KET
Komitee für
Elementarteilchenphysik

The European Strategy for Particle Physics Update (ESPPU) 2026

H. Lacker (RECFA* representative Germany)
HU Berlin

The future of Collider Particle Physics (yHEP workshop), 27.11.2024

* RECFA= Restricted European Comittee for Future Accelerators

Remit of the European Strategy Group by CERN council (June 2024)

*”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 should take into consideration the:

- **input of the particle physics community**
- **status of implementation of the 2020 Strategy update**
- **accomplishments over recent years**, including the results from LHC and other experiments and facilities worldwide, the progress in the construction of the HL-LHC, the outcome of the FCC Feasibility Study, and recent technological developments in accelerator, detector and computing
- **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.

Work / topics covered and shared among Physics Preparatory Group (PPG) and European Strategy Group (ESG)

PPG:
Physics + Technology working groups

- Electroweak physics (including Higgs physics)
- Strong interaction
- Flavour physics
- Beyond the Standard Model physics
- Neutrino physics and cosmic messengers
- Dark matter and dark sector
- Accelerator science and technology
- Detector instrumentation
- Computing

→ **Physics Briefing Book**

ESG: Overarching topics

- **National input / roadmaps (→ strategic)**
- **Projects (FCC, LC, LE-FCC-hh, MC, ..)**
  (timeline, costs, …. (physics → PPG))
- Comparisons across proposed projects
- Relations with other fields of physics
- Implementation of the Strategy
  (role of CERN and National Labs, coordination of European participation in projects sited outside Europe, …)
- Knowledge and Technology transfer
- Sustainability, environmental impact
- Public engagement, education, communication
- …

→ *ESG working groups to be set up, to make sure relevant input becomes available in time*

The Strategy Secretariat and European Strategy Group (ESG)

Strategy Secretariat: **Organising and running the ESPP process**

Strategy Secretary (Chair): Karl Jakobs
SPC chair: Hugh Montgomery
LDG chair: Dave Newbold (→Mike Seidel (PSI): 1st Jan. 2025)
ECFA chair: Paris Sphicas

ESG → **Preparation of the Strategy Document**

- Strategy Secretariat with Strategy Secretary acting as Chair
- One representative from each CERN Member State
- One representative from each of the laboratories represented in the Large Particle Physics Laboratory Directors Group (LDG)
- CERN Director-General
- CERN Director-General elect

- Invitees: President of CERN Council, one representative from each of the Associate Member and Observer States, one representative from the EC, the Chairs of APPEC, NuPECC and ESFRI, the members of the Physics Preparatory Group.

SPC=Scientific Policy Comittee (of CERN); EC= European Comission; ESFRI=European Strategy Forum on Research Infrastructure

APPEC/NuPECC: analogous body to ECFA for Astroparticle/Nuclear Physics in Europe

The European Strategy Group (ESG)

Member States	
Austria	Prof. Jochen Schieck
Belgium	Prof. Pierre Van Mechelen
Bulgaria	Prof. Venelin Kozhuharov
Czech Republic	Prof. Rupert Leitner
Denmark	Prof. Jens-Jørgen Gaardhøje
Estonia	Prof. Martti Raidal
Finland	Prof. Katri Huitu
France	Dr Christelle Roy
Germany	Prof. Klaus Desch
Greece	Prof. Costas Fountas
Hungary	Prof. Dezső Varga
Israel	Prof. Marek Karliner
Italy	Prof. Antonio Zoccoli
Netherlands	Prof. Eric Laenen
Norway	Prof. Heidi Sandaker
Poland	Prof. Tadeusz Lesiak
Portugal	Prof. Mário Pimenta
Romania	Dr Calin Alexa
Serbia	Dr Lidija Zivkovic
Slovakia	Dr Marek Bombara
Spain	Dr Maria Jose Costa
Sweden	Prof. Richard Brenner
Switzerland	Prof. Ben Kilminster
United Kingdom	Prof. Mark Lancaster

CERN Director-General	Dr Fabiola Gianotti
CERN Director-General-Elect	To be appointed in late 2024 → Mark Thomson

Major European National Labs	
CIEMAT	Dr Nicanor Colino
DESY	Prof. Beate Heinemann
IJCLab	Prof. Achille Stocchi
IRFU	Prof. Franck Sabatié
LNF	Dr Sandra Malvezzi
LNGS	Prof. Ezio Previtali
NIKHEF	Prof. Jorgen D'Hondt
PSI	Prof. Klaus Kirch
STFC-RAL	Prof. Dave Newbold
STFC-Daresbury Lab.	Prof. Jim Clarke

Strategy Secretariat Members	
Strategy Secretary (ESG Chair)	Prof. Karl Jakobs
SPC Chair	Dr Hugh Montgomery
LDG Chair	Prof. Dave Newbold → Mike Seidel (01.01.2025)
ECFA Chair	Prof. Paris Sphicas

ESG INVITEES

President of the CERN Council	Prof. Eliezer Rabinovici → Costas Fountas
Associate Member States in the pre-stage to Membership	
Cyprus	Prof. Panos Razis
Slovenia	Prof. Borut Paul Kerševan
Associate Member States	
Brazil	Prof. Leandro Salazar de Paula
Croatia	Dr Budimir Kliček
India	tbc
Latvia	Ms Antra Gaile
Lithuania	Dr Andrius Juodagalvis
Pakistan	Dr Masood Iqbal/Dr Zafar Yasin
Türkiye	Dr Bahadır Saygı
Ukraine	Prof. Borys Grynyov
Observer States	
Japan	Dr Kazunori Hanagaki
United States of America	Prof. Michael Tuts
Organisations with Observer status	
European Commission	Ms Patricia Postigo McLaughlin
Other invitees	
Chair ApPEC	Dr Andreas Haungs
Chair NuPECC	Prof. Marek Lewitowicz
Chair ESFRI	Prof. José Luis Martínez
Other members of the PPG (in addition to the Strategy Secretariat)	

Task and Composition of the Physics Preparatory Group (PPG)

PPG: **collects community input, organises Open Symposium, prepares Briefing Book**

- Strategy Secretary: chair

- 4 members appointed by Council on the recommandation of the SPC

- 4 members appointed by Council on the recommandation of ECFA

- One representative appointed by CERN

- 2 representatives from the Americas

- 2 representatives from ASIA

- SPC chair

- ECFA chair

- LDG chair

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)	

Organisation of the work in the Physics Groups

Charge of WG conveners:
- Select **ECRs as scientific secretaries (Done: see K. Jakobs presentation from yesterday evening)**
- Definition of subtopics and appointment of additional WG members
- Definition of benchmark processes
- Organisation of WG meetings
- Preparation of Physics Book (Support from Roger Forty as scientific secretary)

Comparative assessments on the physics potential of various proposed projects for the defined benchmark processes are made at the working group level

A more global comparison across various physics areas: ESG

To broaden engagement of particle physics community in this ESPPU: additional co-conveners (from SPC and ECFA nominations)

Working group	Co-convener	Co-convener
	PPG member	
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)	Rebecca Gonzales-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 McCollough (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)

10 European countries and CERN represented:
12 men, 6 women; 13 experimentalists, 5 theorists

The scientific secretaries (=ECRs) in the nine Physics and Technology WGs

Electroweak incl. Higgs	Emanuele Bagnaschi (IT)
Strong interactions	Chiara Signorile-Signorile (DE) 
Flavour physics	Maria Piscopo (NL)
BSM physics	Benedikt Maier (UK)
Neutrinos and cosmic messengers	Iván Esteban (ES)
Dark matter and dark energy	Yohei Ema (CERN)
Accelerator technologies	Jacqueline Keintzel (CERN)
Detector instrumentation	Dorothea vom Bruch (FR)
Computing	Daniel Th. Nurnane (DK)

Timeline for the update of the European Strategy for Particle Physics

More details on ESPP web page: https://europeanstrategyupdate.web.cern.ch/

To prepare the national input of the particle physics community to the ESPPU: 3 workshops organized

(KAT, KHuK, KfB involved from the start of the workshop plannings)

November 24	**Annual Meeting (21./22.)**
	+“The future of Non-collider Particle Physics“ (22.-24.: Bad Honnef)
	(not very much attended by ECRs)
	„The future of Collider Particle Physics“ (27.-29.: DESY)
December 24	**Iterate workshop summaries → to be finalized well before:**
January 25	**„Concluding Workshop“ (19.(evening)-22.(afternoon): Bad Honnef)**
	https://indico.desy.de/event/46923/.
	→ Defines ESPPU input of the German Particle Physics Community
February 25	**Iterate input text**
March 25	**Submission of national input**
April/May 25	**Possible workshop to digest all submitted inputs**

Please note that the participant lists of these workshops will be used for all communication regarding the ESPP input statement. If you wish to be informed, we ask you to participate in the discussions which lead to the statement and to register for the workshop, which can also be attended from remote.

Guidelines for documents to be submitted on 31 March

July 2024

European Strategy Update

Contact:
eppsu2024-strategy-secretariat@cern.ch

Guidelines for submitting input for the 2026 update of the European Strategy for Particle Physics

Cover page (1 page)
Each document submitted should carry a single cover page containing no more than the title, the contact person(s) and an abstract.

Comprehensive summary (maximum 10 pages)
The submitted document must be no more than 10 pages long (excluding the cover page) and must provide a comprehensive and self-contained summary of the input. It should address:

- scientific context,
- objectives,
- methodology,
- readiness and expected challenges,
- timeline,
- construction and operational costs (if applicable).

Back-up document
Additional information and details can be submitted in a separate back-up document, which can be consulted by the Physics Preparatory Group (PPG) if clarification on any aspects is required. But the back-up document is not a mandatory component of the submission.

Format and deadline for submission
The cover page and the comprehensive summary are to be submitted in portable document format (pdf) by 31 March 2025. The back-up document should have a cover page with the same title and contact persons and with the words "Back-up Document" added. A dedicated submission portal for both documents will be made available via the ESPPU website.

Distribution
All the documents submitted will be forwarded to the PPG and the European Strategy Group (ESG). Unless explicitly requested otherwise, they will also be made public. The option not to make a given document public will be available upon submission via the dedicated portal.

https://europeanstrategy.cern/

Klick on *"Information for the physics community"*

→ *2026 update;*
direct link: 2026 update
https://europeanstrategyupdate.web.cern.ch/welcome

All inputs shall be submitted via this portal
https://indico.cern.ch/event/1439855/

ECFA guidelines for ESPPU inputs by the National HEP communities

→ **„Uniform“ input allows to better understand and compare the priorities and arguments**

https://ecfa.web.cern.ch/ecfa-guidelines-inputs-national-hep-communities-european-strategy-particle-physics-0

National Input on “next collider at CERN” (I)

Central element of the next ESPP: the choice of next collider at CERN.

ESG remit: “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”.

→ It is imperative that the European HEP community should provide explicit feedback on both the preferred and alternative options for this “next collider at CERN”, which will be the Laboratory's next flagship project, and an explanation of any specific prioritisation.

a) Which is the preferred next major/flagship collider project for CERN?

b) What are the most important elements in the response to (a)?

- **i) Physics potential**
- **ii) Long-term perspective**
- **iii) Financial and human resources: requirements and effect on other projects**
- **iv) Timing**
- **v) Careers and training**
- **vi) Sustainability**

National Input on “next collider at CERN” (II)

c) Should CERN/Europe proceed with the preferred option set out in (a) or should alternative options be considered:

- **i) if Japan proceeds with the ILC in a timely way?**
- **ii) if China proceeds with the CEPC on the announced timescale?**
- **iii) if the US proceeds with a muon collider?**
- **iv) if there are major new (unexpected) results from the HL-LHC or other HEP experiments?**

d) Beyond the preferred option in (a), what other accelerator R&D topics (e.g. high-field magnets, RF technology, alternative accelerators/colliders) should be pursued in parallel?

e) What is the prioritised list of alternative options if the preferred option is not feasible (due to cost, timing, international developments, or for other reasons)?

f) What are the most important elements in the response to (e)? (The set of considerations in (b) should be used).

National Input on non-collider projects and other fields

Remit to ESG also specifies:

> **"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."**

It would thus be most useful if the national inputs explicitly included the preferred prioritisation for non-collider projects. Specific questions to address:

a) What other areas of physics should be pursued, and with what relative priority?

b) What are the most important elements in the response to (a)? (The set of considerations as for the "next collider" should be used).

c) To what extent should CERN participate in nuclear physics, astroparticle physics or other areas of science, while keeping in mind and adhering to the CERN Convention? Please use the current level and form of activity as the baseline for comparisons.