

# REPORT FROM CERN INTERNATIONAL RELATIONS

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Joint CERN-KEK Committee  
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# Science for peace

## CERN was founded in 1954 with 12 European Member States



### 23 Member States

Austria – Belgium – Bulgaria – Czech Republic  
Denmark – Finland – France – Germany – Greece  
Hungary – Israel – Italy – Netherlands – Norway  
Poland – Portugal – Romania – Serbia – Slovakia  
Spain – Sweden – Switzerland – United Kingdom

### 3 Associate Member States in the pre-stage to membership

Cyprus – Estonia – Slovenia

### 7 Associate Member States

Croatia – India – Latvia – Lithuania – Pakistan  
Türkiye – Ukraine

(Brazil signed CERN Associate Membership Agreement  
in March 2022, to be ratified in parliament)

### 6 Observers

**Japan** – Russia (suspended) – USA  
European Union – JINR (suspended) – UNESCO

CERN's annual budget  
is 1200 MCHF (equivalent  
to a medium-sized European  
university)

As of 31 December 2021  
Employees:  
**2676** staff, **783** fellows

Associates:  
**11 175** users, **1556** others

### Around 50 Cooperation Agreements with non-Member States and Territories

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

# A laboratory for people around the world

Distribution of all **CERN Users** by the country of their **home institutes** as of **31 December 2021**



Geographical & cultural diversity  
Users of **110 nationalities**  
**19.4% women**

## Member States **6642**

Austria 74 – Belgium 122 – Bulgaria 39 – Czech Republic 227  
Denmark 42 – Finland 71 – France 811 – Germany 1129  
Greece 133 – Hungary 69 – Israel 67 – Italy 1423  
Netherlands 157 – Norway 69 – Poland 278 – Portugal 89  
Romania 105 – Serbia 36 – Slovakia 66 – Spain 328  
Sweden 88 – Switzerland 372 – United Kingdom 847

## Associate Member States

in the pre-stage to membership **55**

Cyprus 10 – Estonia 24 – Slovenia 21

## Associate Member States **367**

Croatia 36 – India 130 – Latvia 11 – Lithuania 12 – Pakistan 30  
Türkiye 122 – Ukraine 26

## Observers **2917**

Japan **189** – Russia (suspended) 971 – United States of America 1757



## Non-Member States and Territories **1194**

Algeria 3 – Argentina 16 – Armenia 10 – Australia 20 – Azerbaijan 3 – Bahrain 2 – Belarus 24 – Brazil 106  
Canada 189 – Chile 23 – Colombia 18 – Cuba 3 – Ecuador 6 – Egypt 16 – Georgia 36 – Hong Kong 17  
Iceland 3 – Indonesia 6 – Iran 11 – Ireland 6 – Jordan 5 – Kuwait 5 – Lebanon 15 – Madagascar 1  
Malaysia 4 – Malta 2 – Mexico 48 – Montenegro 5 – Morocco 18 – New Zealand 8 – Oman 1 – People's  
Republic of China 314 – Peru 2 – Philippines 1 – Republic of Korea 113 – Singapore 3 – South Africa 52  
Sri Lanka 10 – Taiwan 45 – Thailand 18 – United Arab Emirates 6

# Associate Membership



**Mr. Marcos Cesar Pontes**

Minister of Science, Technology and Innovation of Brazil  
at CERN for signing of Associate Membership Agreement on  
**3 March 2022**

Signature of agreement at CERN on **3 March 2022**.

**Ratification** process in Brazil is in progress.

**Egypt** and **Morocco** have expressed interest  
in CERN Associate Membership.



## **International Cooperation Agreement with Honduras**

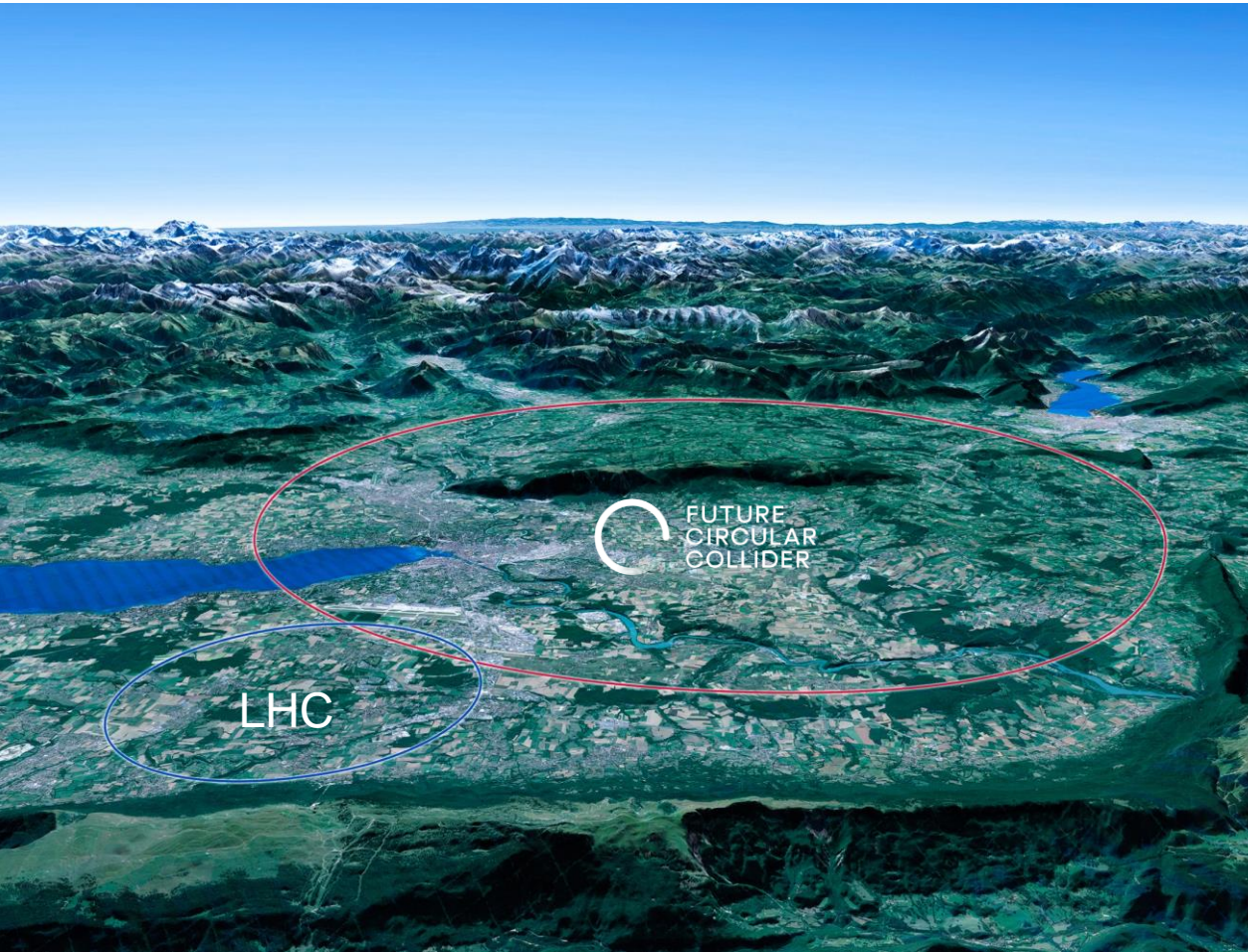
**15 December 2021**

Her Excellency Ms Karen Najarro, Vice Minister for International Cooperation and Promotion and Professor Manlio Dionicio Martinez Cantor, Executive Director Honduran Institute of Science, Technology and Innovation (IHCIETI) on the occasion of the remote signature of the International Cooperation Agreement between CERN and IHCIETI.

# Scientific Priorities for the Future

Implementation of the recommendations of the **2020 Update of the European Strategy for Particle Physics**:

- Fully exploit the **HL-LHC**.
- Build a **Higgs factory** to further understand this unique particle.
- Investigate the technical and financial feasibility of a future **energy-frontier 100 km collider at CERN**.
- Ramp up relevant **R&D**.
- Continue supporting other **projects around the world**.

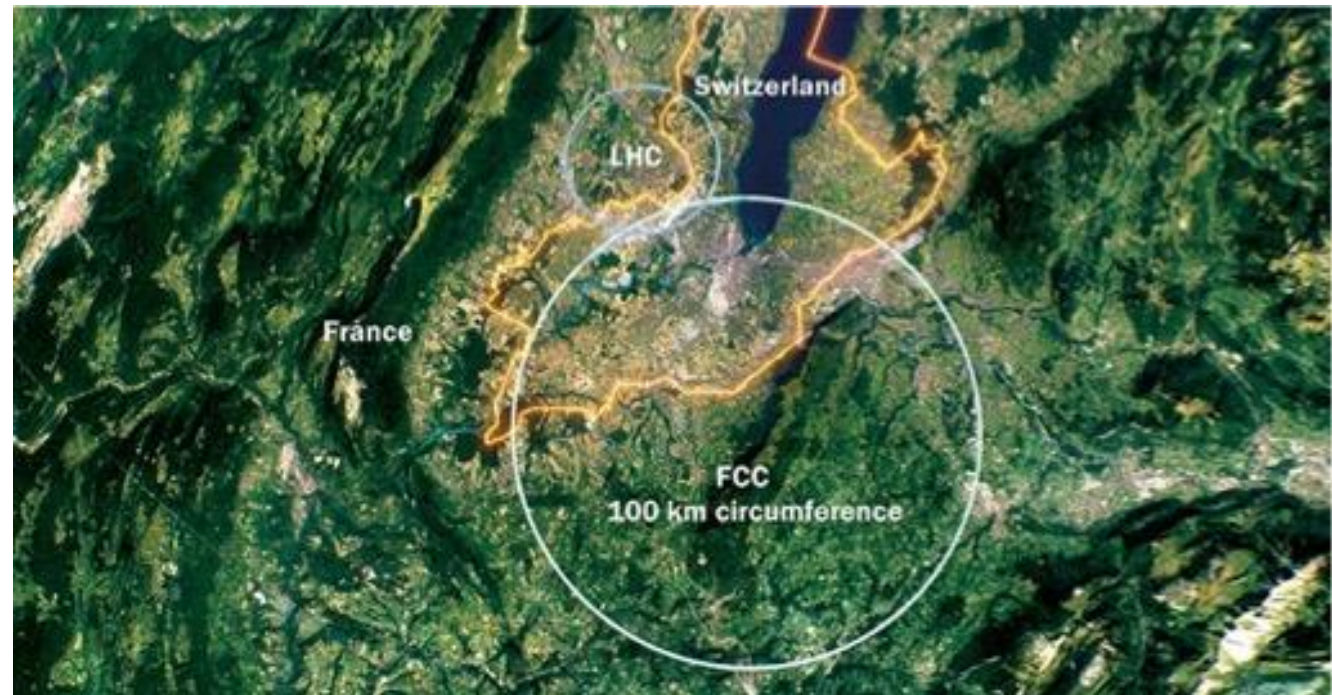


# Future Circular Collider Study

## Phase-1 started in 2014 Leading to CDR

International FCC collaboration  
(CERN as host lab) to study:

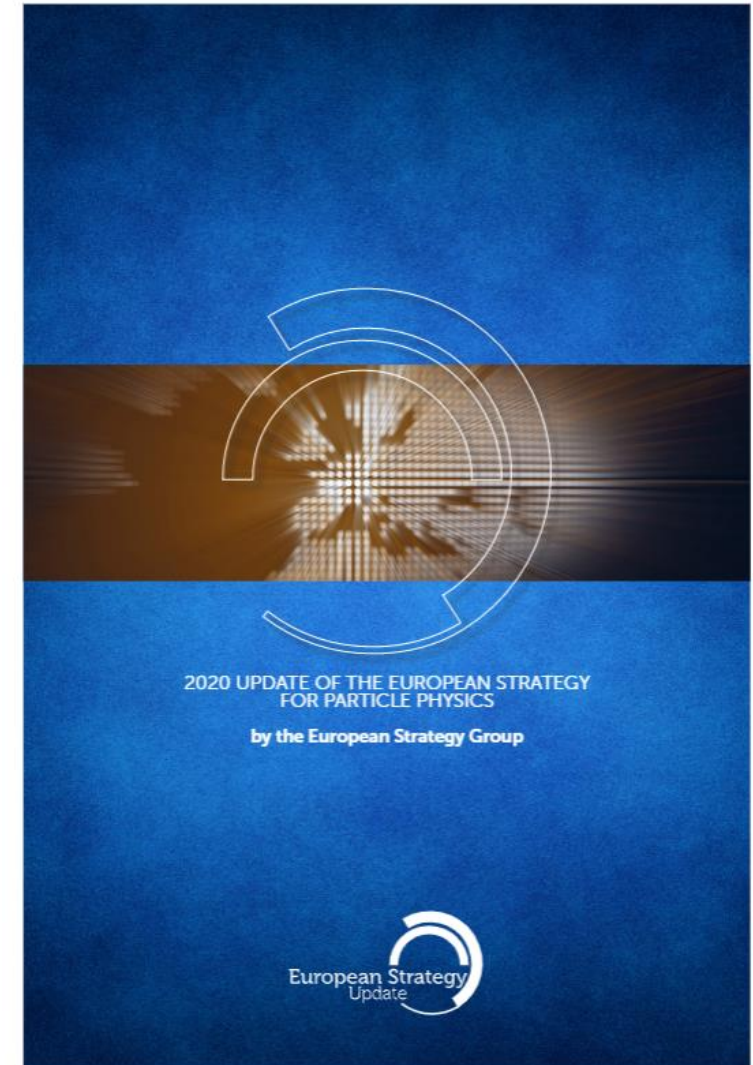
- **proton-proton collider (FCC-hh)**
  - defines infrastructure requirements
  - **80-100 km infrastructure** in Geneva area
    - ~16 T  $\Rightarrow$  100 TeV  $pp$  in 100 km
- **electron-positron collider (FCC-ee)** as first step
- **proton-electron (FCC-he)** option



**FCC Feasibility Study (FS)** will address a recommendation of the 2020 update of the European Strategy for Particle Physics (ESPP):

- “Europe, together with its international partners, should investigate the **technical and financial feasibility** of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an electron-positron Higgs and electroweak factory as a possible first stage.
- Such a feasibility study of the colliders and related infrastructure should be established as a **global endeavour** and be completed on the timescale of the next Strategy update.”

**→ Complete Feasibility Study Report by end 2025**





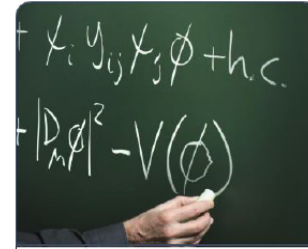
# High-level Goals of Feasibility Study

## High-level goals of Feasibility Study

- optimisation of placement and layout of the ring and related infrastructure, and demonstration of the geological, technical, environmental and administrative feasibility of the tunnel and surface areas;
- pursuit, together with the Host States, of the preparatory administrative processes required for a potential project approval, with a focus on identifying and surmounting possible showstoppers;
- optimisation of the design of the colliders and their injector chains, supported by targeted R&D to develop the needed key technologies;
- development and documentation of the main components of the technical infrastructure;
- elaboration of a sustainable operational model for the colliders and experiments in terms of human and financial resource needs, environmental aspects and energy efficiency;
- identification of substantial resources from outside CERN's budget for the implementation of the first stage of a possible future project;
- consolidation of the physics case and detector concepts for both colliders.



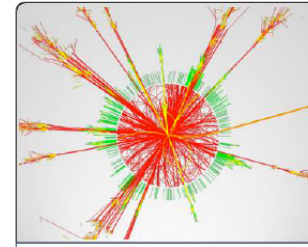
Infrastructures



Physics Cases



Collider Designs



Experiments



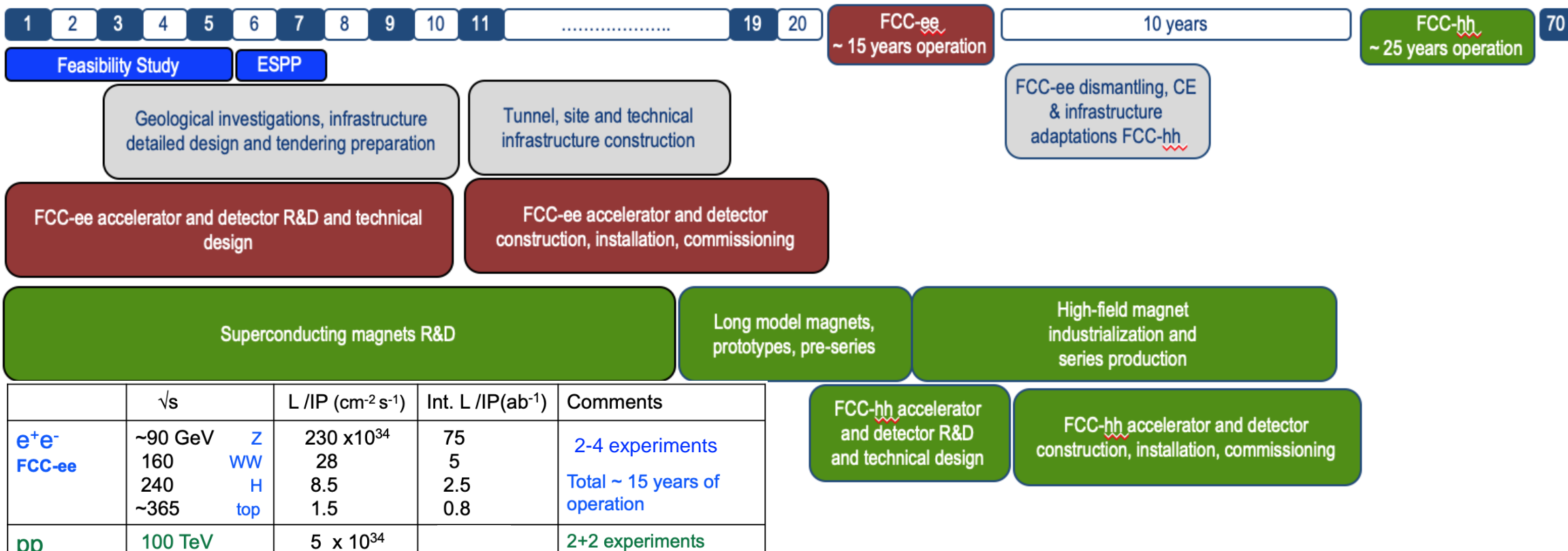
R&D Programs



Cost Estimates

# Timeline of the FCC Integrated Programme

Technical  
schedule

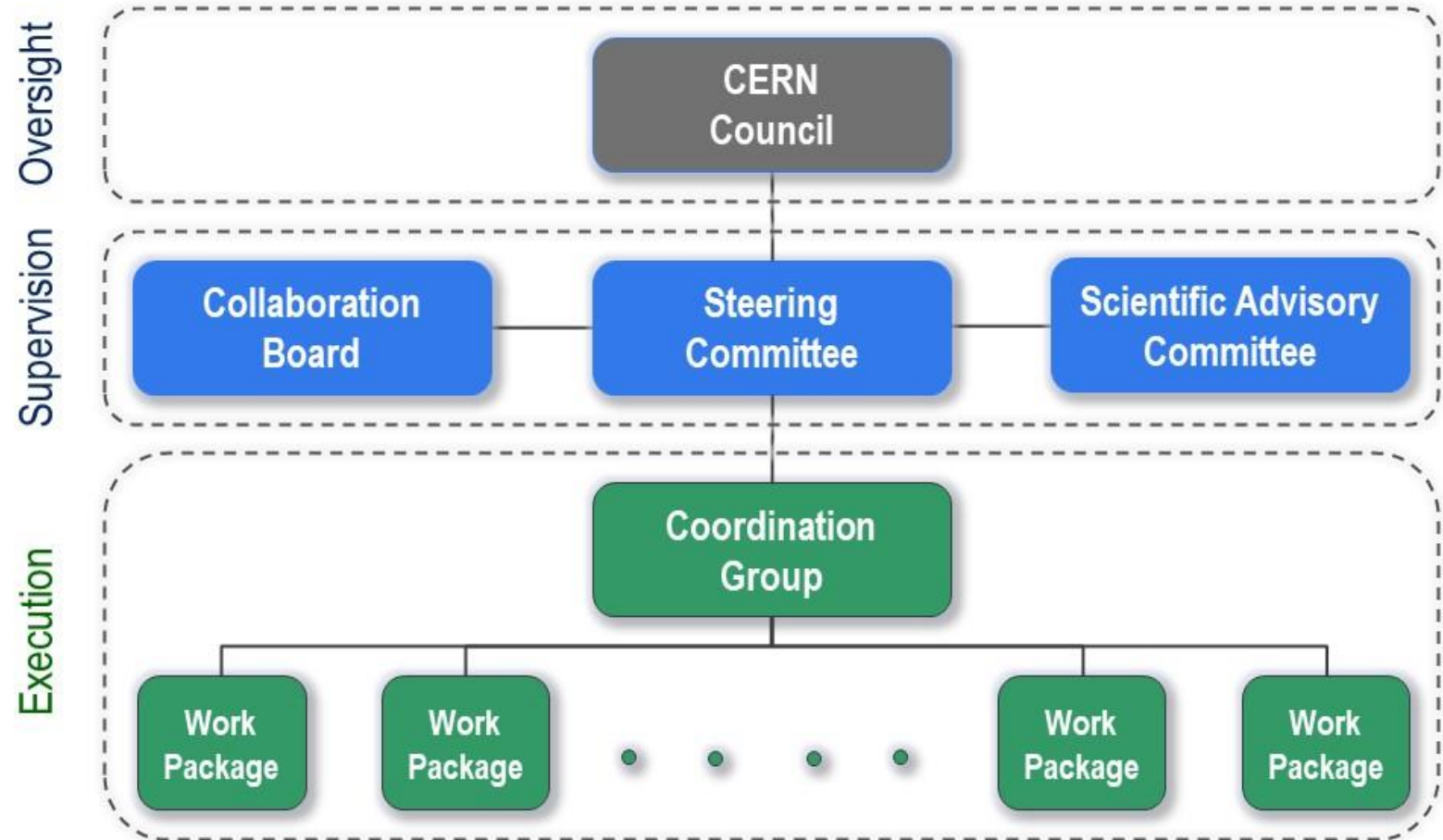


	$\sqrt{s}$	L /IP (cm <sup>-2</sup> s <sup>-1</sup> )	Int. L /IP(ab <sup>-1</sup> )	Comments
<b>e<sup>+</sup>e<sup>-</sup></b> <b>FCC-ee</b>	~90 GeV 160 240 ~365	230 x 10 <sup>34</sup> 28 8.5 1.5	75 5 2.5 0.8	2-4 experiments Total ~ 15 years of operation
<b>pp</b> <b>FCC-hh</b>	100 TeV	5 x 10 <sup>34</sup> 30	20-30	2+2 experiments Total ~ 25 years of operation
<b>PbPb</b> <b>FCC-hh</b>	$\sqrt{s_{NN}} = 39\text{TeV}$	3 x 10 <sup>29</sup>	100 nb <sup>-1</sup> /run	1 run = 1 month operation
<b>ep</b> <b>Fcc-eh</b>	3.5 TeV	1.5 10 <sup>34</sup>	2 ab <sup>-1</sup>	60 GeV e- from ERL Concurrent operation with pp for ~ 20 years
<b>e-Pb</b> <b>Fcc-eh</b>	$\sqrt{s_{eN}} = 2.2\text{ TeV}$	0.5 10 <sup>34</sup>	1 fb <sup>-1</sup>	60 GeV e- from ERL Concurrent operation with PbPb

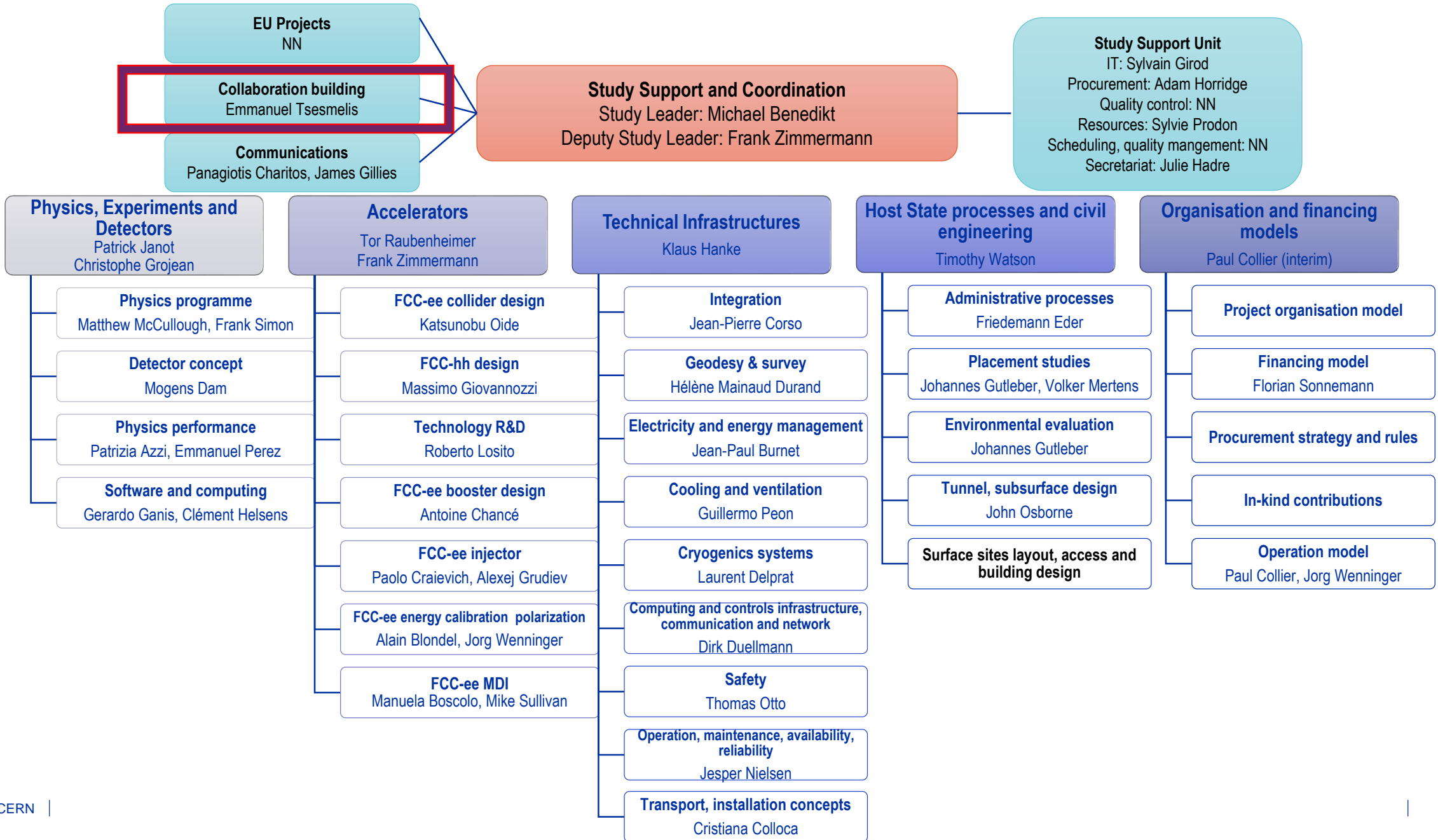
- Feasibility Study: 2021-2025
- If project approved before end of decade → construction can start beginning 2030s
- FCC-ee operation ~2045-2060
- FCC-hh operation 2070-2090++

# FCC Organisational Structure

- **Ownership** of the Feasibility Study by the Council.
- Effective and timely **supervision**.
- Integration of scientific and technical **advice**.
- **Participation of stakeholders** that can potentially make significant financial and technical contributions to a possible future project.
- **Execution** of Feasibility Study.



# FCC Feasibility Study – Coordination Team and Contactpersons



From ESPP 2020: “Such a feasibility study of the colliders and related infrastructure should be established as a **global endeavour....**”

## → FCC Global Collaboration Working Group active since spring 2021

- Engage with institutes/countries/regions with **mature communities**, and the **potential to contribute substantially** to the Organization’s long-term scientific objectives, to facilitate participation in FCC FS.
- Work with national laboratories, institutes, universities and industry in MS, AMS, Observer States and NMS to:
  - Encourage an **expanded membership** and explore **opportunities** for future prospective participants.
  - Explore **opportunities** for future prospective participants in defining **areas of collaboration**.
  - Prepare the foundations for research and contributions by **industry**.
  - Liaise with **national contact persons** and **forums**.

lets**COLLABORATE!**



# Status of Global FCC Collaboration

Increasing international collaboration as a prerequisite for success:

links with science, research & development and **high-tech industry** will be essential to further advance and prepare the implementation of FCC

147

Institutes

30

Companies

34

Countries



# FCC Feasibility Study Collaboration Membership



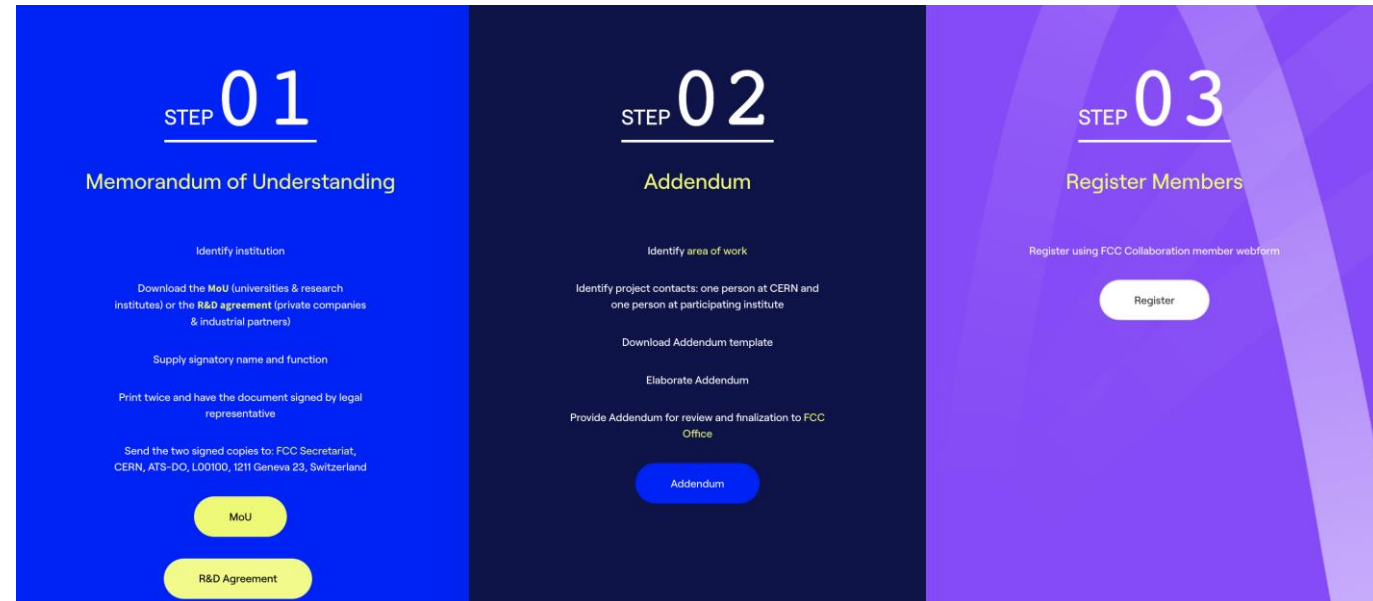
Participation in FCC through **MoU and Addenda**.



The FCC MoU for the first phase of the study has been **updated to cover the Feasibility Study**.



The current participating institutes who wish to take part in the Feasibility Study can continue to participate on the basis of the previously signed MoU until the updated MoU is signed.



The screenshot displays a three-step process for joining the FCC Collaboration:

- STEP 01: Memorandum of Understanding**
  - Identify institution
  - Download the MoU (universities & research institutes) or the R&D agreement (private companies & industrial partners)
  - Supply signatory name and function
  - Print twice and have the document signed by legal representative
  - Send the two signed copies to: FCC Secretariat, CERN, ATS-DO, L00100, 1211 Geneva 23, Switzerland
  - Buttons: MoU, R&D Agreement
- STEP 02: Addendum**
  - Identify area of work
  - Identify project contacts: one person at CERN and one person at participating institute
  - Download Addendum template
  - Elaborate Addendum
  - Provide Addendum for review and finalization to FCC Office
  - Button: Addendum
- STEP 03: Register Members**
  - Register using FCC Collaboration member webform
  - Button: Register

<https://fccis.web.cern.ch/join-now>

# FCC WEEK

# 2023

5 – 9 June

STAY  
TUNED





