Cost Estimates in Japan

for GG5 at Snowmass WS

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T. Shidara

1. Organization of ILC-Asia Costing
2. Method Used for Cost Estimation
3. Issues
4. What We Need
5. Comments to the Required List

1. Organization of ILC-Asia Costing

ILC-Asia Costing Coordinator : T. Shidara
with ILC-Asia WGs and LC office

Supporting Experts :
S. Noguchi, K. Saito (SC Cavities),
K. Tsuchiya, K. Hosoyama (Cryomodules & Cryogenic System),
S. Fukuda, H. Matsumoto (RF Sources & RF Components),
R. Sugahara (BT & Magnets),
H. Hayano (Monitors & LLRF),
M. Kuriki (Damping Rings & Injectors),
K. Furukawa (Control),
S. Ban (Radiation Safety),
A. Enomoto (Conventional Facilities)
+ LC Forum of Japan + Asian Labs

2. Methodology Used for Cost Estimations

Cost estimation related reports :

Enomoto et al for GLC Cost Estimation (2003-04)

Yoshioka et al for TESLA Assessment Task (2003-04)

With construction experiences of :

TRISTAN, KEKB, Electron/Positron Injector Linac, ATF,

(in future + XFEL, STF-I, STF-II, SMTF,)

References :

TESLA TDR

Report on the TESLA Engineering Study/Review (2001)

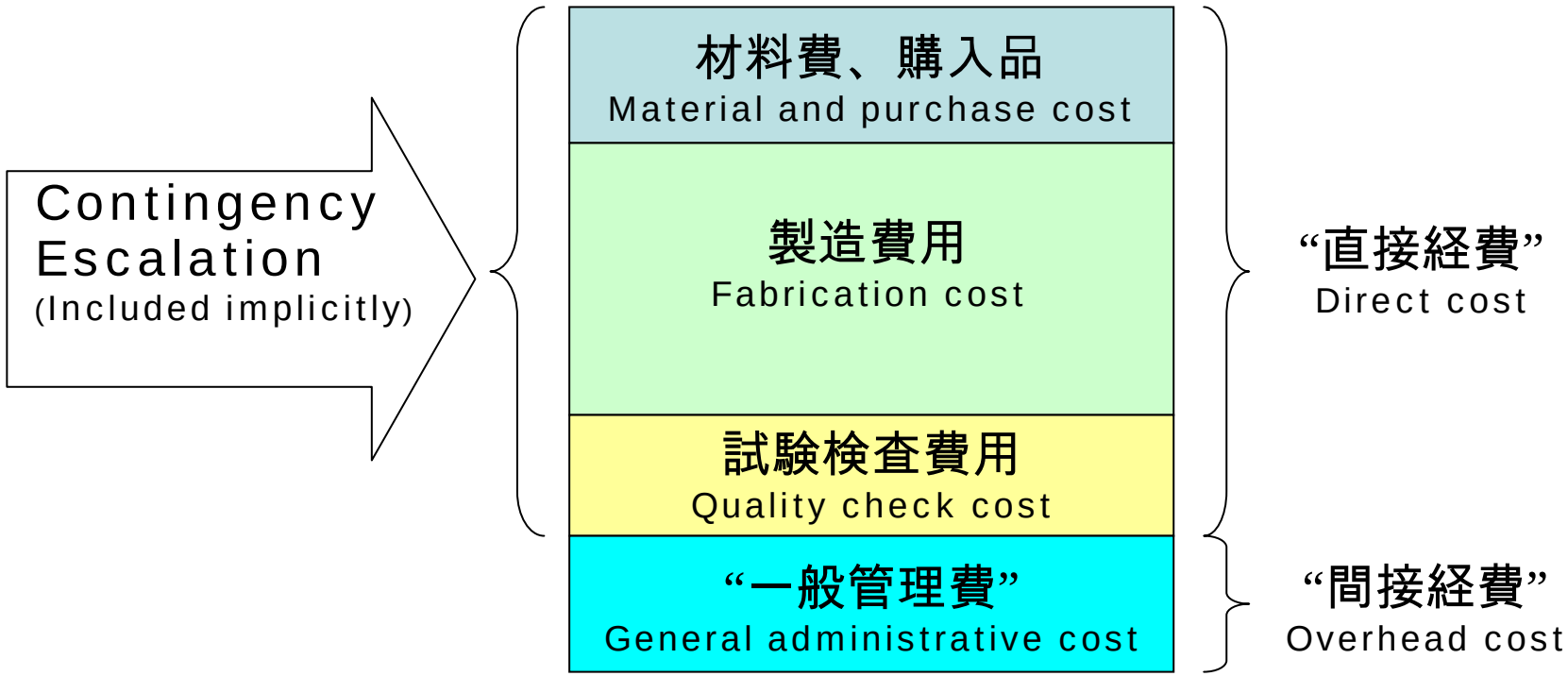
US Linear Collider Option Evaluation Study (2004)

Methodology Used for Cost Estimation

by Enomoto et al.

(1) Cost survey & scaling	Injector
(2) R&D cost x assumed reduction factor	Main linac components: Klystron, Modulator, Waveguides
(3) Cost evaluation based on a production model	Main linac structures
(4) Survey of known commercial data	Vacuum pumps, DC power supplies
(5) Industry estimate	Conventional facility

Japanese Industry Cost Estimation Form



Cost Estimation Method Differences

- The contingencies and escalations are included only implicitly in the Japanese project management
- The design and management costs are included also implicitly in the construction costs
- Salaries for the laboratory staff are not included; the salaries for out-sourcing staff are included
- All required R&D is charged separately before project

TESLA Assessment Task

by Yoshioka et al.

- **First Assessment Task:**

1. Technical assessment of TESLA500 original design

2. Cost evaluation based on KEK experiences of SRF

- **Second Assessment Task:**

Further technical assessment and cost evaluation for 21000 9-cell sections

What was clarified in the First Assessment Task

(1) The items, with small technical risks or global standards of cost, have small cost differences between the TDR and KEK evaluation

Examples: Civil engineering, Infrastructure (excluding cryoplants), Nb material, Surface treatment, Klystron

(2) Technical items specific to the TESLA scheme showed big cost differences

Examples: Cavity fabrication, RF power coupler, Cryomodule fabrication and assembling, Klystron modulator

(3) Others

Examples: RF power distribution systems, HV cables, Cryoplants →Present ”Standard” cost in Japan is high

Second Assessment Task for mass-production of 9-cell sections

1. Basic engineering design, fabrication method →KEK's responsibility
2. Principal contractor's responsibility→"high-tech" parts: EBW, QC, supervising sub-contractors, process management
3. Machining and cup forming→"conventional technologies" →order to small- or medium sized sub-contractors
4. EBW→dedicated high-speed machine with multi-chamber type , capital investments under KEK responsibility

Breakdown of TTF cost

Nb material cost	(1/3: 2.25 M yen)	TDR: 1.28 M yen
Fabrication cost	(2/3: 4.50 M yen)	TDR: 1.50 M yen

Further breakdown of the TTF fabrication cost (4.50 M yen)

EBW	49.3%	2.219 M yen
Machining	35.8%	1.611 M yen
Inspections, quality guarantee	9.4%	0.423 M yen
Cup forming	3.6%	0.162 M yen
Others	1.9%	0.086 M yen

Summary of the Second Assessment Task

	Unit Cost M yen	Sub-total B yen	EBW
TTF	6.75		Conventional multipurpose single-chamber-type
TDR	2.78	58.4	Dedicated high speed machine
First Assessment	8.36 excluding HOM couplers	175	Conventional multipurpose single-chamber-type
Second Assessment	2.97~3.46	62.4~72.7	Dedicated high speed machine

- There is a ***possibility for a drastic reduction*** in the fabrication cost of the 9-cell cavities including the material cost from the First Assessment when various conditions are given

- Further studies are needed for RF couplers, cryomodules, and klystron modulators

3. Issues

Baseline design :
one tunnel vs two tunnels, positron source scheme,
damping ring scheme, 1 TeV extension, 35 MV/m?, +++

Detailed design of each component :
cavity fabrication process, klystron modulator type,
power distribution scheme, +++

Industrialization : essential for cost estimation
STF, TTF, XFEL, SMTF, +++

Regional difference :
contingency, escalation, design and management costs,
salaries for lab staff, R&D charge, +++

4. What We Need

- Aside from the agreement over the contents of BCD, we need to initiate the development of sufficiently detailed WBS for practical cost evaluations
- Time schedule for cost studies
- Guidelines for the inter-regional cooperation and information sharing (for instance, detailed data for TESLA TDR)
- Guidelines for cooperation with the industrial sectors (regional and international)

5. Comments to the Required List

1) Current practice and methodology for Project cost and schedule estimates

   Enomoto et al for GLC Cost Estimation (2003-04)

   Yoshioka et al for TESLA Assessment Task (2003-04)

2) Process for establishing a set of “rules” for ILC cost and schedule estimates

   Do we need “rules” ? We really need BCD, time schedule and sufficiently detailed WBS, as well as guidelines for inter-regional cooperation, information sharing and cooperation with the industrial sectors.

Comments to the Issues – Continued1

3) How to handle contingency, overheads, “in kind” contributions, lab or university contributions etc. Each region is different.

Respect the regional difference; Contingency and escalation are implicitly included, and salaries for lab staff are not included in Japanese project. “In kind” contributions might be a baseline for International collaboration.

4) Include actual estimates for industrial work in a public cost estimate? Current practice is yes in US, but no in Europe, Japan?

Probably is no in Japan.

Comments to the Issues – Continued2

5) Profit: What is the correct methodology to include profit in estimates for industrial work?

?? Ranging from 10 – 30 % in KEK. 20 % is nominal.

6) Should ILC commission industrial cost studies of ILC in all 3 regions?

Yes, as long as assuming the construction of ILC by sharing three regions.