WHERE IS CERN GOING?

Communication to ACCU from the CERN Management

December 4, 2002

1. INTRODUCTION

– A year ago, the detection of a sizeable cost overrun in the LHC Project prompted an in-depth analysis of organization and functioning of CERN and of the LHC Project;

– Investigations have been carried out inside CERN by the Internal Audit Service and by five Task Forces;

– An External Review Committee was appointed by Council in December 2002, chaired by Dr. R. Aymar.

– The External Review Committee (ERC) has presented its Report to the CERN Council (CERN/2444) in June 2002.
– Council has decided to accept the ERC’s recommendations considering them as a well-balanced set of measures for the future of CERN;

– Council noted that the ERC’s recommendations were coherent with the reports of CERN’s internal Task Forces, the new LHC Status Report and the Medium-Term Plan presented by the Management at this June 2002 meeting

– Management has presented in September an ACTION PLAN, to implement the ERC recommendations in the short and medium period.

• From the outset, CERN Management has pursued a balanced package of measures to solve the crisis:
  
  • Reduction of non-LHC programme and savings in normal operation;
  • Revision of the LHC schedule, required by the slow start up of industrial production of LHC components;
  • Prolongation of the LHC repayment period to 2010.

• First proposal made by CERN Management in March have been finalised in the Medium Term Plan 2003-2006 presented in June.

• We are now submitting to the Council in December 2002 a revision of the 1996 agreement, as a new basis for the completion of the LHC.
SUMMARY

1. Baseline Plan 2003-2010, overview
2. Focussing CERN on the LHC
3. The accelerator programme in 2002
5. LHC
6. The 2002 Manpower review
7. Conclusions


This is the conclusion of the complex processes set in motion by the 2001 Cost to Completion Review;
It builds on a very large amount of work (Task Forces, ERC, Medium Term Plan, Action Plan)
Aims at replacing the 1996 framework, in the light of the new cost of the LHC
New elements:

Manpower review (preliminary results)
Proposal for Local Staff (presented in TREF)
Indexation of the LHC project
Progress in setting up a loan from EIB
Annual LHC Cost and Schedule Review.
The Plan rests on **Seven Pillars:**

- They support each other;
- Together make a tough but viable plan for the realization of the LHC in 2007;
- Represent the meeting point between bottom-up and top-down approach

The Plan is finalised to the construction and financing of the LHC;

it provides a base-line only, certainly not an optimal picture of what CERN could do for European Particle Physics in the long run;

CERN’s know-how and infrastructure under used.

We hope Council may reconsider the scientific activities, with more resources added (P&M!)

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### Seven Pillars

**Activity Programme**

- MTP 2002 (SPC/811; FC/4567)
- LHC in 2007;
- Limited scientific and R&D programme.

**Resource Plan: Material**

- MTP 2002 (SPC/811; FC/4567)
- LHC cost to completion; Contingency
- Savings in Industrial Services
- Local Staff: M ® P transfer if established.

**Resource Plan: Manpower**

- CERN/FC/4628
- CERN-wide analysis for the period 2003-2010

**Indexation of the expenditure budget during the LHC construction period**

- CERN/FC/4619/Rev
- Builds a margin against cost escalation of LHC contracts

**Monitoring and Control Tools**

- Action Plan (FC/4591; CC/2461)
- Finance and Programme Control;
- Earned Value Management;
- Annual LHC Cost & Schedule Review, first resue;
- Audit Committee.

**Indexation of MS/HS Contributions over the period**

- Baseline LTP (CERN/SPC/818;FC/4629)
- Indexation to keep purchasing power over 2003-2010

**Loan from the EIB**

- FC/4608
2. Focussing CERN on the LHC

- The reduction of the broad scientific programme has continued after LEP2000.
- The whole of CERN is committed to the LHC, with a limited number of ring-fenced parallel activities
  - To keep a minimum of scientific diversity (COMPASS, long base-line neutrino beam, low energy antiprotons, low energy nuclear and neutron physics)
  - To preserve vital options for CERN’s future (CLIC/CTF3, the design of the Super-conducting Proton Linac).

Resources for the LHC

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
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<th>2002</th>
<th>2003</th>
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<tbody>
<tr>
<td>Fraction of Material Budget to LHC</td>
<td>51%</td>
<td>49%</td>
<td>54%</td>
<td>67%</td>
<td>75%</td>
</tr>
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2003-2010, Personnel+Material
3. The accelerator programme in 2002

2002-Distribution of particle beams accelerated in the PS

Total: 2.71E+19 protons

Ions:

5.5 E+15 charges of

- SPS
- East Hall
- MDs
- AD
- TOF dedicated
- TOF parasitic
SPS Performance

### Total protons delivered to all targets from 1993 to 2002

- **1993 without T9**: 0.0E +00
- **1994**: 2.0E +18
- **1995**: 4.0E +18
- **1996**: 6.0E +18
- **1997**: 8.0E +18
- **1998**: 1.0E +19
- **1999 without T9**: 1.2E +19
- **2000 without T9**: 1.4E +19
- **2001 without T9**: 1.6E +19
- **2002 without T9**: 1.8E +19

### Ions: Charges on Targets (92—02)

- **1992**: 0.0E +00
- **1993**: 1.0E +16
- **1994**: 2.0E +16
- **1995**: 3.0E +16
- **1996**: 4.0E +16
- **1997**: 5.0E +16
- **1998**: 6.0E +16
- **1999**: 7.0E +16
- **2000**: 8.0E +16
- **2001**: 9.0E +16
- **2002**: 1.0E +17

**Last Value 18-10-2002**: 1.56E+15

The Scientific Programme

Budget line for Fixed Target Experiments established from 2006 onwards

dotted lines = = extensions yet to be approved
Cold antihydrogen atoms produced at CERN

- The first controlled production of cold antihydrogen atoms at the Antiproton Decelerator (AD) facility has been announced by the ATHENA Collaboration, Sept. 19.
- anti-hydrogen atoms have been produced by mixing cold clouds of trapped positrons and antiprotons.
- Copious production of Antihydrogen confirmed by ATRAP Collab., Oct.11, which provided the first determination of quantum state of antihydrogen atoms after recombination
NA48/2: New Drift chamber Read-out

- Designed around the F1 TDC chip
- Prototypes were beam tested in 2001
- For our application, the production TDC needed beam tuning
- The two lost weeks were compensated by 8 day extension of the SPS proton run

The new read out was instrumental to run at higher intensity

STATUS of COMPASS

- Year 2002 run quite satisfactory
- Complete spectrometer on the floor
- All detectors OK
- Some problems with RICH1
  BUT CHERENKOV RINGS ROUTINELY RECONSTRUCTED
- Complex FE/RO/DAQ system OK
- CDR OK
- 5000 million events collected and being analyzed in the farm
CERN NEUTRINOS TO GRAN SASSO
Underground structures at CERN

Excavated July 2002

2800 m of tunnels
45000 m$^3$ of excavation

27 Sept. 2002: view inside the target chamber towards the decay tunnel
Technology Developments

- R&D activities, both for accelerators and detectors, have been significantly reduced.
- accelerator R&D resources are focused on the Test Facility III of CLIC (Compact Linear Collider) and on the front-end of SPL (Superconducting Proton Linac).
- CERN is participating in the definition of a European network for accelerator R&D, under the auspices of ECFA, for an application in the FP6.
- Technology Transfer and Education projects are being carried out with substantially external funding, or resources generated by our own income,
- Special technologies such as surface treatment will continue at a reduced level.
Recent result - A 30-cell structure with tungsten irises and low $E_s/E_A$ reached 125 MV/m average accelerating gradient (tested with beam)

150 MV/m accelerating gradient in first cell! (but only 16 ns pulse length)

ACCU, Dec. 4, 2002

CERN

Education and Technology Transfer

ETT Division, established in year 2000

Technology Transfer

- 20 patents,
- 24 licencing agreements,
- 12 TT projects (in majority with external financing, sometime from UE),
- 51 Collaboration Agreements,
- 5 new companies,
- Patenting and licensing,
- TT Projects in partnership,
- Collaboration Agreements,
- Creation of new companies,
- Consulting,
- Training.
SC Cable Production

Brugg machine repaired
CMS cable production finished
New cabling machine due for next spring
• Dipole and quadrupole production is now ramping up. Tooling is in place and is consistent with the peak production rate required.
• Cable production is now close to the rate needed. The Brugg machine is back in operation.
• The LHC project is fully committed to the present schedule.

The LHC Dashboard

• To monitor the progress of LHC
• Can be accessed from the LHC project home page:
• Shows progress of:
  – SC Cables
  – Dipole assembly
  – Progress of installation
  – …
• Note the Disclaimer:
  – Not a contractual document
  – Does not engage CERN
• … but we hope it will increase transparency of the process
Annual LHC Cost & Schedule Review

• Panel
  – J. Peoples (FNAL), Chair
  – R. Bacher (DESY)
  – M. Cox (JET)
  – M. Harrison (BNL)
  – M. Pannier (Min. Finances, France)
  – A. Wrulich (PSI)
• Met on Oct. 21 to 23
• Panel shall meet twice a year;
• Conclusions to be included in the December 2002 LHC Status Report.

Annual LHC Cost & Schedule Review (cont’d)

• Three main recommendations (my recording from the wrap-up session)
  – Cost estimate stable over last year: to take on board;
  – Schedule demanding, not risk free but to be adopted;
  – Earned Value Management crucial, software adequate, implementation difficult (“changing the tires of a car running at 60 mph”!) but necessary.
LHC Experiments

- All four LHC experiments are fully engaged in the construction phase, to have detectors ready for the LHC physics run in 2007.
- experiments have agreed to live within the limits of the pledged funds at any time.
- ALICE, ATLAS and CMS are having to face up to the reality of the likely available funds compared with their Costs to Completion.
- contingency plans have been reviewed by the LHCC and presented to the RRBs: staging and deferrals of items that will only be needed later for high-luminosity running.
- No cost over-run has been identified so far by LHCb, and it is planned to start physics with the complete detector.

LHC Detectors

- M&O MoU now being signed
- 2002 M&O …. ~80% paid
- 2003 M&O …. approved
LHC Detector Construction

- Installation and Integration Reviews
  - annual reviews of the installation and integration plans of each LHC experiment established
  - completed for CMS and ATLAS
- Increased managerial role of the Technical Coordinators
  - relevant EP groups have been made directly responsible to the Technical Coordinators
- Integrated Planning of the LHC Machine, Experimental Areas, and Detector Construction and Commissioning
  - Joint meetings in place since early 2001

LHC Computing

- Of particular interest, in view of the LHC Programme, is the work on computing facilities for physics data analysis and computational Grids, and on advanced electronics techniques for detector readout systems.
- The R&D phase (phase 1) of the LHC Computing Grid (LCG) project started in 2001. The construction phase (phase 2) of the LCG project will extend over 2006-2008.
6. The 2002 Manpower Review

- Bottom-up Manpower Review started in summer 2002
- Detailed instruction given to Divisions and Sectors for uniform format and criteria
- Reference: personnel expenditure as embodied in MTP 2002 (which reflects the 1996 Personnel Plan)
- Boundary conditions:
  - Activity programme
  - Industrial Service savings as planned
  - Identify perspective Local Staff and its present cost
- DG + Directors toured in September all Divisions, separately, and later the four Sectors
- Final conclusions in an off-CERN meeting of Directorate + Division Leaders+Planning Officers (Oct.28-29)

P+M

- Goals:
  - Full transparency of real costs of all CERN activities
  - Instrument for divisions to optimise resource allocation
- All budgets expressed in P+M
- All Sector and Divisional complements in CHF
  - Ensures flexibility (divisions can change between P and M)
  - and responsibility (divisions pay for their choices and receive the benefits)
- Rules of the game are important:
  - Guideline for ratio Limited Duration/Indefinite contract is essential for future flexibility (1:2, at least)
  - General support to extend LD contracts up to 9 years maximum.
  - Category 2 vs Category 3 staff
  - Consider other type of resources (project associates etc.)
- But no rigid rules: Sectors/divisions have to optimise within P+M framework, which may lead to more manpower.
Local Staff

- Approach confirmed (Task Force 4).
- Proposals to be presented for decision by FC and Council in December.
- Importance of gradual implementation and need for selectivity.

Insourcing/outsourcing

- Outsourcing done and is correct. Don’t go back on general principles.
- Manpower contracts must be correctly outsourced
  - Field support units
  - Local Staff (Career Paths A and B)
  - absorbed in Complements (C and up)
- Some services still to be outsourced:
  - mail service,
  - additional training
- Re-insourcing on the base of a business plan (cost/benefits) to be made on a case by case basis. Few cases under discussion
Human Resources Plan 2003-2010

Figure 4 - Programme allocation including Local Staff (FTES)

Human Resources Plan 2003-2010

Figure 6 - CERN staff members by age
Fellows & Associates Programme

- *Given the importance, Council should discuss scope and means of a focussed training programme at CERN.*
- 20% reduction (41MCHF) from 2003 to 2010;
- guideline to minimize the impact on fellows and on the LHC;
- Opportunities for Fellows is provided by the recent open policy of EU (DGXII) towards European Research Organisations;
- CERN asked to organise the Special Workshop of Marie Curie Fellows (October 3-4).

7. CONCLUSIONS

- With the Human Resources Plan completed, all the elements for the Long Term Plan are on the table
- The Plan we shall present in December fits in the financial framework presented in June 2002 (MTP)
- To proceed with LHC spending and to finalise the EIB loan, the decision on LTP in December is mandatory.