

## 21<sup>st</sup> Meeting of the LHC Resources Review Board RRB Held at CERN on 17<sup>th</sup> October 2005

Documents can be found at the URL <http://committees.web.cern.ch/Committees/LHCRRB/>

### Papers and Presentations

CERN-RRB-2005-061 Agenda

CERN-RRB-2005-060 Minutes of the Previous Meeting

CERN-RRB-2005-083 M&O Scrutiny Group Report

LHC Status Report Presentation

LHC Dashboard <http://lhc-new-homepage.web.cern.ch/lhc-new-homepage/>

CERN-RRB-2005-111 M&O Scrutiny Group Presentation

### 1. Introduction - J. Engelen, Chief Scientific Officer

J. Engelen welcomed RRB delegates to this 21<sup>st</sup> session. The minutes of the April 2005 Plenary Session, CERN-RRB-2005-060, were approved without comment.

J.Engelen reviewed the topics on this agenda and pointed out the important discussions scheduled for the parallel sessions on the subject of LCG, which was now at the stage where agencies could begin the process of signing the MoU.

### 2. CERN Status and News – R. Aymar, Director General

R. Aymar welcomed the attendees to the October 2006 RRBs. He noted that his presentation would consist of two opposing points of view, one technical, where he was quite satisfied and proud of what was happening, and one administrative, where there were very difficult future financial problems.

Technically the highest priority was the LHC and the progress in the past six months had been very great indeed. R. Aymar was personally convinced that they had overcome all technical difficulties, such that the installation was now proceeding as fast as possible. The production of components was now going well, such that the challenge was to find the right number of teams to install them. They had taken a small risk in deciding not to fully test every cryogenic sector before installation of the magnets, but the full testing of the first 600 metres of sector 7-8 had been successfully completed. He noted that one should be grateful to those involved for completing this important milestone on time. This news had been well received by the Council. The process of testing the QRL on a larger scale was now continuing. He now saw no reason why the date for achieving first collisions by the summer of 2007 should be in jeopardy. The timescale was very tight but everything needed was in place and even if one could not guarantee the date they could guarantee the effort would be made to achieve the date.

For the detectors the effort and the progress had been as great as that for the machine, perhaps larger. One should be grateful for all those working very long hours for these goals. For the computing one could see that the service challenges had demonstrated notable bandwidth and simultaneous working to the tier 1 centres, and there remained two further service challenges in order to make sure that sufficient capacity was available for 2007. There were no known show-stoppers. The difficulties of manpower in the experiments and in the software production were known and this had now been put as a priority. It might be necessary to divert some money from the materials budget into manpower. He repeated his plea that the second phase of LCG be supported by voluntary contributions to a higher level that was currently the case, which was at a very small level.

Therefore for the three fronts of the LHC, machine, detectors and computing, he thought that they were well on the way to first collisions by the summer of 2007 and he encouraged everyone, funding agencies and collaborations, to make every effort in order that achieve this. It was very important in view of the competition with Fermilab to avoid any further delay. On the financial side as well delay meant extra money.

Coming to the administrative side, he noted the situation was difficult. In June the CERN budget, which was proposed to stay at the same level as 2005, had been rejected. The budget would be probably around 10 million CHF less than the previous year. The deficit at the end of 2006 would be around 1 billion CHF and so the 10 MCHF made little difference at first sight. However the real concern was what would happen in the following years of operation of the LHC and paying back the debt. There would be no money to do anything else, and this situation he found personally unacceptable. He did not know what could be done about this but everyone should be aware of the danger for the future of the discipline and the future of CERN. If no solution were found, the years 2007 to 2011 could be very difficult and frustrating.

In April there were discussions of the shortage of money needed to complete the detectors to be ready to run on time. It would be a great pity not to start on time because of a shortage of tens of millions in a budget of billions. He had proposed a plan such that funding agencies could commit to the money now and CERN would, by adding to the deficit, cover the cash flow of these loans, to be paid back by 2010. He maintained this policy because he believed it was the right one. He trusted that this RRB would allow a firm picture of these plans by the funding agencies to become clear. Giving a firm commitment to the money needed to complete the experiments would allow everyone to put these problems behind them.

### **Discussion**

R. Wade was concerned that the date of summer 2007 was not credible. The Director General emphasized that summer 2007 indeed meant the three months June 21 to September 21. He noted that it was always wrong to give in to the idea that this was not possible and that he saw no reason today why one should not make every effort to achieve this date.

T. Ferbel noted that the Director General had made very positive remarks about the computing but he had heard that ALICE was in serious trouble concerning the provision of tier 1 resources. R. Aymar noted that ALICE had very large computing needs, comparable with ATLAS or CMS, although the experiment was in all other senses smaller. CERN would provide for ALICE its correct share of the resources, and the collaboration would have to see how to provide the rest.

The Director General emphasized an important message concerning computing. The EU had funded EGEE with a large amount of money and in so doing had greatly helped LCG. However in reality Europe was not interested in particle physics alone, but wanted this infrastructure for other sciences and industry as well. It was very important to be aware of this in our strategy. If those outside particle physics did not see an appropriate return from EGEE he doubted whether such support would continue for long. He knew that this had been understood by the experiments.

### **3. LHC Machine Status Report – L. Evans, LHC Project Leader**

L. Evans presented (transparencies available on the LHCRRB web site) the current status of the LHC machine. At the previous meeting in April 2005 the first dipole had just been lowered into the tunnel. There were currently 120 magnets installed and the number one priority was the reliability of the underground transport vehicles. There had been a number of electrical problems and in heavy duty operation, where they had to travel large distances underground, there were problems with over-heating. They were now modifying the cooling systems to fix these problems. They had just moved to a 6 day week for magnet installation. If that rate of installation was not

fast enough they would move to a 7 day week. He was surprised by the remark that the summer 2007 date was becoming less credible. Within the project the contrary was true.

Looking at the LHC dashboard (see URL above) and some of the leading indicators one could see that deliveries of many of the supplies were now essentially finished such as the superconducting cable. The number of cold masses dipoles had reached nearly 900 out of 1200 and one of the manufacturers had completed his work. All magnets should be delivered to CERN by autumn 2006 as required to meet the schedule. Similarly the quadruple cold masses were well on schedule. The cryodipole overview dashboard showed the full picture including the fully installed magnets. This rate of installation needed now to be increased and he was confident that with the steps outlined above they would be able to achieve this.

They had started the process of interconnecting the magnets. This was a complex task as could be seen from his photographs. Progress was slow, as was normal at the beginning, and the crews were learning how to improve the rate of interconnections.

In the insertion regions there were inner triplet quadrupoles for focussing the beams down to the detectors. These were produced in the USA and Japan. The first such triplet had been pre-assembled above ground and would be moved to the point 8 tunnel the next week as the first of the special magnets to be installed.

He showed the dashboard overview of the cryogenics systems. A great improvement since the previous meeting could be seen. The QRL had been a major problem but they had now almost completely recovered from that situation. More than 80% of the incorrectly manufactured elements had been repaired. The manufacturing rate of the remaining elements had been doubled. QRL was being installed currently in 4 sectors and QRL supports in a fifth sector. Sector 8-1 was the sector completely installed by the manufacturer Air Liquide and was now awaiting pressure testing and cool down. The cool down of this whole sector of 3.8 kilometres would be an important milestone before the end of the year. In this sector they had installed a little over 100 dipoles. Sector 4-5 was being installed by the contractor and this was almost complete. A pressure test was foreseen before the end of the year, ready for magnet installation starting in January. Sector 3-4 was also being installed by the contractor and this was going very well. Sector 7-8, where a large part had been installed before they discovered the problems, and which was taken over by CERN, was used for a successful cool down test of two sub-sectors of about 600 meters. The heat losses agreed very well with that expected. This sector would now be the subject of a crash installation programme. This sector was foreseen for a test transporting a beam along the whole sector for the end of 2006.

In conclusion the main objectives were to terminate the installation of the machine by the end of 2006, thus allowing the closure of the interconnects by February 2007, and to start the cool down of the whole machine in order to get first collisions during the summer of 2007. The ramping up of industrial scale installation was the main problem at this stage. Another problem was finding the additional manpower for the next eighteen months, and they had been pleased by the response to the Director General's request, including that from Member and non-Member States.

## **Discussion**

R. Wade congratulated the project on the very encouraging progress that had been made. He was concerned that the experiments might be trying to meet false objectives given the necessary steep increase in the rate of installation of the cryodipoles. L. Evans agreed that they needed to increase to a rate of 25 per week, and also needed to complete the interconnects at a matching rate. They were not there yet but they were preparing themselves to get there. They had agreed with the experiments and the CSO that if they saw, by late spring 2006, a delay that could not be recuperated, then they would not hide that. The Director General noted that the detectors and the machine needed to work together, and that one should also ask whether any serious delays in the

detectors needed to be communicated to the machine builders. J. Engelen noted that this was indeed the agreement in force for about a year.

R. Wade asked whether the RRBs could visit the LHC tunnel. L. Evans replied that this was harder to arrange for a large number of people than a visit to the experimental caverns since there were more constraints such as oxygen masks. For a few individuals something could be arranged.

The Chairman thanked L. Evans for his presentation.

#### **4. M&O Scrutiny Group Report – M. Morandin, Chairman M&O SG**

J. Engelen introduced M. Morandin as the chairman of the M&O Scrutiny Group of the RRBs. The presentation can be found on the RRB web pages.

M. Morandin described the procedures followed by the Scrutiny Group. They had divided into sub-groups for much of the work. He acknowledged that they had benefited greatly from the depth of knowledge displayed by the Resource Coordinators and the quality of the documentation supplied. They had appreciated the timely delivery of written responses to the SG questions.

He presented the M&O Category A approved budgets and actual expenditure (excluding power) for the years 2002 to 2004 for all four experiments. In relative terms the two lines were getting closer, reflecting perhaps experience gained in projecting the needs. One reason for the differences were the unpaid contributions from the funding agencies. He noted that the latter could have a serious impact as the M&O budgets approached steady state and he acknowledged the efforts made by CERN and the collaborations to reduce the level of missing payments.

The Scrutiny Group had been solicited to make a proposal on how experiments should handle such budget surpluses and had agreed a recommendation, namely:

- Any surplus, defined as the difference between the budgeted and the actual expenditures, incurred in the year N should be entered as an initial income into the preliminary budget of year N+2

This timing was compatible with the book closing. The LHCb experiment had the largest cumulative surplus in relative terms and proposed to implement the principle but with a gradual approach. Half of the outstanding surplus would be entered into the 2006 budget.

There were a number of common issues worked upon by the Scrutiny Group, notably:

- Core computing
- Invoicing CERN Services (power distribution, cooling and ventilation etc.)
- Status of Collaborative Tools
- Further harmonisation of budget reports and projections.

The invoicing of CERN services was by now essentially a closed issue. The phrase “status of collaborative tools” concerned the provision of efficient audio and video collaborative communications, which were believed essential for the operation of the LHC collaborations and which did not appear to be adequate at present. The SG believed that the provision of such tools was mainly the responsibility of the host laboratories. For experiment-specific installations the SG accepted that M&O costs were eligible for inclusion in Cat. A budgets. However, the Scrutiny Group wished first to see a plan by CERN, describing the installation of these tools. Finally there had been work on harmonisation of the reporting by the experiments and this could continue.

A number of experiment specific issues had been discussed with the Resource Coordinators and had led to refinements of the estimates. Morandin showed the M&O category A profiles for the four experiments out to 2010 and noted that 2006 was a year in which there would be steep increases as more detectors were installed and became operational.

Core Computing was the subject of a specific addendum to the M&O MoU approved by the RRB in April 2005. Category A was comprised mainly of manpower for technical service tasks and was mostly expected to be manned through in-kind contributions. Category B represented a large effort, up to 60-70 FTE for ATLAS and CMS, and should be provided on a voluntary basis and shared amongst a fraction of the Institutions (up to 50%). Several aspects had been examined in detail by the SG. Detailed explanations had been provided by the experiments in written form and the cost for personnel had been revised with common estimates agreed across the experiments.

The number of posts required by the experiments was derived in two parts. The first came from the specific list of tasks to be included in Cat. A budget and which had been defined in the addendum approved by the RRB in April. Differences between the experiments were due to the specific computing strategy adopted and the level of expertise available amongst the collaborators. The second ingredient was the number of FTE's per task. The estimates were based on the computing models of the experiments and the real experience acquired so far. The SG was informed that the experiments' projections of manpower resources were being examined in the context of the Computing TDR review. The SG might return to this issue next year.

He showed the proposed staffing levels by experiment in Category A Core Computing, noting that LHCb was in a special position and did not at this point envisage anyone in this role. The SG believed that the sharing of core computing costs among Cat. A and Cat B. as proposed by the experiments was sound and well motivated. It might well require further refinements in the light of experience. The SG was concerned by the considerable impact created by the large number of positions requested by ATLAS and CMS in Cat. A budgets. Collaborations were encouraged to look carefully for future opportunities to find alternative solutions to hiring staff under Cat. A.

The RRB Scrutiny Group recommended that the 2006 estimates for the M&O budgets of the experiments be approved by the appropriate RRBs.

The SG took the opportunity to remind the RRB how essential it was for the experiments to receive contributions to the Cat. A accounts in a timely manner (50% to be paid by the end of February and the remaining 50% to be paid by the end of June).

M. Morandin thanked A. Ceccucci, H. Gutbrod and E. Tsesmelis for having served three years on the SG, and expressed special appreciation for the contributions of the CERN members whose help had been crucial to the success of the SG activity.

## **Discussion**

R. Wade asked why, given that the funding agencies pay their final instalments by June, the surplus at the year end could not be fed back by June of the following year. Morandin noted that this would require a further set of invoices in the middle of the year which would arrive after some funding agencies had already paid. He considered that the mechanism with N+2 was more practical and also gave the experiments more flexibility in handling any missing contributions.

J..Engelen thanked M. Morandin for his report and presentation.

## **5. Summary**

The dates of the next RRBs were agreed as the 24<sup>th</sup> to 26<sup>th</sup> April 2006 and 23<sup>rd</sup> to 25<sup>th</sup> October 2006. These dates were on the RRB website. There being no questions and no further business, the Chairman closed the meeting.

C. Jones  
November 2005