ITRP Statement on LC Costing

5 June 04

A difference in the costs between a linear collider employing a warm or cold technology is potentially an important discriminating factor in making the ITRP technology recommendation. For that reason, the panel has spent considerable effort gathering and analyzing all the information that is available regarding the total costs and the relative costs of the two options. We have had presentations by those who have performed the various linear collider cost estimates and comparisons. These discussions have included the DESY costing of the cold TESLA design (based largely on estimates from industry); the SLAC NLC costing of the warm technology (based on experience with the technical components and cost models for construction costs), and KEK GLC warm technology estimates (based mainly on Japanese industry estimates). All of the HEP laboratories have considerable experience estimating costs and building large projects to cost. Finally, we have investigated comparative costs of the two technologies done in a US Study, as well as a comparative study done at KEK. .

At this conceptual and pre-industrialized stage of the linear collider project we must recognize that uncertainties in estimating the total costs are necessarily large. Although it might be thought that relative costing could be done with more certainty, there are additional complications in determining the relative costs of the warm and cold technologies due to differences in design choices and differences in costing methods used in different regions. Some of the important contributors to the uncertainties are:

- There are significant uncertainties due to the current preliminary state of the R&D and design of important technological components employed for both a warm or cold machine.
- There are differences in design philosophy by the proponents that lead to difference in construction cost, as well as final performance. These cannot be resolved until a global and integrated design exists.
- The assumptions about industrialization/learning curves for some key components have large uncertainties at this early stage in the design.
- Present cost estimates have some regional philosophies or prejudices regarding how the project will be industrialized affecting the cost estimates. Contingency accounting, inclusion of staff cost for construction, accounting of R&D costs to further develop components and management overheads are other contributing factors that are not consistently included and therefore add uncertainty to cost comparisons.
- In an international project, the procurement of substantial parts of the collider will be from outside the regions that prepared the present estimates, and this can considerably alter the costs.
- The costs of operating the accelerator are also difficult to determine at this stage without a better definition of the reliability, access and staffing requirements as well as the power and klystron replacement costs.

We conclude that comparable warm and cold machines, in terms of energy and luminosity, will have total construction and lifetime operations costs that are within the present margin of errors of each other.

An independent international costing would be necessary to do more accurate costing, and even that is premature at this time and should follow a conceptual global design. Therefore, for the purpose of the ITRP technology decision, we have concluded that the costs differences between the two technologies cannot be considered to be an important discriminator in making the ITRP technology recommendation.