

Report of the Scrutiny Group to the LHC RRBs

On behalf of the LHC Scrutiny Group

Heidi Sandaker (chair), University of Oslo

RRB, CERN, October 2022



**UNIVERSITY
OF OSLO**

2022 Scrutiny Cycle - Membership of the Group

* DANIELSSON, Hans	CERN, EP Department
FREY, Ariane	Gottingen, DE
GOLDSTEIN, Joel	Bristol, UK
MAZZUCATO, Edoardo	CEA/IRFU, FR
PEPE, Monica	Perugia, IT
PITTS, Kevin	Fermilab, US
POESCHL, Roman	IN2P3, FR
ROZYCKA, Agata	CERN, Service Contacts
SANDAKER, Heidi	University of Oslo, NO, Chair
SCHMIDT, Burkhard	CERN, EP Department , Secretary
SCHWANDA, Christoph	Institute of High Energy Physics, Vienna, AT
Jan Troska	CERN, EP Department
YECK, James	Brookhaven National Lab., US

Composition :

New members:

2019 - 21%
2020 - 14 %
2021 - 0 %
2022 - 35 %
2023 - 8 %

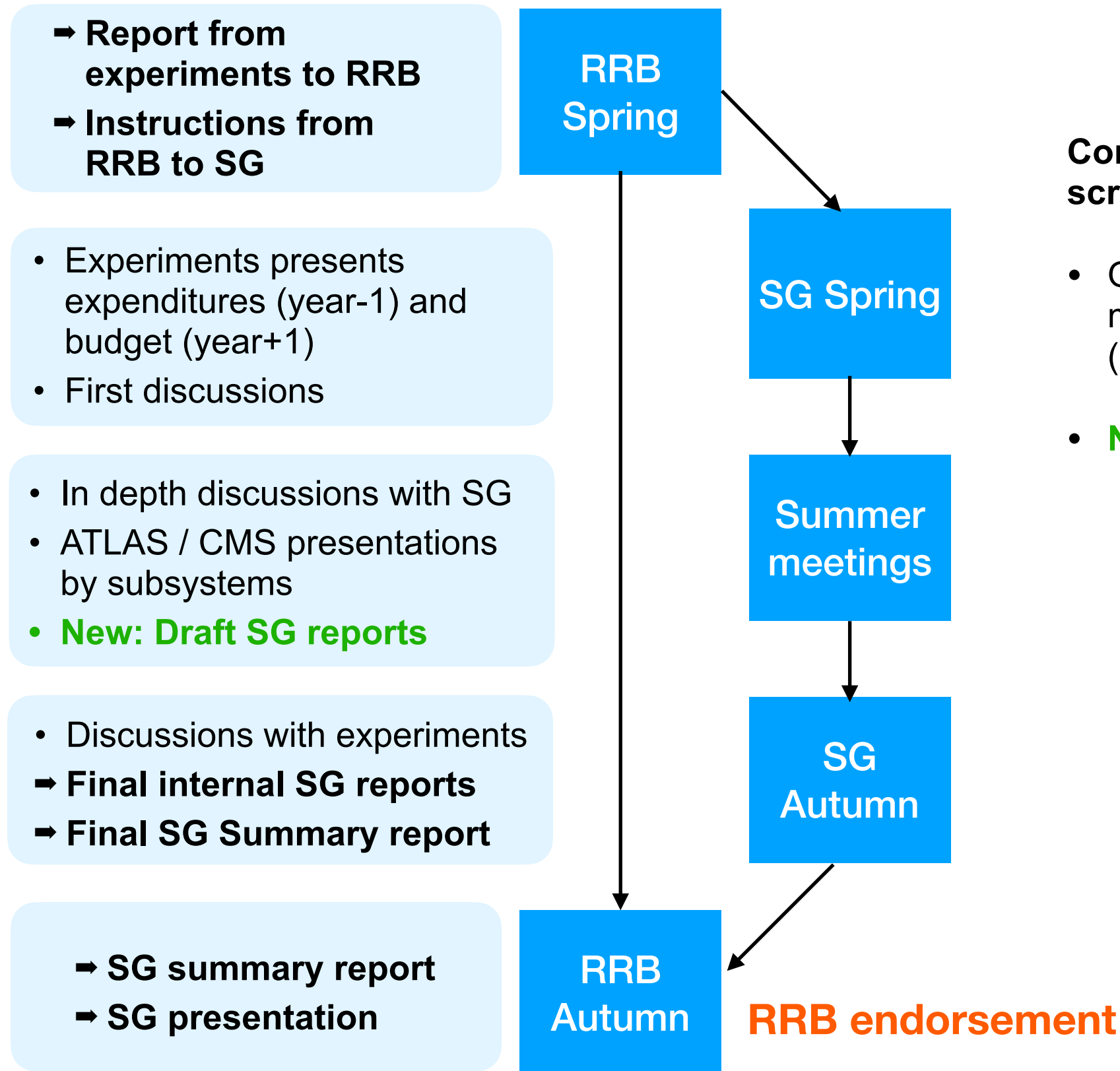
31% from CERN
31% women

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

*Proposed new member for 2022, to be endorsed by the RRB:
GYS, Thierry (CERN, EP)*



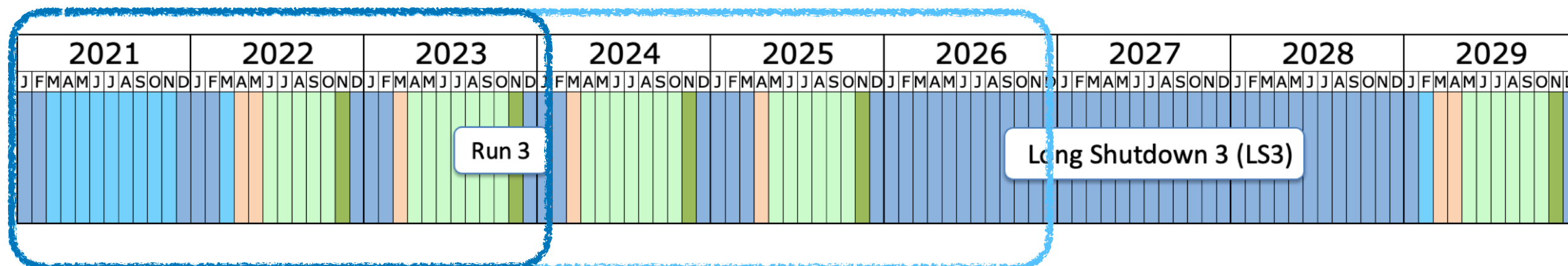
The Scrutiny Cycle



Continuous work to improve the scrutiny :

- Optimisation of the meetings, mandate and summary report (2019-2021)
- **New 2022:**
 - ➔ Early internal reports available after Summer SG
 - ➔ **Result:** Found a larger number of issues and topics to discuss and clarify with the experiments
 - ➔ **M&O B:** Work to improve the reporting/scrutiny

Scrutiny Cycle 2022 - Summary



2021: Long Shutdown 1 (LS2) ends

- Installation and commissioning of new detector and computing systems
- *Extraordinary shutdown year reflected in budget and expenditures*

2022: Start of operation Run 3

- Commissioning and operation of new detectors and computing systems
- *Budget and expenditures reflects the inclusion of new detector and computing systems, overspending signalled for some experiments*

2023: Operation year Run3

- *Proposed budgets not yet adapted to war in Ukraine, increased costs of power and raw materials, shortages and delays*

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

* year of reporting



2022 Scrutiny Cycle - summary

Discrepancies with the CERN Finance Reports (RRB-2017-070)	A number of minor discrepancies needed to be sorted out, when understood we find excellent agreement for all experiments
M&O B Carry over (to stay below ~30% of the annual budget, RRB-2017-070)	All experiments are below this limit or execute down-spending according to their plans
Online computing replacement account (should not accumulate excessive reserves and are allowed to go negative)	All experiments have presented their plans and projections and plans to down-spend. The total amount of accumulated funds show now a trend increasing with time.
Tracking of entry fees (not the same level of scrutiny)	No issues found
Collection of common funds proceed according to plan?	Overall yes



2022 Scrutiny Cycle - special issues

War in Ukraine	Spring SG: The experiments presented two scenarios, with and without Russia/Belarus/JINR Autumn SG: The experiments have presented budgets for 2023 according to the decision taken in the June council where Russia/Belarus/JINR stays in the collaborations until the ICA agreement expires
Covid-19	No particular issues reported by the experiments
LS2 work and the inclusion of new systems	All experiments presented plans for the transition to the new detectors and the corresponding modification this makes to the future budgets. Increased costs were and will be studied in more detail where applicable.
Upgrade versus M&O	First discussions on the implementation of the division between upgrade and M&O Follow up planned for 2023
Contributions	Trend with delayed contributions as observed in 2020 and 2021 continues in 2022
Other issues	Increased concerns about the rise of cost of power, inflation, exchange rates, shortages of raw materials, other shortages etc.



ALICE M&O - Overview

Closing report 2021 M&O A :

- Budget w/o power: **4,910 kCHF**
- Actual costs w/o power: **5,081 kCHF**
- End of year open commitments: **83 kCHF**
- NMS power costs: **147 kCHF**

Comments closing report 2021

- **M&O A** : Late payments of contributions continues, cash flow issues are mitigated by late payment to the online replacement account
- **M&O B** : Those systems which will not continue in Run3 have now spent their reserves. Other systems have reduced their cash reserves to less than 30% of their annual budget

M&O (kCHF)	2022	2023	2024	2025	2026
M&O A Total w/o power	4,983	4,935	4,935	4,935	4,935
M&O A Grand Total	7,528	7,437	7,437	7,170	5,528
M&O B Grand Total	1,418	1,385	1,444	1,455	1,453
Technical Manpower (FTE)	221	213	213	213	223

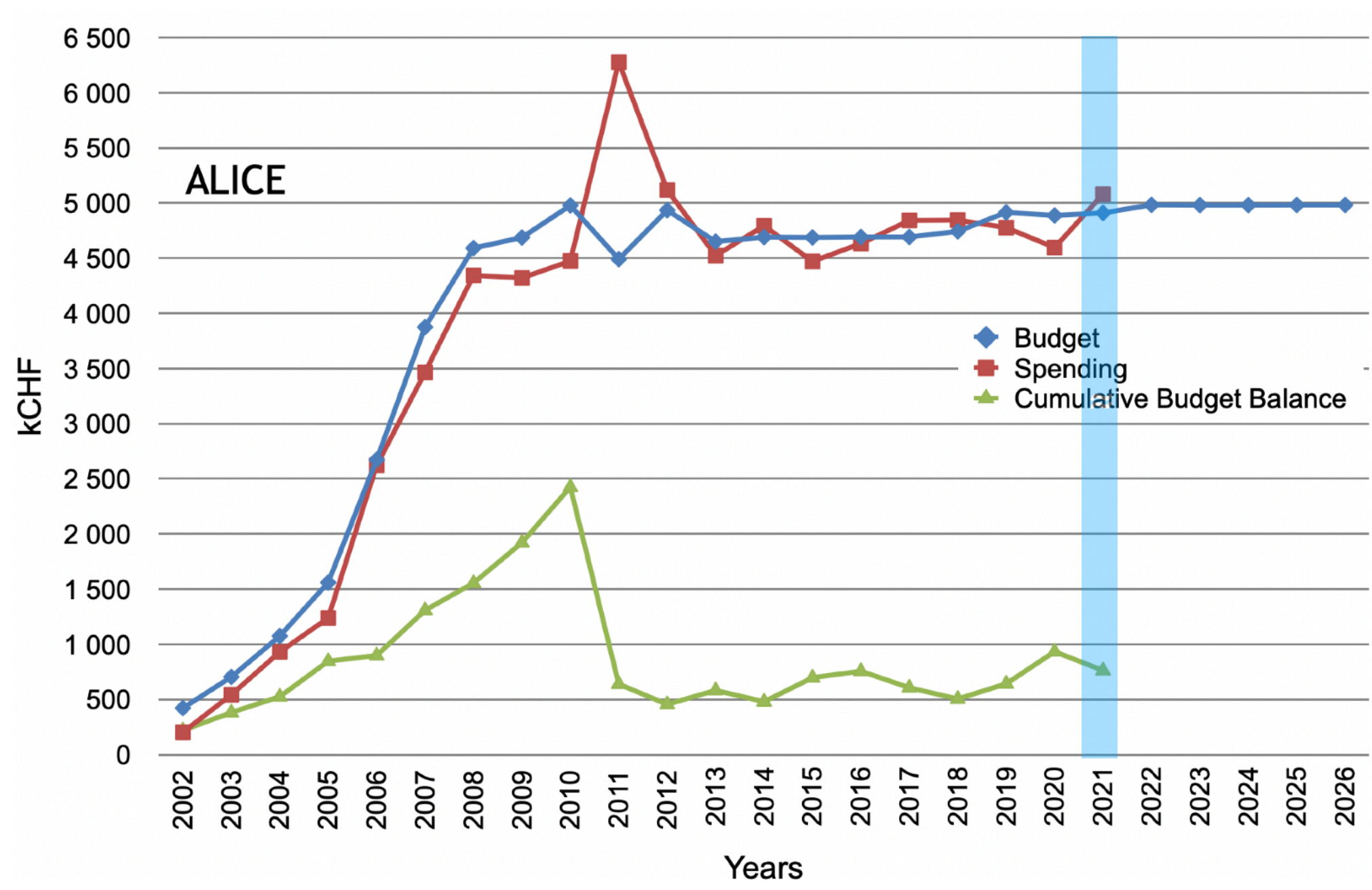
Comments budget request 2023

- **M&O A** : Budget request is **4,935 kCHF**, transition to new level taking into account new and upgraded detectors is finished. There have been no significant changes to the projections for future M&O A since the 2020 RRB.
- **M&O B** : Budget request is **1,385 kCHF**. This request takes into account changes in major subsystems due to the upgrade of detectors in LS2. Minimal changes since 2022.



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 2021, and the budget requests for 2023



ATLAS M&O - Overview

Closing report 2021 M&O A :

- Budget w/o power: **13,759 kCHF**
- Actual costs w/o power: **13,311 kCHF**
- End of year open commitments: **499 kCHF**
- NMS power costs: **723 kCHF**

Comments closing report 2021

- **M&O A** : Underspending is compensated by open commitments. Smaller withdrawal from the online account than planned due to reduced cost of servers.
- **M&O B** : Globally, the M&O B carry-over is 41% of the annual budget and thus above the target limit of 30%. ATLAS plans to return the carry-over to the Funding Agencies during 2023-26.

M&O (kCHF)	2022	2023	2024	2025	2026
M&O A Total w/o power	13,982	13,230	12,869	12,905	13,727
M&O A Grand Total	16,182	15,430	15,069	15,105	15,927
M&O B Grand Total	5,258	5,970	6,331	6,295	5,473
Technical Manpower (FTE)	242	239	239	237	211
Core Computing (FTE)	161	162	162	162	162

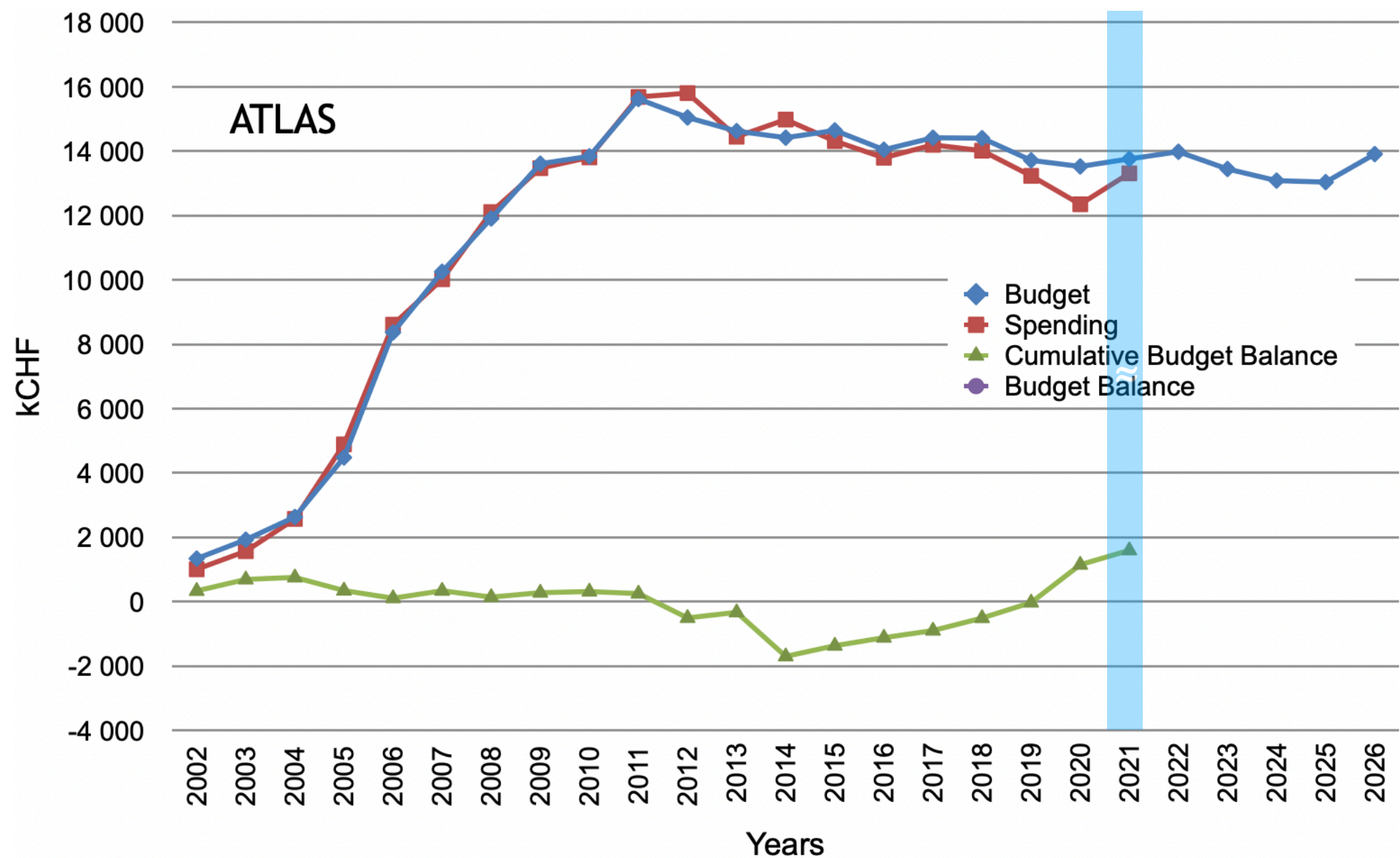
Comments budget request 2023

- **M&O A** : The ATLAS M&O A budget request without power for 2023 is **13,230 kCHF**, down by 752 kCHF compared to the corresponding budget approved for 2022.
- **M&O B** : The M&O B budget request for 2023 is **5,970 kCHF**, increased from last year, less will be charged to the FA due to the return of surplus funds. The increase is mainly due to a first request from ITK.



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 2021, and the budget requests for 2023



CMS M&O - overview and evolution

Closing report 2021 M&O A :

- Budget w/o power: **12,951 kCHF**
- Actual costs w/o power: **13,262 kCHF**
- End of year open commitments: **494 kCHF**
- NMS power costs: **724 kCHF**

Comments closing report 2021

- **M&O A** : Small overspending largely for detector related costs, mainly manpower, due to the extension of LS2 to include 2021.
- **M&O B** : Budget was **5,715 kCHF**, some systems overspend, but this is largely compensated by others underspending. The main cause of overspending is hired manpower at CERN.

M&O (kCHF)	2022	2023	2024	2025	2026
M&O A Total w/o power	13,366	13,653	13,410	13,197	13,077
M&O A Grand Total	15,066	15,353	15,110	14,897	14,777
M&O B Grand Total	6,089	6,578	6,965	7,310	7,809
Core Computing (FTE)	8	8	8	8	8

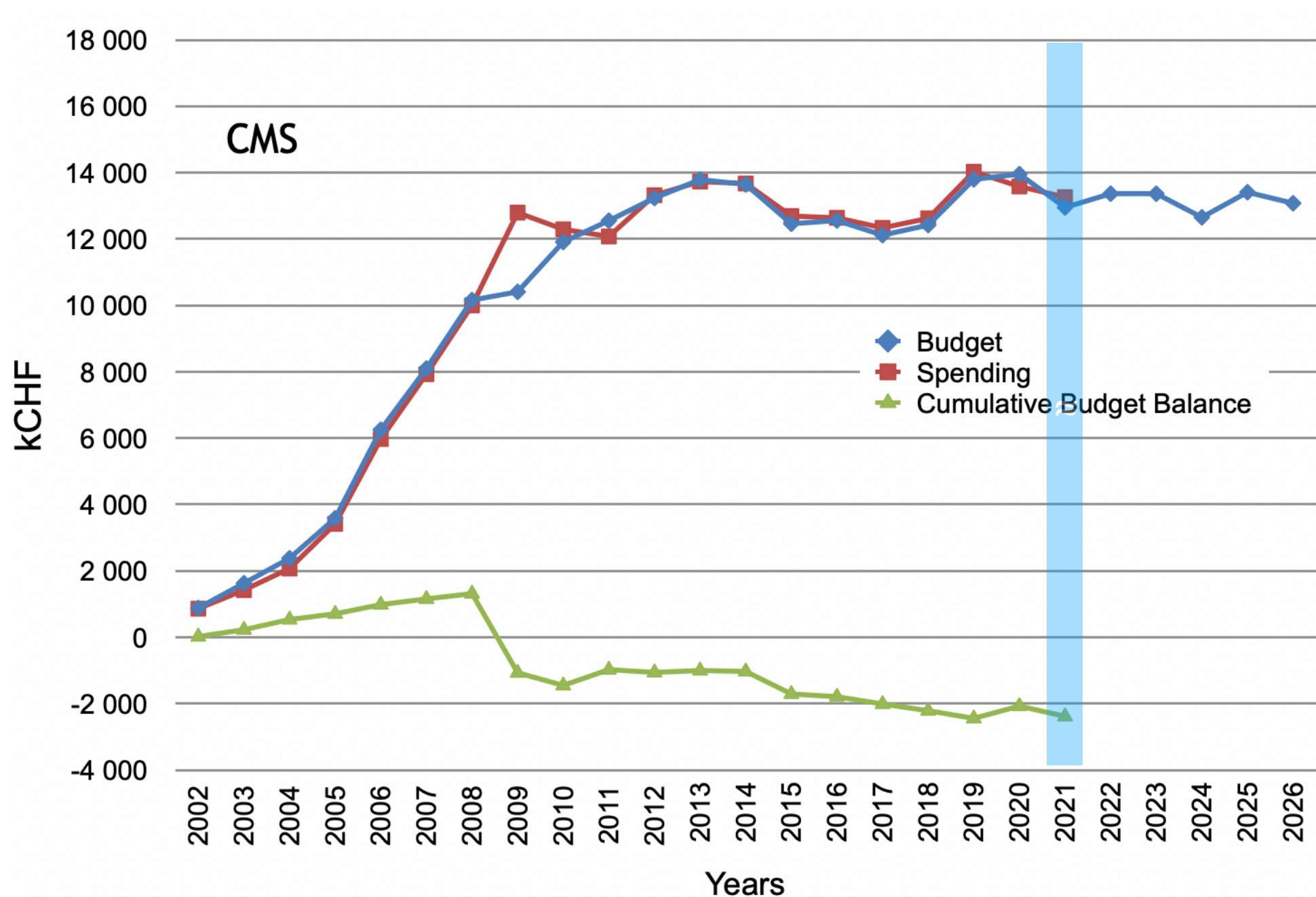
Comments budget request 2023

- **M&O A** : Budget request of **13,653 kCHF** is increased by 287 kCHF from last year mainly due items for maintenance and upgrade of the detectors such as temporary infrastructure and a new CO2 pump.
- **M&O B** : Budget request is **6,578 kCHF** has increased by 489 kCHF from the 2022 budget, part of a steady increase of the M&O B requests until 2026 that can be attributed to the Phase-2 Upgrade Projects and future decommissioning.



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 2021, and the budget requests for 2023



LHCb M&O - overview and evolution

Closing report 2021 M&O A :

- Budget w/o power: **3,070 kCHF**
- Actual costs w/o power: **2,794 kCHF**
- End of year open commitments: **483 kCHF**
- NMS power costs: **60 kCHF**

Comments closing report 2021

- **M&O A** : Some underspending mainly from detector related costs and online computing; general services saw some overspending.
- **M&O B** : Budget was **1,080 kCHF**, spending in accordance within 10%. The expected increase due to the adding of new and upgraded sub-detectors.

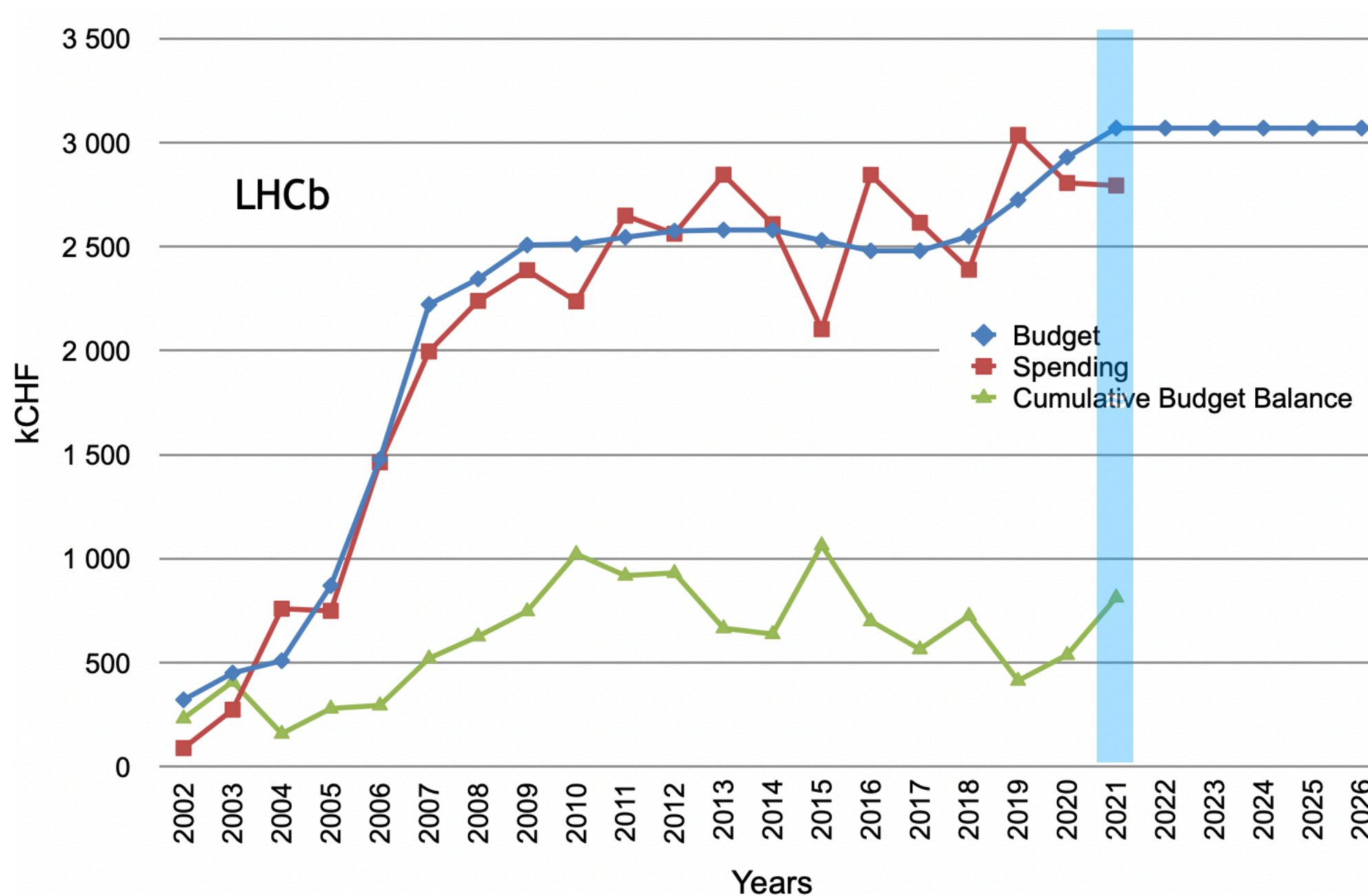
M&O (kCHF)	2022	2023	2024	2025	2026
M&O A Total w/o power	3,070	3,070	3,070	3,070	3,070
M&O A Grand Total	3,370	3,670	3,970	3,970	3,970
M&O B Grand Total	1,270	1,290	1,290	1,290	1,290

Comments budget request 2023

- **M&O A** : Budget request of **3,070 kCHF** is unchanged from previous years. This number includes increased costs of power for operational years and the transition to the new sub-detectors
- **M&O B** : Budget request is **1,290 kCHF**, a small adjustment from the 2022 budget due to the new sub-systems and in particular the new RTA project.

LHCb M&O A evolution

Graph does not include open commitments

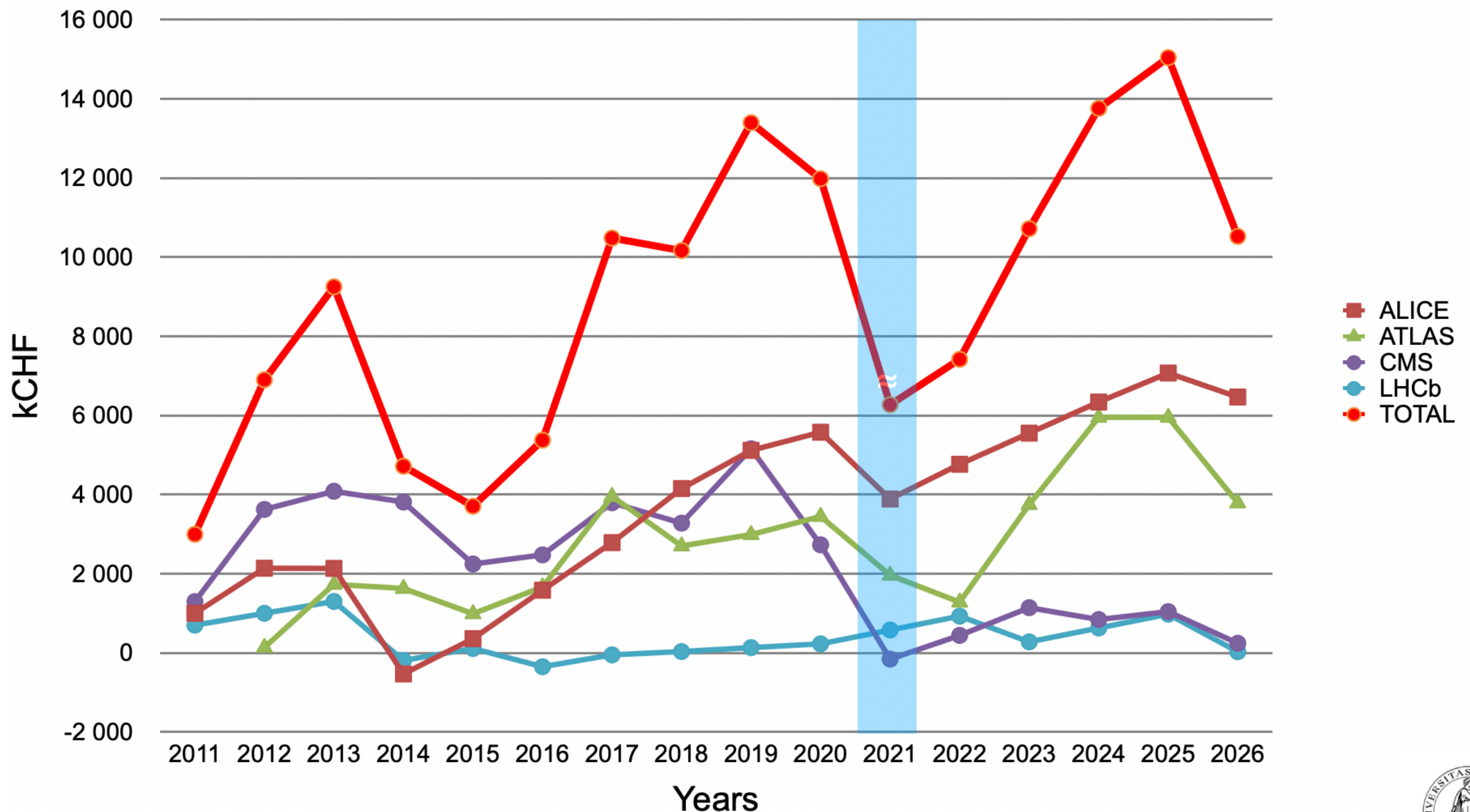


The SG recommends approval of the LHCb M&O A and M&O B closing reports for 2021, and the budget requests for 2023



2022 Scrutiny Cycle - Special Online Replacement Account

- All experiments plan for periods of (close to) negative balance, ALICE will have significant downspend in 2028 and plan to go negative in 2039, ATLAS in 2028, CMS in 2026 and LHCb in 2023 and 2026.
- However, the **total accumulated amount increase over time**, during 2022 the SG recommend the experiments with significant accumulation over longer periods to revisit their plans.



2022 Scrutiny Cycle - Upgrade Common Fund

- ALICE** *Phase-1 Upgrade CF* budget 5,8 MCHF, by September 2022 5,7 MCHF was collected from the FA (98%). 5,9 MCHF has been spent or committed by the end of 2021. The plan is to spend the remainder of the funds in 2022, any funds remaining is proposed to move to the next upgrade (ALICE3).
- ATLAS** *Phase-1 Upgrade CF* has been completed after the end of LS2 and the installation of the NSW. In May 2022, the balance of this account was 688 kCHF. This account is proposed to be used in the future for entry fees.
- Phase-2 Upgrade CF* budget is of 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 2021, contributions of 9,513 kCHF have been received and 524 kCHF spent.
- CMS** *Phase-1 Upgrade CF* has been completed. Close to all savings are used. during LS2 and the payments for the common facilities have been finalised. 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* contributions is 25 MCHF, to be collected over 9 years from 2018 to 2026. At the end of 2020 9,9 MCHF has been collected and spending is 6,484 kCHF. CMS reviewed the Phase-2 Upgrade CF during 2022, which showed that the total amount of 25 MCHF is insufficient. This will be scrutinised during the 2023 cycle by the SG.
- LHCb** *Phase-1 Upgrade CF* budget is of 15,710 kCHF, with approximately 90% available or fully committed. Outstanding contributions amounts to 1,260 kCHF. By the end of 2021 10,5 MCHF have been spent. The purchases related to the farm is moved and will now take place during 2022-2023 (just-in-time).



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 years 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

