



# Annual Progress Report for 2017

CERN/SPC/1102/Rev. – CERN/FC/6206/Rev. – CERN/3345/Rev.

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CERN Audit Committee - 1 June 2018

# 2017 APR: Summary

- Document structure - unchanged
  - Executive Summary describing 2017 accomplishments over full spectrum of activities
  - Summary tables with revenues, expenses and budget balance
  - Key Performance Indicators (KPI): enhanced with comparison over two years
  - Appendices with details (fact sheets and more detailed tables)
- Comparison of 2017 objectives (as approved in June 2016) with 2017 Out-Turn
- 2017 spending profile was reviewed during the annual planning exercise; consequently
  - 2017 Revised Budget was presented as part of the Medium Term Plan in June 2017
  - **The 2017 Budget Out-Turn is compared to the revised figures**

# 2017 Highlights (examples)

- LHC and accelerator complex performance
  - Record LHC peak luminosity:  $\sim 2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$  (x2 beyond design)
  - $\sim 50 \text{ fb}^{-1}$  to ATLAS and CMS
  - Great scientific output, e.g. observation of Higgs couplings to  $t/b/\tau$ ,  $tZq$ , electroweak  $W_{\pm}W_{\pm}$  production in ATLAS and CMS, many precise measurements
  - WLCG computing holding up; progress with preparation for future HEP computing with release of Community White Paper
  - Unprecedented availability of full accelerator complex
- LHC upgrades
  - First reliability run of LINAC4 (operated from CCC)
  - LHC Injector Upgrade on schedule for installation in LS2
  - HL-LHC: technical specifications and call for tender for Civil Engineering work at IP1 and IP5 completed
  - Phase-1 upgrades of experiments mostly on track
- Successful non-LHC programme (progress on HIE-ISOLDE, ELENA, neutrino platform)

# 2017 Highlights (continued)

- Preparation for CERN future:
  - CLIC: progress on project implementation plan for ESPP updated
  - FCC: great progress towards CDR for ESPP update
- Geographical enlargement:
  - India joined as Associate Member
  - Slovenia joined as Associate Member in the pre-stage to Membership
  - AM agreement signed with Lithuania
- Other activities
  - Two new buildings completed: B311 (magnetic measurements), B107 (surface treatment)
  - Agreement with American Physical Society signed
  - Working Group on “Quality of Working Life” (“Stress Management”) established
  - Great progress with disposal of low-level radioactive waste
  - CERN Environmental Protection Steering (CEPS) board released first high-priority recommendations to mitigate impact of CERN on environment

# Facts and key performance indicators: including the trend by comparing 2016 with 2017

	2017	2016
<b>ACCELERATORS</b>		
<b>LHC pp run</b>		
Peak luminosity	$2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$	$1.5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$
Fraction of time in stable beams	49%	49%
Integrated luminosity		
ATLAS	51 fb <sup>-1</sup>	39 fb <sup>-1</sup>
CMS	51 fb <sup>-1</sup>	40 fb <sup>-1</sup>
LHCb	2 fb <sup>-1</sup>	2 fb <sup>-1</sup>
ALICE	19 pb <sup>-1</sup>	13 pb <sup>-1</sup>
<b>Injectors: beam availability</b>		
Linac2	99%	97%
PS Booster	97%	95%
PS Machine	93%	90%
AD (Anti-Proton deaccelerator)	94%	89%
Linac3 (during ion run)	99%	na
LEIR (during ion run)	97%	na
SPS Machine	91%	76%
<b>EXPERIMENTS and THEORY</b>		
<b>Publications</b>		
ATLAS	113	106
CMS	132	110
ALICE	29	24
LHCb	60	68
Theory papers with at least one CERN author	284	262
Non-LHC experiments	178	
<b>PhD students</b>		
ATLAS	1 198	1 133
CMS	908	819
ALICE	371	254
LHCb	285	276
Non-LHC experiments	383	
<b>LHC COMPUTING</b>		
Detector data recorded	39 PB	49 PB
Global data transfer rates	35 GB/s	35 GB/s
Number of jobs per day	2.2 million	2 million

Full production  
year

	2017	2016
<b>SAFETY, HEALTH and ENVIRONMENT PROTECTION</b>		
<b>Occupational accidents</b>		
Total number	29	32
Accidents at work	13	18
Commuting accidents	16	14
<b>Radioactive waste</b>		
Received	920	316
Eliminated	3 017	1 200
Stored	6 516	8 613
<b>OUTREACH</b>		
<b>Protocol visits</b>		
Visitors at CERN	136	142
Visits	5 692	5 048
Participants		
Requested	236 431	200 688
Received	135,949	119,985
<b>S'Cool LAB visitors</b>		
CERN Teacher Programme	7 240	5 877
Number of programmes	33	35
Number of participants	952	953
<b>Travelling exhibitions</b>		
Number of visitors	~400 000	~100 000
Number of visited countries	3	7
<b>On-site exhibitions visitors</b>		
Press	~100 000	~70 000
Number of media visits	214	242
Number of journalists	527	628
Press cutting	~138 000	~145 000
<b>Mentions on social media</b>		
Number of web site hits	~2 million	~1.7 million
	> 5 million	~ 4 million

# Facts and key performance indicators

	2017	2016
<b>REVENUES</b>		
<b>Percentage of outstanding revenues</b>		
Member States	0.2	1.6
Associate Member States	0.0	4.2
Associate Member States in the pre-stage to Membership	0.0	15.3
<b>Percentage of contributions received on time</b>		
Member States	98.0	86.2
Associate Member States	43.3	74.6
Associate Member States in the pre-stage to Membership	49.5	0.0
<b>PROCUREMENT &amp; KNOWLEDGE TRANSFER</b>		
<b>Orders</b>		
Invitations to tenders (>200 kCHF)	98	93
Number of orders		
>= 200 kCHF	137	120
between 1 and 200 kCHF	12 150	12 693
< 1 kCHF	11 914	12 495
Total kCHF of adjudications	270 189	291 273
<b>Industrial return</b>		
Balanced countries for supplies	9	5
Balanced countries for industrial services	6	6
Very poorly balanced countries for supplies	8	8
Poorly balanced countries for industrial services	23	21
<b>Knowledge transfer</b>		
New technologies identified	73	91
KT contracts signed	41	42

	2017	2016
<b>HUMAN RESOURCES</b>		
<b>Resources</b>		
FTE paid on CERN budget (excl. Teams)	2,475	2,439
Fellows	807	750
Associates for the purpose of training		
Administrative students	30	35
Apprentices	22	20
Doctoral students	204	190
Summer students	295	278
Technical students	182	193
Trainees	141	114
Scientific Associates	49	43
Project Associates	255	188
Users	12 255	11 856
Visiting scientists hosted by the Theory Department		
	499	476
<b>Staff Recruitment</b>		
Vacancies published	184	158
Applications received	13 835	12 192
Fraction of LD contracts	33%	31%
<b>Training</b>		
Courses	248	251
Sessions	535	508
Training days	12 659	13 700
Participants	6 002	5 800

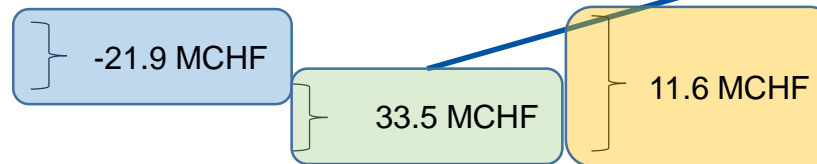
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# Budget position of the Organization

(in MCHF, rounded off)	Final 2017 Budget	Revised 2017 Budget	2017 Out-Turn	Variation of 2017 Out-Turn with respect to Revised 2017 Budget	
	CERN/FC/6060	CERN/FC/6124	CERN/FC/6206/RA	MCHF	%
	(2017 prices)	(2017 prices)	(2017 prices)	(c)=(b)-(a)	(c)/(a)
		(a)	(b)		
<b>REVENUES</b>	<b>1,230.1</b>	<b>1,235.2</b>	<b>1,271.9</b>	<b>36.7</b>	<b>3.0%</b>
Member States' contributions	1,119.9	1,119.9	1,119.9	0.0	0.0%
Associate Member States' contributions	10.2	21.8	22.3	0.5	2.3%
Contributions anticipated from new Associate Member States	10.0				
EU contributions	16.0	14.1	15.9	1.8	12.6%
Other revenues	74.1	79.4	113.8	34.4	43.4%
<b>EXPENSES</b>	<b>1,202.5</b>	<b>1,229.5</b>	<b>1,232.7</b>	<b>3.2</b>	<b>0.3%</b>
Scientific programmes	503.0	497.4	476.1	-21.3	-4.3%
Infrastructure and services	287.6	298.4	292.2	-6.2	-2.1%
Centralised expenses <sup>1</sup>	178.4	177.9	196.7	18.8	10.6%
Projects and studies	233.6	255.8	267.6	11.8	4.6%
<b>BALANCE</b>					
Annual balance	27.6	5.7	39.2	33.5	
Capital repayment allocated to the budget (Fortis, FIPOI 1, 2 and 3)	-25.9	-25.9	-25.9	0.0	
Recapitalisation Pension Fund	-60.0	-60.0	-60.0		
Annual balance allocated to budget deficit	-58.3	-80.2	-46.7	33.5	
<b>-Cumulative balance-</b>	<b>- 118.4</b>	<b>-176.7</b>	<b>-165.1</b>	<b>33.5</b>	

Cumulative budget deficit **slightly improved** if compared to expectations:

Planned: -176.7 MCHF in Final 2017 Budget  
 Revised: -198.6 MCHF in Revised 2017 Budget  
**Actual amount: -165.1 MCHF**





# Changes with respect to March version

- Following feedback received from committees:
  - Some wording in the narrative summary and fact sheets was implemented
  - The information on the EU applications success rate and EU administrative support was included
  - Data for accidents concerning contractors was added (this information was not yet available for the March publication)

A great thank you to the External Audits (NIK) and Delegates for their suggestions and review.



[www.cern.ch](http://www.cern.ch)

# Further observations for 2017 Out-Turn figures

- The cumulative budget deficit is 11.6 MCHF lower than anticipated in the Final 2017 Budget
- If compared to the 2017 Probable Revenues and Expenses (presented to the Council in December 2017):
  - Both expenses and the revenues in the 2017 Out-Turn are slightly higher (23 MCHF and 31 MCHF respectively)
  - Open Commitments at the end of 2017 amount to 80 MCHF

# Variation of revenues

(in MCHF, rounded off)	Final 2017 Budget	Revised 2017 Budget	2017 Out-Turn	Variation of 2017 Out-Turn with respect to Revised 2017 Budget	
	CERN/FC/6060	CERN/FC/6124	CERN/FC/6206/RA	MCHF	%
	(2017 prices)	(2017 prices)	(2017 prices)	(c)=(b)-(a)	(c)/(a)
	(a)	(b)	(b)		
<b>REVENUES</b>	<b>1,230.1</b>	<b>1,235.2</b>	<b>1,271.9</b>	<b>36.7</b>	<b>3.0%</b>
Member States' contributions	1,119.9	1,119.9	1,119.9	0.0	0.0%
Associate Member States' contributions	10.2	21.8	22.3	0.5	2.3%
Contributions anticipated from new Associate Member States	10.0				
EU contributions	16.0	14.1	15.9	1.8	12.6%
Additional contributions	4.8	8.1	8.6	0.5	6.4%
<i>for LINAC4, HIE-ISOLDE, ELENA, AWAKE, CLIC, IdeaSquare, FAIR, CESSAMag</i>	4.8	8.1	8.6	0.5	6.4%
Personnel paid from team accounts	13.7	13.7	12.0	-1.6	-11.9%
Personnel on detachment	1.0	1.0	0.9	-0.1	-7.8%
Internal taxation	30.1	30.1	33.4	3.3	11.0%
Knowledge transfer	1.1	2.3	1.7	-0.6	-27.4%
Other revenues	23.4	24.2	57.1	32.9	135.9%
<i>Sales and miscellaneous</i>	6.2	6.9	30.1	23.1	333.8%
<i>SCOAP3 revenues</i>	4.9	4.9	5.2	0.3	6.1%
<i>OpenLab revenues</i>	2.2	2.3	2.2	-0.1	-5.0%
<i>Financial revenues</i>	2.0	2.0	11.8	9.8	489.8%
<i>In-kind</i>	2.0	2.0	1.8	-0.2	-11.9%
<i>Housing fund</i>	6.0	6.0	6.1	0.1	0.8%

The miscellaneous line includes revenue corresponding to materials expenses recharged to teams and collaboration (18.4 MCHF). This item is shown separately for the first time in 2017.

The financial revenues heading includes gains and losses resulting from currency exchange-rate fluctuations.

# Variation of expenses

(in MCHF, rounded off)	Final 2017 Budget	Revised 2017 Budget	2017 Out-Turn	Variation of 2017 Out-Turn with respect to Revised 2017 Budget	
	CERN/FC/6060 <sup>3</sup>	CERN/FC/6124	CERN/FC/6206/RA	MCHF	%
	(2017 prices)	(2017 prices)	(2017 prices)	(c)=(b)-(a)	(c)/(a)
	(a)	(b)	(b)	(c)=(b)-(a)	(c)/(a)
<b>EXPENSES</b>	<b>1,202.5</b>	<b>1,229.5</b>	<b>1,232.7</b>	<b>3.2</b>	<b>0.3%</b>
<b>Running of scientific programmes and support</b>	<b>969.0</b>	<b>973.7</b>	<b>965.1</b>	<b>-8.6</b>	<b>-0.9%</b>
<b>Scientific programmes</b>	<b>503.0</b>	<b>497.4</b>	<b>476.1</b>	<b>-21.3</b>	<b>-4.3%</b>
<i>LHC (machine, detectors and computing, including spares and consolidation)</i>	267.7	258.4	252.2	-6.2	-2.4%
<i>Non-LHC physics and scientific support</i>	82.0	80.4	71.0	-9.4	-11.7%
<i>Other accelerators and areas (including consolidation)</i>	153.3	158.6	152.9	-5.7	-3.6%
<b>Infrastructure and services</b>	<b>287.6</b>	<b>298.4</b>	<b>292.2</b>	<b>-6.2</b>	<b>-2.1%</b>
<b>Centralised expenses</b>	<b>178.4</b>	<b>177.9</b>	<b>196.7</b>	<b>18.8</b>	<b>10.6%</b>
<b>Projects and studies</b>	<b>233.6</b>	<b>255.8</b>	<b>267.6</b>	<b>11.8</b>	<b>4.6%</b>
<b>LHC upgrades</b>	<b>148.8</b>	<b>162.6</b>	<b>177.8</b>	<b>15.3</b>	<b>9.4%</b>
<i>LINAC4</i>	1.0	1.2	0.7	-0.4	-38.1%
<i>LHC injectors upgrade</i>	52.4	51.9	49.4	-2.5	-4.8%
<i>HL-LHC construction</i>	71.8	71.9	84.9	13.0	18.0%
<i>LHC detectors upgrade (Phase 1) and consolidation</i>	16.1	25.1	24.1	-1.0	-3.9%
<i>HL-LHC detectors, including R&amp;D (Phase 2)</i>	7.6	12.5	18.7	6.2	49.5%
<b>Preparation for the future</b>	<b>41.2</b>	<b>44.5</b>	<b>44.1</b>	<b>-0.4</b>	<b>-1.0%</b>
<i>Linear collider studies (CLIC, ILC, detector R&amp;D)</i>	22.0	19.8	19.0	-0.8	-4.0%
<i>Future Circular Collider study</i>	12.8	15.5	16.9	1.4	9.0%
<i>Proton-driven plasma wakefield acceleration (AWAKE)</i>	6.4	8.4	7.0	-1.5	-17.4%
<i>Physics Beyond Colliders study</i>		0.8	1.2	0.4	49.8%
<b>Scientific diversity activities</b>	<b>43.6</b>	<b>48.7</b>	<b>45.7</b>	<b>-3.0</b>	<b>-6.1%</b>
<i>ELENA</i>	2.5	5.1	4.2	-0.9	-17.4%
<i>HIE-ISOLDE</i>	4.2	4.0	2.9	-1.0	-26.5%
<i>CERN Neutrino Platform</i>	17.9	19.4	20.9	1.5	7.8%
<i>R&amp;D (incl. EU support) for accelerators, medical applications</i>	19.1	20.2	17.7	-2.5	-12.6%

The focus on the LHC upgrades resulted in a shortage of personnel that generated some underspending in spares procurement, electrical network consolidation, accelerator maintenance and consolidation and in other areas.

Higher expenses than planned for Building 107 (surface treatment), the flexible storage building in Prévessin (for LS2) and building consolidation, but less for site operation

The miscellaneous item under the heading energy and water, includes the materials expenses (18.4 MCHF) recharged to team accounts that are shown separately for the first time in 2017.

Some of the expenses for non-LHC projects, such as AWAKE, ELENA, HIE-ISOLDE, MEDICIS and FAIR, were re-profiled.

The priority given to the LHC upgrades resulted in a slightly higher level of expenses than planned for HL-LHC and the Phase-2 detectors upgrades.