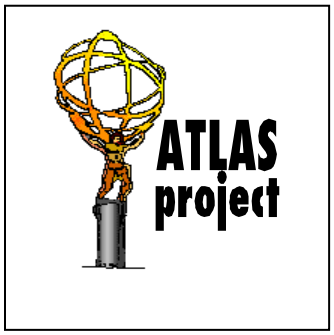
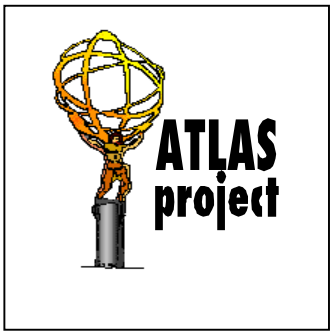


CERN-RRB-2013-053

ATLAS Resources Review Board, April 16, 2013

2012 – 2014 ATLAS M&O Budgets



CERN-RRB-2013-053

ATLAS Resources Review Board, April 16, 2013

For RRB approval

Part 1
Closing Report for 2012 ATLAS M&O Budgets

Introduction

The ATLAS management, supported by the ATLAS Executive and Collaboration Boards, kindly invites the RRB to approve the final M&O payments for 2012.

The RRB approved the year 2012 Maintenance and Operation (M&O) budget in October 2011 (CERN-RRB-2011-069) for 17.9 MCHF (Category-A), including cost of energy of 2.8 MCHF, and 5.1 MCHF (Category-B), respectively.

1. M&O Budgets for 2012

M&O BUDGET REPORT ELEMENTS

- Payment Summary
- Activity Description
- Table References

The final M&O payments in 2012 amounted to 16 753 kCHF in Category-A (including energy for the CERN NMS-part) and 5 434 kCHF in Category-B. The remaining open commitments amounted to 947 kCHF in total (A+B). The total payments were 1042 kCHF above the budgeted total income (i.e. invoices sent out) due to past commitments and advanced payments.

In 2012, the Category-A costs covered various technical services invoiced by CERN such as access and cranes operation, site management, providing gases and coolants, running the cooling and ventilation plants (8.7 MCHF) as well as operating the cryogenic plants at Point 1 (2.8 MCHF) and operating the TDAQ system (2.2 MCHF). Core computing infrastructure services were also provided for, and this amounted to 2.1 MCHF.

The CERN member state share of the energy cost for 2012 was paid by CERN in full and partially for those non-member states contributing to the machine construction outside the M&O budget. The cost of energy consumption for 2012 amounted to 0.95 MCHF (non-member state part).

In Category B, the main costs were related to operation of the electronics systems as well as carrying out repairs in-situ in the ATLAS cavern. The above activities included related mechanics, gas and cooling systems (0.2 MCHF), electronics replacements, controls and pool rentals (2.6 MCHF) and area operation and purchasing of store items (0.5 MCHF). Sub-detector spares were purchased worth 0.1 MCHF. The hired technical manpower supported all these activities (2.1 MCHF).

The value of in-kind contributions in Category-A amounted to 1.2 MCHF. In Category-B, no in-kind contributions were made in 2012.

As a consequence of the 2012 payments and amortization of the remaining open commitments from the past, the cumulative budget balance (i.e. the approved budgets less executed payments and remaining open commitments) amounts

to -1485 kCHF in Category-A and +39 kCHF for Category-B. Due contributions in 2012 amounted to 1.037 MCHF in Category-A and 0.164 MCHF in Category-B. Efforts are being made to obtain these due contributions as soon as possible.

For Category-A, the status of contributions (sent invoices less received contributions) are shown in the document "Financial Report" (CERN-RRB-2013-028).

Table 1 summarizes the 2012 M&O payments per system. The participating institutes provided, as part of their detector operation tasks (OTP) obligations, 364 man-years for expert-related activities (excluding shift work), of which 138 man-years in core computing tasks. Table 1 includes also support given to IBL (more details are provided in CERN-RRB-2013-043).

Table 2 shows the M&O contributions made for 2012 or earlier by the Funding Agencies for each system.

It should be noted that in order for ATLAS to pay for the 2012 expenses as well as for the past open commitments, permission was given by the CERN Management at the very end of the year to exceptionally overdraft on the M&O-A accounts while waiting for due contributions.

ATLAS M&O (A) and (B) Payments in 2012 (kCHF)

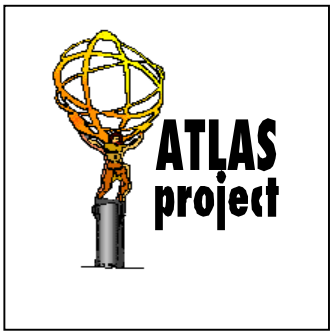
Item & Cost Driver (by RRB SG Headings)	Cat. A M&O	Pixel	SCT	TRT	IDGen	LAr	TileC	Muon	FD	Comp.	Cat. B M&O	Item & Cost Driver (by RRB SG Headings)
Detector related costs	7,023						3	122	10		135	Mechanics
Cryogenics, gas system operations												
Shutdown activities, support, safety				8	33		6				47	Gas systems
Secretariat	396											
2 FTE charged to ATLAS												
Publications, consumables											0	Cryo-systems
Collaborative tools	256											
GSM phones							2				2	Cooling system
Computer network connections												
Videoconferencing, archiving						402	42		20		464	FE electronics
Core computing (infrastr. & services)	2,127											
Software process service												
Central production & operation		314	421	126	51	410	366	218	70		1,977	Standard electronics Power supplies, crates, RO-modules
On-line computing	1,912											
System management		16	29	6	3	8	6	90	10		167	Controls (DCS, DSS)
Hardware replacements (HLT, networks)												
Test beams, facilities	2,595	0	0				25		69		94	Sub-detector spares
Testing equipment (DCS)												
Consolidation												
		53	31	17	183	6	12		12		314	Areas
Laboratory operations	165											System tests, lab. Operations, SR1 (ID)
Assembly areas, workshops												
TDAQ laboratory equipment		2	5	3	4	16	2	12	0		44	Communications
General services	2,279	23	11	12	14	4	2	15	12		92	Store items
Heavy handling												
Technical support, storage												
Survey												
Outreach												
Energy												
TOTAL	16,753	408	497	172	288	845	466	457	203	0	3,337	(Excluding hired manpower, Cat. B)
Hired manpower at CERN (in kCHF)	incl. above	247	302	235	326	297	224	392	74		2,097	
Institute manpower (in FTE), excl. Shi	0	31	15	18	12	30	32	61	28	138	364	Class 3 expert tasks (OTP)
TOTAL M&O FOR A	16,753	655	799	407	614	1,142	690	849	278	0	5,434	TOTAL M&O FOR B

Notes
(*) It is acknowledged that Russia has contributed 133 KCHF as part of its FTE effort in cash

M+O Contributions (cash and in-kind) for ATLAS in 2012 by Funding Agency (kCHF)

Funding Agency	Cat. A items*	Category B item contributions									A + B Total	Core comp. Cat.B (FTE)
		Pixel	SCT	TRT	IDGen	LAr	TileC	Muon	FD	Total		
Argentina	**40**							2		**2**	**42**	0
Armenia	**15**					1				**1**	**16**	1
Australia	**119**		27		14					**41**	**160**	1
Austria	**17**		2	2		2		1		**7**	**24**	0
Azerbaijan	**20**					1				**1**	**21**	0
Belarus	**152**							9		**9**	**161**	0
Brazil	**45**						3			**3**	**48**	0
Canada	**589**					204				**204**	**793**	5
Chile	**40**							2		**2**	**42**	0
China NSFC+MSTC	**129**					3		3		**6**	**135**	0
Colombia	**49**							3		**3**	**52**	0
Czech Republic	**275**	2	1		1		6		6	**16**	**291**	2
Denmark	**92**			31	5					**36**	**128**	0
France IN2P3	**883**	71			14	253	75		13	**427**	**1310**	9
France CEA	**225**					66		24		**90**	**315**	3
Georgia	**49**					1		1		**2**	**51**	0
Germany BMBF	**1316**	210	57		72	82		51	57	**529**	**1845**	10
Germany DESY	**242**					32		32	33	**97**	**339**	8
Germany MPI	**250**		32		16	36		17		**101**	**351**	1
Greece										**0**	**0**	0
Israel	**193**							10		**10**	**203**	2
Italy	**1324**	184			29	61	53	169	36	**532**	**1856**	6
Japan	**678**		72		47		20	96		**235**	**913**	2
Morocco										**0**	**0**	0
Netherlands	**233**		23		14			57		**94**	**327**	2
Norway	**133**		34		20					**54**	**187**	1
Poland	**192**		2	5	2				2	**11**	**203**	2
Portugal	**110**						11		1	**12**	**122**	0
Romania	**119**						6			**6**	**125**	0
Russia	**548**			14	3	7	5	5		**34**	**582**	4
JINR	**285**			7	4	13	16	15		**55**	**340**	1
Serbia	**59**					3				**3**	**62**	0
Slovak Republic	**75**					4				**4**	**79**	0
Slovenia	**69**		2		1					**3**	**72**	2
South Africa	**49**		2							**2**	**51**	0
Spain	**391**		17		9	36	87			**149**	**540**	4
Sweden	**258**		13	40	13	14	20		5	**105**	**363**	1
Switzerland	**192**		44		23	10				**77**	**269**	0
Taipei	**89**	2	1		1	1				**5**	**94**	0
Turkey	**119**			6						**6**	**125**	0
United Kingdom	**1482**		304		292					**596**	**2078**	18
US DOE + NSF	**3655**	84		334		316	316	135	76	**1261**	**4916**	34
CERN	**1082**	1	2	251		92	40	17	32	**435**	**1517**	17
total contributions	**15,882**	554	635	690	580	1,238	658	649	261	**5,266**	**21,148**	**138**
total payments	**16,753**	655	799	407	614	1,142	690	849	278	**5,434**	**22,187**	

Notes:
*Following invoices sent to Funding Agencies; including energy cost adjustments



CERN-RRB-2013-053

ATLAS Resources Review Board, April 16, 2013

For RRB approval

Part 2

New In-Kind Contribution to the 2013 M&O Budget

Introduction

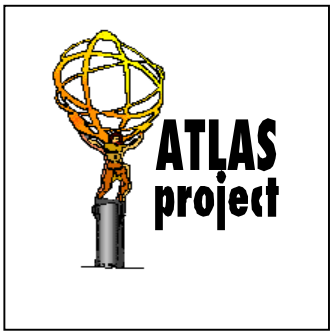
The ATLAS management, supported by the ATLAS Executive and Collaboration Boards, kindly invites the RRB to approve the new in-kind contribution to the M&O budget for 2013 proposed hereunder.

According to paragraph 9.3 in the ATLAS M&O MoU (CERN-RRB-2002-035), the RRB needs to agree to possible in-kind contributions made to Category-A (Annex 9).

Proposed In-Kind Contribution (Category –A)

The IBL MoU, endorsed by the RRB in April 2012 (CERN-RRB-2012-028-Appendix 1), includes general work packages accounted for in M&O-A, worth 4.1 MCHF. These work packages include, among others, the cables type 2, 3, and 4 for the IBL High Voltage (HV) and Detector Control System (DCS) (MoU item 7, total value 505 kCHF).

IN2P3 has the required competence and capacity for providing these cables as an in-kind contribution, in accordance with the schedule agreed with the IBL Project Management and Technical Coordination. The recognized value of these cables to is 325 kCHF.



CERN-RRB-2013-053

ATLAS Resources Review Board, April 16, 2013

For RRB to take note

Part 3

Preliminary 2014 ATLAS M&O Budget Estimates

Introduction

The ATLAS management, supported by the ATLAS Executive and Collaboration Boards, kindly invites the RRB to take note of the preliminary M&O budget estimates for 2014.

The first M&O budget estimates for the ATLAS detector in 2014 amount to 21.4 MCHF in payments. The year 2014 represents the second year of the first long shutdown (LS1). The extensive repair and consolidation work, begun in March 2013, is scheduled to be completed during 2014. Extensive system tests and the complete re-commissioning of the whole ATLAS experiment prior to the start of LHC Run-2, in spring 2015, requires the technical infrastructure (e.g. cryogenics, gas, coolants plants, access operations, cooling and ventilation systems) to be operational during most of 2014.

M&O BUDGET REPORT ELEMENTS

- Budget summary
- Activity Description
- Table References

1. Preliminary M&O Budget Estimate for 2014

The preliminary 2014 M&O payments for Category-A items are 16.5 MCHF (including energy) and 4.9 MCHF for Category-B items.

The dominant part of the cost in Category-A is providing the required technical services (e.g. detector access, safety systems, gas systems, heavy handling, crane operations, cooling and ventilation maintenance services, electricity; amounting to 9.5 MCHF). Another cost driver is the operation of the LAr and magnet system at an annual level of 1.6 MCHF. The general support for running the TDAQ system and replacement of equipment is 3.3 MCHF, more than half of which is foreseen for high-level trigger processor replacements, following the planned four full years of operation. Core computing (infrastructure) services are planned at 2.1 MCHF.

Similarly to Category-A, activities in Category-B profit from the shutdown for repair and consolidation of the detector systems and related interfaces.

The main Category-B cost driver is related to replacing and operating detector modules and related electronics (2.0 MCHF). Scheduled maintenance work of detector structures and mechanics, including the use of store items and areas activities, amount to 0.8 MCHF. The cost of hired technical manpower to run the facilities is estimated at 2.1 MCHF.

The manpower required from institutes for operation expert tasks (OTP), excluding shifts, amounts to 438 man-years. This represents the important manpower effort required during the long shutdown, including 138 man years for core computing tasks such as core computing management, software project management, data management and computer operations. The core computing effort is planned to be provided fully as in-kind contributions.

Figure 1 provides a summary of actual payments up to end of 2012 and a forward look to M&O budget estimates up to 2018, including the full cost of energy and defined parts of the IBL (CERN-RRB-2011-028 Annex 1). The breakdown between Categories A and B is provided in **Table 3**.

Following the wishes expressed in the April 2011 RRB, the 2013 M&O Category-A budget and future estimates have been smoothened using averaging up to 2018, in order not to exceed the current budget levels and to facilitate more accurate budget planning for the Funding Agencies. No cost-variation index is applied. It should be noted that this was possible only by manually modulating the budget line for TDAQ replacements. This implies a cumulative deficit of 1.3 MCHF up to end of 2015 which is amortized by 2018, when the new TDAQ replacement model of five full years is applied. The annual modulations are managed within the framework agreed with the RRB (CERN-RRB-2012-118).

Figure 1. Evolution of M&O Budget up to 2018 (MCHF)

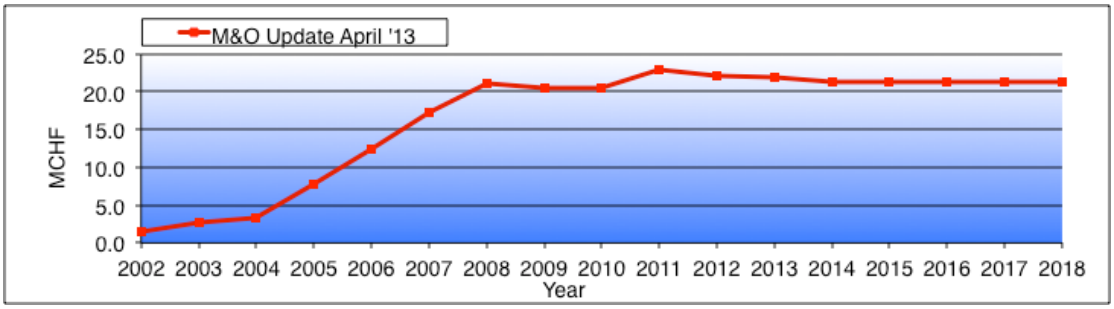


Table 3. Evolution of M&O Budget up to 2018 (MCHF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Category A	1.0	1.6	2.6	5.6	9.0	10.5	14.3	14.4	14.8	16.6	16.8	16.8	16.5	16.8	16.5	16.5	16.4	**206.7**
Category B	0.4	1.1	0.7	2.2	3.5	6.7	6.8	6.2	5.7	6.4	5.4	5.1	4.9	4.6	4.8	4.8	5.0	**74.3**
Total (A+B)	**1.4**	**2.7**	**3.3**	**7.8**	**12.5**	**17.2**	**21.1**	**20.6**	**20.5**	**23.0**	**22.2**	**21.9**	**21.4**	**21.4**	**21.3**	**21.3**	**21.4**	**281.0**

Table 4 gives the breakdown of the 2014 M&O budget estimates for both Category-A and Category-B.

Table 5 shows the expected M&O-A and M&O-B contributions for 2014 for each Funding Agency. The Category-A contributions are based on authors holding a PhD or equivalent. The column "budgeted" shows the cost sharing including full electricity costs, while the amounts after the energy cost adjustments are shown in the column "adjusted". Foreseen in-kind contributions, mostly in core computing, shown in a dedicated column are then subtracted to obtain the final Category-A contributions for each Funding Agency. The rightmost column, "Total A+B invoiced ", represents the total (Categories A and B) M&O contributions to be invoiced to the Funding Agencies. The detailed breakdown of the M&O-B contributions by Funding Agency and System is given in **Table 6**.

Planned ATLAS M&O (A) and (B) Payments in 2014 (kCHF)

Item & Cost Driver (by RRB SG Headings)	Cat. A M&O	Pixel	SCT	TRT	IDGen	LAr	TileC	Muon	FD	Comp.	Cat. B M&O	Item & Cost Driver (by RRB SG Headings)
Detector related costs	6,807			20		5	8	60	5		98	Mechanics
Cryogenics, gas system operations												
Shutdown activities, support, safety						1	8				9	Gas systems
Secretariat	305											
2 FTE charged to ATLAS												
Publications, consumables						5					5	Cryo-systems
Collaborative tools	220											
GSM phones						15	3	15	60		93	Cooling system
Computer network connections												
Videoconferencing, archiving						420	60		1		481	FE electronics
Core computing (infrastr. & services)	2,128											
Software process service												
Central production & operation		165	285	190	45	280	224	160	39		1,388	Standard electronics Power supplies, crates, RO-modules
On-line computing	2,384											
System management		10	20	10	5	40	16	30	2		133	Controls (DCS, DSS)
Hardware replacements (HLT, networks)												
Test beams, facilities	730						30		16		46	Sub-detector spares
Testing equipment (DCS)												
Consolidation												
		90	20	30	120	10	20		18		308	Areas
Laboratory operations	135											System tests, lab. Operations, SR1 (ID)
Assembly areas, workshops												
TDAQ laboratory equipment		1	5		8	5	5	5	2		31	Communications
General services	3,781	24	30	30	80	10	23		18		215	Store items
Heavy handling												
Technical support, storage												
Survey												
Outreach												
Energy												
TOTAL	16,490	290	360	280	258	791	397	270	161	0	2,807	(Excluding hired manpower, Cat. B)
Hired manpower at CERN (in kCHF)	incl. above	250	277	265	315	320	250	300	82		2,059	
Institute manpower (in FTE), excl. shi	0	21	24	27	30	40	32	100	26	138	438	Class 3 expert tasks (OTP)
TOTAL M&O FOR A	16,490	540	637	545	573	1,111	647	570	243	0	4,866	TOTAL M&O FOR B

Proposed Sharing of M&O Contributions for ATLAS in 2014 by Funding Agency (kCHF)

Funding Agency	Authors M&O-A	Category A items				Cat. B	Total A + B
		budgeted	adjusted[1]	in-kind	invoiced[2]	budgeted[3]	invoiced[4]
Argentina	**6**	55	55		55	3	**58**
Armenia	**1**	9	9		9	1	**11**
Australia	**16**	146	146		146	51	**196**
Austria	**2**	18	16		16	6	**22**
Azerbaijan	**2**	18	18		18	1	**19**
Belarus	**4**	36	36		36	2	**38**
Brazil	**11**	100	100		100	5	**105**
Canada	**66**	601	589		589	211	**800**
Chile	**5**	46	46		46	2	**48**
China NSFC+MSTC	**17**	155	155		155	8	**163**
Colombia	**4**	36	36		36	2	**39**
Czech Republic	**39**	355	308	26	282	18	**299**
Denmark	**11**	100	87		87	35	**122**
France IN2P3	**113**	1,028	891	99	792	361	**1,153**
France CEA	**30**	273	237		237	96	**333**
Georgia	**4**	36	36		36	2	**38**
Germany BMBF	**148**	1,347	1,167	140	1,027	472	**1,499**
Germany DESY	**29**	264	229		229	93	**321**
Germany MPI	**30**	273	237		237	96	**333**
Greece	**17**	155	134		134	8	**142**
Israel	**22**	200	173		173	10	**183**
Italy	**158**	1,438	1,246	182	1,064	504	**1,568**
Japan	**77**	701	688		688	246	**934**
Morocco	**9**	82	82		82	4	**86**
Netherlands	**30**	273	237		237	96	**332**
Norway	**14**	127	110		110	45	**155**
Poland	**24**	218	189		189	11	**200**
Portugal	**13**	118	103		103	6	**109**
Romania	**13**	118	103		103	6	**109**
Russia	**65**	592	511	57	454	30	**484**
JINR	**27**	246	246		246	12	**258**
Serbia	**5**	46	39		39	2	**41**
Slovak Republic	**10**	91	79	6	72	5	**77**
Slovenia	**8**	73	73		73	4	**77**
South Africa	**8**	73	73		73	4	**77**
Spain	**47**	428	371		371	150	**521**
Sweden	**31**	282	244		244	99	**343**
Switzerland	**23**	209	181		181	73	**254**
Taipei	**9**	82	82		82	4	**86**
Turkey	**12**	109	109		109	5	**115**
United Kingdom	**186**	1,693	1,467	169	1,298	594	**1,891**
US DOE + NSF	**347**	3,158	3,114	365	2,749	1,107	**3,856**
CERN	**119**	1,083	938		938	380	**1,318**
Total	**1,812**	**16,490**	**14,989**	**1,044**	**13,945**	**4,866**	**18,810**

Notes:
Based on qualified authors with PhD or equivalent from September 30, 2012 shown in the rightmost column
[1] Includes energy cost adjustments
[2] After accounting for energy cost adjustments and in-kind contributions
[3] See Table 6 for the detailed breakdown by System and Funding Agency
[4] Expected cash contributions by Funding Agencies (Sum of Cat. A invoiced + Cat. B budgeted)

Proposed Sharing of System-specific M&O-B Contributions for ATLAS in 2014 by Funding Agency (kCHF)

Funding Agency	Category-B items budgeted									Comp. B (FTE)
	Pixel	SCT	TRT	IDGen	LAr	TileC	Muon	FD	Total	
Argentina	0	0	0	0	0	0	3	0	**3**	0
Armenia	0	0	0	0	1	0	0	0	**1**	0
Australia	0	34	0	17	0	0	0	0	**51**	1
Austria	0	2	2	0	1	0	1	0	**6**	0
Azerbaijan	0	0	0	0	1	0	0	0	**1**	0
Belarus	0	0	0	0	0	0	2	0	**2**	0
Brazil	0	0	0	0	0	5	0	0	**5**	1
Canada	0	0	0	0	211	0	0	0	**211**	5
Chile	0	0	0	0	0	0	2	0	**2**	0
China NSFC+MSTC	0	0	0	0	4	0	4	0	**8**	1
Colombia	0	0	0	0	0	0	2	0	**2**	0
Czech Republic	2	1	0	1	0	6	0	6	**18**	3
Denmark	0	0	29	6	0	0	0	0	**35**	1
France IN2P3	63	0	0	1	217	69	0	11	**361**	9
France CEA	0	0	0	0	76	0	20	0	**96**	2
Georgia	0	0	0	0	1	0	1	0	**2**	0
Germany BMBF	184	49	0	63	89	0	40	47	**472**	11
Germany DESY	0	0	0	0	40	0	32	21	**93**	2
Germany MPI	0	29	0	16	36	0	15	0	**96**	2
Greece	0	0	0	0	0	0	8	0	**8**	1
Israel	0	0	0	0	0	0	10	0	**10**	2
Italy	175	0	0	44	75	56	124	31	**504**	12
Japan	0	77	0	51	0	20	97	0	**246**	6
Morocco	0	0	0	0	4	0	0	0	**4**	1
Netherlands	0	27	0	14	0	0	55	0	**96**	2
Norway	0	29	0	16	0	0	0	0	**45**	1
Poland	0	2	5	2	0	0	0	2	**11**	2
Portugal	0	0	0	0	0	5	0	1	**6**	1
Romania	0	0	0	0	0	6	0	0	**6**	1
Russia	0	0	11	3	6	5	4	0	**30**	5
JINR	0	0	1	1	3	4	3	0	**12**	2
Serbia	0	0	0	0	2	0	0	0	**2**	0
Slovak Republic	0	0	0	0	5	0	0	0	**5**	1
Slovenia	0	2	0	1	0	0	0	0	**4**	1
South Africa	0	4	0	0	0	0	0	0	**4**	1
Spain	0	11	0	10	40	89	0	0	**150**	4
Sweden	0	10	34	14	14	22	0	5	**99**	2
Switzerland	0	48	0	25	0	0	0	0	**73**	2
Taipei	2	1	0	1	1	0	0	0	**4**	1
Turkey	0	0	5	0	0	0	0	0	**5**	1
United Kingdom	0	309	0	285	0	0	0	0	**594**	14
US DOE + NSF	3	0	334	0	262	294	149	65	**1107**	26
CERN	111	3	123	2	23	65	0	53	**380**	9
total	**540**	**637**	**545**	**573**	**1111**	**647**	**570**	**243**	**4,866**	**138**

Notes:
Based on authors, modulated by CORE contributions
Core computing in Category B (Comp. B) is expressed in Full-Time-Equivalents (FTE). Figure 0 refers to an effort smaller than 0.5 FTE