M&O Scrutiny Group Report to LHC Resource Review Boards

29 – 31 October 2012

Bernd Löhr

DESY

Composition of the Scrutiny Group in 2012:

Gabriele Cosmo	(CERN)	Robert Kephart	(FNAL)
Marcos Dracos	(Strasbourg)	Bernd Löhr	(DESY, Chair)
George Ginther	(FNAL, University of Rochester)	Gerhard Mallot	(CERN)
Stefan Haider	(CERN)	Christos Touramanis	(Liverpool)
Enrico Iacopini	(INFN Firenze)	Emmanuel Tsesmelis	(CERN)
Scientific Secretary: Sascha Schmeling	(CERN)	Didier Vilanova	(CEA)

This year's new members are listed in green.

General points of discussion

Excellent performance of LHC and the experiments

Excellent performance of LHC in 2011 and 2012:

- instantaneous luminosity up to 6×10^{33} cm^{-2}s^{-1}, almost at design level
- bunch spacing 50 ns
- successful heavy ion runs

Very efficient operation of the experiments:

- collected ~6 fb^{-1} in 2011 and ~18 fb^{-1} in 2012 (so far)
- ATLAS and CMS had to cope with up to 40 overlay events per bunch crossing

Continuous support by Funding Agencies at high level:

⇒ rewarded by the discovery of a Higgs-like Boson,
possibly the Standard Model Higgs,
and many other exciting results.

Further increase of instantaneous luminosity ⇒ LHC operation with 25 ns bunch spacing needed, otherwise major modification for the trigger and data acquisition system are necessary.

Major parts of the experiments are in operation now for about 10 years

⇨ increased maintenance, consolidations, and replacements are necessary in LS1 2013-2014.

Preparations for design energy and design luminosity

detector upgrades needed, TDRs will appear soon.

The Scrutiny Group attempted so far to separate upgrade projects from M&O.

Collaborations request that oversight will be provided for upgrade projects.
Related activities are already being carried out or have to start very soon and upgrade costs are being generated.

CERN support of EVO, the video-conferencing tool, will stop end 2012.
A commercial system, VIDYO, will replace EVO and is being tested right now.
CERN will take over costs for VIDYO.

The Scrutiny Group acknowledges that CERN has taken a positive attitude in showing leadership in safety and infrastructure related items which enabled M&O A budget reductions in respective areas.

Revised agreement for maintenance & operation budget of the online systems of the LHC experiments ALICE, ATLAS, and CMS:

- old agreement dates back to 2004, typical replacement period was 4 years;
- validity questioned by Scrutiny Group since 2009;
- reassessment by experiments in 2011 → full 4 years of usage before replacement.

- Scrutiny Group requested full 5 years of usage:

- experiments declared that warranty for the 4. and 5. year would be a necessary condition, negotiations with vendors could not be finished in time for 2012 budget requests;
- early 2012, experiments agreed to move to 5 year replacement period;
- task force of experiments formed to work out the formulation of a revised agreement.

- Revised agreement in document CERN-RRB-2012-118 available, endorsed by Scrutiny Group.

The new 5 year replacement cycle for online farm PCs leads to considerable reductions in the M&O A requests from 2013 onwards.
This is most visible for ATLAS where the online-budget reductions are about 0.9 MCHF per year w.r.t. the projections as of October 2011.

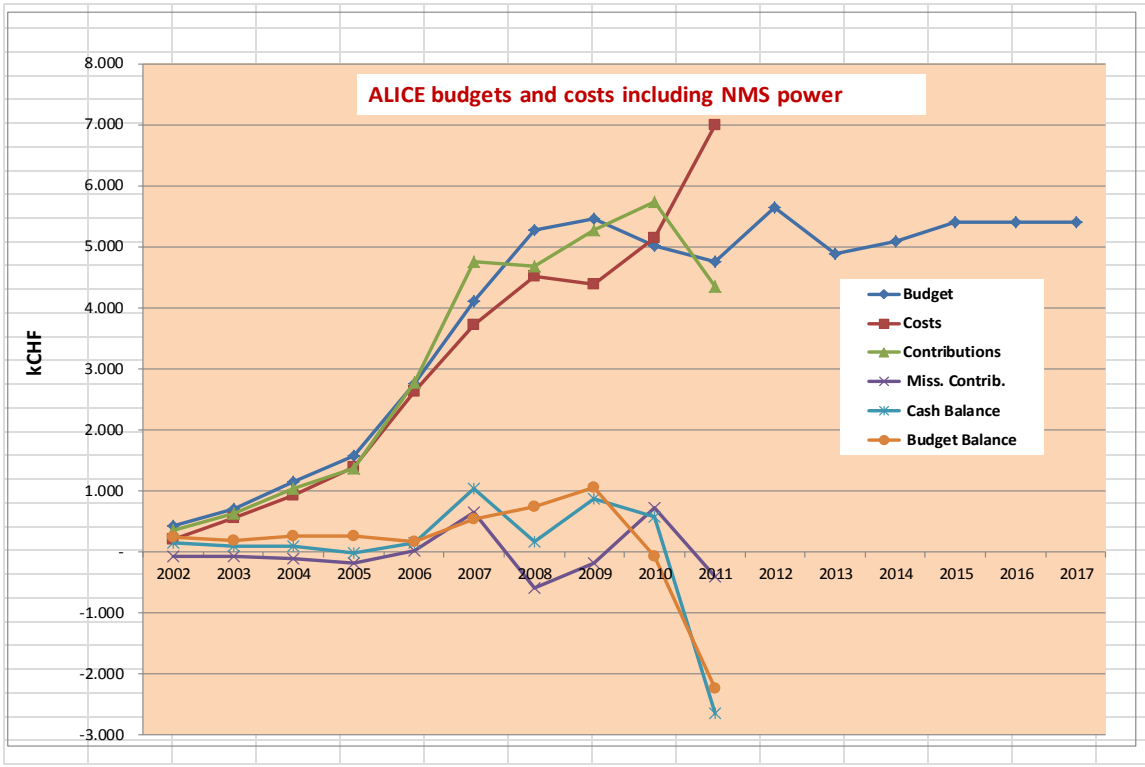
Apart from the online-hardware replacement, the experiments made efforts to reduce their M&O A costs.
As a consequence all future M&O A budgets are considerably lower than in 2012 in particular after LS1.

ALICE M&O A

ALICE M&O A closing Report 2011:

Actual costs w/o power	6,277 kCHF
including online accrual	1,000 kCHF
Budget w/o power	4,491 kCHF
Power costs NMS	724kCHF

Overspend covered from accumulated cash surplus.



ALICE request for 2013 M&O A and projections to 2016 in kCHF:

Year	2012	2013	2014	2015	2016	2017
Costs w/o power	4,935	4,650	4,650	4,650	4,650	4,650
Costs w. NMS power	5,647	4,876	5,081	5,398	5,398	5,398
Costs full power	7,321	5,371	6,024	7,036	7,036	7,036

- During LS1 installation of additional TRD, PHOS, and Dcal modules.
- Consolidation of electrical infrastructure, cooling and ventilation in cavern.
  → Increased maintenance costs but considerably lower power costs resulting in lower total M&O A costs during LS1.
- After LS1 reduced total costs w.r.t. 2012.

The Scrutiny Group recommends approval of the ALICE M&O A closing report for 2011 and the budget request for 2013.

ALICE M&O B

Closing report for 2011:

Total costs	1820 kCHF
Budget	1832 kCHF

SDD overspend due to deferred payments
SSD underspend because LV power supply costs deferred to 2013

Budget requests and projections:

ALICE M&O B Budget Requests	*2012*	*2013*	*2014*	*2015*	*2016*
Mechanics	28.5	50	40.5	26.5	26.5
Gas Systems	82	38	38	38	38
Cooling Systems	110	151	101	94	94
FEE Spares	100.5	135	119	105	105
Standard Electronics LV/HV PS	421	322.5	241.5	212.5	212.5
Standard Electronics Crates	63.5	26.5	27.5	17.5	17.5
Standard Electronics R/O Modules	172.5	94.5	106	166	106
Controls (DCS & DSS)	33	33.5	29.5	29.5	29.5
Sub-Detectors Spares	81.5	143	140	41	41
Areas	57	42	42	42	42
Communications	92.5	91	91	88	88
Store Items	83.5	97.5	79.5	78.5	78.5
Technical Manpower @ CERN Industrial Support	23	6	6	6	6
Technical Manpower @ CERN Subsistence	433.4	427	410	353	353
Grand Total in kCHF	1782	1658	1472	1298	1238
Technical Manpower @ CERN In-Kind from Institutes in Man-Months	324	270	192	192	192

Experience in running and maintenance of detector components led to reduced estimates.

During LS1 in 2013 and 2014 additional shutdown cost.

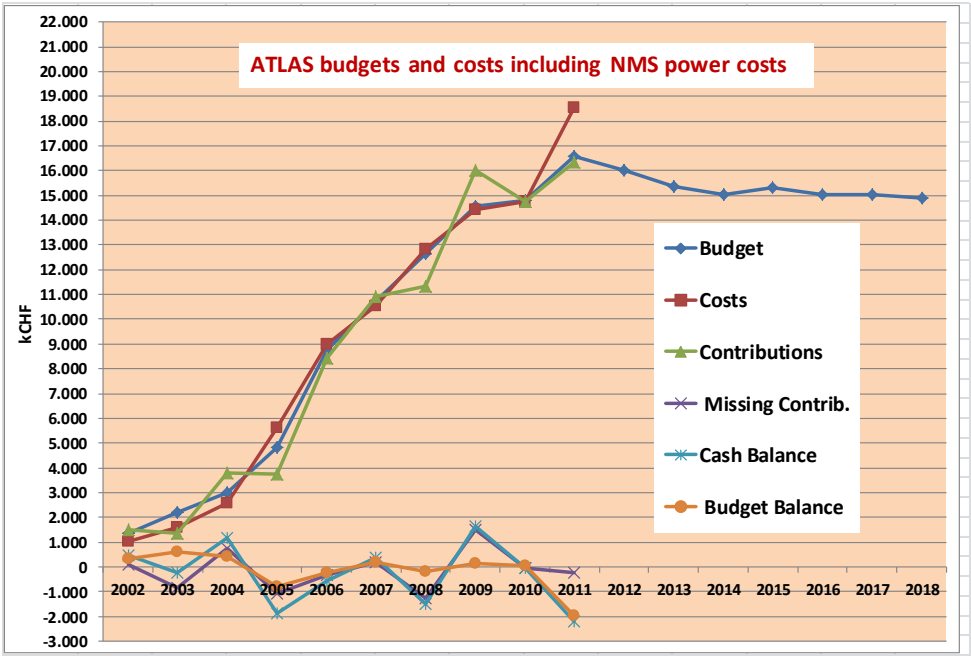
From 2015 on lower costs than in 2012.

Scrutiny Group recommends approval of the ALICE M&O B budget for 2013.

ATLAS M&O A

ATLAS M&O A closing Report 2011:

Actual costs w/o power	17,585 kCHF
incl. commitments of	1,900 kCHF
Budget w/o power	15,623 kCHF
Power costs for Non-Member-States	936 kCHF



ATLAS request for 2013 M&O A and projections to 2018 in kCHF:

Year	2012	2013	2014	2015	2016	2017	2018
Costs w/o power	15,047	14,623	14,290	14,600	14,300	14,300	14,163
Costs w. NMS power	15,995	15.348	15,015	15,325	15,025	15,025	14,888
Costs w. full power	17,866	16,823	16,490	16,800	16,500	16,500	16,363

Considerable cost reductions: sum of costs for 2013-2018 is now 99,476 kCHF, it was 108,440 in October 2011.

- new online-hardware replacement model,
- CERN took over responsibility for infrastructure and safety items.

Installation of Insertable B-Layer (IBL) advanced to 2014.
Some consolidation worked delayed because of shift of LS1 schedule but funding profile kept.

The Scrutiny Group recommends approval of the ATLAS M&O A closing report 2011 and of the budget for 2013.

ATLAS M&O B

ATLAS M&O B:

Closing report 2011: Total costs 6372 kCHF; Budget 6135 kCHF; Open commitments 331 kCHF; Unobligated balance 251 kCHF

M&O B budget requests:

ATLAS M&O B Requests							
Subsystems	2012	2013	2014	2015	2016	2017	2018
Inner Detector (ID)	2435	2465	2295	2245	2245	2245	2345
Liquid Argon Calorimeter (LAr)	1196	1081	1111	981	981	981	1071
Tile Calorimeter (TileCal)	617	647	647	604	604	604	604
Muon Detectors (Muons)	640	650	570	570	800	830	830
Forward Detectors (FD)	262	284	243	167	167	170	167
Totals	5150	5127	4866	4567	4797	4830	5017

A diamond beam detector has been added to the IBL.
Costs of 336 kCHF are coming from project and not from M&O B.

Total M&O B budget request and projections summed over 2013-2018 are slightly lower than given in October 2011.

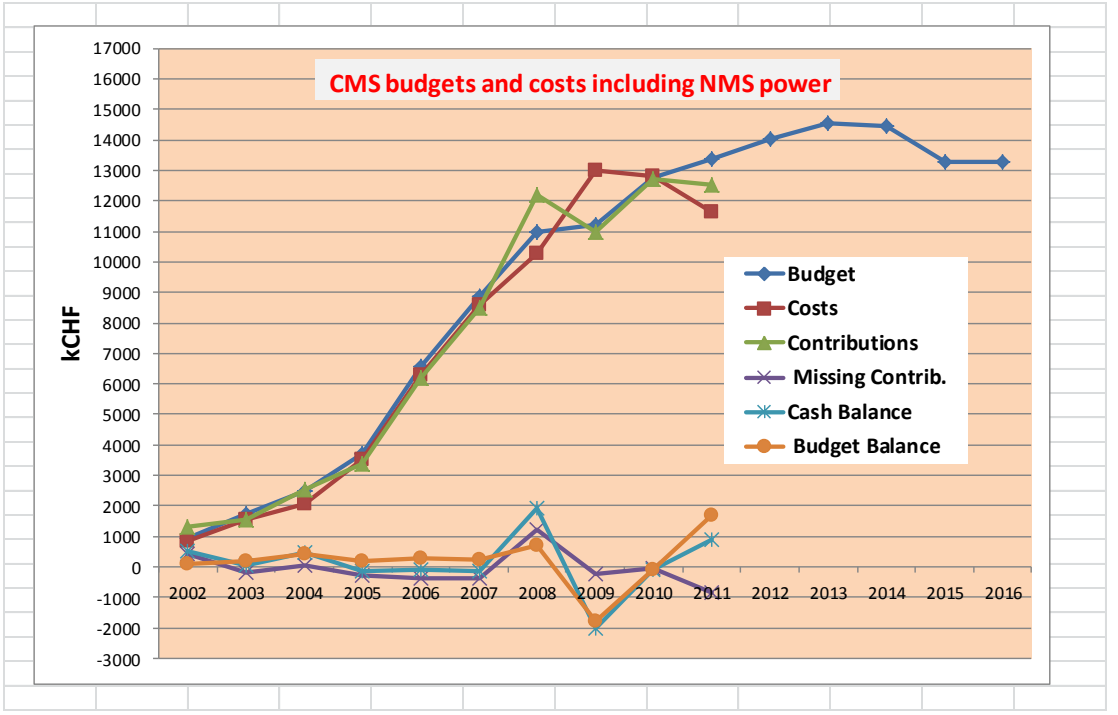
The SG recommends approval of the M&O B closing report for 2011 and approval of the M&O B budget request for 2013.

CMS M&O A

CMS closing Report 2011:

Actual costs w/o power	12,553 kCHF
incl. online accruals	1,296 kCHF
Budget w/o power	12,579 kCHF
Power costs for Non-member states	373 kCHF

Reminder: bushing repair costs of 1100 kCHF at the end of 2010 were moved into 2011 budget.
Budget balance 2010-2011 96 kCHF



Note: 1296 kCHF transferred to online hardware account in 2011 not included in the plots.

CMS request for 2013 M&O A and projections to 2016 in kCHF:

Year	2012	2013	2014	2015	2016
Costs w/o power	13,235	13,789	13,656	12,480	12,462
Costs w. NMS power	14,048	14,534	14,446	13,293	13,275
Costs w. full power	15,035	15,439	15,406	14,280	14,262

Request and projections through 2016 slightly lower than in October 2011.

Online hardware replacement shifted from 2012/13 to 2013/14.

Not all reductions made in 2011 can be maintained.

Previously unforeseen items added: use of HLT farm during LS1 → additional cooling costs;
repair of nitrogen system because of micro-leaks;
cover plates for ME1/1 electronics to be replaced;
new machines in workshop because of safety reasons.

The SG recommends approval of the M&O A closing report for 2011 and approval of the M&O A budget request for 2013.

CMS M&O B

Closing report 2011: Total costs 5517 kCHF
Budget 6418 kCHF

Budget surplus from 2011 intended to be used for 2013
→ although increased costs due to shutdown the request for 2013 can be kept low.

M&O B budget requests:

CMS M&O-B Requests							
Amount (kCHF/FTE)			Year				
Description	**Detector**	**Subsystem**	**2012**	**2013**	**2014**	**2015**	**2016**
Material Resources	Tracker	Pixel	285	295	175	185	185
		SST	1305	1285	1425	1195	1195
	Tracker Total		1590	1580	1600	1380	1380
	ECAL		1123	1020	1120	1120	1120
	HCAL		1531	1072	1018	1018	1018
	Muon	Barrel Alignment	53	53	53	53	53
		Drift Tubes	488	481	483	388	438
		EMU	1063	911	911	911	911
		LinkAlignment	16	16	16	16	16
		RPC	275	363	363	254	254
	Muon Total		1895	1824	1826	1622	1672
	Trigger		500	419	419	419	419
Material Resources Total			6639	5915	5983	5559	5609
Core Computing Human Resources Total			8	8	8	8	8

All sub-detectors plan major maintenance and replacements during the shutdown in 2013-2014.

The requests for 2013 and 2014 are nevertheless lower than in 2012 due to the planned usage of surplus from previous years.

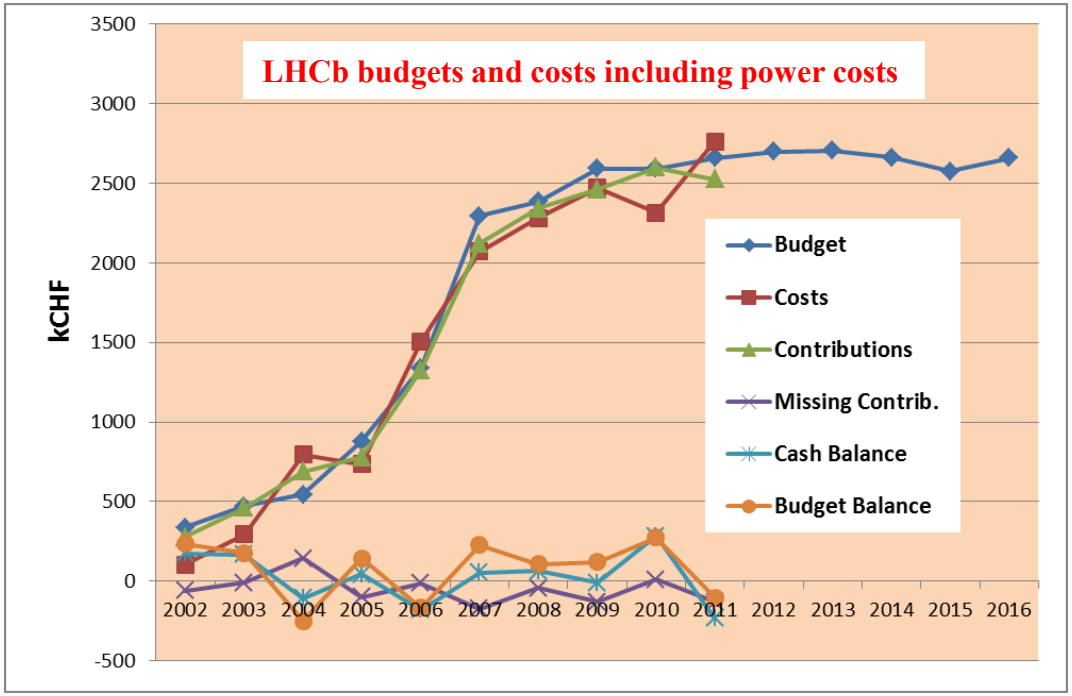
Projections beyond 2014 are lower based on more reliable estimates due to several years of operation.

The SG recommends approval of the CMS M&O B budget request for 2013.

LHCb M&O A

LHCb closing report 2011:

Actual costs w/o power	2,649 kCHF
Budget w/o power	2,545 kCHF
Power costs for Non-Member States	114 kCHF



LHCb requests for 2013 M&O A and projections to 2016 in kCHF:

Year	2012	2013	2014	2015	2016
Costs w/o power	2,575	2,580	2,580	2,530	2,530
Costs w. NMS power	2,702	2,706	2,664	2,572	2,656
Costs w. full power	3,545	3,555	3,280	2,830	3,500

Budget numbers are slightly lower than the ones presented in October 2011.
In 2014 larger replacement of online computers is planned.
Increase of manpower for programming multi-core computers, this will persist because of preparation for higher luminosity.

A section of the beryllium beam-pipe has to be replaced because of micro-leaks. To be paid by CERN.
It is not yet clear whether the VELO will have to be removed for bake-out of new beam-pipe.

The SG recommends the approval of the LHCb closing report for 2011 and the M&O A budget request for 2013.

LHCb M&O B

Longer term planning now available for LHCb M&O B budgets

M&O B budgets 2010 -2016	2010	2011	2012	2013	2014	2015	2016
Mechanics	111	65	65	110	110	65	65
Gas-system	10	10	10	10	10	10	10
Cryo-system	0	0	0	0	0	0	0
Cooling system	15	15	15	15	15	15	15
FE electronics	124	125	125	125	125	125	125
Standard electronics	229	224	224	250	250	224	224
Controls, (DCS, DSS)	68	70	71	70	70	60	60
Sub-Detector Spares	200	200	170	200	200	170	170
Maintenance of clean rooms	45	45	45	45	45	45	45
Communications	31	37	36	30	30	30	30
Store Items	25	25	25	25	25	25	25
Hired Manpower @ CERN (in CHF)	0	0	0	0	0	0	0
Technical Manpower @CERN (in FTE)	290	295	280	300	300	280	280
Totals (CHF)	**1148**	**1111**	**1066**	**1180**	**1180**	**1049**	**1049**

The 2012 M&O B budget is slightly lower than in previous years and the projections stay at this level except for the shutdown years 2013-2014.
A detailed list of activities during LS1 has been presented to the Scrutiny Group.

There exists a VELO replacement program which is funded with a yearly payment of 100 kCHF each year for 2009 through 2013. These payments are in parallel to M&O A and M&O B.

The SG recommends the approval of the LHCb M&O B budget request for 2013.

TOTEM M&O A

TOTEM closing report 2011:

Actual costs	469 kCHF
incl. commitments	52 kCHF
Budget	440 kCHF

No power costs arise for the TOTEM experiment, They are born by CMS.

The integrated cash balance is presently -9 kCHF with outstanding contributions of 5 kCHF.

TOTEM requests for 2013 M&O A and projections to 2016 in kCHF:

Year	2012	2013	2014	2015	2016
Costs	440	413	422	470	470

During LS1 the T1- and T2-detectors have to be removed in cooperation with CMS.
TOTEM is now integrated in the CMS trigger, data-streams have to be integrated during LS1.
Therefore the core computing costs will not decrease during the shutdown.
Costs for moving hydraulics and electronics pool rentals will increase during the shutdown.

Overall, the total costs during LS1 are slightly lower because of reduced gas consumption, less online efforts, and reduced survey needs.

The SG recommends the approval of the TOTEM closing report for 2011 and the M&O A budget request for 2013.

TOTEM M&O B

Closing report 2011:

The M&O B budget for 2011 was 247 kCHF, the actual costs amounted to the same value.

M&O B budget requests:

TOTEM M&O B budgets	2012	2013	2014	2015	2016
Detector related costs	195	195	195	195	195
On-line computing	50	50	50	50	50
General services	2	2	2	2	2
TOTAL	**247**	**247**	**247**	**247**	**247**

The M&O B costs are estimated to be constant over the years.
This is supported by experience from previous years.

The SG recommends approval of the TOTEM M&O B budget request for 2013.

Acknowledgement

The Scrutiny Group wants to thank all Resource Coordinators and Managers of the experiments for their efforts and for the high quality information which has been provided .

The Scrutiny Group acknowledges the cooperation of the M&O B subsystem project managers and subsystem resource managers for this year's successful scrutiny process .

Since this is my last RRB meeting as the chairman of the Scrutiny Group I want to thank

- all members of the group during the last four years for their fruitful and effective work,
- the CERN management and all Funding Agencies for their support.