UK input to 2026 European Strategy for Particle Physics Update (ESPPU) Introduction to 3rd Drafting Day

28-Apr-2025
RAL

Jim Clarke, Davide Costanzo, Ruben Saakyan, Mark Williams, Sarah Williams

On behalf of
The Drafting Team

Julia Allen, Daniela Bortoletto, Jim Clarke, Davide Costanzo, Patrick Dougan, Alison Elliot, Sinead Farrington, Henning Flaecher, Joel Goldstein, Mark Lancaster, Atanu Modak, Holly Pacey, Chris Parkes, Haroon Rafique, Aidan Robson, Ruben Saakyan, Michael Spannowsky, Jessica Turner, Harriet Watson, Aidan Wiederhold, Mark Williams, Sarah Williams, Matthew Wing

Start with good news from Sarah!

Not twins,
Just
different
projections!
😂😂

Big thanks to RAL for hosting! In particular to Sinead Farrington and Karen Woudberg!

Preamble

- UK input submitted on 31 Mar [link].
- Massive effort from drafting team and entire community
- Extensive consultations, “physics landscape” meeting in Durham [link] and two community drafting days at Daresbury [link] and UCL [link].
- **Support for FCC tunnel at CERN as major next PP infrastructure**
- *Balance of small, medium and large projects, collider and non-collider*
- *Critical mass support for R&D in detectors, accelerators, S&C, sustainability*
- *Embracing new research approaches (e.g. QTFP)*
- Opportunity to update national input by 26 May
- Subsequent steps
  - Symposium in Venice [link] Register!
  - Briefing book - Sep 2025
  - Strategy drafting session - Dec 2025
  - Approval by CERN Council - early 2026
  - Publication of ESPP - mid 2026

See key reminders at the end of Intro slides

Goals of today

- Hear from digest teams (thank you!) on news since 31 Mar ESPP submissions
  - Collider; Non-Collider; Accelerators
- Discuss “Plan B” scenarios
  - FCC in global context
  - Alternative options (if FCC unfeasible or delayed)
- Discuss scenarios for both collider and non-collider physics. Identify emerging consensus where possible.
- Discuss cross-cutting themes (R&D, sustainability, EDI, talent pipeline…)
- Overall: attempt to agree on major updates for UK input (by 26 May)

Plans for today

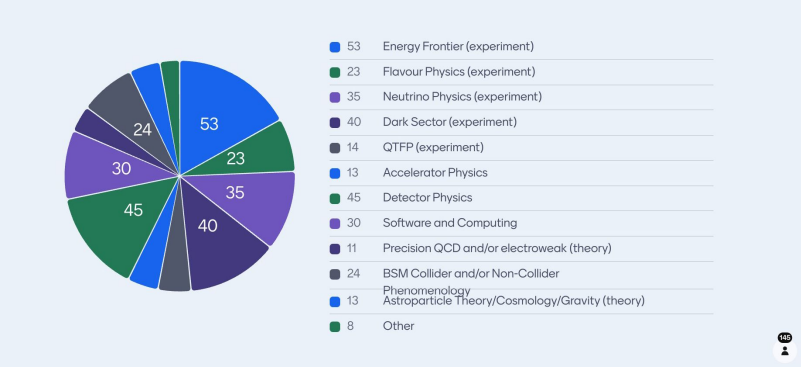
- Results of survey were made available [link]*. Selected findings will be shown during relevant sessions.
- Feel free to keep adding comments in the google doc (also linked from indico page of the meeting)
- Intro session: Digests
- Session 1. ESG Question 3c (FCC in global context) and introduction to Q3e (Alternatives to FCC).
- Session 2. Q3e continued. Q3d (accelerator R&D)
- Session 3. Q4a (Non-collider priorities)
- Session 4. Cross-cutting themes and summaries (if have time)

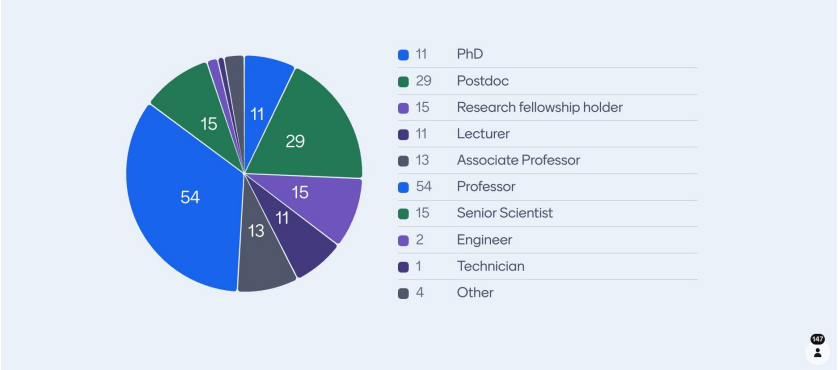
* Also available as pdf on overview indico page

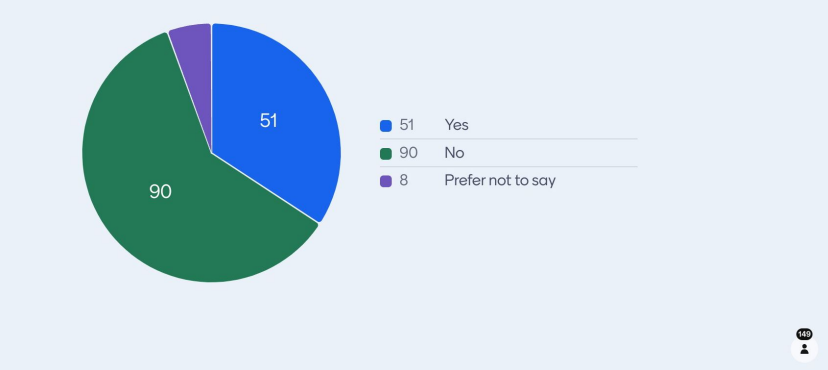
Survey: 185 participants

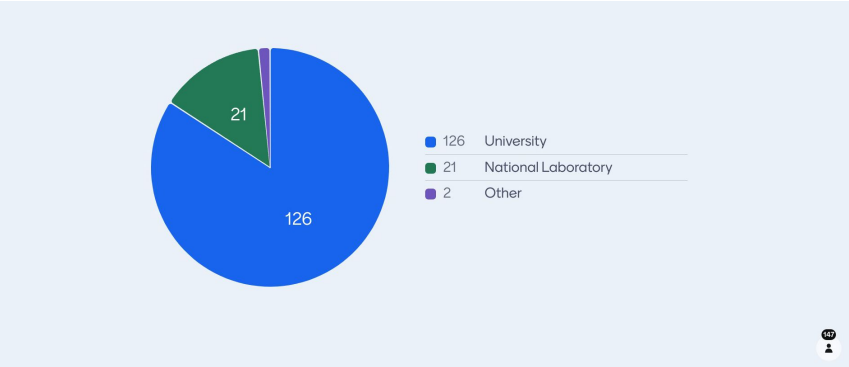
This survey is intended to help inform discussions. Not a vote or decision-making tool.

https://www.mentimeter.com/app/presentation/al1iabvmf6rbqvfyp3gm3cq191afgdhp/edit?source=share-modal









Steps after today

- Drafting team will work on summarising outcomes of Plan B and other discussions since last UK input submission
- Updated UK input released for community comments **15 May**
- Community comments period until CoB **22 May**
- Implementation of comments and submission by **26 May**
- Expect to have a UK meeting in October following briefing book publication in Sep 2025

ESPPU Process: Key Reminders

Timeline


Council appointment of the members of the PPG and decision on the venue for the Open Symposium
End September 2024
December 2024
Council decision on the venue for the ESG Strategy Drafting Session
Deadline for the submission of main input from the community
31 March 2025
26 May 2025
Deadline for the submission of additional national input in advance of the Open Symposium
Open Symposium
23-27 June 2025
End September 2025
Submission of the "Briefing Book" to the ESG
Deadline for the submission of final national input in advance of the ESG Strategy Drafting Session
14 November 2025
1-5 December 2025
ESG Strategy Drafting Session
Submission of the draft strategy document to the Council
End January 2026
March and June 2026
Discussion of the draft strategy document by the Council and updating of the Strategy

UK:
Mark Lancaster

Sinead Farrington

Jim Clarke

- **"Secretariat":**
  - Secretary (chair): K. Jakobs
  - CERN SPC chair: H. Montgomery
  - ECFA chair: PS
  - LDG chair: M. Seidel

- **European Strategy Group (ESG):**
  - Secretariat (secretary chairs ESG);
  - One rep per CERN member state;
  - One rep per lab in LDG;
  - CERN DG, CERN DG-elect;
  - Invitees: PPG, President of Council, 1 rep from each Associate Member State and Observer State, 1 rep from EC; chairs of ApPEC, NuPECC, ESFRI

- **Physics Preparatory Group (PPG):**
  - Secretariat (secretary chairs ESG);
  - 4 people nominated by SPC
  - 4 people nominated by ECFA
  - 2 people nominated by Americas
  - 2 people nominated by Asia
  - 1 person nominated by CERN

- **Nine Working Groups (WGs):**
  - Last time's Computing and Instrumentation split (8 WGs of 2020 ESPP→ 9 WGs):
    - Computing WG and
    - Instrumentation WG

- **Increase engagement by HEP community:**
  - Each WG: only one co-convener from PPG
  - Second co-convener from SPC/ECFA lists
  - So: Ex-officio members (ECFA, SPC and LDG Chairs) and representatives from the Americas and Asia are not co-conveners.
- **Role of representatives from Asia and the Americas, and ex-officio members and Chair: maintain coherence of overall effort.**
- **Engage the generation most concerned: Each WG must appoint a scientific secretary who is an Early Career Researcher:**
  - A scientist without an indefinite position and within 10 years from PhD.
  - To be selected by conveners, using nominees collected by ECFA and their own knowledge of the people in the thematic area.

ESG Working Groups (I): (1–3)

(1) National Input, Diversity in European Particle Physics

- Analyse and summarise the input that will be submitted by the national HEP communities.
- Discuss constraints imposed by a large accelerator project at CERN. What fraction of the CERN and European research budget should be put on a single flagship project?
- Discuss the level of European participation in projects outside Europe
- Chairperson: C. Alexa (RO); B. Kliček (HR), E. Laenen (NL), M. Lancaster (UK), S. Malvezzi (LNF), C. Roy (FR), J. Schieck (AT).

(2) Project Comparison Group

- (A): Project assessment (technical feasibility, timeline, risks, cost and human resources, environmental impact.
- Chairpersons: G. Arduini and P. Burrows; K. Desch (DE), S. Farrington (STFC-RAL), K. Hanagaki (Japan), F. Sabatié (IRFU, CEA), M. Tuts (USA), A. Zoccoli (IT).
- (B) Physics potential
- Chairperson: M. Dunford; A. Canepa (US), C. Diaconu (FR), M. Dunford (DE), P. Hernandez (ES), G. Isidori (CH), X. Lou (CN), F. Maltoni (BE/IT), J. Monroe (UK), R. Rosenfeld (BR), Y. Yamazaki (JP).

(3) Implementation of the Strategy / Deliverability of large projects

- Assess how European National Labs/institutes can best work together with CERN to deliver large-scale accelerator and detector projects. ("Distributed delivery model" for CERN's next flagship?)
- Lessons learnt from recent major projects (e.g. ATLAS and CMS upgrades)
- Model for international participation (beyond CERN Member & Associate Member States)?
- Chairperson: A. Stocchi; Members: J. Clarke (STFC-Daresbury), B. Heinemann (DESY), J. D'Hondt (Nikhef), K. Kirch (PSI), B. Kilminster (CH).

ESG Working Groups (II): (4–7)

(4) Relations with other fields of physics

- Connections to Astroparticle and Nuclear physics
- Chairperson: M. Karliner; Membership: N. Colino (CIEMAT), P. Garay (APPEC), K. Huitu (FI), M. Karliner (IL), B. Kersevan (SI), R. Leitner (CZ), V. Kozhuharov (BG), E. Previtali (LNGS), E. Widmann (NuPECC).

(5) Sustainability and environmental impact

- Energy consumption during operation of each stage (peak (MW) and integrated (TWh)); Integrated carbon-equivalent energy cost of construction
- Any other significant expected environmental impacts; Mitigation measures
- Chairperson: T. Lesiak; Members: T. Boccalli (IT), J.J. Gaardhøje (DK), A. Gaile (LV), T. Lesiak (PL), R. Razis (CY), H. Sandaker (NO), D. Varga (HU).

(6) Public Engagement, Education, Communication & Social and career aspects for the next generation

- Merge of two groups in 2020 update of the ESPP
- Chairperson: P. van Mechelen; Members: M. Bombara (SK), M.J. Costa (ES), P. van Mechelen (BE), L. de Paula (Brazil), M. Pimenta (PO), B. Saygi (TR), L. Zivkovic (RS)

(7) Knowledge and Technology Transfer

- Connections to Industry, spinoffs, etc.
- Chairperson: B. Heinemann; T. Bergauer (AT), R. Brenner (SE), B. Grynyov (UA), B. Heinemann (DESY), A. Juodagalvis (LT), M. Raidal (EE), Z.Yasin (PK).

PPG Working Groups: conveners and scientific secretaries (ECRs)

Working Group	Conveners	Scientific Secretary
Electroweak incl. Higgs	Monica Dunford (DE, exp); Jorge de Blas (ES, theory)	Emanuele Bagnaschi (IT)
Strong interactions	Cristinel Diaconu (FR, exp); Andrea Dainese (IT, exp, HI)	Chiara Signorile (DE)
Flavour physics	Gino Isidori (CH, theory); Marie-Hélène Schune (FR, exp)	Maria Piscopo (NL)
BSM physics	Fabio Maltoni (BE/IT, theory); Rebeca Gonzalez-Suarez (SE, exp)	Benedikt Maier (UK)
Neutrinos and cosmic messengers	Pilar Hernandez (ES, theory); Sara Bolognesi (FR, exp)	Iván Esteban (ES)
Dark matter and dark sectors	Jocelyn Monroe (UK, exp); Matthew McCullough (CERN, theory)	Yohei Ema (CERN)
Accelerator technologies	Gianluigi Arduini (CERN, accelerators); Phil Burrows (UK, exp, accelerators)	Jacqueline Keintzel (CERN)
Detector instrumentation	Thomas Bergauer (AT, exp); Ulrich Husemann (DE, exp)	Dorothea vom Bruch (FR)
Computing	Tommaso Boccali (IT, exp, comp); Borut Kersevan (SI, exp, comp)	Daniel Th. Nurnane (DK)

- **Physics Preparatory Group (PPG): physicists/engineers, experts in different subfields of particle physics (nominated by SPC, ECFA, CERN, Americas/Asia)**
- **European Strategy Group (ESG): secretariat (secretary chairs ESG); One rep per CERN member state; One rep per lab in LDG; CERN DG, CERN DG-elect. Invitees: PPG, President of Council, 1 rep from each Associate Member State and Observer State, 1 rep from EC; chairs of ApPEC, NuPECC, ESFRI**

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
- …

OPEN SYMPOSIUM

European Strategy for Particle Physics

2026 UPDATE

European Strategy for Particle Physics

23-27 **JUNE** 2025

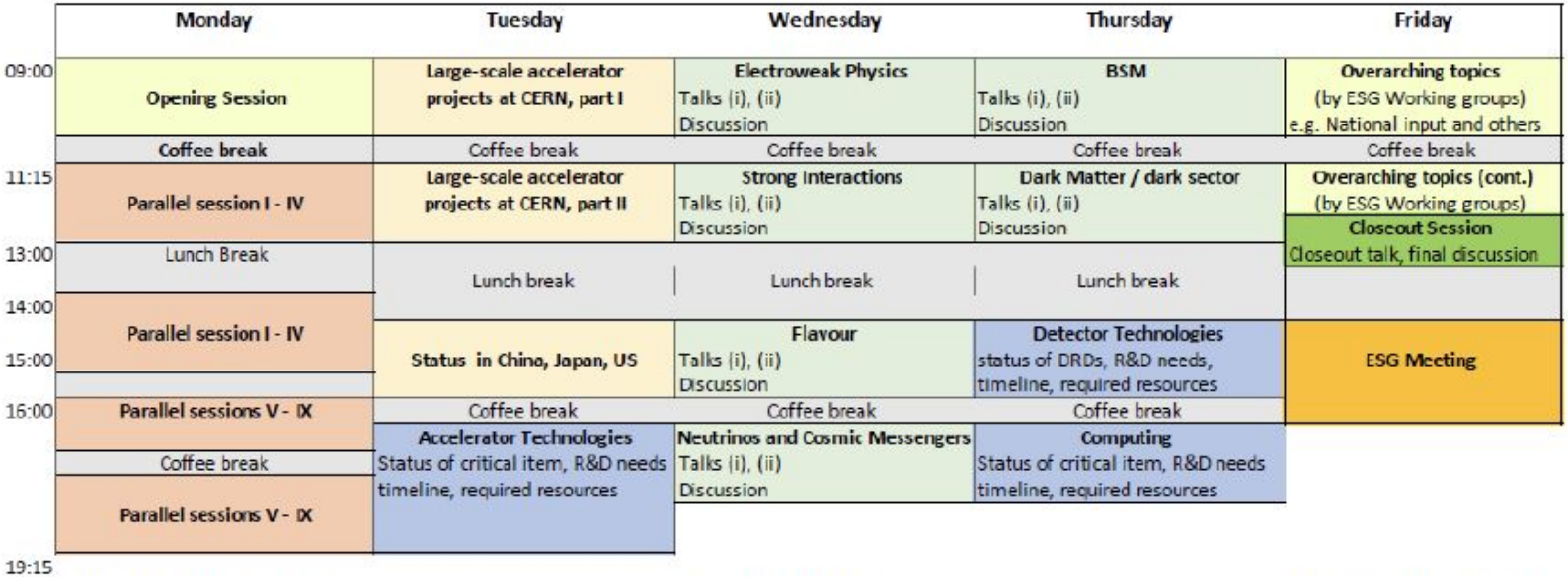
Lido di Venezia

Lungomare G. Marconi, 1861

CERN

INFN

Istituto Nazionale di Fisica Nucleare



9:00 - 10:45 Opening Session

Parallel Sessions I - IV
11:15 - 13:00 Parallel I - IV, part I
Lunch Break: 13:00 - 14:00

14:00 - 15:30 Parallel I - IV, part II
Very short break; 15:30 - 15:40 to change rooms
15:40 - 17:00 Parallel V - IX, part I
17:00 - 17:20 Coffee break
17:20 - 19:15 Parallel V-IX, part II

16:45 - 19:15 Accelerator Tech.

For each **Physics Block**:
(i) Status, open questions
(ii) How can they be addressed by the various projects
(iii) Discussion

11:15 - 12:30 ESG Session II
12:30 - 13:30 Closeout session

14:30 - 16:30 ESG Meeting

Open Symposium (III)

- Dominance of Plenary Sessions: deliberate, following feedback from 2020 update.
- Opening Session will contain:
  - Opening Ceremonies
  - A retrospective on achievements following the previous strategy update (F. Gianotti)
  - A perspective of the field (theorist speaker)
- We anticipate ~six "Large Project" talks; plus 3 International talks (CN, JP, US)
- Some PPG Groups are organizing supplemental Open Meetings ahead of the symposium, to supplement the relatively short parallel sessions in Venice.
- With one or two variations, the six Physics group plenaries will typically have:
  - One talk setting out the physics goals and ambitions
  - One talk explaining how (experimentally) the ambitions are achieved/approached
  - One extensive structured discussion session → see following slides
- The structures of the technical group sessions are still under discussion.
- The ESG Session will not cover all the ESG Working Groups. One of the topics that will be covered: summary of input from National HEP copmmunities.
- We anticipate a short "ECR" presentation as well.

Guidelines for Large Project talks

- **Although we have sent guidelines to the large projects, which were mainly thought to structure the written input/submission by 31 March, the invitation letter will list a few topics that should be addressed in the oral plenary presentation:**
  - **Layout of the proposed accelerator project**
  - **Technical status, R&D needs**
  - **Physics running scenarios: centre-of-mass energies, luminosities, ..**
  - **Resource requirements (capital cost for construction (accelerator and detectors), annual cost of operation at each stage, human resources)**
  - **Environmental impact (peak (MW) and integrated energy consumption (TWh) during operation; CO_2 equivalent cost of construction;**
  - **energy consumption required to reach certain physics goals:**
    - **t.b.d., e.g. Higgs coupling at target value, sensitivity in searches, sensitivity for top observables**
  - **Timeline (technically limited; time for approval/feasibility)**

Plan for plenary sessions

- After the two (three in some cases) plenary talks in each physics session, a discussion session of 45 minutes is foreseen.
  - Main purpose of this discussion session: give the full community the possibility to give input, get heard in the discussion of the big physics questions related to the next large accelerator-based project at CERN.
- To make it successful, the discussion needs to be structured by an excellent chairperson. Currently envisaged structure of discussion session:
  - Discussion leader presents a set of physics topics / key questions (4 - 5) to be discussed
    - List of topics should be discussed and defined beforehand by the two plenary speakers, the scientific secretary and the discussion leader.
    - For each topic, a discussion time of max. 10 min is foreseen; if no additional arguments come up, one can move to the next topic. One should also aim to have some time left for additional questions.
  - The talks will be streamed
  - Questions can be asked only by individuals in the room; It is not foreseen to have questions on Zoom.
    - Questions are addressed to the two speakers. However, they can be delegated to a member of their working group. To ease this, WG members will sit in the front lines, close to a microphone.