



Welcome

The European Strategy for Particle Physics is the cornerstone of Europe's strategy-setting process for the long-term future of the field. Mandated by the CERN Council, the Strategy takes into account results from the LHC and other facilities in the world, the international physics landscape and developments in related fields with the aim to maximise scientific returns.

In March 2024, the CERN Council launched the process for the third update of the Strategy. [The European Strategy Group \(ESG\)](#) and the [Strategy Secretariat](#) for this update were established in June 2024 to organise the full process. The [remit](#) of the European Strategy Group was also approved in June 2024.

The Strategy update process is expected to converge by January 2026, when an draft Strategy document will be submitted to the Council. The community at large will be involved during the full [process](#) and is asked to provide input at several stages.

European Strategy for Particle Physics Update 2024-2026

RELATED WEBSITES

▶ [The European Strategy for Particle Physics](#)

▶ [CERN Council](#)

(basato su slides preparate da A. Nisati e R. Tenchini)

▶ [F. Tartarelli - 29/10/2024](#)

▶ [Future Accelerators \(ECFA\)](#)

▶ [European Strategy Forum on](#)

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European Strategy for Particle Physics

The **European Strategy for Particle Physics** is a comprehensive framework coordinated by CERN Council to set the priorities and future directions for particle physics research in Europe. It aims at guiding scientific, technological, and financial decisions in particle physics, in Europe, but not only: it impacts on a global scale due to the international collaboration and to the impact of CERN/Europe on the fundamental research worldwide.

This process, typically carried out every 7-8 years, is based on an extensive consultations with the scientific community, stakeholders, and relevant institutions to ensure that the strategy reflects the latest scientific and technological advancements and addresses emerging challenges.

Previous update completed in 2020

- <https://home.cern/sites/home.web.cern.ch/files/2020-06/2020%20Update%20European%20Strategy.pdf>

This is the third update:

- <https://europeanstrategyupdate.web.cern.ch/welcome>

ESPP 2020 update recommendations

The successful completion of the high-luminosity upgrade of the machine and detectors should remain the focal point of European particle physics, together with continued innovation in experimental techniques. The full physics potential of the LHC and the HL-LHC, including the study of flavour physics and the quark-gluon plasma, should be exploited.

The particle physics community should ramp up its R&D effort focused on advanced accelerator technologies, in particular that for high-field superconducting magnets, including high-temperature superconductors; 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.

The European particle physics community must intensify accelerator R&D and sustain it with adequate resources. A roadmap should prioritise the technology, taking into account synergies with international partners and other communities such as photon and neutron sources, fusion energy and industry.

Europe should continue to vigorously support a broad programme of theoretical research covering the full spectrum of particle physics from abstract to phenomenological topics. The pursuit of new research directions should be encouraged and links with fields such as cosmology, astroparticle physics, and nuclear physics fostered. Both exploratory research and theoretical research with direct impact on experiments should be supported, including recognition for the activity of providing and developing computational tools.

Detector R&D programmes and associated infrastructures should be supported at CERN, national institutes, laboratories and universities. Synergies between the needs of different scientific fields and industry should be identified and exploited to boost efficiency in the development process and increase opportunities for more technology transfer benefiting society at large. Collaborative platforms and consortia must be adequately supported to provide coherence in these R&D activities. The community should define a global detector R&D roadmap that should be used to support proposals at the European and national levels.

Steps in the update process

- ✓ **1. Mandate by the CERN Council:**
 - The update process begins when the CERN Council issues a [mandate to review and update the current strategy](#). This mandate outlines the scope, goals, and timeline for the update.
- ✓ **2. Community Involvement and Call for Input:**
 - A [public call for input is issued](#), inviting contributions from the global particle physics community, including researchers, institutions, and national funding agencies. This step ensures that a wide range of perspectives and ideas are considered.
- ✓ **3. Establishment of the Physics Preparatory Group (PPG):**
 - A [Physics Preparatory Group \(PPG\)](#) is formed, consisting of experts from the field. This group is responsible for collecting input, organizing discussions, and preparing a draft of the updated strategy. The PPG typically includes representatives from CERN, member states, and prominent physicists.
- 4. Open Symposium:**
 - An [Open Symposium is held](#), gathering scientists and stakeholders to discuss the input received and the key scientific questions that the updated strategy should address. This symposium serves as a platform for debate on the future direction of the field, including potential projects, experiments, and technologies.
- 5. Drafting the Strategy Update:**
 - Based on the discussions and input, the [PPG drafts the updated strategy](#). This draft, [the Briefing Book](#), outlines the recommended scientific priorities, technological developments, and necessary investments for the coming years.
- 6. Submit the European Strategy Update recommendations to the CERN Council :**
 - The [Briefing Book is reviewed by the European Strategy Group \(ESG\)](#), which includes representatives from CERN, member states, and observer states. Additional feedback is sought to refine and adjust the recommendations. A final document based is issued by the ESG to the CERN Council

Timeline of the Strategy Update



Recent updates

- Launch of the ESPP update (March 21, 2024 CERN Council)
- Election of Karl Jacobs as Strategy Secretary (ESG Chair) and establishment of the [European Strategy Group](#) (June 21, 2024 CERN Council)
- Appointment of members of the [Physics Preparatory Group](#) (September 26, 2024 CERN Council)
- Announcement that the Strategy Open Symposium will take place in Venice, 23-27 June 2025 (September 26, 2024 CERN Council).

Mandato del Council all'European Strategy Group (ESG)

(From CERN/SPC/1239/Rev.2)

The ESG 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

Input alla ESPP e "Briefing Book"

To inform the Strategy update, the ESG calls upon the particle-physics community across universities, laboratories and national institutes to provide **input to the process** in various forms and at various stages.

An Open Symposium, at which the community will be invited to debate scientific input into the Strategy update.

A "Briefing Book" based on the input and discussions will then be prepared by the **Physics Preparatory Group**. The Briefing Book will be submitted to the ESG for consideration during a five-day-long drafting session which is scheduled to take place from 1 to 5 December 2025.

Alcune importanti considerazioni

Baseline e possibili scenari alternativi (da Karl Jakobs - July ECFA meeting):

- In this Strategy Update process, we must converge on a preferred option for the next collider at CERN plus alternative options (prioritized)
- This may imply as well strong focus on certain R&D lines
- It will provide the basis for a decision on construction of the next major collider at CERN by Council in 2027/28
- Current baseline – justified by 2020 Strategy: FCC integrated programme (FCC-ee followed by a hadron collider of at least 100 TeV)
- Possible alternative scenarios (for next collider, following the HL-LHC):
 - Realisation of a lower-energy hadron collider (50 – 80 TeV) on an earlier timescale (2050 – 2055)
 - Linear Collider at CERN (CLIC, ...)
 - Muon Collider at CERN
 - Further exploitation of the LHC physics program, eventually with the addition of e-h collisions
 - ...

Non-exhaustive list, other scenarios may come up and be proposed by the community

Dal mail di Fabiola del 11/10/2024

The previous update of the European Strategy for Particle Physics, completed in 2020, recommended that 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.

Since then significant progress has been made and an international consensus reached on the scientific case for a Higgs factory. [A mid-term report on the feasibility study for the proposed multi-stage Future Circular Collider \(FCC\) at CERN was presented in March 2024, with a final report expected in spring 2025.](#) In December 2023, a rigorous planning exercise in the US prioritised support for a Higgs factory based outside the US. [It was followed in April 2024 by a joint statement of intent by CERN and the US government to continue collaboration on the feasibility study for the FCC Higgs factory \(FCC-ee\) and on its construction and physics exploitation, should the CERN Member States determine the FCC-ee to be CERN's next world-leading research facility.](#)

“Given the long timescales involved in building large colliders, it is vital that the community is united so as to enable the Council to take a decision on the next collider at CERN in 2027/2028. [There is excellent progress with the LHC and no new indication that would change our physics priorities: understanding the Higgs boson much better and exploring further the energy frontier are key to the next project](#)”, said Strategy Secretary, Karl Jakobs, University of Freiburg.

[In addition to identifying the preferred option for the next collider at CERN, the Strategy update is expected to prioritise alternative options to be pursued if the chosen preferred plan turns out not to be feasible or competitive. It will also indicate areas of priority for scientific exploration complementary to colliders, as well as for other items identified as relevant to the field. These include accelerator, detector and computing research and development, theory developments, actions to minimise environmental impact and improve the sustainability of accelerator-based particle physics, initiatives to attract, train and retain early-career researchers, and public engagement.](#)

Come possiamo dare input alla ESPP?

Essenzialmente in due modi :

- Come comunità, ovvero come partecipanti a progetti di interesse alla preparazione del Briefing Book (e.g. FCC, Muon Collider, etc.). Possiamo contribuire agli input document che questi progetti sottometteranno con deadline 31 Marzo 2025.
- Come INFN le comunità nazionali possono dare input sia per il 31 Marzo 2025, che in altre due fasi: sia per il 26 Maggio 2025 (ovvero prima del simposio) che per il 4 Novembre 2025 (ovvero dopo la finalizzazione del Briefing Book e prima della stesura del documento di strategia da parte dell'ESG)

Fortunatamente, intuendo una accelerazione del processo relativo alla prossima Strategy, l'INFN si e' mosso per tempo

Il [workshop INFN del 6 e 7 Maggio](#) ha anticipato ed è consistente con quanto presentato e discusso dal Segretariato ESPP.

Dobbiamo continuare il lavoro sia sul progetto baseline (FCC) che su progetti complementari o alternativi

La preparazione dei documenti che si pensa di utilizzare come input alla prossima ESPP è in linea con quanto richiesto o suggerito

Come procediamo noi?

L' INFN ha istituito un **Gruppo di Lavoro (GdL)** composto dai Presidenti delle Commissioni Scientifiche Nazionali, dai Direttori dei Laboratori Nazionali, dal Coordinatore del MAC e da un rappresentante attività inerenti Calcolo la nostra comunità scientifica (CNC). Il GdL è guidato da uno steering group*.

I Presidenti delle CSN, oltre ad organizzare eventi interni, inviteranno i loro Coordinatori a avviare **presentazioni e discussioni locali sulle attività di interesse per la ESPP**, in accordo con i rispettivi Direttori. Le conclusioni che scaturiranno da questi incontri saranno condivise con gli stessi Presidenti.

I Direttori dei Laboratori avvieranno una discussione, presso la comunità scientifica dei Laboratori da loro diretti, che metta in risalto soprattutto i **contributi che essi possono offrire in base alle infrastrutture di ricerca disponibili presso i Laboratori stessi**.

*Steering group : Marco Ciuchini (GE), Sandra Malvezzi (GE), Aleandro Nisati, Roberto Tenchini (Pres. CSN1), Cecilia Borca (Rappresentate ECR)

Come procediamo noi?

I Presidenti delle CSN e i Direttori dei Laboratori dovranno produrre un documento da inviare allo Steering Group INFN; esso sintetizzerà i risultati del processo all'interno delle CSN e dei Lab e potrà eventualmente essere sottomesso come input alla Strategy.

Il Coordinatore del MAC curerà la preparazione di un documento che raccolga in modo omogeneo gli studi di macchine acceleratrici svolti dall'INFN e che sono stati finanziati dalla Giunta Esecutiva con fondi dedicati per contribuire allo sviluppo delle raccomandazioni European Strategy 2020.

Il Rappresentante Calcolo curerà la preparazione di un documento che raccolga in modo omogeneo gli studi degli aspetti legati al calcolo per i progetti futuri.

Sottometteremo entro il 31 Marzo 2025 i nostri documenti di Input. Il documento principale lo vorremmo sottomettere insieme a tutti gli altri. Il Management INFN valuterà se sarà necessario un aggiornamento da parte nostra, da sottomettere dopo il Briefing Book e prima della Drafting Session.

Riunioni svolte e previste dello Steering con il GdL, previsto anche un evento pubblico finale il 4 Febbraio 2025 a Milano – da confermare!

Possibili riunioni anche dopo il Simposio e prima della riunione dell' ESG