CERN – RRB – 2002 - 108

21 September 2002
Revised 17 October 2002

M E M O R A N D U M

To: Members of the RRB via R. Cashmore / DG-DI, Chair

From: M&O Scrutiny Group[1]

Subject: M&O Scrutiny Group Report (October 2002 RRB)

Introduction

After the April 2002 RRB meetings, the Scrutiny Group met once at the beginning of September in order to review the "A" and "B" costs for the years 2003 and 2004. In the conclusion of its April report (CERN – RRB –2002 – 036) the Scrutiny Group wrote "…. the M&O cost estimates given by the Collaborations for the years 2002 and 2003 are sound and independent of the LHC machine schedule. The cost estimates for the years 2004-2007 and beyond depend strongly on the final machine schedule…". Therefore the Scrutiny Group concentrated its September meeting on examining the cost estimate changes for 2003. It also reviewed the 2004 to 2007 cost estimates with emphasis on 2004. The Scrutiny Group also tried to establish how the change of LHC machine schedule affects the development of M&O A and B cost estimates.

1. Scrutiny of "A" costs

The old and revised cost estimates for ATLAS and CMS are shown in figure 1 a) and b). Since the April 2002 RRB meetings, ATLAS has adjusted its installation plans to the new LHC machine schedule indicating the first run for April 2007. In its original plan, the ATLAS detector was ready for October 2006. As expected, the M&O "A" costs are practically not affected for the year 2003. Visible savings are made in the years 2006 and 2007 due to the later arrival of sub-detector systems at CERN.

CMS had already adjusted its installation plans to the new machine schedule for the April 2002 RRB meetings. Therefore no changes in cost estimates were expected, as can be seen from figure 1 b).

Due to the rescheduling of the LHC machine ALICE and LHCb could achieve significant economies. As indicated in previous Scrutiny Group reports, both experiments are less advanced in detector construction and can therefore profit considerably from the delay in the start-up of the LHC. Figure 1 c) and d) show the cost estimates for the forthcoming years comparing estimates given in April 2002 (old LHC schedule) and October 2002 (new LHC schedule).

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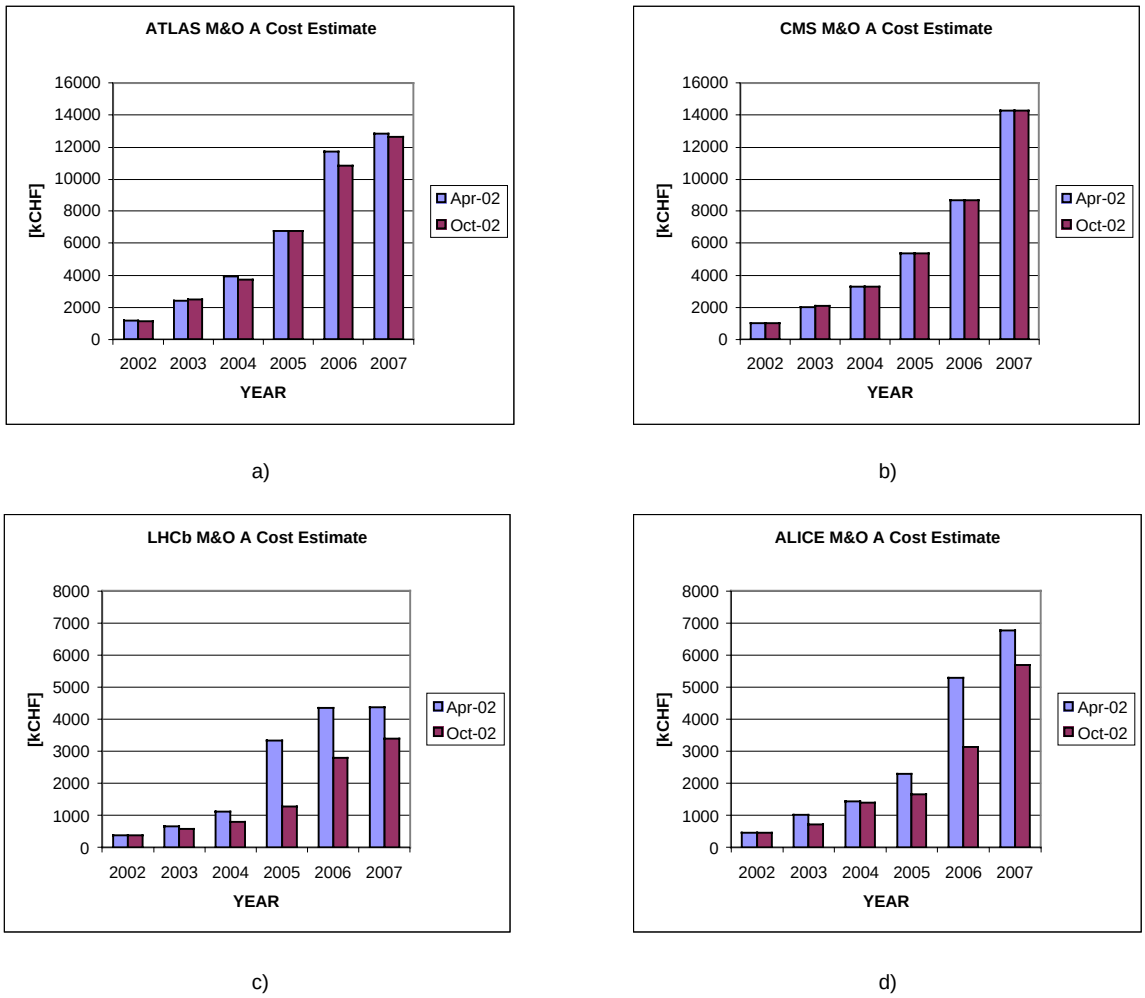


Figure 1: Comparison of M&O "A" cost estimates taking into account the old (Apr-02) and new (Oct-02) LHC machine schedule.

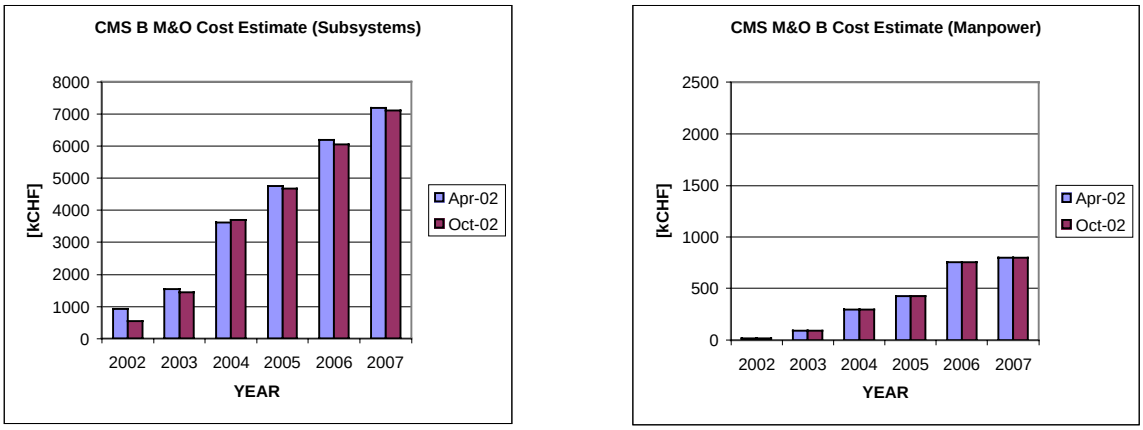
Summarizing, the Scrutiny Group concludes that the "A" cost estimates, presented in Annex 1, are reasonable. However, while the M&O estimates for 2003 and 2004 are fairly independent of the machine schedule for ATLAS and CMS, the M&O cost estimates for LHCb and ALICE proved to be highly dependant on the LHC completion schedule.

2. Review of "B" costs

As explained in the report CERN – RRB – 2002 – 036, the Scrutiny Group reviews the "B" cost estimates of the LHC experiments by strictly applying the guidelines published in the above report.

The review concentrated on changes of cost estimates caused by the rescheduling of the LHC machine.

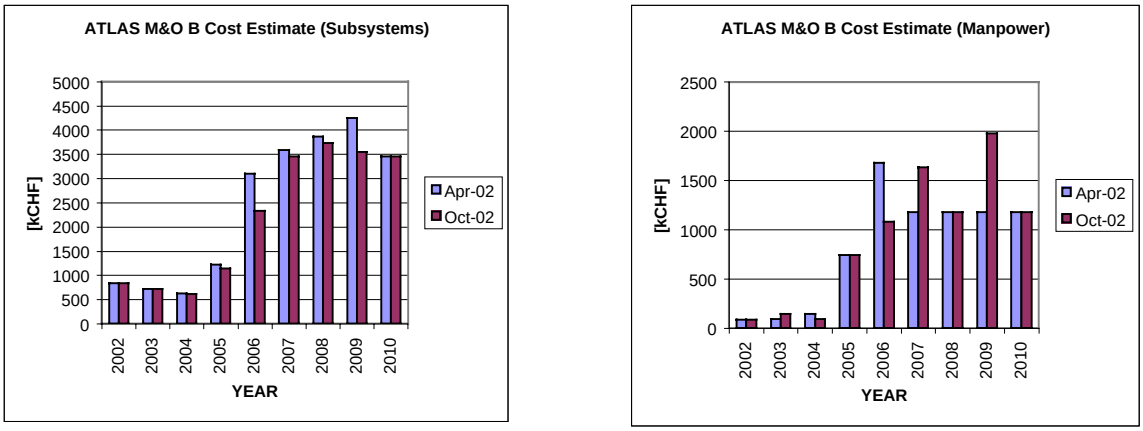
For CMS, as shown in figures 2 a) and b), only slight changes are visible. As mentioned above, this is due to the fact that the CMS schedule was already aligned to the LHC schedule for the April 2002 RRB.



a) b)

Figure 2: Comparison of CMS "B" cost estimates for the April 2002 and October 2002 RRB meetings.

ATLAS could take advantage of the new machine schedule by shifting subsystem schedules and by rescheduling component deliveries to CERN. In addition, ATLAS achieved a real cost reduction by re-evaluating ten specific items, for example "Gas-system", "Cooling system", "Standard electronics, etc. This is reflected in figures 3 a) and b). Note that the peak in 2009 in figure 3b) is due to special interventions on the Inner Detector.



a) b)

Figure 3: ATLAS "B" cost estimates given in April 2002 and in October 2002.

The Scrutiny Group would like to remind the RRB members that the ATLAS “B” cost estimates extend to 2010 due to the special arrangements made within ATLAS, using advanced payments which will be amortized before the year 2010.

The Scrutiny Group believes that the M&O “B” cost estimates, presented in Annex 2, are reasonable and can be considered as an adequate planning base for the experiments for the years 2003 and 2004.

3. Summary

The M&O cost estimates given by the LHC Collaborations for the year 2003 are sound and well justified. Therefore, the recommendation to the RRB is to endorse the costs for 2003 and take note of the costs for 2004. A first review of the 2004 - 2008 cost estimates should be presented in the October 2003 RRB meetings.

Dietrich Schinzel

N.B.: P. Carolan / DoE replaced J. Yeck / DoE during the September Scrutiny Group Meetings

M&O A Cost Estimates in kCHF October 2002	O=Operations C=Consumables	ALICE 2003	ATLAS 2003	CMS 2003	LHCb 2003	ALICE 2004	ATLAS 2004	CMS 2004	LHCb 2004
Detector related costs		**15**	**242**	**597**	**5**	**195**	**457**	**774**	**5**
Magnet	O								
	C								
Magnet controls	O								
	C								
Magnet power supply	O		12				12		
	C		15				15		
Gas systems	O			30		30	50	40	
	C			30		10		40	
Gas consumption	O								
	C		70	100			70	200	
Cooling systems	O		10	30		30	120	70	
	C		5	20		10	10	30	
Cooling fluids(above –50°C)	O		5				5		
	C		5				25		
External cryogenics	O			210				170	
	C								
Cryogenic fluids (below –50°C)	O								
	C			42				24	
Moving / hydraulic systems	O		100	50		40	100	50	
	C		20	20		20	20	50	
Detector safety systems	O			15		20		20	
	C								
Shutdown activities	O								
	C								
General Technical support	O								
	C								
UPS maintenance	O								
	C	10			5	10	30	30	5
Electronics pool rentals	O								
	C	5				5			
Beam pipe & vacuum	O								
	C								
Counting & control rooms	O			50				50	
	C					20			
Secretariat		**114**	**110**	**115**	**120**	**150**	**155**	**205**	**125**
Secretarial assistance	O	70	45	70	70	100	90	140	70
	C								
Economat	O								
	C	15	15	15	15	15	15	15	20
Printing and publication	O								
	C	29	50	30	35	35	50	50	35
Communications			**10**	**5**	**7**		**15**	**10**	**9**
GSM phones / on-call service	O								
	C		10	5	7		10	10	9
Automatic call-back	O								
	C						5		
On-line computing (no rec. media)			**75**	**260**		**20**	**530**	**1,150**	**150**
System management	O			70		20	120	180	110
	C								
Data storage, (temporary on disk)	O								
	C								10
Detector controls	O								
	C		20	40			20	90	
Computers / processors / LANs	O								
	C						300	720	
Software licenses	O								
	C		55	150			90	160	30
Common desktop infrastructure	O								
	C								

Annex 1 M&O Category A Cost Estimates for 2003 and 2004 (1)

M&O A Cost Estimates in kCHF October 2002	O=Operations C=Consumables	ALICE **2003**	ATLAS **2003**	CMS **2003**	LHCb **2003**	ALICE **2004**	ATLAS **2004**	CMS **2004**	LHCb **2004**
Test beams, calibration facilities		**224**	**580**	**150**	**120**	**231**	**590**	**170**	**120**
General operation	O		240	60	5		240	60	5
	C	65		20	10	65		20	10
Common electronics	O								
	C	15	95	20	25	15	95	40	25
Electronics pool rentals	O								
	C	77	60	30		84	60	30	
Gas systems	O	40			45	40			45
	C	7		10	5	7		10	5
Gas consumption	O								
	C	20		10	30	20		10	30
External cryogenics	O		150				170		
	C		35				25		
Laboratory operations		**160**	**80**	**20**	**55**	**210**	**130**	**20**	**45**
Assembly areas, clean rooms	O	40				40			
	C		50		40		100		30
Workshops	O	20			5	70			5
	C	50	10	20	10	50	10	20	10
Laboratory instruments	O	50				50			
	C		20				20		
General services		**240**	**1,386**	**759**	**263**	**634**	**1,833**	**972**	**353**
Cooling & ventilation	O	50	73	67	39	76	109	101	59
	C	50	73	67	39	76	109	101	59
Power	O								
	C	54	560	280	120	383	1,030	350	5
Power distribution system	O								
	C		20	10			25	20	
Heavy transport	O		190				60		
	C								
Cranes	O		60				60		
	C		30	30			60	50	150
Cars	O								
	C	15	30	30	15	20	30	40	30
Survey	O		170		40		170		40
	C								
Storage space	O								
	C			50				75	
Common desktop infrastructure	O								
	C		20	35			20	45	
Academic subsistence	O	40	100	130		40	100	130	
	C								
Outreach	O								
	C	30	60	60	10	40	60	60	10
TOTALS (1)+(2)		**753**	**2,483**	**1,906**	**570**	**1,440**	**3,710**	**3,301**	**807**
Operation sub-items		310	1,155	782	170	556	1,406	1,011	278
Consumables sub-items		443	1,328	1,224	332	885	2,304	2,290	417

Annex 1 M&O Category A Cost Estimates for 2003 and 2004 (2)

ATLAS [kCHF] / YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	SUM
Total (All Subdetectors)	915	865	710	1880	3585	7285	7110	7085	6085	35520
Spares	0	0	0	0	130	2130	2130	1590	1590	7570
Manpower [kCHF]	85	145	95	740	1080	1630	1180	1980	1180	8115
Subdetectors without Spares and Manpower	830	720	615	1140	2335	3455	3730	3555	3455	19835
Spares Spending Profile	2900	2034	1803	733	0	0	100	0	0	7570

CMS [kCHF] / YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	SUM
Total (All Subdetectors)	564	1528	3988	5110	6815	7913				25918
Spares*										
Manpower	17	89	294	428	754	797				2379
Subdetector (without Manpower)	547	1439	3694	4682	6061	7116				23539
Spares Spending Profile										

Annex 2 M&O Category B cost estimates