

In March 2025, the **Statement by the German Particle Physics Community as Input to the Update of the European Strategy for Particle Physics** was submitted to the ESPP Update process (<https://indico.cern.ch/event/1439855/contributions/6461423/>). For easier reference we extract here the parts relevant for the answers to the three questions posed by the ESPPU secretariat in October 2025. We assume that “large-scale post-LHC accelerator for CERN” is equivalent to “Future Collider Flagship project at CERN”, i.e. these questions are not about possible intermediate projects.

What is the preferred large-scale post-LHC accelerator for CERN?

The German community concludes that the FCC-ee provides an excellent potential to explore Higgs physics as well as the electroweak sector. It will allow us to perform QCD and flavour measurements, test BSM physics and, after an upgrade, to make important measurements in top physics. With this program the FCC-ee will offer an exciting experimental approach towards answers to the fundamental open questions. It offers high luminosity at up to four interaction regions. The FCC-ee concept was developed at CERN and its feasibility studied in depth, with no technical showstopper reported so far. The tunnel to be built for the FCC-ee could be re-used for a future FCC-hh. Clearly, CERN has the required expertise to carry out this integrated programme.

The German community supports the FCC-ee as the next flagship project at CERN with highest priority. The German community will be fully committed to engage in all aspects of this project. Its realization requires the timely development of a solid and affordable financial plan by CERN.

What is the preferred alternative, if the preferred option is not feasible?

In this case, an e^+e^- Linear Collider provides an attractive alternative path towards a Higgs factory. It has interesting additional features (polarization of both beams) and can provide up to two interaction regions sharing the luminosity. The foreseen luminosity at 250 GeV and below is lower than for the FCC-ee. It offers a reduced electroweak and much reduced flavour program at the Z pole. The tunnel cannot be reused for a hadron collider. A Linear Collider can, however, provide an upgrade path to TeV lepton collisions by extending its length or installing more powerful acceleration devices. The ongoing cost analysis of different linear collider stages will give important input to balancing the financial, scientific, and scheduling aspects in the decision for a next flagship project if the FCC-ee is not financially feasible.

In case China proceeds with the CEPC on the announced timescale, a Linear Collider at a centre-of-mass energy of 250 GeV is not considered competitive; it would need a minimum energy of 550 GeV to be considered as a flagship project; see Sect. 3.2.3 of our statement. A hadron collider in a tunnel of about 90 km circumference is more expensive than the FCC-ee. In any case, a vigorous accelerator R&D program is required to enable a future high-energy flagship project as detailed in Sect. 3.3 of our statement.

What is the preferred alternative, if the preferred option would not be competitive?

With the CEPC project the Chinese particle physics community promotes an ambitious collider project to be built in China which provides a physics reach comparable to that of the FCC-ee. If China proceeds with the CEPC on the announced timescale, physics results from this machine are expected to become available about 10 years earlier than results from a future flagship project to be built at CERN. In this case the FCC-ee as well as a linear e^+e^- collider operating at a centre-of-mass-energy around 250 GeV are not considered competitive enough by the German community to serve as the next flagship collider project at CERN. To secure the European leadership in collider-based particle physics, CERN then has to aim for a complementary and

competitive next flagship collider project at higher energies in order to extend the reach to answer the open questions. Two projects are considered mature enough for a timely realisation after the HL-LHC. Both offer a world-leading physics program securing European leadership in particle physics on the long-term:

- A hadron collider with magnet technology expected to be available at the end of the HL-LHC, installed in a tunnel of about 90 km circumference, will provide a huge improvement of the physics reach in comparison to the expected status after the HL-LHC and will be largely complementary to the physics potential of the CEPC. It offers superb perspectives for precision studies of the Higgs boson (e.g. very precise measurement of the trilinear Higgs coupling) and opens a completely new territory in the search for new physics at the energy frontier not accessible at other colliders. Like the LHC today, this collider would offer a world-leading, very broad physics program lasting for several decades.
- A linear e^+e^- collider facility with a centre-of-mass energy of initially at least 550 GeV offers a highly competitive physics program in the area of Higgs physics (e.g. with its unique opportunity of direct access to ZHH production) and in the top sector. With its upgrade options to higher energies, either by extending the tunnel length or by installation of improved technologies (CLIC-like, plasma wake-field acceleration), this collider could access the high-energy region with remarkable precision. This makes this option highly attractive for a high-level physics program at CERN lasting for several decades.