Slides from Fabiola Gianotti,
8 October 2020

Implementation of ESPP update in this year's MTP

- Full exploitation of LHC physics potential → successful completion of high-luminosity upgrades
  → progressing well, according to (revised) schedule, 27.5 M allocated to cover HL-LHC increased cost-to-completion; 51 M Host Lab support to upgrades of the experiments

- e^+e^- Higgs factory as the highest-priority next collider
  → support for CLIC (accelerator R&D only) and FCC-ee

- Increased R&D on accelerator technologies: high-field superconducting magnets, high-gradient accelerating structures, plasma wakefield, muon colliders, ERL, etc.
  → R&D on high-field superconducting magnets significantly strengthened; effort started on muon colliders; CLIC continues R&D on key technology; etc.

- Investigation of the technical and financial feasibility of a future ≥ 100 TeV hadron collider at CERN, with e^+e^- Higgs and electroweak factory as a possible first stage.
  → resources secured for high-priority items of feasibilty study (tunnel, accelerator R&D, etc.)

- Support to long-baseline neutrino projects in US and Japan, in particular successful implementation of DUNE at LBNF
  → continued/increased support to Neutrino Platform

- Support to high-impact scientific diversity programme complementary to high-E colliders
  → budget for Physics Beyond Colliders increased by factor ~ 3

- Theory, detector R&D, SW and computing
  → new initiatives launched (e.g. Quantum Technology)

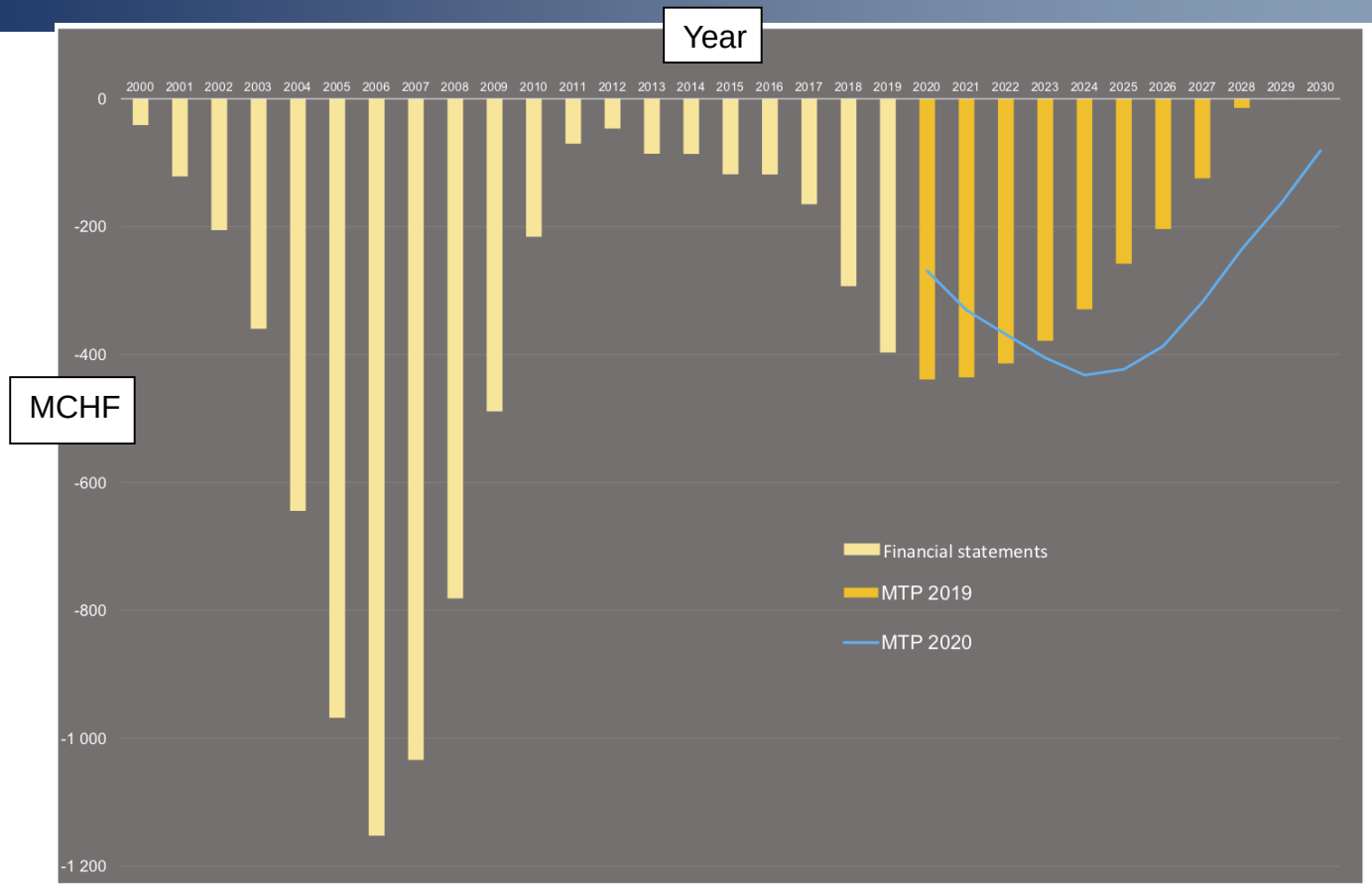
Site renovation and new buildings

Additional investment of 15 M/y in this year's MTP to renovate site and buildings

Building	Construction period	Site	Cost (MCHF)	Comments
777	2021-2026	Prévessin	41	Offices and labs for accelerator teams (~ 600 people)
140	2021-2026	Meyrin	50	Office and labs for EP Dept and users (~ 700 people)
CCP	2021-2022	Prévessin	22	New Computing Centre
Joint Learning Centre	2021-2025	Meyrin	9	Training centre for HR, HSE, IR
90	2025-2028	Meyrin	27	New main building
60	2027-2030	Meyrin	12	Refurbishment of the current main building

New B140 will allow dismantling of ~ 20 old buildings and barracks aged 30-65 years (→ energy savings: 760 MWh/year)

Cumulative Budget Deficit (CBD) vs time



- Curve shifted by 3-4 years wrt last year's MTP due mainly to: postponed re-payment of loan and postponed expenses due to COVID-19
- Peak CBD: -432 M in 2024 (Council would like it to stay below ~ 390 M)
- CBD below -200 M as of 2028 → can start significant investment into new projects

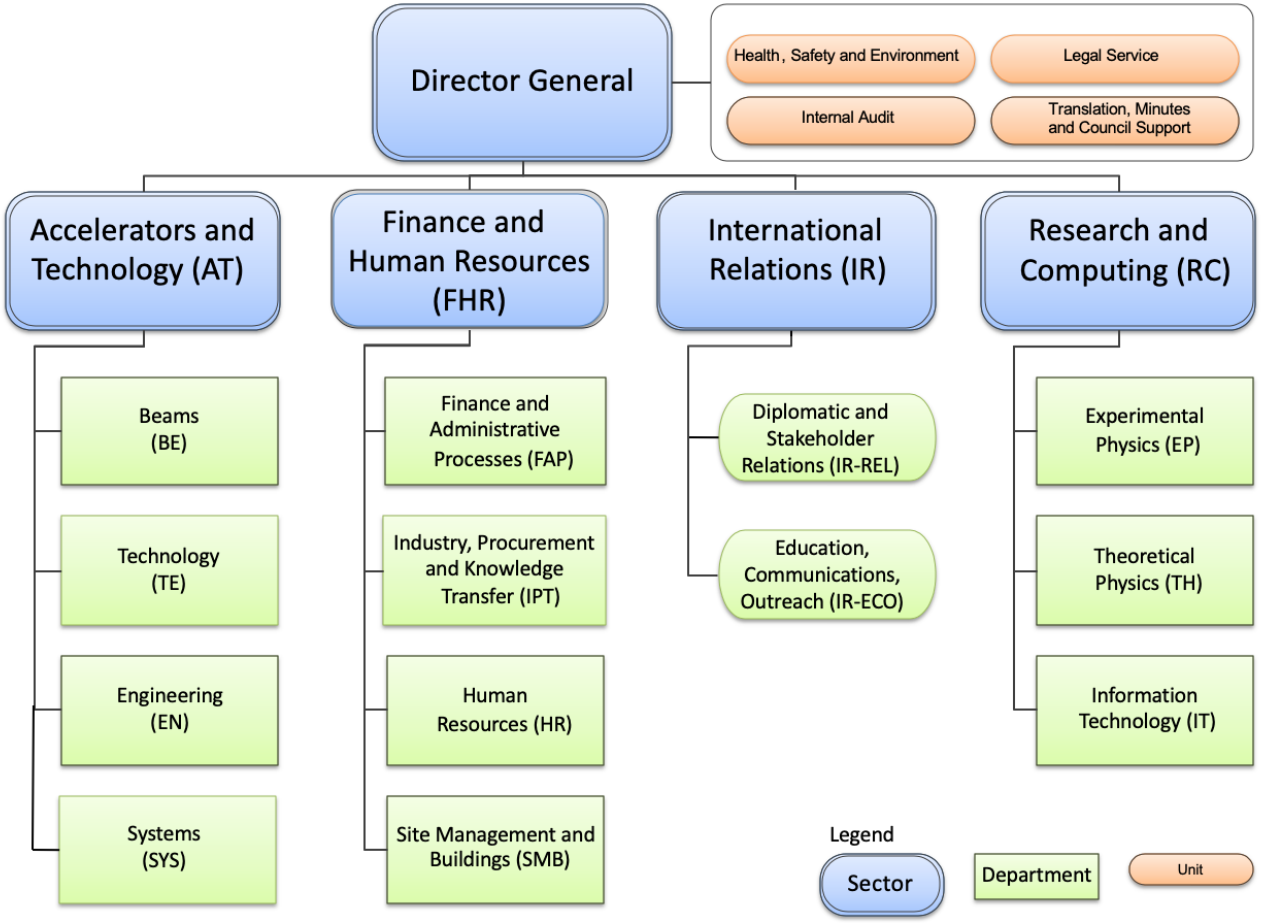
Council approved the MTP with very strong support (only 1 abstention)

CERN organisational structure and Management positions 2021-2025

Organisational structure proposed by DG and endorsed by Council.
Directors and Department Heads proposed by DG and appointed by Council.

Organisational structure 2021-2025

Four Sectors as today
Each Sector comprises several Departments or units and is led by a Director
DG and Directors form the Directorate
Enlarged Directorate brings together Directorate, Department Heads and Head of HSE unit

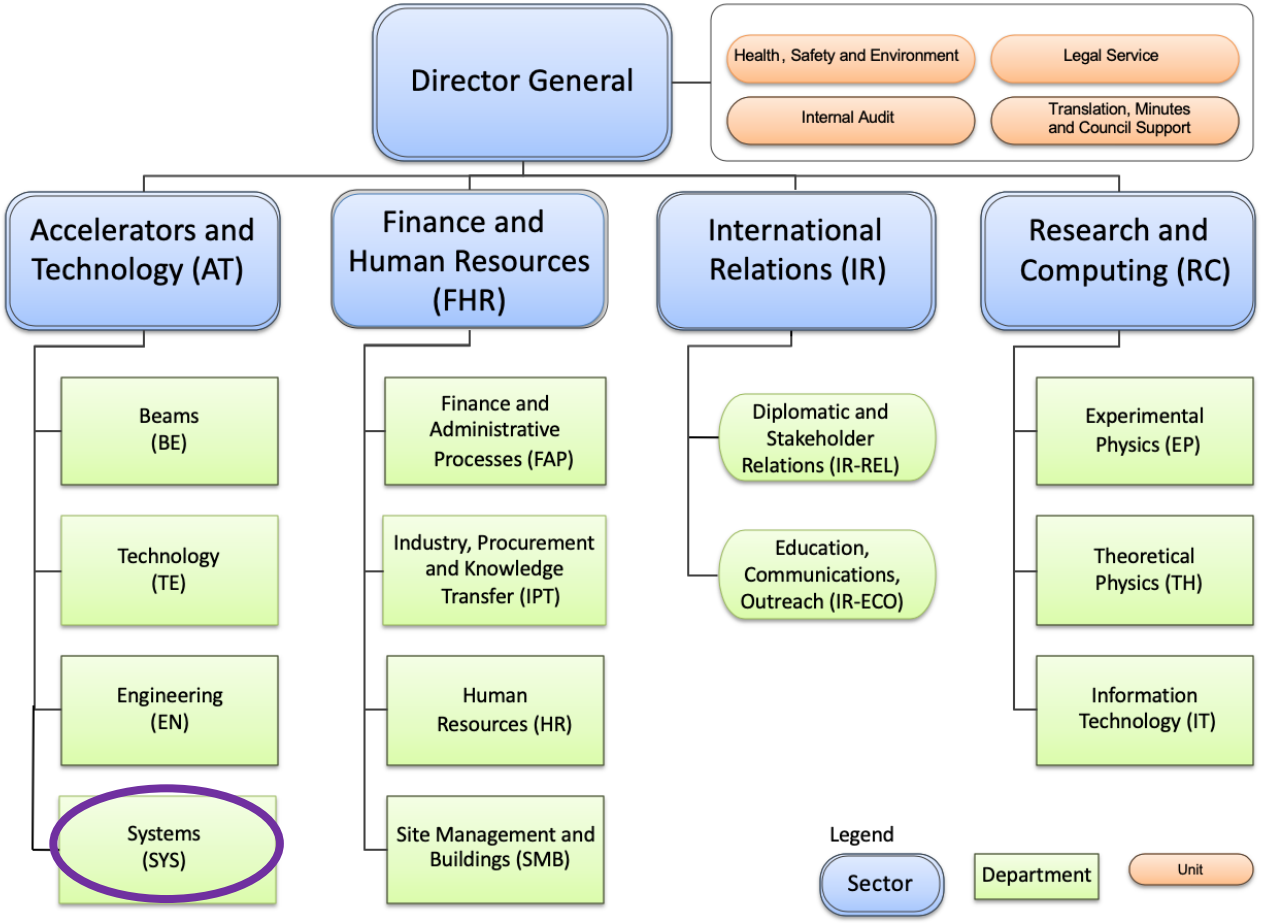


Organisational structure 2021-2025

Main change: AT Sector will consist of 4 Departments

New Accelerator Systems Department (SYS) will group together beam-related systems/devices (beam instrumentation, RF, beam transfer, targets, dumps, collimators, etc.)

→ Change facilitates supervision, streamlines activities, increases focus of Departments and enhances inter-departmental collaboration

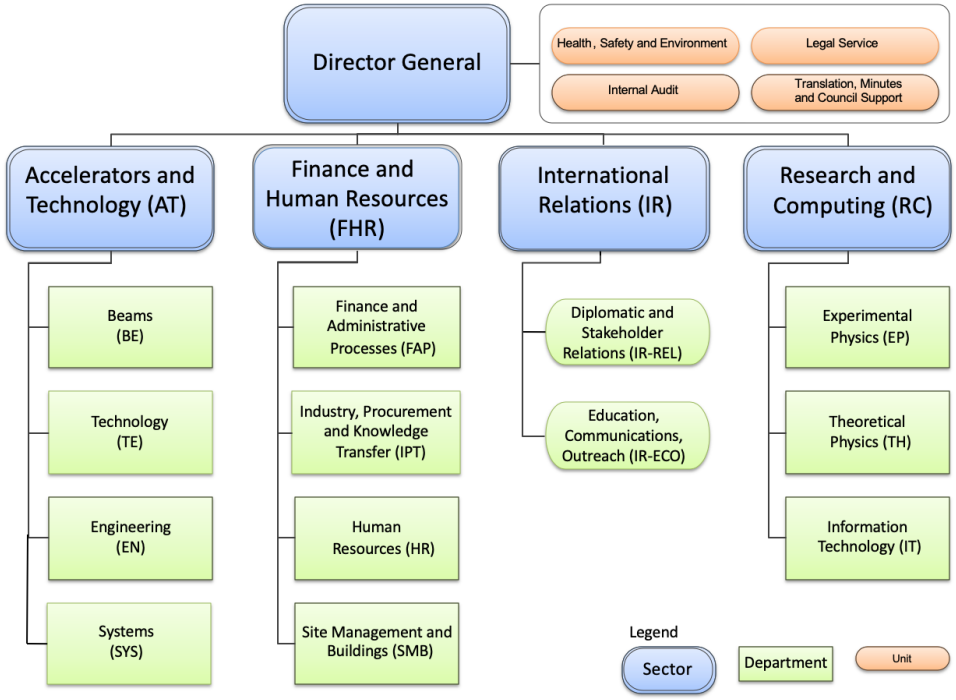


Organisational structure 2021-2025

Only top-level organisational structure (Sectors, Departments, top-level units) presented to Council and here.

Changes in groups, units and services and their assignment to Departments and Sectors, based also on experience gained over past five years and **your input**, are being implemented or being discussed with newly-appointed Directors and Department Heads.

→ More details on final structure and priorities for 2021-2025 in meeting with personnel Jan 2021



The Council appointed the following Directors

Accelerators and Technology (ATS)	Finance and Human Resources (FHR)	International Relations (IR)	Research and Computing (RC)
			
Mike Lamont (UK)	Raphaël Bello (FR)	Charlotte Warakaulle (DK)	Joachim Mnich (DE)

Renowned experts with:

- ❑ vast competencies in their respective fields
- ❑ considerable management experience
- ❑ strong connections with the international community in their domains

The Council appointed the following Department Heads

Mar Capeans
(SMB)

Katy Foraz
(EN)

Brennan Goddard
(SYS)

Gian Giudice
(TH)

Frédéric Hemmer
(IT, *ad interim*)

José Miguel Jimenez
(TE)

Rhodri Jones
(BE)

Thierry Lagrange
(IPT, *ad interim*)

James Purvis
(HR)

Florian Sonnemann
(FAP)

Still to be appointed: EP, IPT, IT

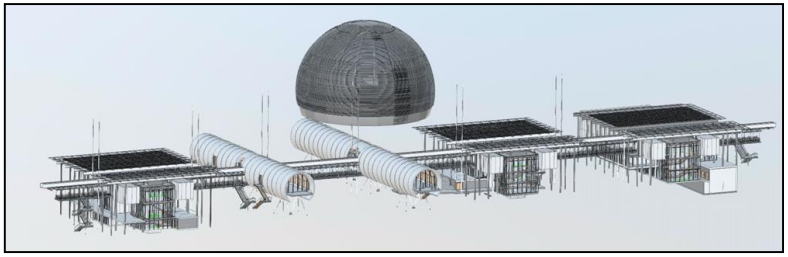
Event at end of year to thank outgoing Directors and Department Heads

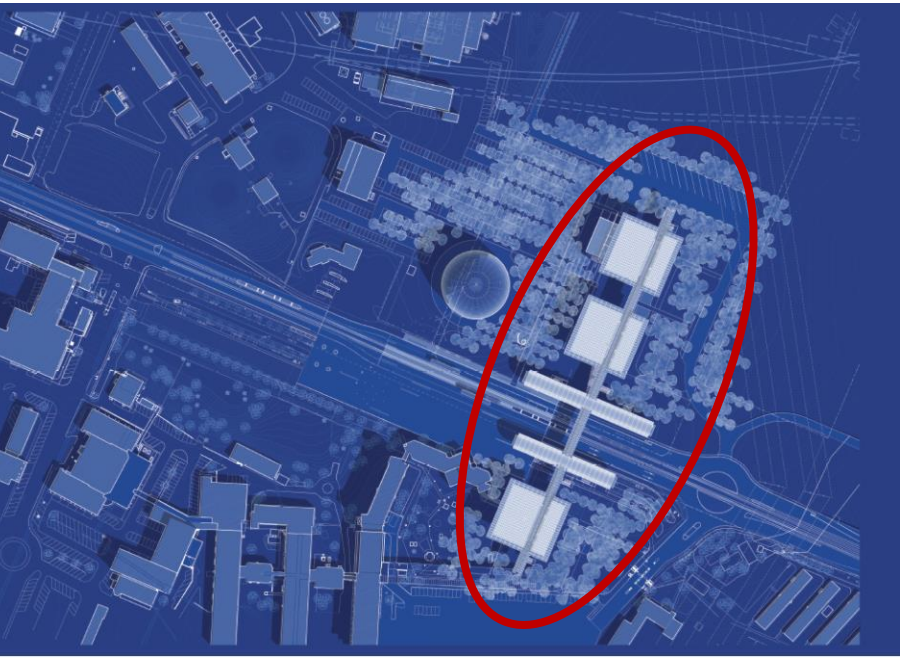
Update on Science Gateway

A new facility for scientific education and outreach targeting the general public of all ages with the goal in particular of stimulating vocations for STEM careers.

It will include: exhibitions; hands-on experiments for children and school students from 5 years up; immersive tours; a 900-seater Auditorium.

It will be housed in an iconic building complex across Route de Meyrin (architect: Renzo Piano)

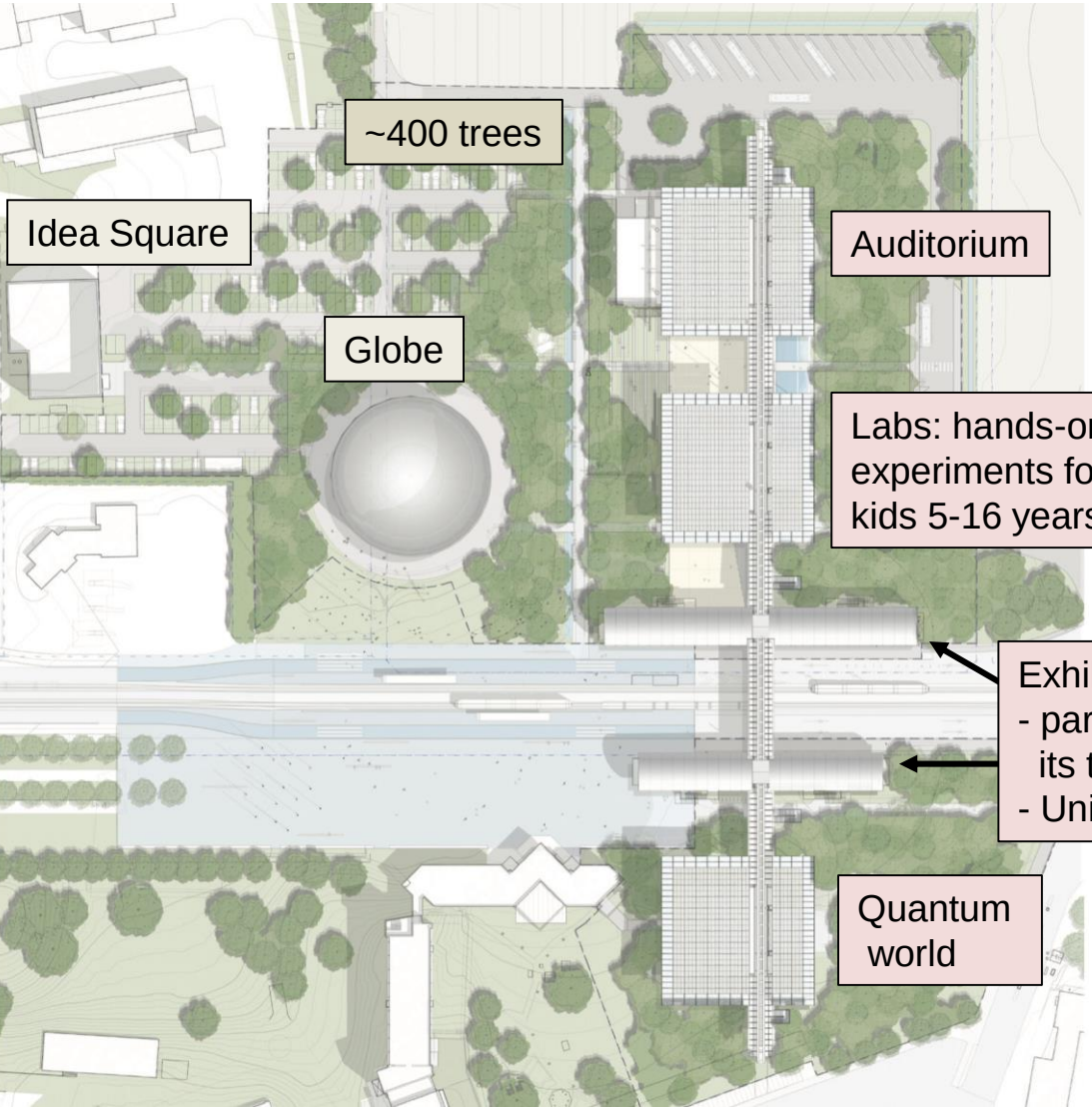




Construction starts end 2020
→ inauguration at the end of 2022

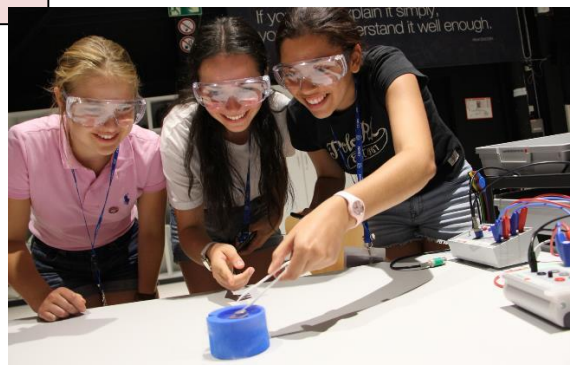
It will be realised entirely with **external donations**.

The Science Gateway ”campus”



Aim at > 300000 visitors/year

SG will also expand opportunities of collaboration with similar projects and initiatives in CERN’s Member States and beyond



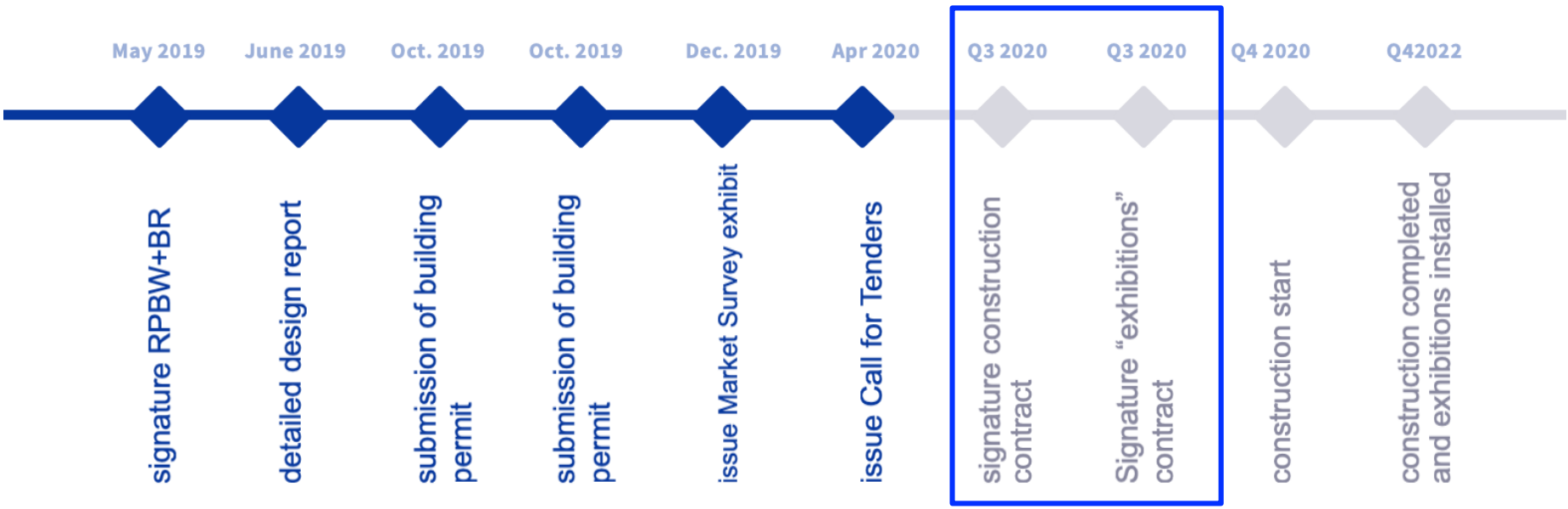
Recent progress

All administrative procedures completed: land “reclassification” (Globe’s parking is temporary and sits on agricultural land), concession for the bridge, final building permit obtained

3 contracts adjudicated at Sept Finance Committee (big milestone!):
- construction
- solar panels and geothermal installation
- scenography

→ construction can start before end of 2020 as planned

(Ambitious) schedule met so far (despite COVID!)



Cost and funding

Cost:

Building: 73 MCHF

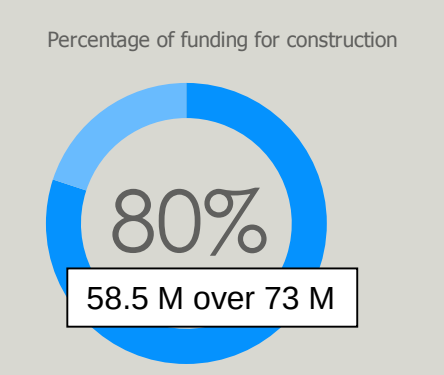
Content: 14 MCHF

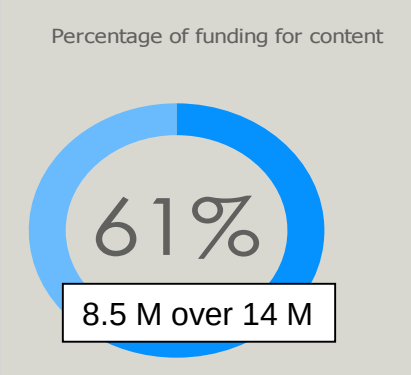
Total: **87 MCHF** (up from 79 MCHF, mainly due to more expensive construction contract)

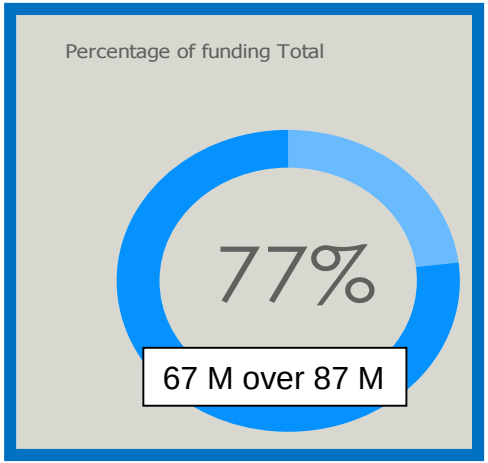
Fundraising: secured donations so far (MCHF)

Fiat-Chrysler Automobiles Foundation	45
Private foundation in Geneva	10
LEGO foundation	5
Ernst Göhner Foundation	2.5
Loterie Romande	2
Rolex	2
Others	0.5
Total	**67 M**

Fundraising paused during lock-down period
→ restarted recently







In conclusion

"*The Council expressed appreciation to everyone working on the accelerators and the experiments, both at CERN and in the collaborating institutes, for their hard work and commitment to keeping the activities on track despite the difficult conditions over the past six months*."

"*The Finance Committee commended the Management for its efficient handling of the unprecedented situation, as well as the personnel for their exemplary observance of the measures in place*."

99% of the financial contributions to the 2020 budget received so far from the Member and Associate Member States → we thank them for their continued support and trust, despite the difficult times

A big THANK YOU to all of you for your commitment to CERN, your compliance with the health measures (no one was infected on site so far!) and your forbearance towards the restrictions since the beginning of the pandemic


CERN

EXTRAs

Accelerator R&D: superconducting magnets

This MTP: reinforced, comprehensive R&D programme for superconducting high-field magnets, as key technology for future accelerators (hadron colliders, muon colliders, neutrino beams, etc.) and detectors, with great potential for wider societal applications.

Budget increased from 10 M/y to 16-18 M/y over 2021-2024 and 20 M/y as of 2026
→ total of 90 M over 2021-2025 and 190 M over 2021-2030

All magnet R&D activities at CERN (including FCC and others) now under one roof and budget line to maximise synergies.

Main R&D activities:
- ❑ materials: LTS (Nb_3Sn) and HTS (including iron-based) → goal: 16 T for LTS, at least 20 T for HTS inserts
- ❑ magnet technology: engineering, mechanical robustness, insulating materials, field quality
- ❑ production of models and prototypes to demonstrate material, design and engineering choices, industrialisation and costs
- ❑ infrastructure and test stations for tests up to ~ 20 T and 20-50 kA

Strong partnership with industry (e.g. Bruker-EAS in Germany: only remaining wire supplier in Europe) and European national labs and universities
→ **40% of budget is for industrial procurement and collaboration with partners**

Goals (ambitious) for next ESPP (~ 2026):
- ❑ Nb_3Sn: demonstrate technology for large-scale accelerator deployment
- ❑ HTS: demonstrate suitability for accelerator magnet applications

Future colliders

	Revised 2020 Budget	2021	2022	2023	2024	2025	Total 2020-2025	2026	2027	2028	2029	2030	Total 2020-2030
Future colliders studies	**23.9**	**23.0**	**33.9**	**34.0**	**24.8**	**23.7**	**163**	**20**	**20**	**20**	**20**	**20**	**263**
Linear collider	*6.3*	*5.7*	*6.5*	*6.0*	*4.4*	*4.4*	*33*						*33*
Future Circular Collider	*17.6*	*15.3*	*25.3*	*26.0*	*18.4*	*17.3*	*120*						*120*
Muon colliders		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*10*						*10*
High-energy frontier								*20*	*20*	*20*	*20*	*20*	*100*

2021-2025: 3 studies: CLIC, FCC and muon colliders (new)
≥ 2026: single ”High-energy frontier” line as “placeholder” for project selected by next ESPP

FCC

Budget ~ 20 M/y for feasibility study of infrastructure and colliders (as recommended by ESPP).
High-priority: tunnel, including high-risk zones, surface areas, administrative processes, environment; R&D (superconducting RF for FCC-ee; magnets for FCC-hh, see “Accelerator technology and R&D” line); machine design → Goal is CDR++ with results of feasibility studies by ~ 2026.

CLIC

Budget 4.5-6.5 M/y to continue R&D on key technology (X-band structure, beam dynamic, etc.) to maintain CLIC as option for a future collider. Klystrons and CLEAR moved to “Accelerator technology and R&D” line. Net budget reduction over 2021-2025: ~ 6.5 M.

Muon colliders

Budget 2 M/y to start efforts at CERN and to support European community.
Mainly personnel to work on: accelerator and collider ring, design of interaction region, muon cooling, muon source, fast-ramping magnets and power converters, neutrino radiation and civil engineering.

Future colliders: FCC's main challenges

Financial feasibility

Cost of tunnel: ~5.5 BCHF; FCC-ee: ~5-6 BCHF; FCC-hh: ~17 BCHF (if after FCC-ee)

→ cannot be funded only from CERN's (constant) budget + additional "*ad hoc*" contributions from Member and other States → need innovative mechanisms

First priority of feasibility study: find funds for the tunnel

Governance model for an unprecedented, global project

To be developed with international partners from the outset → discussion with the DOE started

Technical and administrative feasibility of tunnel

- ❑ highly-populated area; two countries with different legislative frameworks
- ❑ land expropriation and reclassification
- ❑ environmental aspects

First priority of feasibility study: no show-stopper for ~100 km tunnel in Geneva region

Technologies of machine and experiments

- ❑ huge challenges, but under control of our scientific community → "easier"
- ❑ environmental aspects (aim at "green collider"): energy, cooling, gases, etc.

First priority of feasibility study: magnet technology; how to minimise environmental impact

Gathering political and societal support

→ requires "political work" and communication campaign for "consensus building" with governments and other authorities, scientists from other fields, general public (Science Gateway, etc. …)

Proposed Directors

Accelerator and Technology : Mike Lamont

A successful Run 3, completion of HL-LHC construction, preparation for CERN's future (through e.g. accelerator R&D) require deep knowledge of CERN's accelerator complex, technical infrastructure and services, and working practices at the Lab.
Mike Lamont (CERN staff since 1991) has competencies spanning from accelerator operation and consolidation to development of new projects and management of large teams.

Finance and Human Resources : Raphaël Bello

Post of FHR Director opened to internal and external applications.
Selected candidate, Rapahël Bello, brings excellent financial experience and expertise in managing challenging projects involving variety of public and private partners.

Proposed Directors

International Relations: Charlotte Warakaulle

IR Sector created in 2016 with goal of bringing together relations with Member and other States, education, communications, outreach, etc. Under leadership of Charlotte Warakaulle, IR has gradually expanded its scope and impact. Continuity is crucial to consolidate this young Sector and to enable it to support key objectives in coming years (geographical enlargement, communication on implementation of ESPP, etc.)

Research and Computing : Joachim Mnich

Selected by DG from European particle physics community according to criteria of scientific excellence, knowledge of CERN, international standing and overall balance of profiles in the composition of the Directorate. He will bring a view of European national laboratories and Universities and of the user community, as well as management experience in a leading scientific research centre (DESY).