

Report of the Scrutiny Group to the LHC RRB

On behalf of the **LHC Scrutiny Group**

Ariane Frey (chair), University of Göttingen

RRB, CERN, October 2024

2024 Scrutiny Cycle - Membership of the Group

COCHRAN, James	Iowa State University, US	<i>Composition :</i> 10 persons + Secretary + Service Contacts = 12 in total (-1 to previous year)
D'HOSE, Nicole	CEA-IRFU, FR	
FREY, Ariane	University of Göttingen, DE, Chair	
GYS, Thierry	CERN, EP Department	
MARSHALL, Philip	SLAC, US	
PEPE, Monica	INFN Perugia, IT	
PÖSCHL, Roman	IN2P3, FR	
ROZYCKA, Agata	CERN, Service Contacts	
SCHMIDT, Burkhard	CERN, EP Department , Secretary	
SCHWANDA, Christoph	HEPHY Vienna, AT	
TROSKA, Jan	CERN, EP Department	<i>New members:</i> 2019 - 21% 2020 - 14 % 2021 - 0 % 2022 - 35 % 2023 - 8 % 2024 - 33%
VOSSEBELD, Joost	University of Liverpool, UK	33% from CERN 33% women

New members 2024: Welcome to the Scrutiny Group

Many thanks to Heidi Sandaker (Oslo, NO) for her dedicated and excellent work as SG chair 2019-2023

2024 Scrutiny Cycle - Membership of the Group

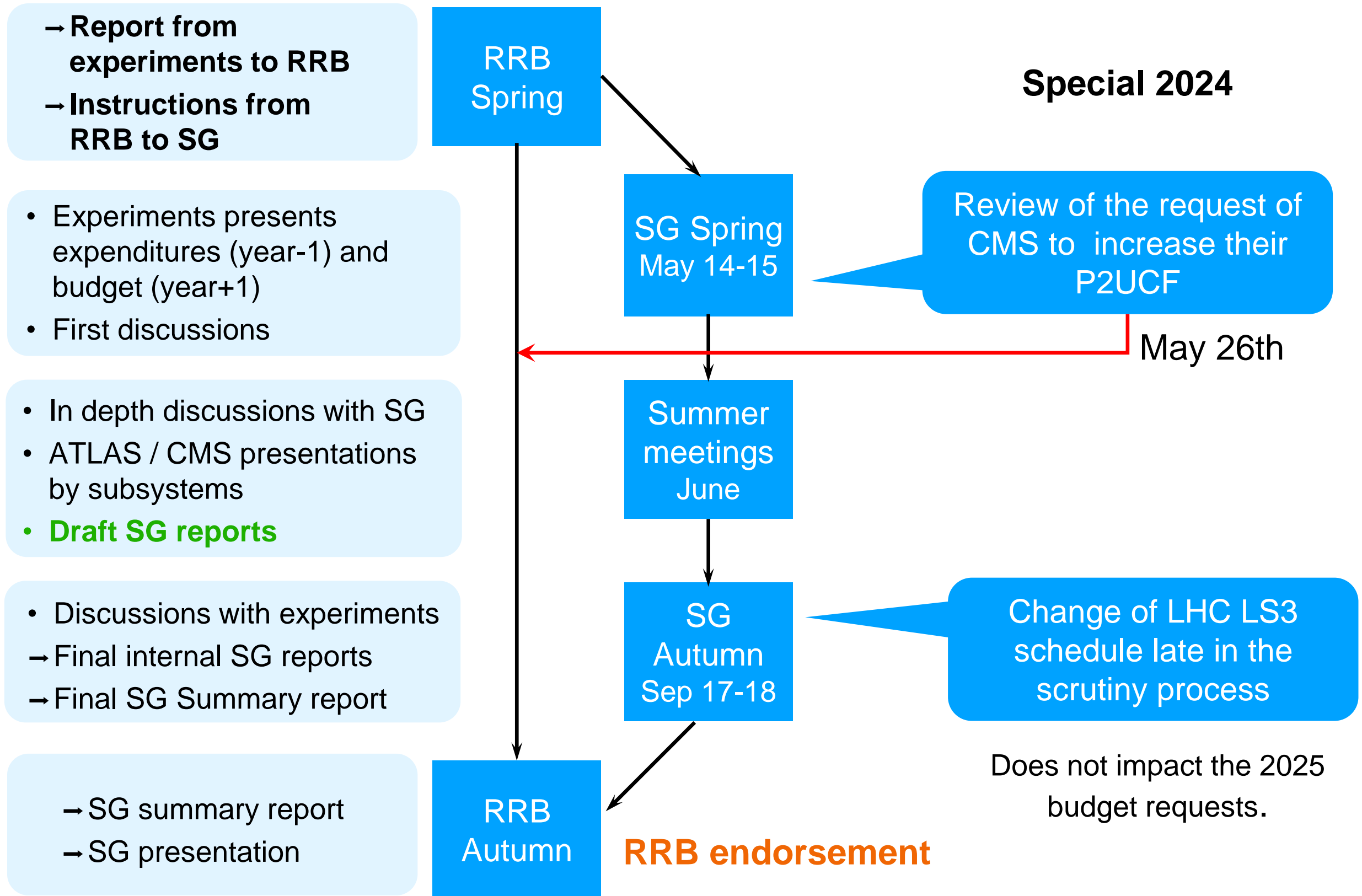
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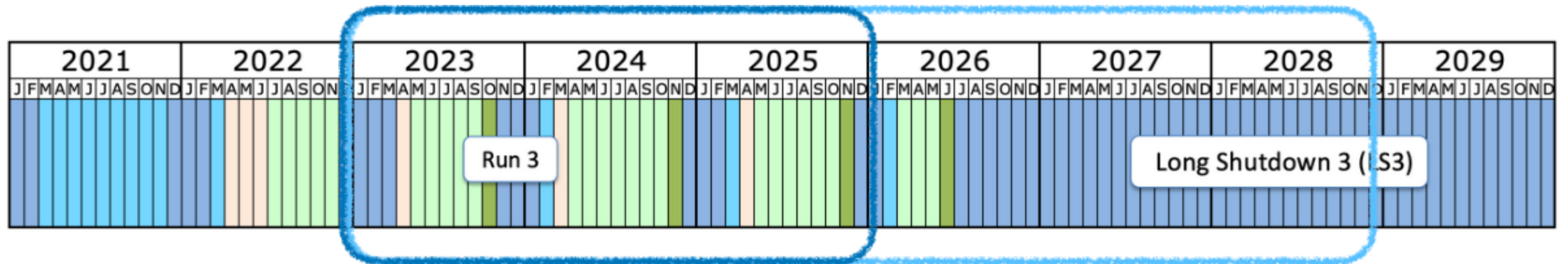
*** *Outgoing members: Many thanks for all the excellent work over many years!***

***Call for new members for 2025: suggestions for candidates from France (IN2P3)
and smaller member states very welcome!***

The Scrutiny Cycle



Scrutiny Cycle 2024



2023: Operation Run 3

- Running year with shorter p-p run

2024: Operation Run 3

- Very successful LHC running and data taking. The SG congratulates 😊
- Expenditures largely on target. Mitigations of the effects due to war in Ukraine are ongoing.

2025: Operation Run 3

- Budget for a full operation year
- Total M&O budget without power requested:
51.26 MCHF

Global sum M&O without power	MCHF
2024*	50.6
2023	50.2
2022	50.1
2021	49.3
2020	49.0
2019	49.6
2018	47.0
2017	47.2
2016	46.9
2015	47.5

* Budget approved for this year

2024 Scrutiny Cycle - summary

CERN Finance Reports (RRB-2017-070)	Overall very good agreement for all experiments
M&O B Carry over (RRB-2017-070)	All experiments are below the limit of 30% accumulated funds or execute down-spending
Online computing replacement account	Projections are presented up to 2028 with down-spending below zero until 2028/2029.
Delayed contributions	Trend with delayed contributions has improved (except for ALICE).
Integration of new subsystems (LS2, LS3)	All new sub-detectors in LS2 are integrated. Expenses for detectors to be installed in LS3 ramping up.
M&O B	More in-depth review with special emphasis on cash versus in-kind contributions. Varies for the experiments (ATLAS: only cash into CERN accounts, for other experiments substantial in-kind contributions (~30%, cash at institutes and human resources).
Collection of common funds	Proceeds according to plan, delays have slightly improved in 2024.
Tracking of entry fees	No issues found
Change in LS3 schedule	Does not affect the 2025 budget requests, but the projections up to 2028. CMS has not explicitly taken into account the updated schedule in the budget profile, but the anticipation is that the overall envelope will not change; for the other experiments based on the new schedule (2026 short running year).
War in Ukraine	Affects all experiments, mitigations are ongoing and not trivial. Continuation of ICA with JINR helps and is baseline of this year's cycle. Outstanding contributions from Russia for 2024 are a concern.
Other issues	Concerns about the rise of cost of power, inflation, exchange rates, shortages of raw materials etc. continues. SLA costs increased for experiments.

ALICE M&O - Overview

Closing report 2023 M&O:

M&O A:

- Budget w/o power: 4,935 kCHF
- Actual costs w/o power: 4,875 kCHF
- End of year open commitments: 51 kCHF
- NMS power costs: 669 kCHF

Comments:

- M&O A: Cumulative outstanding contributions have increased in 2023 to 1,300 kCHF.
- M&O B: Budget was 1,385 kCHF, spending was within 1%. About 70% of M&O B contributions are paid into CERN accounts. All subsystems are maintaining their cash reserves at less than 30% of their annual budget.

Request 2025 M&O:

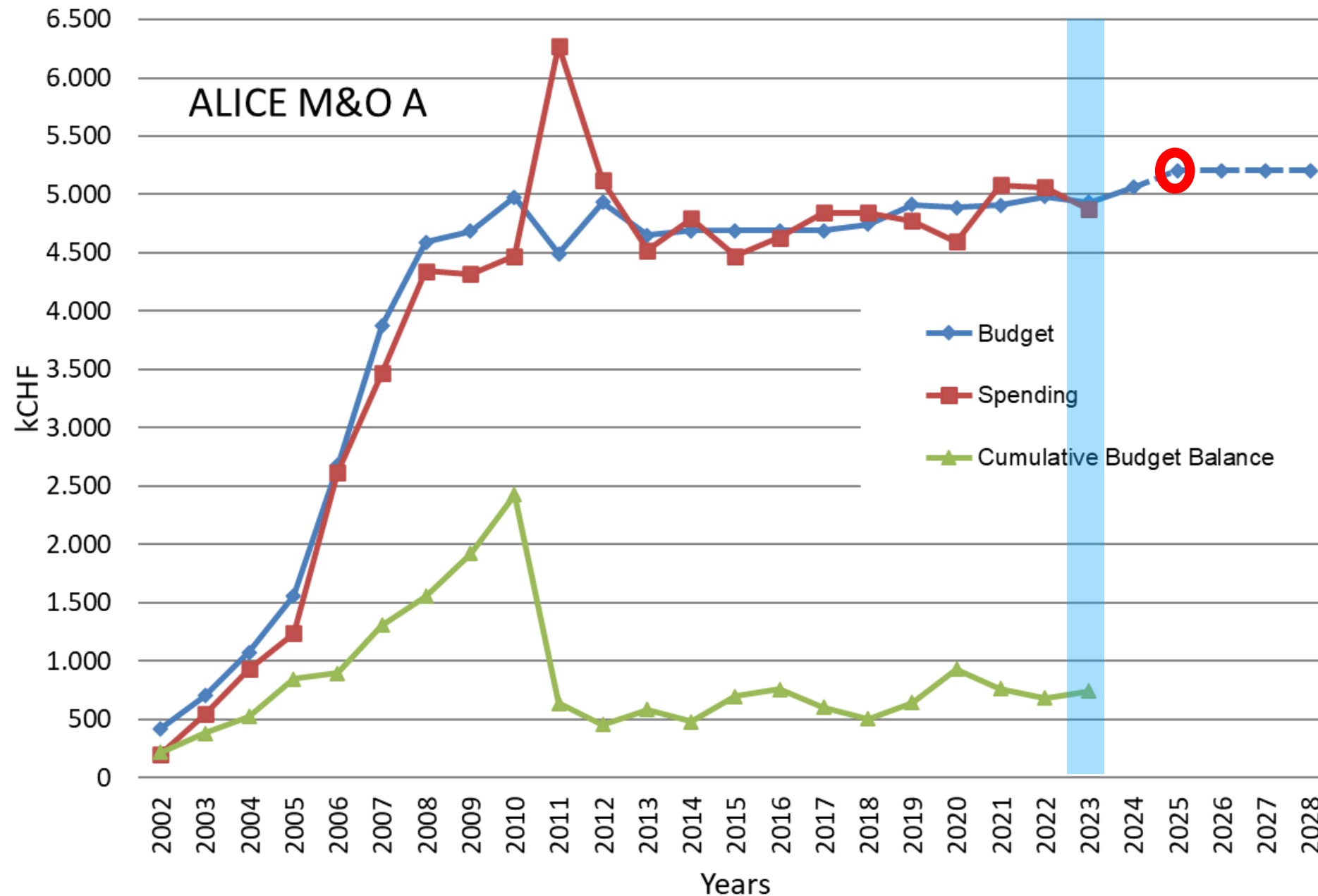
M&O (kCHF)	2024	2025	2026	2027	2028
M&O A Total w/o power	5,064	5,206	5,206	5,206	5,206
M&O A Grand Total	7,764	7,555	6,925	5,609	5,609
M&O B Grand Total	1,456	1,335	1,360	1,316	1,315
Technical Manpower (PM)	226	146	156	156	138

Comments:

- M&O A: Budget request is 5,206 kCHF, a small increase to the 2024 budget. This is mainly due to changes in the SLAs and includes the rent for temporary data storage.
- M&O B: Budget request is 1,335 kCHF, less than in 2024. This request takes into account changes in some subsystems, such as the end of operation of the PHOS detector at the end of 2024.

ALICE M&O A evolution

Graph does not include open commitments



The SG recommends approval of the ALICE M&O A and M&O B closing reports for 2023, and the budget requests for 2025

ATLAS M&O - Overview

Closing report 2023 M&O:

M&O A:

- Budget w/o power: 13,230 kCHF
- Actual costs w/o power: 11,331 kCHF
- End of year open commitments: 1,163 kCHF
- NMS power costs: 742 kCHF

Comments:

- M&O A : Large underspending \leq planned transfer of 1.8 MCHF to online replacement account.
- M&O B : The budget was 5,970 kCHF (money into CERN accounts), overspent by 5%. Main expenditure was hired effort at CERN. Globally, the M&O B carry-over has come down to 29% of the annual budget, just below the target limit of 30%.

Request 2025 M&O:

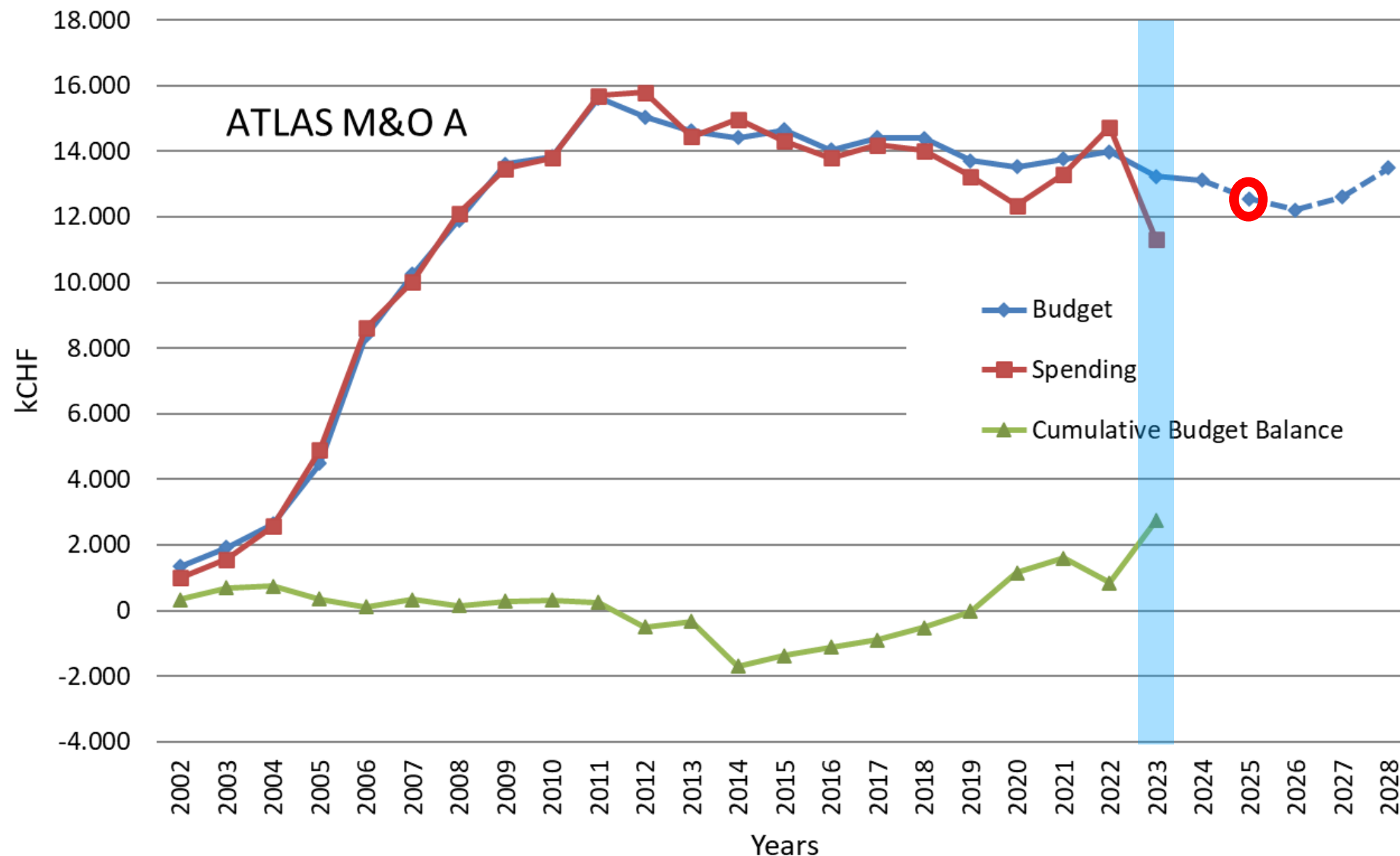
M&O (kCHF)	2024	2025	2026	2027	2028
M&O A Total w/o power	13,108	12,550	12,220	12,597	13,492
M&O A Grand Total	15,308	14,750	14,420	14,797	15,692
M&O B Grand Total	6,092	6,650	6,980	6,603	5,708
Technical Manpower (FTE)	266	299	341	272	191
Core Computing (FTE)	162	162	162	162	162

Comments:

- M&O A : The ATLAS M&O A budget request is 12,550 kCHF, down by 558 kCHF compared to the budget approved for 2024 and less than anticipated last year.
- M&O B : The M&O B budget request for 2025 is 6,650 kCHF, increased by 558 kCHF compared to the 2024 budget, mainly due to the ramp up of ITK expenses.

ATLAS M&O A evolution

Graph does not include open commitments



The SG recommends approval of the ATLAS M&O A and M&O B closing reports for 2023, and the budget requests for 2025

CMS M&O - overview and evolution

Closing report 2023 M&O:

M&O A :

- Budget w/o power: 13,653 kCHF
- Actual costs w/o power: 13,858 kCHF
- End of year open commitments: 499 kCHF
- NMS power costs: 664 kCHF

Comments:

- M&O A : Detailed justification of overspending of 1.5% (personpower indexation, Forward Shielding, revised SLA, ECAL laser lab, dry air system consolidation).
- M&O B : Budget was 6,606 kCHF (about 1/3 in-kind), the expenditures about 10% less , with an underspend mainly for the HGAL due to delays in the HL-LHC upgrade and less needed personpower (e.g. Muon).

Request 2025 M&O :

M&O (kCHF)	2024	2025	2026	2027	2028
M&O A Total w/o power	13,554	13,814	15,096	13,575	13,315
M&O A Grand Total	15,254	15,514	16,796	15,275	15,015
M&O B Grand Total	7,005	7,293	7,851	7,852	7,256
Technical Manpower (FTE)	0	0	0	0	0
Core Computing (FTE)	8	8	8	8	8

Projections based on previous LS3 schedule

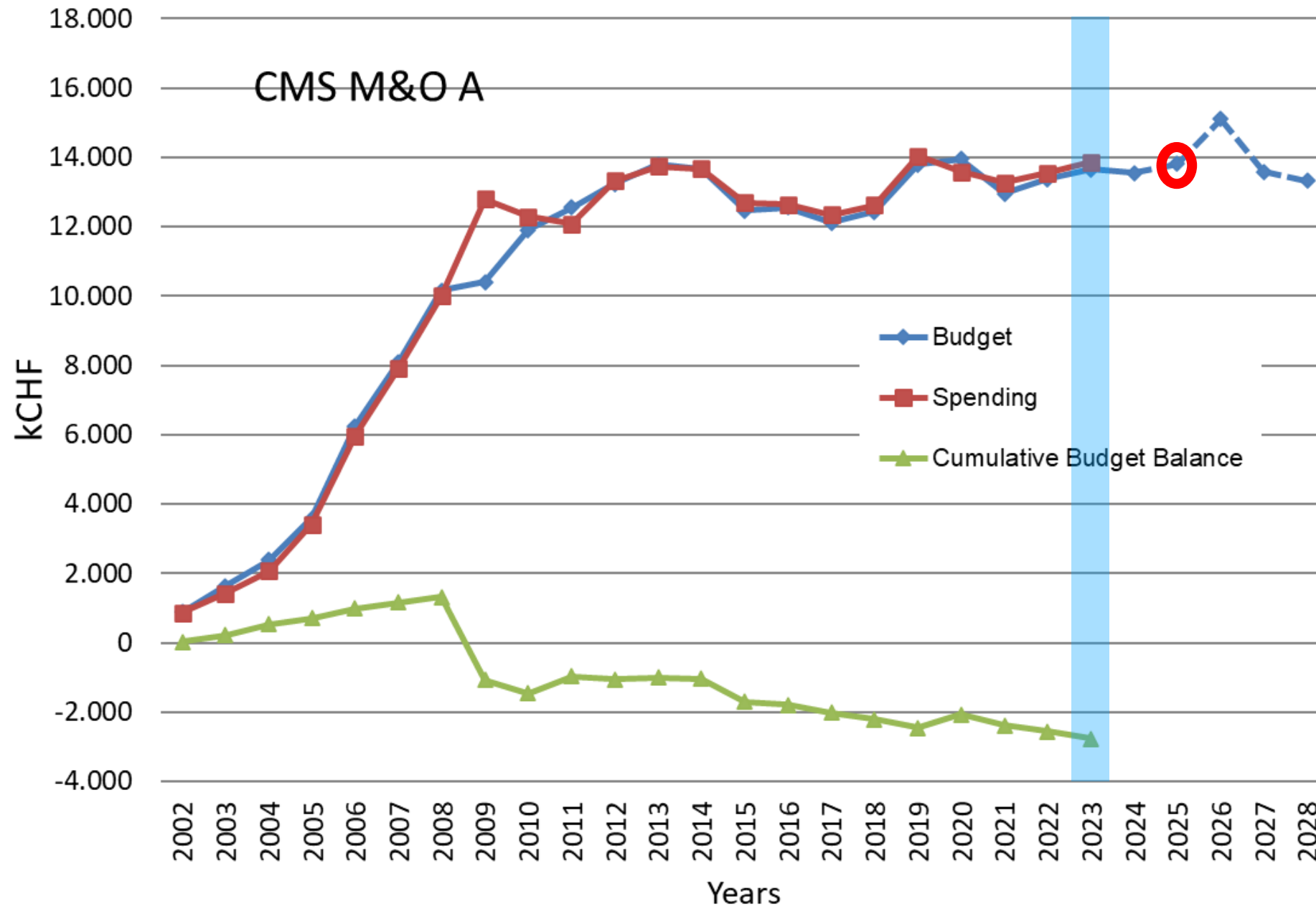
Comments:

- M&O A : Budget request of 13,814 kCHF is 260 kCHF higher than the M&O A for 2024, will increase in 2026/27 and decrease in the following years. The request for 2025 and the projections have increased from what was presented last year.
- M&O B : Budget request is 7,293 kCHF (30% in-kind) and has increased by 288 kCHF compared to the request for 2024, part of a steady increase of the M&O B requests until 2027 that can be attributed to the Phase-2 Upgrade Projects and future decommissioning.

Special 2024 review: Review of the increased funding needed concerning P2UCF

CMS M&O A evolution

Graph does not include open commitments



The SG recommends approval of the CMS M&O A and M&O B closing reports for 2023, and the budget requests for 2025

LHCb M&O - overview and evolution

Closing report 2023 M&O:

M&O A :

- Budget w/o power: 3,070 kCHF
- Actual costs w/o power: 2,805 kCHF
- End of year open commitments: 98 kCHF
- NMS power costs: 133 kCHF

Comments:

- M&O A : Underspending of about 9%, mainly due to delayed delivery of cooling fluids.
- M&O B : Budget was 1,290 kCHF, the level that should be maintained throughout Run 3. About 1/3 is in-kind.

Request 2025 M&O:

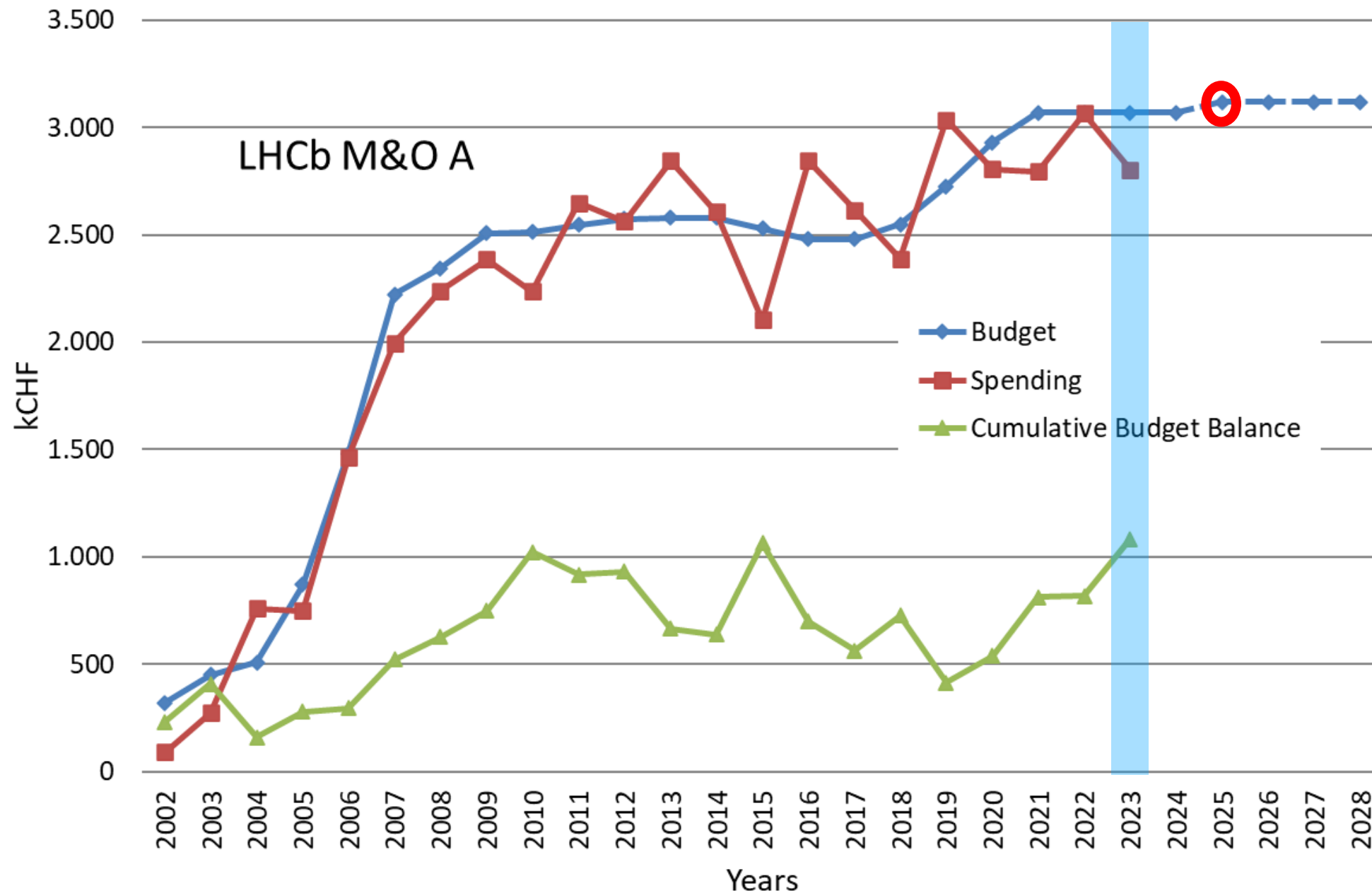
M&O (kCHF)	2024	2025	2026	2027	2028
M&O A Total w/o power	3,070	3,120	3,120	3,120	3,120
M&O A Grand Total	3,970	4,020	4,020	3,720	3,420
M&O B Grand Total	1,290	1,290	1,290	1,290	1,290

Comments.

- M&O A : Budget request of 3,120 kCHF is increased by 50 kCHF (also for the following years). This is due to the increased SLA cost (>100 kCHF).
- M&O B : Budget request is 1,290 kCHF, unchanged from the 2024 budget.

LHCb M&O A evolution

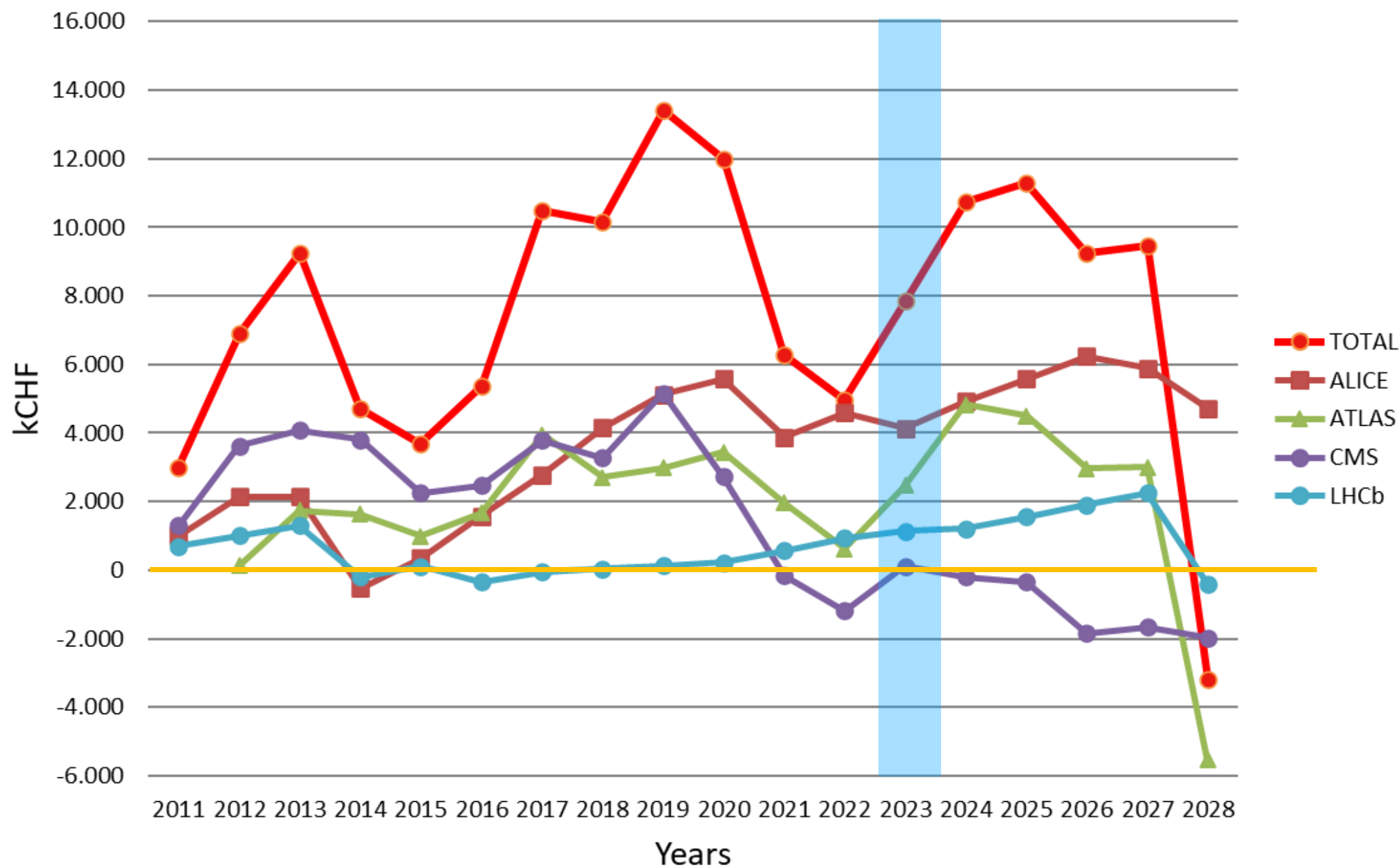
Graph does not include open commitments



The SG recommends approval of the LHCb M&O A and M&O B closing reports for 2023, and the budget requests for 2025

2024 Scrutiny Cycle - Special Online Replacement Account

All experiments presented projections for the online replacement accounts. They will go to a negative balance by 2028 (2029 for ALICE), CMS already earlier.



2024 Scrutiny Cycle - Upgrade Common Fund

- ALICE** *Phase-1 Upgrade CF* budget 5.8 MCHF. By the end of 2023, 70 kCHF was outstanding. 5.9 MCHF has been spent including additional entry fees. The remaining 747 kCHF have been transferred to the next upgrade common fund (ALICE3).
- ATLAS** *Phase-1 Upgrade CF* has been completed after the end of LS2 and the installation of the NSW and is now used to collect entry fees. At the end of 2023, the balance of this account was 736 kCHF with outstanding contributions of 89 kCHF.
Phase-2 Upgrade CF budget is 24.4 MCHF to be collected over 9 years from 2018 to 2026 with a flat profile of 2.7 MCHF per year. As of the end of year 2023, contributions of 15,091 kCHF have been received and 1,916 kCHF spent (940 kCHF in 2023).
- CMS** *Phase-1 Upgrade CF* has been completed. CMS has received all contributions except one, the account will be closed when a solution is found for the last contribution.
Phase-2 Upgrade CF after a detailed review, CMS requested an increase of the P2UCF from the original 25 MCHF to 31.7 MCHF which was endorsed by the SG. The funds are to be collected over 9 years from 2018 to 2026. As of September 2024, 19.4 MCHF has been collected. At the end of 2023, 10,854 kCHF have been spent.
- LHCb** *Phase-1 Upgrade CF* budget is of 15,710 kCHF, with approximately 96% available or fully committed. Outstanding contributions amount to 1,018 kCHF. By the end of 2023, 1,641 kCHF were left in the upgrade fund which were spent just-in-time on the online farm. The remaining 19 kCHF that are left will be spent by the end of 2024 when the fund will be closed.

Acknowledgements

*The Scrutiny Group thanks the **Resource Coordinators and the collaborations** as a whole for the excellent work, outstanding cooperation and the constructive spirit of the discussions of this year's process.*

*We thank **Patricia Mage-Granados and her team** in EP-AGS-SCS for their excellent support.*

*And last but not least, many thanks to the **CERN management and the Funding Agencies**.*