

NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

From technology to diplomacy

by Lyn Evans



On 21 February the International Linear Collider Steering Committee (ILCSC) handed over to the new linear collider structure. The Linear Collider Board (LCB), chaired by Sachio Komamiya, replaces ILCSC, and the Linear Collider Collaboration (LCC) replaces GDE and the groups working on physics and detectors for both the ILC and CLIC. The LCC of course also includes the CLIC study. Linear Collider Director Lyn Evans looks ahead.

IMAGE OF THE WEEK



DIRECTOR'S CORNER

ILC TDR cost under review

by Barry Barish



The final deliverable of the Global Design Effort, the ILC Technical Design Report, was completed and submitted in draft form to the International Linear Collider Steering Committee in November 2012. Following a successful technical review of the design in December, an International Cost Review was conducted in February of the value estimate. The cost review validated the TDR value estimates, and pointed out other costing efforts that will be needed as the ILC becomes a site-specific construction project.

Cherry seed colliders unite

by Barbara Warmbein

According to Linear Collider Deputy Director Hitoshi Murayama, the Large Hadron Collider is a collider of cherry pies, with lots of cherries, pastry and cream flying off in all directions, while what scientists are really after is the collision of two cherry seeds, he said at the 21 February press conference for the start of the Linear Collider Collaboration. Watch the video of the press conference - in both English and Japanese - [here](#).

VIDEO OF THE WEEK

Higgs session at Moriond

Video: IN2P3

The Moriond conference, one of the most central physics conferences where latest results are presented to the community, is in full swing. Yesterday, Wednesday, was entirely dedicated to "The SM Scalar boson" - or, in other words, the new particle discovered at the LHC. Both the CMS and ATLAS experiments presented their latest results, and it seems that the new particle is compatible with a Higgs boson. The summer conferences will see even more updates - and maybe a confirmation? Find out more about yesterday's talks by watching the webcast, kindly made available by IN2P3.



IN THE NEWS

from *The Japan Times*

5 March 2013

[A chance to host linear collider](#)

To increase its chances of hosting the ILC, the government should clearly explain the merits and demerits of the ILC project experiments to the public in an objective way so that meaningful discussions on the project can be held.

from *New York Times*

5 March 2013

[Chasing the Higgs Boson](#)

At the Large Hadron Collider near Geneva, two armies of scientists struggled to close in on physics' most elusive particle.

from *The Guardian*

3 March 2013

[Steven Weinberg: 'I wanted to be on the in – privy to all the secrets of physics'](#)

The real problem will then be how we get government to build the next facility – these things have gotten so expensive I don't know how that's going to be possible. We really should begin that work now because it takes so long to get these things built that if we don't start now we're going to have a very long hiatus.

from *symmetry magazine*

22 February 2013

[Linear collider plans move forward](#)

A new international organization will guide the development of a \$7.78 billion particle accelerator that could be heir to the Large Hadron Collider.

from *mainichi.jp*

22 February 2013

[次世代加速器:リニアコライダー実現求め科学者が新組織](#)

宇宙誕生の謎に迫る大型実験施設「国際リニアコライダー」の実現を求める世界の科学者たちが、日、国際研究を中心的に進める新たな組織「リニアコライダー・コラボレーション」を設立した。日本を含む各国政府に建設への協力を働きかけ、施設の詳しい設計を進める。

from *Global News*

21 February 2013

[Physicists team up in Vancouver to tackle mysteries of the universe](#)

VANCOUVER – Some of the world's greatest minds have collided in Vancouver and agreed to build a new US\$7.78-billion particle collider that will help answer some of the universe's deepest secrets.

from *Times Colonist*

21 February 2013

[Physicists team up in Vancouver to tackle mysteries of the universe](#)

VANCOUVER – Some of the world's greatest minds have collided in Vancouver and agreed to build a new US\$7.78-billion particle collider that will help answer some of the universe's deepest secrets.

from News 1130

21 February 2013

Next physics mega-project could boost the local economy

When you start talking about quarks, anti-electrons and the Higgs boson, most people get lost very quickly. But there are real-world implications, as TRIUMF at UBC hosts a meeting of the leaders of the major high-energy physics laboratories around the globe, including a potential boost to the local economy if a major, multi-country project goes ahead.

from Castanet

21 February 2013

Physicists design new particle collider

"Everyone wants this collider to go forward, and the technology or which one is which is sort of a secondary concern," he said. "It's like everyone is going to start rowing in the same direction."

from The Province

21 February 2013

Physicists meeting in Vancouver agree to build a new particle accelerator

Meyer said physicists from all over the world working on the two projects met at TRIUMPH in Vancouver on Thursday and have agreed to form a team to develop a new particle accelerator.

CALENDAR

Upcoming events

Calorimetry for the High Energy Frontier (CHEF2013)

Paris, France
22- 25 April 2013

Upcoming schools

Joint Universities Accelerator School (JUAS 2013)

Archamps, France
07 January- 15 March 2013

CERN - Latin-American School of High-Energy Physics

Arequipa, Peru
06- 19 March 2013

Excellence in Detectors and Instrumentation Technologies (EDIT 2013)

KEK, Japan
12- 22 March 2013

[View complete calendar](#)

PREPRINTS

ARXIV PREPRINTS

[1303.1087](#)

Dark matter within the minimal flavour violation ansatz

[1303.0289](#)

Higgs diphoton rate and mass enhancement with vector-like leptons and the scale of supersymmetry

[1302.6587](#)

Naturalness and the Status of Supersymmetry

[1302.6481](#)

Effective Field Theory Analysis of New Physics in $e+e^- \rightarrow W+W^-$ at a Linear Collider

[1302.6302](#)

Further Studies of Higgs Properties at An ILC \sqrt{s} Collider

ANNOUNCEMENTS

2013 Europhysics Conference on High Energy Physics takes place in Stockholm, Sweden, from 18 to 24 July

The [2013 Europhysics conference on High Energy Physics](#) will take place in Stockholm, Sweden, from 18 to 24 July 2013. Parallel and plenary sessions will be held at the Royal Institute of Technology (KTH) and the Aula Magna at Stockholm University, respectively. The programme includes sessions on the Standard Model and Beyond, Electroweak Symmetry Breaking, Neutrino Physics, Flavour Physics, Detectors and Data handling, Accelerator R&D, Future Facilities and many more. There will also be a joint ECFA EPS session on Particle Physics after the European Strategy Update on 20 July. Visit the [conference website](#) or download the [first bulletin](#).

Snowmass Energy Frontier workshop at Brookhaven

The [agenda](#) of the joint meeting of the Snowmass Energy Frontier working groups at Brookhaven from 3 to 6 April is [now online](#) (click on Agenda). *Registration is available at the same site.*

Submit your papers for Snowmass 2013

The Snowmass 2013 Community Summer Study on the future of high-energy physics encourages the submission of papers to its electronic proceedings. Submitted papers may be White Papers on specific topics or more technical contributions that illuminate questions asked by the study. We welcome anyone or any group in the international high-energy physics community to submit a paper to the study.

[...Read more](#)

DIRECTOR'S CORNER

From technology to diplomacy

Lyn Evans | [7 March 2013](#)



The new LCC directorate: Mike Harrison, ILC Director; Hitoshi Yamamoto, Detector Director, Steinar Stapnes, CLIC Director, and Lyn Evans. Hitoshi Murayama (not pictured) is Deputy Director. Image: LCC

Let me take this opportunity to acknowledge the enormous achievement of the very small GDE team, led by Barry Barish. They have produced the *Technical Design Report*, which has been favourably reviewed by an independent expert committee. The TDR also contains a detailed cost estimate which has also been independently reviewed and has proved to be robust – see Barry’s Corner for more detail on the cost review. I would also like to acknowledge the work of the physics and detector community, led by Sakue Yamada. They are in the process of finalising the *Detailed Baseline Design (DBD)* report.

The mandate of the LCC is strongly supported by the recent update of the proposed European Strategy for Particle Physics (still to be endorsed by the CERN Council). For CLIC, “*CERN should undertake design studies for accelerator projects in a global context, with emphasis on proton-proton and electron-positron high-energy frontier machines. These design studies should be coupled to a vigorous accelerator R&D programme, including high-field magnets and high-gradient accelerating structures, in collaboration with national institutes, laboratories and universities worldwide.*”

For ILC, “*There is a strong scientific case for an electron-positron collider, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of the International Linear Collider (ILC) has been completed with large European participation. The initiative of the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. Europe looks forward to a proposal from Japan to discuss a possible participation*”. The next step in developing a world consensus is the “Snowmass” process which is now underway. Hopefully the result of these discussions will lend as strong support to the ILC from the US HEP community as has been shown by the European Strategy Group.

The new structure of the LCC Directorate is very light. Hitoshi Murayama will be my deputy, who will mainly be responsible for explaining the scientific case for the ILC to governments and the public. Steinar Stapnes will continue in his role as Director of the CLIC effort and Mike Harrison will take over the ILC. Hitoshi Yamamoto, as Detector Director, will take on the difficult task of bringing the experimental community together so that they are capable of building two state-of-the-art detectors. Regional representation and coordination will be strengthened by appointing regional members (of the directorate?) for Europe and the Americas. For the moment it is considered that the representation from Japan is adequate and regional advice will be sought case by case as the ILC project develops.

The GDE has left the ILC in very good shape. Although continuing R&D is still needed to try to further reduce the cost and to prepare for a possible construction project, the main thrust of the effort must now move to a diplomatic campaign to convince governments to participate in the construction of a first-rate laboratory that will further the world’s efforts in understanding the fundamental nature of matter.

[CLIC](#) | [EUROPEAN STRATEGY FOR PARTICLE PHYSICS](#) | [ILC](#) | [LINEAR COLLIDER COLLABORATION](#) | [PHYSICS AND DETECTORS](#) | [SNOWMASS](#) | [TECHNICAL DESIGN REPORT](#)

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DIRECTOR'S CORNER

ILC TDR cost under review

Barry Barish | [7 March 2013](#)



The ILC international cost review was carried out at Oakley Court in Windsor, UK, where the "Rocky Horror Picture Show" was filmed in 1975.

The final deliverable of the Global Design Effort, the ILC *Technical Design Report*, was completed and submitted in draft form to the International Linear Collider Steering Committee (ILCSC) in November 2012. Following a successful technical review in December, an international cost review of the TDR ILC value estimate was chaired by Norbert Holtkamp of SLAC in February. The total TDR value estimate averaged over the three regional sites is 7.8 BILCU (Jan 2012 US\$), plus an explicit labour estimate averaged over the three regional sites of 23 million person-hours. The international cost review validated these TDR value estimates, as well as pointed out other costing that will be needed as the ILC becomes a site-specific construction project.

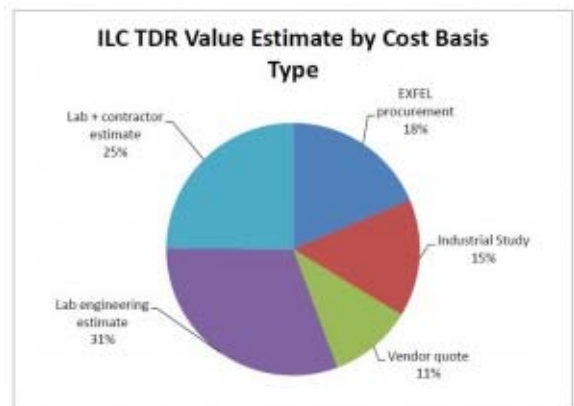
Costing international projects, like the ILC, is a particularly challenging undertaking. The project will involve the collaboration of countries from around the world that all have different traditions and conventions for planning and cost-estimating large projects. The "value" methodology, which we have adopted for the ILC, is independent of any particular country-specific system, while being compatible with conversion to any such system. Value is an especially useful concept for dividing up a project where collaborators mostly contribute equipment "in kind," because of the large differences in manufacturing costs and in labour rates around the world. Converting value estimates to country costing is accomplished by adapting to the local costing practices.

The ILC TDR value estimate is for a machine of 500 GeV centre-of-mass energy, but includes some items rated for 1TeV to enable a later energy upgrade. The reference currency (the "ILCU") is the United States dollar (USD) as of January, 2012. A very important consideration is how to relate the currency in one country to that in another for providing the goods and services in an international collaboration. In order to eliminate regional price distortions related to exchange rates, conversions from other currencies to ILCU are based on purchasing-power-parity (PPP) indices published by the Organisation for Economic Co-operation and Development (OECD).

The ILC TDR value estimate gives the resources required to build the ILC, as described in the *Technical Design Report*. We expect that the project will be supported by a mixture of cash and in-kind contributions from a collaboration of countries around the world. The ILC TDR value estimate should allow funding agencies in nations that are considering in-kind contributions to the ILC project to assess the nature and scope of resources needed for their part of the project. We provide detailed information on the cost basis, drivers and trade-offs that can be used in the pre-construction phase for further cost-optimisation of the project through value engineering and R&D.

The ILC TDR value estimate consists of two important parts:

- **Value** (in terms of currency units) for items procured from vendors. The value of a component is defined as the lowest reasonable estimate of the procurement cost of an item with the required specification and in the appropriate quantity, based on production costs in a major industrial nation.



An illustration of the cost basis by type for the ILC TDR value estimate.

Labour (in terms of person-hours). In this context, Labour is defined as “explicit” labour, which may be provided by the collaborating laboratories and institutions, or may be purchased from industrial firms. This to be distinguished from a company’s “implicit” labour associated with the industrial production of components and contained (implicitly) within the purchase price.

The total TDR value estimate for the cost of the ILC design as will be presented in the *Technical Design Report*, averaged over the three regional sites, is **7.8 BILCU**, plus the explicit Labor estimate, averaged over the three regional sites, is **23 million person-hours**. We estimate the uncertainty in these costs at this stage of the project at about 24%. (The estimates above include the small changes recommended by the cost review committee). The cost chapter of the TDR will contain details of these costs by subsystems and will be released as part of the TDR in June.

The international cost review committee reviewed the value estimates in detail with respect to the following charge given to them by the ILCSC:

- Assess the methodology and costing guidelines used for the TDR cost estimate, including the use of Purchasing Power Parity to convert regional currencies to a common ILC unit.
- Evaluate the reliability and robustness of the estimate, together with its associated uncertainties, for the baseline 500 GeV machine.
- Assess the quality and completeness of the cost estimate.
- Evaluate the procurement and industrialisation models used to establish the estimate.
- Review the proposed project schedule, taking into account the tasks and manpower required each year.
- Assess the list of the cost drivers to be addressed through future R&D and value engineering.
- Comment on the cost estimates for a 250-GeV machine, a 500-GeV machine with a luminosity upgrade, and a 1-TeV machine, together with the assumptions that underlie them.

The committee responded to this charge, reviewed our estimates and summarised their conclusions as follows:

“In responding to the charge, the review team assessed the overall quality of the design and the cost estimate and determined that it is sufficient to begin the preparatory activities for construction and to steer the future R&D program. The team also concluded that the quality of the TDR and its associated cost document, as well as the supporting documentation, is sufficient to begin negotiations among contributing parties and government agencies to determine how to execute the project. As compared to other projects of similar scale (ITER, LHC, ATLAS, CMS, ALMA, XFEL, FAIR, ESS, SSC) the quality of the documentation presented by the GDE team is equal or superior to that utilized to launch into a similar process. The TDR is a robust estimate for its intended purpose and, as expected for an estimate at this stage, there is a substantial list of recommendations that should be addressed at an appropriate time.”

In addition, the committee went beyond the charge.

Looking at the project more broadly and going beyond the charge, they discussed project management, engineering design and cost areas not included in the TDR. Specifically, the committee considered the next pre-construction steps before beginning a construction project. As a result, they encouraged the ILC organisation to focus on several key areas, including:



- “Develop a plan for the next (transitional) phase of engineering design leading to readiness to start construction.
- Develop key deliverables and prioritized activities and milestones needed for start of construction.
- Seek funding for these activities and support for sufficient manpower commensurate with a project of this magnitude.
- Create a resource-loaded schedule that takes into account the comments in this report, and re-evaluate the manpower distribution, capital needs and space requirements.
- Conduct site-specific engineering studies to a level allowing construction to start.
- Update the cost estimate and schedule with key missing items.
- Develop a preliminary ILC Project Management Plan that is suitable for negotiation with potential collaborators.”

In the words of the cost review chair, Norbert Holtkamp, “We did not quite stick with the charge only. Our real question was: What does it take to bring this facility from inception to physics? The TDR stops really at the Design/Costing/Planning level.”

This important review provided validation of the value costing in the TDR, as well as very useful guidance for the future. The combination of the Cost and Technical Review were discussed by the ILCSC on 21 February in Vancouver, and as a result they have approved the TDR, conditional on our making a few specific changes recommended by the reviews. We are now incorporating those changes and, as a result, we remain on track to complete the TDR as planned for release in June.

I end today by noting the terrific job of leading the GDE costing effort by Gerry Dugan (Cornell), who led the effort and the successful review of the ILC value costing that will now be incorporated into the TDR.

More explanation of the ILC value costing can be found [here](#) .

[COST ESTIMATE](#) | [COST REVIEW](#) | [ILCU](#) | [LABOUR](#) | [TECHNICAL DESIGN REPORT](#) | [VALUE ESTIMATE](#)

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IMAGE OF THE WEEK

Cherry seed colliders unite

Barbara Warmbein | [7 March 2013](#)



Image by Marcello Pavan, TRIUMF

According to Linear Collider Deputy Director Hitoshi Murayama, the Large Hadron Collider is a collider of cherry pies, with lots of cherries, pastry and cream flying off in all directions, while what scientists are really after is the collision of two cherry seeds. The ILC and CLIC, by contrast, are colliders of cherry seeds, he explained at a [press conference](#) at TRIUMF laboratory in Vancouver to mark the beginning of the Linear Collider Collaboration.

“Throwing two cherry seeds at each other is difficult, but you can see clearly what’s going on – and for the ILC that is similar to what happened in the early Universe,” he said when asked about the fundamental differences between LHC and the linear collider. Detector Director Hitoshi Yamamoto added that once the LHC discovered the Higgs, “at the ILC we can do in a day” with the Higgs what it would take the LHC several years to accomplish. Linear Collider Board chair Sachio Komamiya estimated that some 80 to 90 percent of collisions at the ILC would feature the Higgs, making it easy to fund and study in detail. Barry Barish made the new value

estimate for the ILC public at the conference. Watch the video of the press conference – in both English and Japanese – [here](#).

[ILC](#) | [LHC](#) | [LINEAR COLLIDER COLLABORATION](#) | [PRESS CONFERENCE](#)

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VIDEO OF THE WEEK

Higgs session at Moriond

Video: IN2P3 | [7 March 2013](#)

The Moriond conference, one of the most central physics conferences where latest results are presented to the community, is in full swing. Yesterday, Wednesday, was entirely dedicated to “The SM Scalar boson” – or, in other words, the new particle discovered at the LHC. Both the CMS and ATLAS experiments presented their latest results, and it seems that the new particle is compatible with a Higgs boson. The summer conferences will see even more updates – and maybe a confirmation?



Find out more about yesterday's talks by viewing the [individual talks](#), or all of the [event webcasts](#) kindly made available by [IN2P3](#).

[BOSON](#) | [HIGGS](#) | [LHC](#) | [MORIOND](#)

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