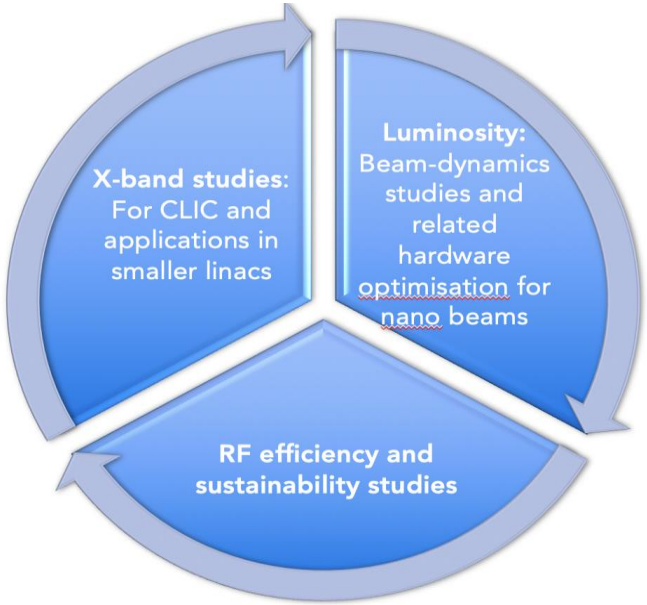
CLIC Project Readiness 2025-26

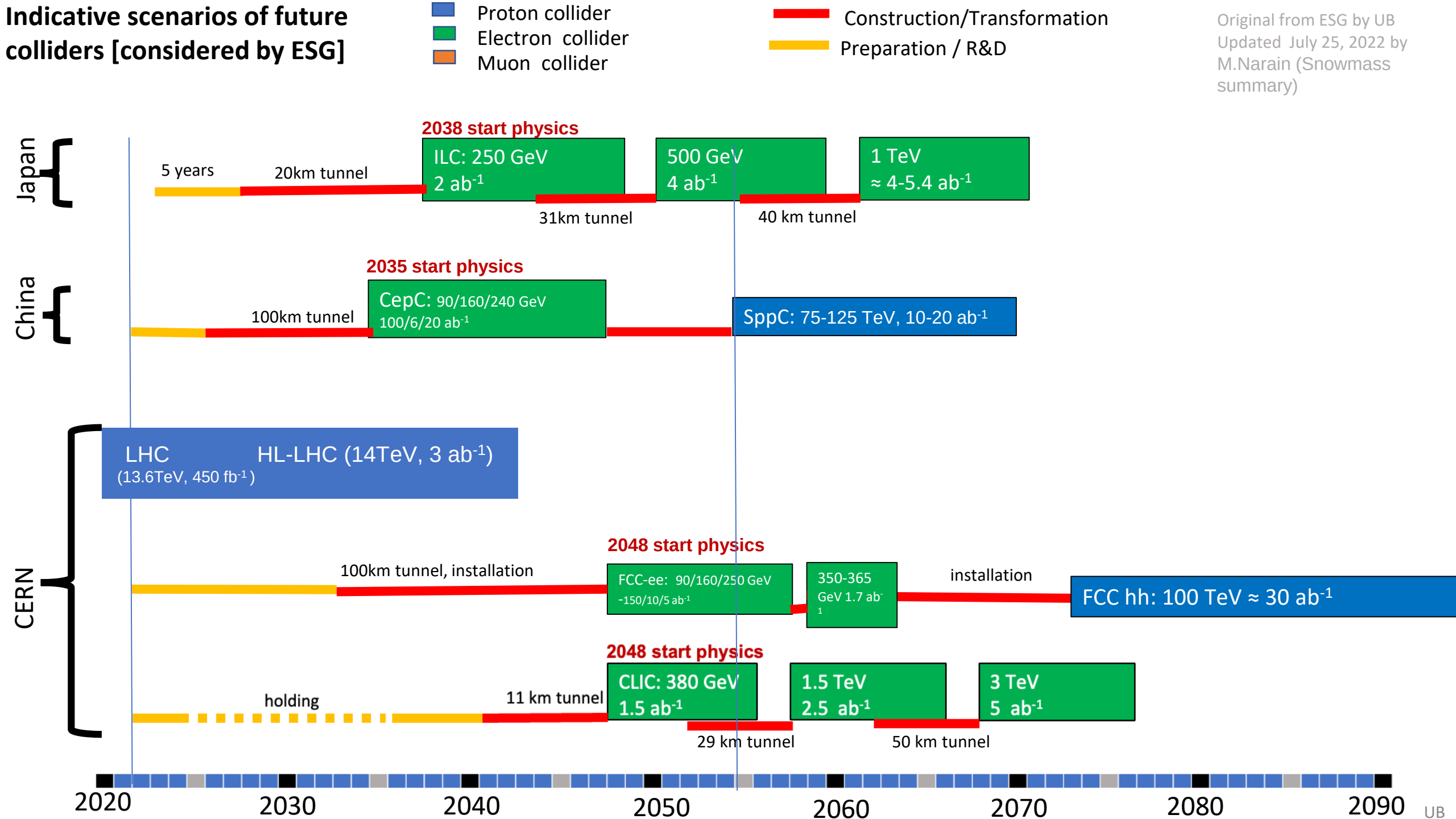
Project Readiness Report as a step toward a TDR – for next ESPP
Assuming ESPP in 2026, Project Approval ~ 2028, Project (tunnel) construction can start in ~ 2030.



Focusing on:

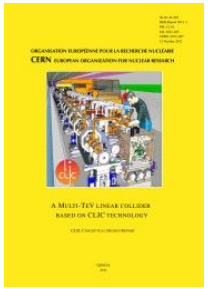
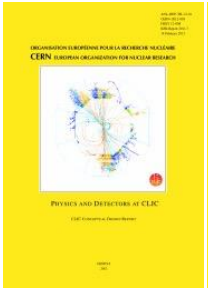
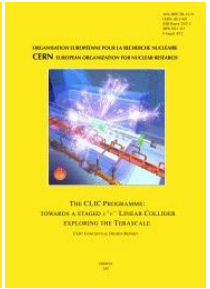
- The X-band technology readiness for the 380 GeV CLIC initial phase - very important part driven by use in small compact accelerators
- Optimizing the luminosity at 380 GeV – already implemented for Snowmass paper, further work to provide margins will continue
- Improving the power efficiency for both the initial phase and at high energies, including more general sustainability studies

Indicative scenarios of future colliders [considered by ESG]

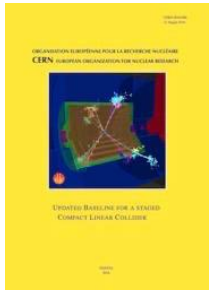


Status reports and studies

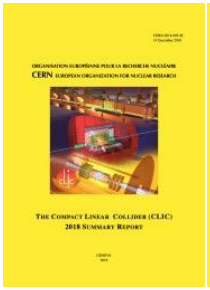
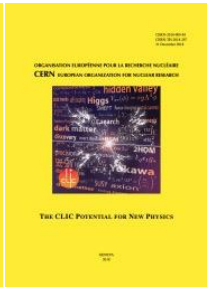
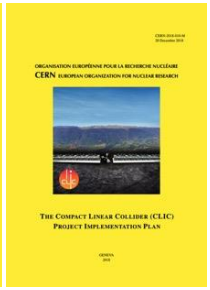
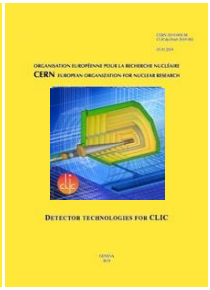
3-volume CDR 2012

Updated Staging Baseline 2016



4 CERN Yellow Reports 2018

Details about the accelerator, detector R&D, physics studies for Higgs/top and BSM

Available at:
clic.cern/european-strategy

Two formal submissions to the ESPPU 2018


Several LoIs have been submitted on behalf of CLIC and CLICdp to the Snowmass process:

- *The CLIC accelerator study: Link*
- *Beam-dynamics focused on very high energies: Link*
- *The physics potential: Link*
- *The detector: Link*

Snowmass white paper:
https://arxiv.org/abs/2203.09186

Broadly speaking: "Updated accelerator part of 2018 Summary Report"

The CLIC project

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April 4, 2022

Abstract

The Compact Linear Collider (CLIC) is a multi-TeV high-luminosity linear e^+e^- collider under development by the CLIC accelerator collaboration, hosted by CERN. The CLIC accelerator has been optimised for three energy stages at centre-of-mass energies 380 GeV, 1.5 TeV and 3 TeV [21]. CLIC uses a novel two-beam acceleration technique, with normal-conducting accelerating structures operating in the range of 70 MV/m to 100 MV/m.

The report describes recent achievements in accelerator design, technology development, system tests and beam tests. Large-scale CLIC-specific beam tests have taken place, for example, at the CLIC Test Facility CTF3 at CERN [39], at the Accelerator Test Facility ATF2 at KEK [53, 67], at the FACET facility at SLAC [35] and at the FERMI facility in Trieste [38]. Crucial experience also emanates from the expanding field of Free Electron Laser (FEL) linacs and recent-generation light sources. Together, they demonstrate that all implications of the CLIC design parameters are well understood and reproducible in beam tests and prove that the CLIC performance goals are realistic. An alternative CLIC scenario for the first stage, where the accelerating structures are powered by X-band klystrons, is also under study. The implementation of CLIC near CERN has been investigated. Focusing on a staged approach starting at 380 GeV, this includes civil engineering aspects, electrical networks, cooling and ventilation, installation scheduling, transport, and safety aspects. All CLIC studies have put emphasis on optimising cost and energy efficiency, and the resulting power and cost estimates are reported. The report follows very closely the accelerator project description in the CLIC Summary Report for the European Particle Physics Strategy update 2018-19 [22].

Detailed studies of the physics potential and detector for CLIC, and R&D on detector technologies, have been carried out by the CLIC detector and physics (CLICdp) collaboration. CLIC provides excellent sensitivity to Beyond Standard Model physics, through direct searches and via a broad set of precision measurements of Standard Model processes, particularly in the Higgs and top-quark sectors. The physics potential at the three energy stages has been explored in detail [2, 3, 17] and presented in submissions to the European Strategy Update process.

Submitted to the Proceedings of the US Community Study on the Future of Particle Physics (Snowmass 2021)

*Compiled and edited by the CLIC Accelerator Steering Group on behalf of the CLIC Accelerator Collaboration, corresponding author: steinar.stapnes@cern.ch

CLIC Project Readiness 2025-26

Goals for the studies by ~2025, key improvements:

- Luminosity numbers, covering beam-dynamics, nanobeam, and positrons - at all energies. Performance risk reduction, system level studies
  - Substantial progress already documented in Snowmass report and associated references, remains a focus for beamdynamics, nanobeam related technical developments and positron production studies

- Energy/power: 380 GeV well underway, 3 TeV to be done, L-band klystrons
  - In Snowmass report for 380 GeV

- Sustainability issues, more work on running/energy models and carbon footprint
  - Initial studied in Project Implementation Plan (PiP) 2018, just referred to briefly in Snowmass report

- X-band progress – for CLIC, smaller machines, industry availability, including RF network
  - Addressed by establishing improved baseline, CompactLight Design Study very important and many smaller setup. No complete documentation in PiP 2018 or Snowmass report 2022.

- RF design optimization/development – including injectors, R&D for higher energies, gradient (cool/HTS/etc.), optimal beam parameters
  - Links to power, nanobeam and beamdynamics

- Cost update, only discuss changes wrt Project Implementation Plan in 2018
  - Possible impact of sustainability optimization, inflation ?

- Low cost klystron version – reoptimize for power, cost and fewer klystrons

- CLIC versus ILC and C3 (maybe not needed in readiness report) – performances and upgrade scenarios