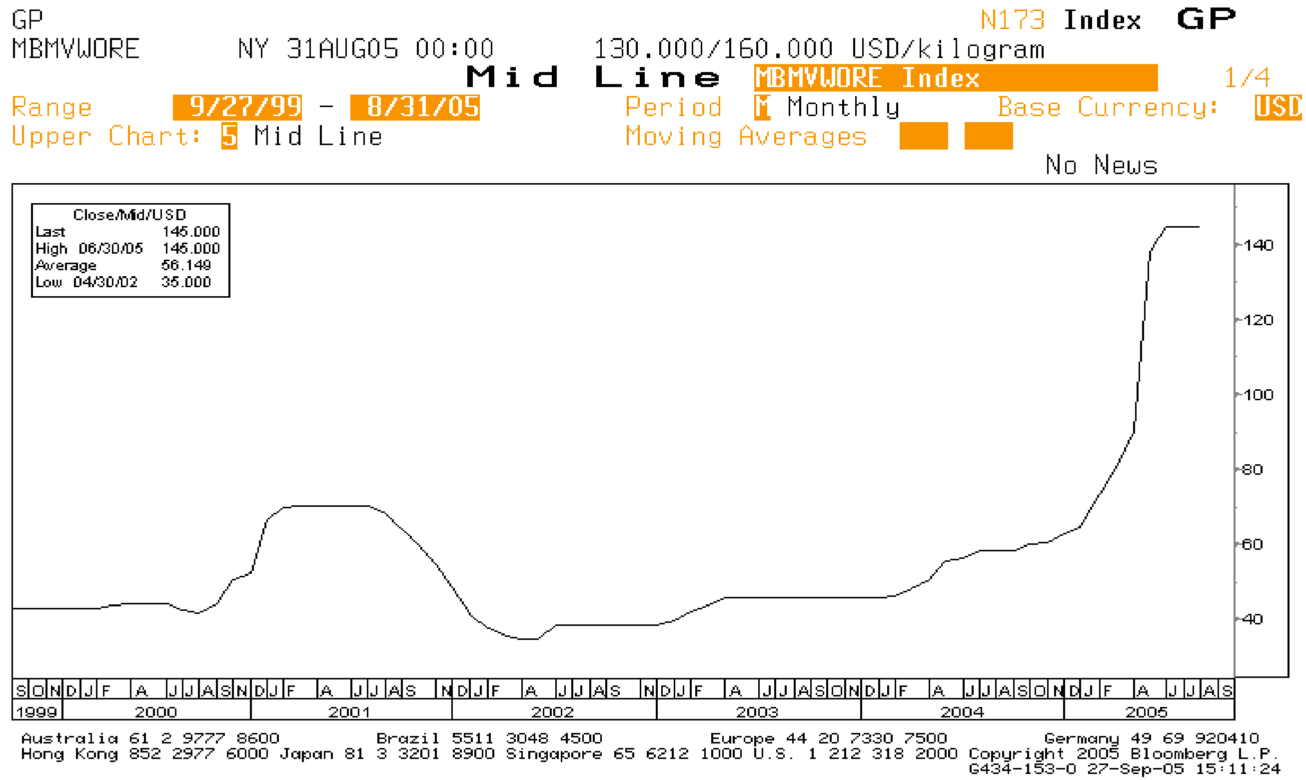
In summary, an ITER cost takes into account:

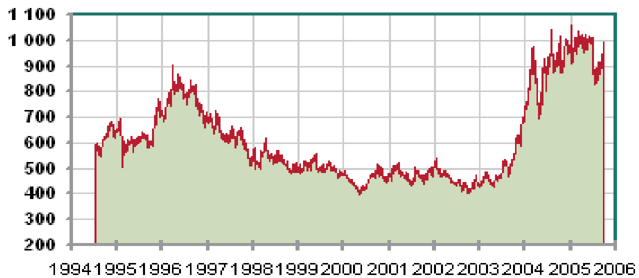
Construction and schemes for transfer to industry
Installation on site and assembly + diagnostics and tests
Interfaces
Ancillary and common systems
Cost of the management for construction and technical personnel support (including possible complements of R&D during construction)
Annual cost of operation, running, (energy, fluids, manpower)
and maintenance (spares and manpower)
Dismantling cost (taking into account the selling value?)

The probable inflation between the presentation of the numbers and the project execution has to be indicated.

Caveat:
take into account the inflation?
what about the huge moves in the price of the raw materials?

Tungsten





Lead in London

To cost the LDC concept (with options)
we need a fully defined baseline
for each item a description and a WBS (see below)

As the baseline is not written in the stone
we need some scaling laws for cost driving items.

In view of the fact that I did not get any information after Snowmass, I will take as cost contact for the different items the persons who have accepted to contribute to the outline document (not excluding any good will).
Then I will send them my own guess about their contribution asking them to rearrange, correct and provide the numbers.

Remember, we need it for Bangalore!

For each subsystem we need:
- a description
- a WBS

description:

Physics objectives

Detector principles

Dimensions

Interfaces: manipulation tooling, assembling in situ,
type and number of outgoing channels, transfer mo
fluids, volume, temperature

Spares

Schematic description:

general description to enable understanding of the interfaces

System : LDC PBS Number : 2.9.1

Sub- System : Barrel of the Electromagnetic Calorimeter (ECAL)

Characteristics : detectors : Si, 30, layers, pad size 1x1 cm^2

Absorber : W , 29 layers, 24 X0

Energy resolution : $\Delta E/E < ?$

Actives layers : Si detectors :

thickness =525μm , 1510 m^2

PCB : Thickness : 650μm, various size, 25200 units

Chips :TECH2 , 420000 units, 15 Mchannels

Power dissipation ; 100 μW/c

Ecal structure : Octagonal geometry,8 supermodules divided in 5 modules in length,

Pure W wrapped in Prepreg foils Total Weight : 82 t

Dimensions :

inner Radius : 160 cm Thickness: 17.4 cm length : 440 cm

W : 20 layers of 2.1 mm; 9 layers of 4.2 mm

(size of unitary plate + tolerance ???)

Interfaces Positionning and Attachment system :3 lines of rails per module

Fixation on the inner part of the Hcal with a Hcal/Ecal gap : 3 cm

Cooling :(depending on power dissipation)

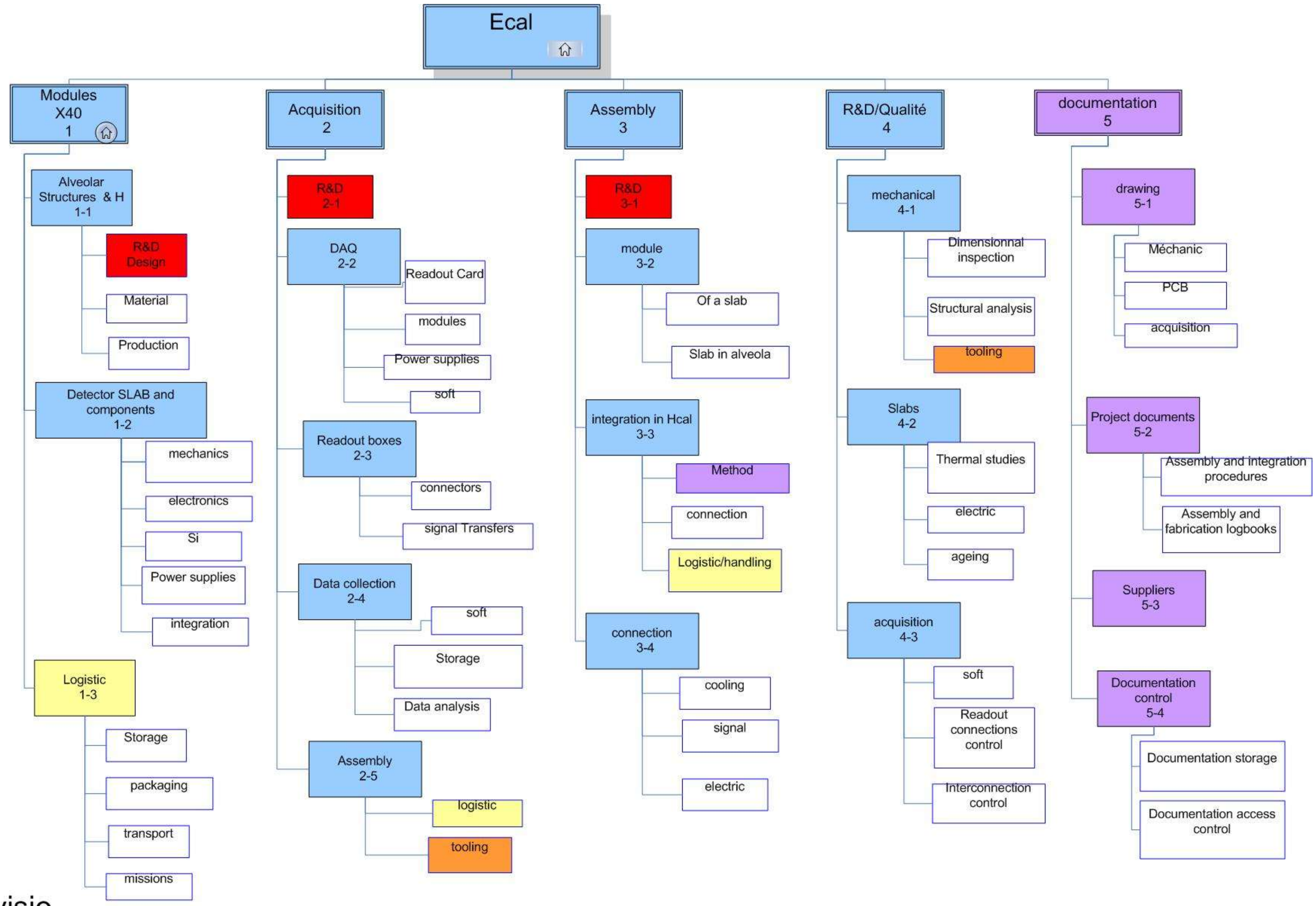
R/O electronics :15Mchannels, optical fibers , power lines Nber to be defined

Signal and fluid pipes in the Ecal and HCal mechanical gap .

Provide WBS

WBS Number			Detector concept / detector items	Unit	Unit cost (€	Quantity	total m&s	associated unit labor	labor cost
WBS Number			**LDC**						
1			Vertex detector						
2			Forward Tracker						
3			Luminosity Calorimeter						
4			Beam calorimeter						
5			Intermediate Tracker						
6			Silicon envelope						
7			Time projection Chamber						
	7.1		Field cage						
		7.1.1	inner						
		7.1.2	outer						
		7.1.3	central cathode						
		7.1.4	field termination grid						
		7.1.5	Assembly						
	7.2		Endplate						
		7.2.1	Mechanicalstructure and support						
		2.7.2.2	readout pads						
		2.7.2.3	gas amplification system						
	7.3		Gas system						
		7.3.1	recirculation system components						
		7.3.2	piping						
		7.3.3	gas properties monitors						
	7.4		Laser calibration system						
		7.4.1	Laser						
		7.4.2	laser transport						
	7.5		High voltage distribution						
		7.5.1	power supplies, cables, connectors						
		7.5.2	monitoring , interlocks, control						
	7.6		Readout electronics						
		7.6.1	front end readout						
		7.6.2	cables and connectors						
		7.6.3	cooling						
		7.6.4	back end readout						
	7.7		Assembly and installation						

8			Forward Chambers						
9			Electromagnetic Calorimeter						
	9.1		Barrel						
		9.1.1	Mechanics (material W&prepreg&mold, fabrication)						
		9.1.2	Detector (Si) and components (VFE, PCB)						
		9.1.3	DAQ						
		9.1.4	Calibration system						
		9.1.5	Assembly and installation						
	9.2		Endcap						
10			Hadron Calorimeter						
	10.1		Barrel						
		10.1.1	Mechanics (design,material, fabrication)						
		10.1.2	Photodetectors						
		10.1.3	Scintillators						
		10.1.4	Electronics, VFE, PCB						
		10.1.5	DAQ						
		10.1.6	HV/LV power supply and slow control						
		10.1.7	Calibration systems						
		10.1.8	Cabling and cooling						
		10.1.9	Assembly and installation						
	10.2		endcap Barrel						
11			Muon Detector						
12			Magnet						
	12.1		Coil						
		12.1.1	Conductor						
		12.1.2	winding operation						
		12.1.3	Internal cryogenics and suspension						
		12.1.4	tooling or assembly						
	12.2		Yoke and vacuum tank						
	12.3		ancilleries						
		12.3.1	cryogenic plant						
		12.3.2	Electrical power circuit						
		12.3.3	Control/monitoring system						
	12.4		Test , external manpower						
13			Electronics						
14			Offline computing						
15			Infrastructure						
16			Integration/installation						



Ecal.visio

17/08/2005

Cost of the coil

From F. Kircher

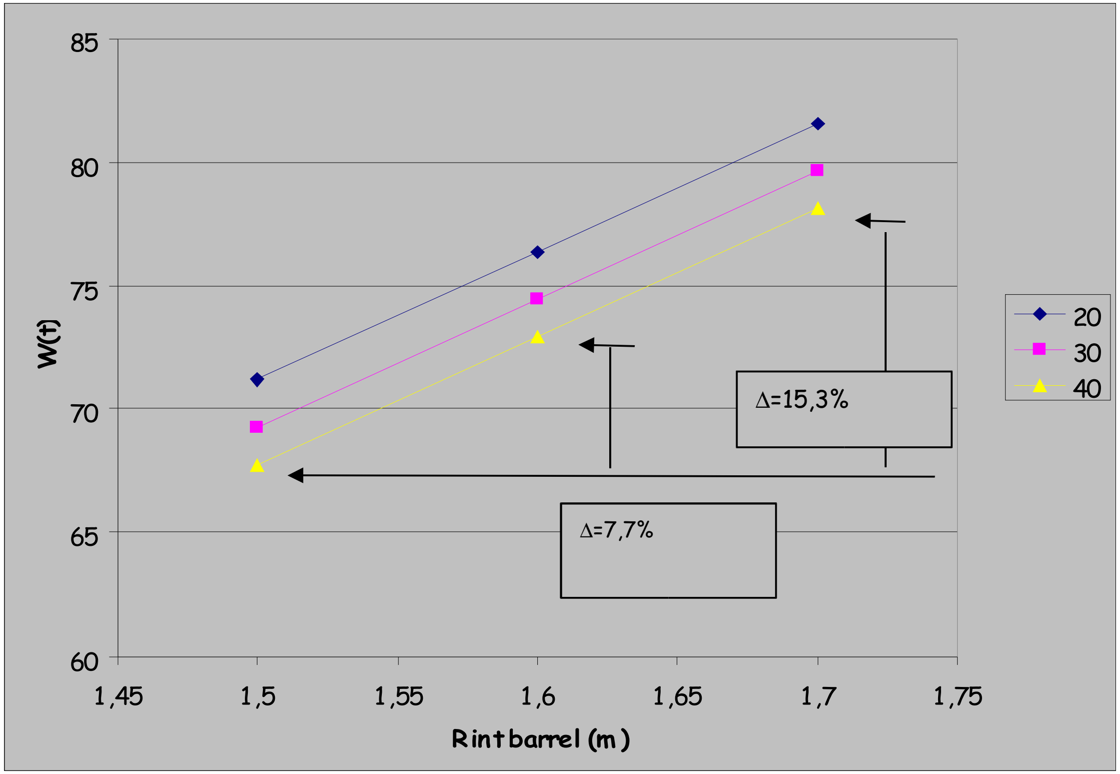
Item	Cost (Y 2000 M€)	
	Long magnet (9.25 m) (TESLA TDR)	**Short magnet (7.0 m)**
Coil		
Conductor	9.5	7.8
Winding operation	10.0	8.2
Internal cryogenics and suspension	3.0	2.5
Tooling for assembly	1.2	1.1
Total for coil	**23.7**	**19.6**
Yoke and vacuum tank		
Total for yoke and vacuum tank	**25.0**	**20.5**
Ancillaries		
Cryogenic plant	4.3	3.8
Electrical power circuit	1.9	1.5
Control/monitoring system	1.3	1.3
Total for ancillaries	**7.5**	**6.6**
Miscellaneous (external manpower, test…)		
Total for miscellaneous	**8.8**	**8.8**
Total for magnet	**65.0**	**55.5**

NB. The manpower costs listed are those for external manpower only (cost of manpower from laboratories is not included)

There is no contingency

Scaling laws.

- For the material, 25% increase per m for the barrel length, hence for the price.
- 7,5% increase for a 10 cm variation of the internal radius



That is my understanding of the problem

But we also need to have precise recommandations
from the adequate authority