

LHC Cost Review to Completion:

At the CERN Finance Committee and the Committee of Council on 19-20 September, CERN management presented a review of costs to completion in 2006 of the LHC project. The present document is a review of the background, evolution, and facts behind these costs. It is intended to provide an informed briefing for all CERN staff, users and collaborating institutes.

BACKGROUND

The LHC project was approved in 1996 with a budget for materials of 2600 million Swiss francs for the completion of the accelerator and the experimental areas. In addition, the CERN contribution to the LHC experiments was budgeted at 210 million Swiss francs. It was understood that other costs relating to the project, i.e., LEP dismantling, consolidation and upgrading of the pre-LHC accelerator system (PS, SPS, ion injection), and prototyping for magnets, cryogenics and vacuum systems, would be absorbed within the CERN budget up to 2009. There was no contingency for unexpected developments in the project.

COST REVIEW

Cost overruns in different areas were announced to Council in 1999 and 2000 and CERN management prepared to provide a full cost review of LHC. During 2000, extensive reviews were launched concerning detector costs and the computing infrastructure which would be needed to cope with the enormous data flow that will come from the LHC.

In late 2000 the central issue which dominated the planning of the laboratory was whether or not the LEP accelerator should extend its run throughout the year 2001. The decision to continue the LEP experiments would have had major repercussions on the final costs of LHC. It was thus impossible to make a reliable assessment of the final cost of construction of the accelerator until the difficult decision to close LEP had been made.

The Director-General launched a full review of accelerator costs in early 2001, with all groups concerned with LHC providing accurate figures of costs to completion. An essential element in the costing of the LHC project is the final price of the assembly of the 1236 superconducting magnets and their associated cryogenic systems. The final tenders for these contracts arrived in August 2001 and are still under negotiation.

THE FIGURES

For the sake of clarity, we quote here the figures given in the Finance Committee and the Committee of Council in September. The final figures for the November Finance Committee are being prepared – there will be only minor variations.

LHC project costs increases

Project	1996 Budget (million CHF)	Cost increase (million CHF)	2001 Total (million CHF)
LHC machine and experimental areas	2600	480	3080
CERN share of detector costs	210	50	260

The main categories for cost increases are: magnet assembly, civil engineering and industrial services for infrastructure and installation.

There are other essential components for the LHC, that were not part of the original budget package, which have to be absorbed within the CERN budget. For example, the prototyping research and development for the superconducting magnets has cost 150 million Swiss Francs.

In addition, the CERN computing infrastructure at the centre of the GRID, the revolutionary solution to LHC computing needs, is costed at 120 million Swiss Francs.

Finally, confirmed contributions from non-Member States fall 50 million Swiss Francs short of the target estimated in 1996.

It is important to realize that the costs above do not represent a bill which has to be paid immediately, but are total extra costs to the completion of the project. The current period for which these costs should be paid from the CERN budget is 1996 to 2009.

Many of the costs which are given above were difficult to predict in 1996. However, they are also unavoidable for the successful completion of this extremely challenging technological project.

The cost increase presented in the table corresponds to a 19% overrun. It compares favourably with other projects of this complexity involving many international and industrial partners and a duration of over ten years.

This percentage, however, together with other expenses not foreseen in 1996 represent a large sum of money. We are aware that providing the additional resources needed will require major efforts from the member state governments and funding agencies.

THE FUTURE

The Committee of Council has asked the CERN management to present to the Finance Committee on 6 November 2001, scenarios, including financial and management measures, to confront the budget challenge. This document is being actively prepared and will certainly contain the following components to assure the future financial stability of the project.

1. Internal organization and economies

The time span until completion of the project in 2006 is now short. Consequently, new methods of monitoring and controlling expenditure will be established to enable immediate reaction to budget developments. There will be great austerity

demanded from all sectors of the laboratory, with discussion of slowing down or possibly stopping non-LHC activities.

2. Extending the period of repayment of loans

Time has been recognized from the outset as a possible LHC contingency. The 1996 plan foresaw the need for loans to absorb peak expenditure within a constant budget. The extra costs could in part be absorbed within the CERN budget by extending the period of repayment of LHC beyond 2009.

3. Possible extra contributions from Member States

CERN management will ask Member States to examine the possibility of extra contributions, particularly for the expenses not foreseen in 1996.

The meeting of Finance Committee in November will be the next step in a discussion and collaboration with CERN council and delegates. A solution will only be found with the advice and input of the various scientific and political committees of CERN.

CONCLUSION

The technical foundation of the LHC project is rock solid. All the many technological components and programs which are working in parallel towards the successful completion of the accelerator are progressing extremely well. This is due to the competence and commitment of personnel at CERN and at the collaborating institutions.

All the cards are now on the table. There are cost increases from the original budget, but they are not running out of control, and compare favorably with other similar scientific endeavours of this scale.

CERN's capacity to absorb these extra costs for LHC has been severely limited by the large reduction in the CERN budget and staff which was decided in 1996 at the time of LHC final approval. Support from the governments and funding agencies of the Member States is now essential to reach a solution.

There is no smoke without fire. The Laboratory's management has been criticized for its handling of the current situation and there are lessons to be learnt. Greater transparency of the financial evolution of the project and better communication by the management both to Council members and the CERN staff would to a large extent have reduced the shock which followed the announcement of the cost increases. This will not happen again. Building on the motivation and competence of CERN staff, and with the support of the governments and scientific communities of the Member States, we are confident that the challenges now confronting this unique scientific enterprise, the LHC, can be met.

Luciano Maiani