Report from CERN Council

Partikeldagarna 2025
Göteborg, November 24-25

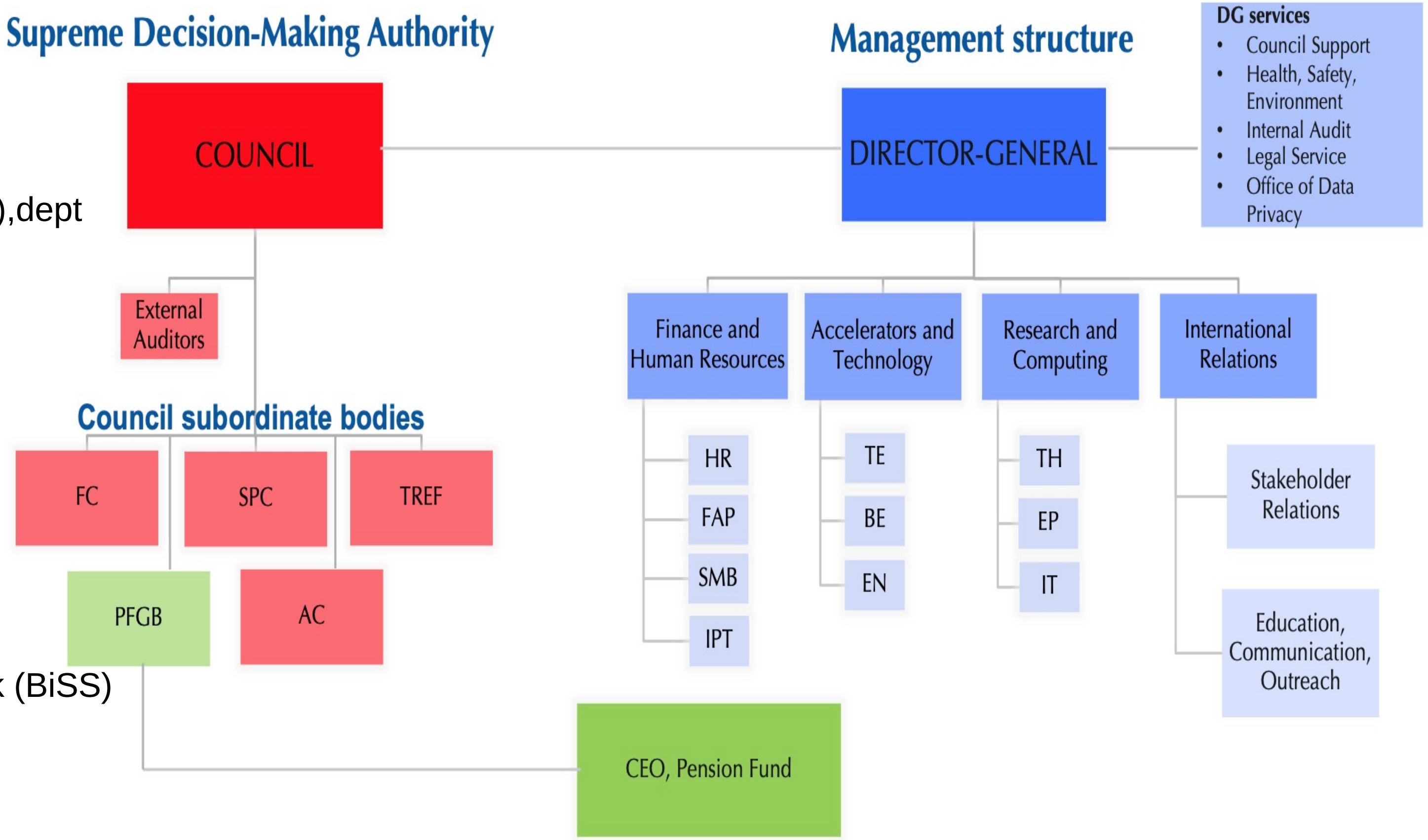
Richard Brenner, Uppsala University

Organigram → 2026

M. Hamberg (VR)
R. Brenner (UU)
S. Strandberg(SU),dept

FC:
A. Carlmark
Malkoch (VR)
B. Åsman (SU)

ILO:
Fredrik Engelmark (BiSS)



Organigram2026 →

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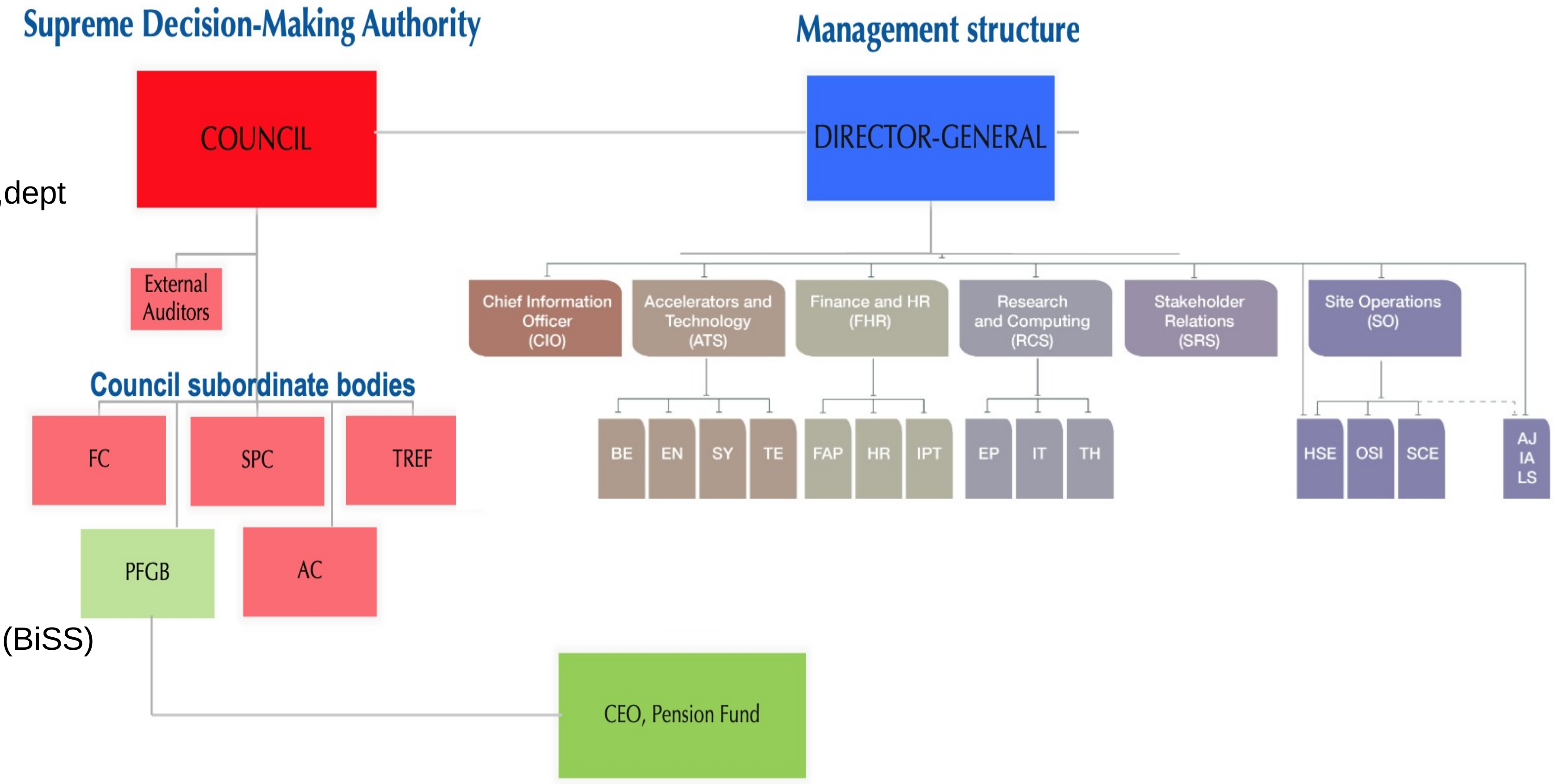


CERN management 2026-2030

Mark Thomson (DG)

Directors

- Director for Accelerators and Technology: Oliver Brüning
- Director for Research and Computing: Gautier Hamel de Monchenault
- Director for Stakeholder Relations: Ursula Bassler
- Director for Finance and Human Resources: Jan-Paul Brouwer
- Director for Site Operations: Mar Capeans
- Chief Information Officer (CIO): Enrica Porcari

Department heads

- Accelerators and Technology sector
  - Said Atieh will lead the Engineering (EN) department
  - Rhodri Jones will lead the Technology (TE) department
  - Roberto Losito will lead the Accelerator Systems (SY) department
  - Malika Meddahi will lead the Beams (BE) department
- Finance and Human Resources sector
  - Giovanni Anelli will lead the Industry, Procurement and Knowledge Transfer (IPT) department
  - Kasia Pokorska will lead the Finance and Administrative Processes (FAP) department
  - Lisette Van Den Boogaard will lead the Human Resources (HR) department
- Research and Computing sector
  - Simone Campana will lead the Information Technology (IT) department
  - Giovanna Lehmann will lead the Experimental Physics (EP) department
  - Urs Wiedemann will lead the Theoretical Physics (TH) department
- Site Operations sector
  - Benoît Delille will lead the Occupational Health & Safety and Environmental Protection (HSE) department, formerly a unit, and will continue to report directly to the Director-General
  - Cedric Garino will lead the Site and Civil Engineering (SCE) department
  - Alex Kohls will lead the new Organisational Support and Improvement (OSI) department

CERN ”family”

- Member states (25):

Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia (21 June 2025), Spain, Sweden, Switzerland and United Kingdom.

- Associate Member States in the pre-stage to Membership (1):

Cyprus and Slovenia

- Associate Member States (9):

Brazil, Croatia, India, Ireland (22 October 2025), Latvia, Lithuania, Pakistan, Türkiye and Ukraine

Chile has submitted applications for Associate Membership

- Observer status LHC (2):

Japan and the United States of America

- Observer status CERN (2+2):

EU and UNESCO + Russian Federation and JINR suspended from 2022

CERN ”family”

- Non-member states with international co-operation agreements with CERN:

Albania, Algeria, Argentina, Armenia, Australia, Azerbaijan, Bahrain, Bangladesh, Belarus, Bolivia, Bosnia & Herzegovina, Canada, Chile, China, Colombia, Costa Rica, Ecuador, Egypt, Georgia, Iceland, Iran, Japan, Jordan, Kazakhstan, Lebanon, Malta, Mexico, Mongolia, Montenegro, Morocco, Nepal, New Zealand, North Macedonia, Palestine, Paraguay, Peru, Philippines, Qatar, Republic of Korea, the Russian Federation, Saudi Arabia, South Africa, Sri Lanka, Thailand, Tunisia, United Arab Emirates, United States and Vietnam

- Scientific contacts:

Bahrain, Costa Rica, Cuba, Ghana, Honduras, Hong Kong, Indonesia, Ireland, Kuwait, Luxembourg, Oman, Madagascar, Malaysia, Mauritius, Mozambique, Rwanda, Singapore, Sudan, Taiwan, Tanzania, Uzbekistan and Zambia

European Commission: ”Draghi’s report” delivered on September 9, 2024

Box 2 “The CERN success story”

A notable example of the remarkable returns from the joint collaboration of European countries is the creation of the European Organization for Nuclear Research (CERN) in 1954. CERN started with an initial coalition of 12 European countries. Today, it comprises 23 European Member States, along with 11 non-European Associate Member States and 4 Observers (the EU, UNESCO, Japan, and the US). CERN made it possible to set up and sustain investment in high-energy physics research that any single European country would have regarded as unsustainable over such a
prolonged period of time. The pooling of country-specific resources allowed single countries to share the considerable risks and uncertainty inherent to fundamental innovative research. Its collaborative effort has yielded remarkable successes, including two most notable discoveries: the invention of the World Wide Web, invented at CERN 35 years after its inception, and the discovery of the Higgs Boson particle, announced on 4 July 2012. CERN scientific leadership spans various domains, including superconductivity, magnets, vacuum, radio frequency, precision mechanics, electronics, instrumentation, software, computing and Artificial Intelligence. CERN’s technologies have generated significant societal benefits, including advancements in cancer therapy, medical imaging, autonomous driving with artificial intelligence, and environmental applications of superconducting cables. The Large Hadron Collider has propelled CERN to global leadership in particle physics – a mantle that has shifted from the US to Europe – and it stands as CERN’s flagship facility. **One of CERN’s most promising current projects, with significant scientific potential, is the construction of the Future Circular Collider (FCC): a 90-km ring designed initially for an electron collider and later for a hadron collider. Chinese authorities are also considering constructing a similar accelerator in China, recognising its scientific potential and its role in advancing cutting-edge technologies. If China were to win this race and its circular collider were to start working before CERN’s, Europe would risk losing its leadership in particle physics, potentially jeopardising CERN’s future.**

We have already discussed the remarkable returns from the creation of the European Organization for Nuclear Research (CERN) and emphasised that the future of CERN is at risk due to China’s progress in emulating one of CERN’s most promising current projects, the Future Circular Collider (FCC). **Refinancing CERN and ensuring its continued global leadership in frontier research should be regarded as a top EU priority, given the objective of maintaining European prominence in this critical area of fundamental research, which is expected to generate significant business spillovers in the coming years**

European Particle Physics Strategy Update

https://europeanstrategyupdate.web.cern.ch/welcome

- In June 2024, the CERN Council established and approved the remit of the European Strategy Group

”The aim of the Strategy update should be to develop a visionary and concrete plan that greatly advances human knowledge in fundamental physics through the realisation of the next flagship project at CERN. This plan should attract and value international collaboration and should allow Europe to continue to play a leading role in the field.”

- The ESG (European Strategy Group) should take into consideration:

- The input of the particle physics community;
- The status of implementation of the 2020 Strategy update;
- The accomplishments over recent years, including the results from the LHC and other experiments and facilities worldwide, the progress in the construction of the High-Luminosity LHC, the outcome of the Future Circular Collider Feasibility Study, and recent technological developments in accelerator, detector and computing;
- The international landscape of the field

- The Strategy update should include the preferred option for the next collider at CERN and prioritised alternative options to be pursued if the chosen preferred plan turns out not to be feasible or competitive.
- The Strategy update should also indicate areas of priority for exploration complementary to colliders and for other experiments to be considered at CERN and at other laboratories in Europe, as well as for participation in projects outside Europe.
- The ESG should review and update the Strategy and add other items identified as relevant to the field, including accelerator, detector and computing R&D, the theory frontier, actions to minimise the environmental impact and to improve the sustainability of accelerator-based particle physics, the strategy and initiatives to attract, train and retain the young generations, public engagement and outreach.

The Strategy Secretariat and European Strategy Group (ESG)

Strategy Secretariat: Organising and running the ESPP process

Karl Jakobs (Strategy Secretary, Chair)
Hugh Montgomery (SPC Chair)
Dave Newbold (LDG Chair)
Paris Spicas (ECFA Chair)

European Strategy Group (ESG) Preparation of the Strategy Document

- The Strategy Secretary (acting as Chair)
- One representative appointed by each CERN Member State (R. Brenner appointed by VR)
- One representative appointed by each of the laboratories represented in the Large Particle Physics Laboratory Directors Group (LDG), including its Chair
- The CERN Director-General
- The CERN Director-General elect
- The SPC Chair
- The ECFA Chair
- Invitees: President of CERN Council, one representative from each of the Associate Member and Observer States, one representative from the European Commission, the Chairs of APPEC, NuPECC and ESFRI, the members of the Physics Preparatory Group.

The Physics Preparatory Group (PPG)

Physics Preparatory Group (PPG): collects input from the community, organises the Open Symposium, prepares the Briefing Book

- Strategy Secretary (acting as Chair)
- **Four members appointed by Council on the recommendation of the SPC**
- **Four members appointed by Council on the recommendation of ECFA**
- **One representative appointed by CERN**
- **Two representatives from the Americas and two representatives from Asia (appointed by the respective regional representatives in ICFA)**
- The SPC Chair
- The ECFA Chair
- The LDG Chair

PPG and working groups

PPG MEMBERS	
Strategy Secretariat	
Scientific Secretary (Chair)	Prof. Karl Jakobs (DE)
SPC Chair	Dr Hugh Montgomery (USA)
ECFA Chair	Prof. Pareskevas Sphicas(GR)
LDG Chair	Prof. Dave Newbold (UK)
SPC	
Prof. Pilar Hernandez (ES)	
Prof. Gino Isidori (CH)	
Prof. Fabio Maltoni (BE/IT)	
Prof. Jocelyn Monroe (UK	
ECFA	
Dr Tommaso Boccali (IT)	
Dr Thomas Bergauer (AT)	
Dr Cristinel Diaconu (FR)	
Prof. Monica Dunford (DE)	
CERN	
Dr Gianluigi Arduini (CERN)	
ASIA/AMERICAS	
Dr Anadi Canepa (USA)	
Prof. Xinchou Lou (China)	
Prof. Rogerio Rosenfeld (Brazil)	
Prof. Yuji Yamazaki (Japan)	

Working Group		
	Co-convener (PPG member)	Co-convener
Electroweak physics	Monica Dunford (DE, exp)	Jorge de Blas (ES, theory)
Strong interaction	Cristinel Diaconu (FR, exp)	Andrea Dainese (IT, exp, HI)
Flavour physics	Gino Isidori (CH, theory)	Marie-Hélène Schune (FR, exp)
BSM physics	Fabio Maltoni (BE/IT, theory)	Rebeca Gonzalez-Suarez (SE, exp)
Neutrino physics and cosmic messengers	Pilar Hernandez (ES, theory)	Sara Bolognesi (FR, exp)
Dark matter and dark sector	Jocelyn Monroe (UK, exp)	Matthew McCullough (CERN, theory)
Accelerator science and technology	Gianluigi Arduini (CERN, acc)	Phil Burrows (UK, exp, acc)
Detector instrumentation	Thomas Bergauer (AT, exp)	Ulrich Husemann (DE, exp)
Computing	Tommaso Boccali (IT, exp, comp)	Borut Kersevan (SL, exp, comp)

Timeline for the update of the European Strategy for Particle Physics

EPSS 2026 documents

- Future Circular Collider Feasibility Study Report Volume 1: Physics and Experiments
- Future Circular Collider Feasibility Study Report Volume 2: Accelerators, technical infrastructure and safety
- Future Circular Collider Feasibility Study Report Volume 3: Civil Engineering, Implementation and Sustainability
- Physics Briefing Book
- Preliminary report of the ESG WG2a on Project Assessment:
- Full assessment of large-scale accelerator projects at CERN - Report of ESG WG2a:

Future Circular Collider (FCC)

- <u>FCC reference group in Sweden:</u> Lars Börjesson (CTH), Anders Karlhede (SU), Sara Strandberg(SU), Lisbeth Ohlsson (VR), Olof Lundberg (VR), Mathias Hamberg (Nordforsk), Mathias Marklud (CTH), Anna Carlmark Malkoch (VR), R.Brenner (UU), Dag Hanstorp (GU), Paula Eerola (AKA), Marika Edoff (VR), Johan Holmberg (VR) , Mikael Dahlgren (Hitachi)

FCC IN A NUTSHELL

Timeline

- **2025**: Release of the FCC Feasibility Study report
- **2028**: Decision by CERN Member States and international partners

Tunnel

- **90.7 km** circumference
- **180 – 400 m** depths for access shafts
- **8 surface sites** (7 in France, 1 in Switzerland)

Two stages

- **FCC-ee** (precision measurements) about 15 years from the **late 2040s**
- **FCC-hh** (high energy) about 25 years from the **2070s**

Costs/benefits

- **15 billion CHF**, spread over about **12 years** for FCC-ee with four experiments
- **Positive** socio-economic benefit–cost ratio
- About **800 000** person-years of employment created

https://home.cern/science/accelerators/future-circular-collider

Focus areas

- Physics case → Swedish input to ESPP (*see Arnauds presentation this morning*)
- Technical feasibility for FCC
- Reduce uncertainty in FCC cost
- Reduce uncertainty in FCC risks
- Present different funding scenarios for FCC alt. flagship project
- Investigate alternatives to FCC → Future Colliders Comparative Evaluation

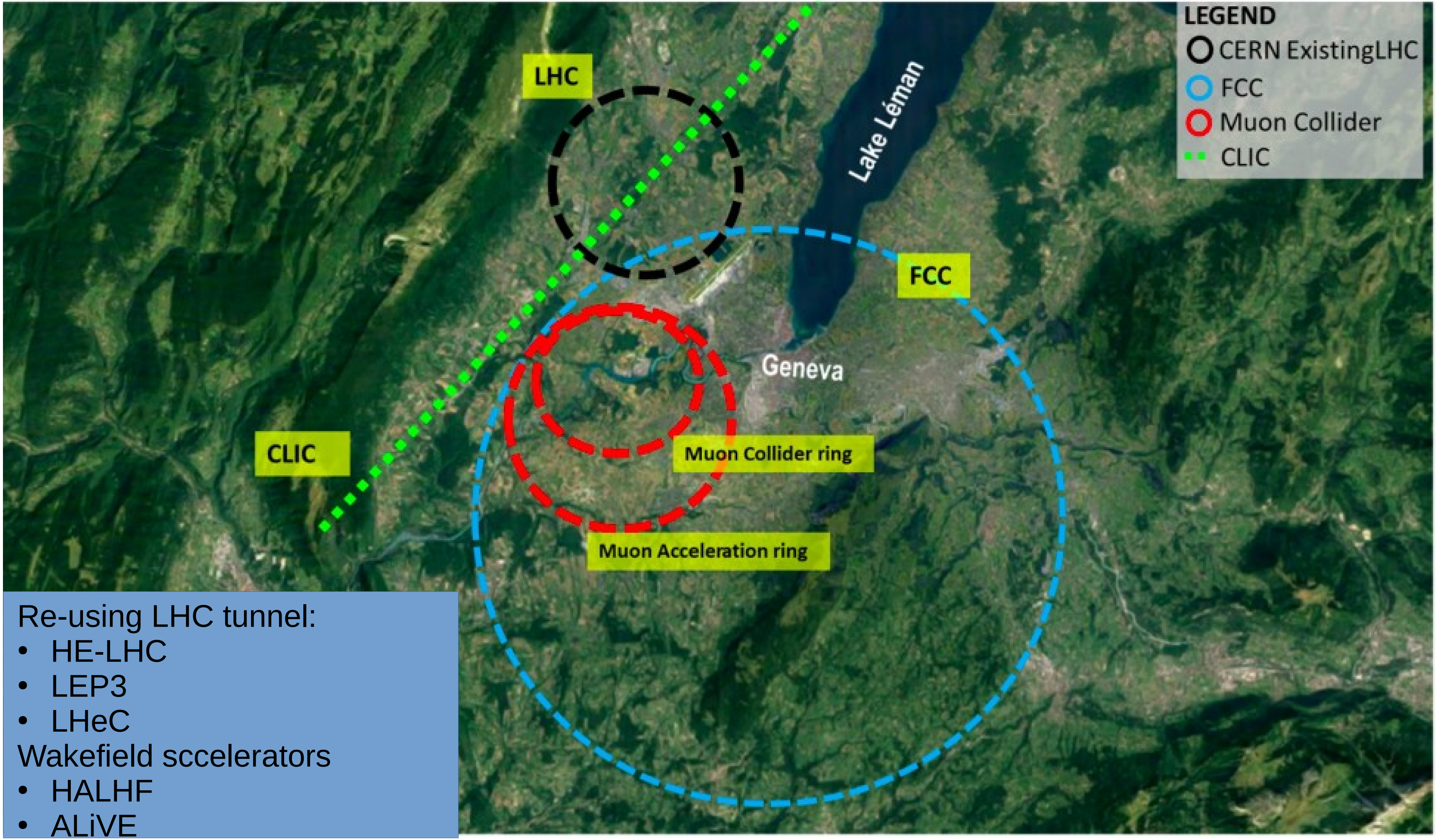
Future Colliders Comparative Evaluation

- Goal: compare FCC and alternative scenarios in a consistent way, using common assumptions and methodology, in view of the ESPP Update in 2026.

Deliverables:

- Summaries of FCC-ee and alternative options for implementation at CERN
- Metrics for comparison
- Comparative evaluation of the potential options for realization at CERN
- Credible and consistent timelines for implementation and time to first physics
- Summary of options considered elsewhere in the world that could be realized within the given time frame

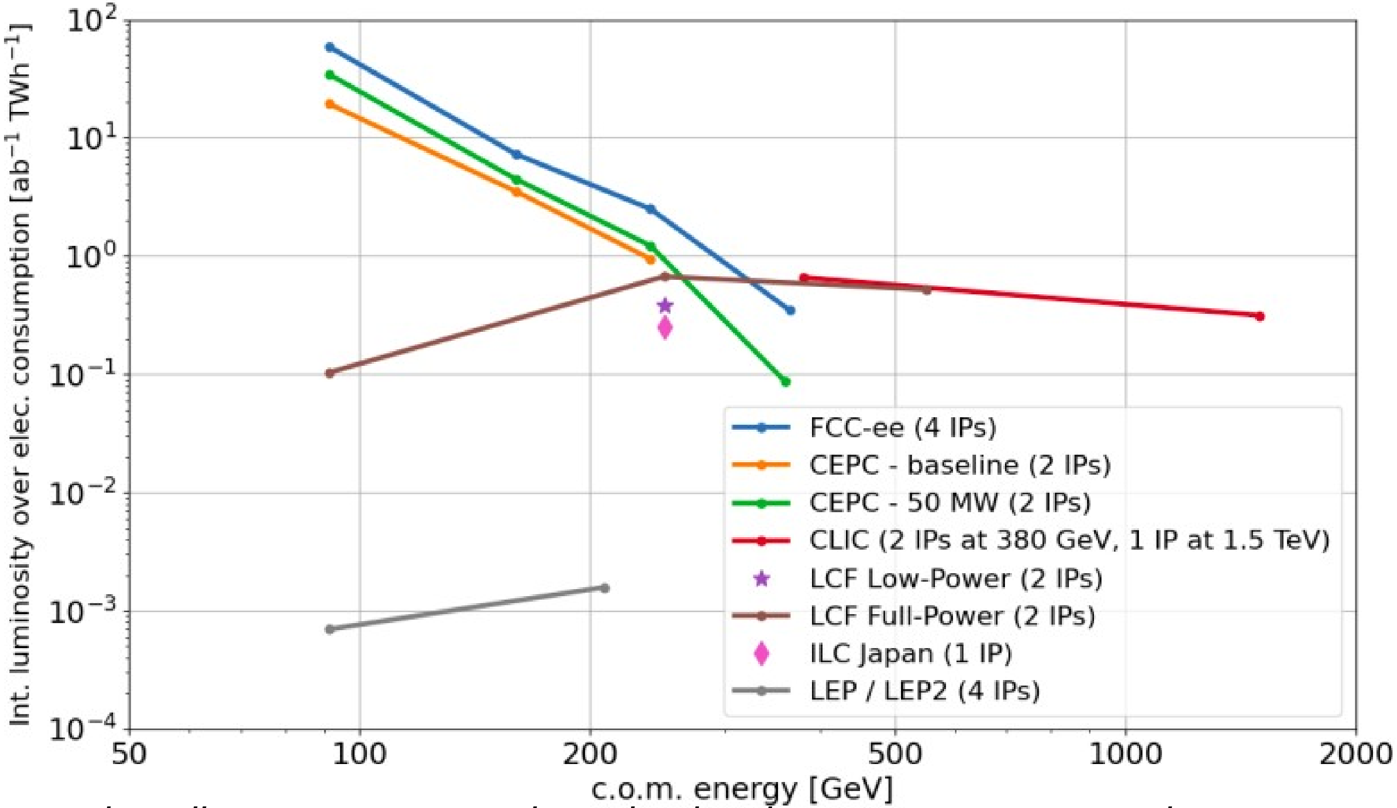
https://indico.cern.ch/event/1439855/contributions/6542430/



Re-using LHC tunnel:
- HE-LHC
- LEP3
- LHeC

Wakefield sccelerators
- HALHF
- ALiVE

One figure of merit



LEP3 pre- conceptual studies are too uncertain on luminosity an power consumption

Cost CLIC/LCF/FCC-ee

- **Breakdown** of construction costs:

Domain	CLIC – 380 GeV Cost [MCHF]	CLIC – 380 GeV Cost class
Collider	2471	3–4
Main beam production and transfer lines	1046	3–4
Drive beam production and transfer lines	1060	3–4
Civil engineering	1403[a]	4
Technical infrastructures	1361	3–4
Experiments	795	4
TOTAL	**8136**	

Domain	FCC-ee – 240 GeV Cost [MCHF]	FCC-ee – 240 GeV Cost class
Booster and collider	4140	3
Pre-injectors and transfer lines	590	3
Civil engineering	6160	3
Technical infrastructures	2840	3
Experiments	1590	4
TOTAL	**15320**	

Domain	LCF LP – 250 GeV Cost [MCHF]	LCF LP – 250 GeV Cost class
Collider	3864	3
Injectors and transfer lines	1181	3
Civil Engineering	2338[a]	4
Technical infrastructures	1109	4
Experiments	795	4
TOTAL	**9287**	

Costs include **construction**, **tooling**, **reception tests**, **pre-conditioning, hardware commissioning**, **total detector costs** (CERN contribution will actually be 10% of the total), and **land-related and administrative costs**.

CLIC will require a large demonstrator to be built (not included in table) before the main project.

Cost CLIC/LCF/FCC-hh/MuCOL

- **Breakdown** of construction costs:

Domain	CLIC – 1.5 TeV Cost [MCHF]	Cost class
Collider	4684	3 – 4
Main beam production and transfer lines	23	3 – 4
Drive beam production and transfer lines	302	3 – 4
Civil engineering	703	4
Technical infrastructures	1404	3 – 4
Experiments	N/A	
TOTAL	**7116**	

Domain	LCF FP – 550 GeV Cost [MCHF]	Cost class
Collider	4204	3
Injectors and transfer lines	86	3
Civil Engineering	0	
Technical infrastructures	1174	4
Experiments	N/A	4
TOTAL	**5464**	

Domain	FCC-hh Cost [MCHF]	Cost class
FCC-ee dismantling	200	4
Collider	13400	4
Injectors and transfer lines	1000	4
Civil Engineering	520	4
Technical infrastructures	3960	4
Experiments	N/A	
TOTAL	**19080**	

Options summary: Traffic Light Table

Project	Scope	TRL	R&D	Test facilities	Performance	Site preparation	Schedule	Cost	Risk
CLIC 380 GeV, 1.5 TeV		4 - 6 / 5.2							
FCC-ee 91-365 GeV		4 - 7 / 6.0							
FCC-hh 85 TeV		4 - 7 (Nb_3Sn) / 4.3 2 - 7 (HTS) / 3.2							
FCC-hh - SA 85 TeV		4 - 7 (Nb_3Sn) / 5					Nb_3Sn		
LCF 250 - 550 GeV		5 - 7 / 5.5							
LEP3 91 - 230 GeV		3 - 6 / 4.0							
LHeC: HL-LHC + 50 GeV ERL		3 - 6 / 4.5							
MC 3.2 TeV, 7.6 TeV		3.2 TeV: 3 - 5 7.6 TeV: 2 - 5							

TRL = Technical Readiness Level