CLIC timeline

2013 - 2019 Development Phase

Development of a Project Plan for a staged CLIC implementation in line with LHC results; technical developments with industry, performance studies for accelerator parts and systems, detector technology demonstrators

2020 - 2025 Preparation Phase

Finalisation of implementation parameters, preparation for industrial procurement, Drive Beam Facility and other system verifications, Technical Proposal of the experiment, site authorisation

2026 - 2034 Construction Phase

Construction of the first CLIC accelerator stage compatible with implementation of further stages; construction of the experiment; hardware commissioning

2019 - 2020 Decisions

Update of the European Strategy for Particle Physics; decision towards a next CERN project at the energy frontier (e.g. CLIC, FCC)

2025 Construction Start

Ready for construction; start of excavations

2035 First Beams

Getting ready for data taking by the time the LHC programme reaches completion

Project Plan (main results by end 2018)

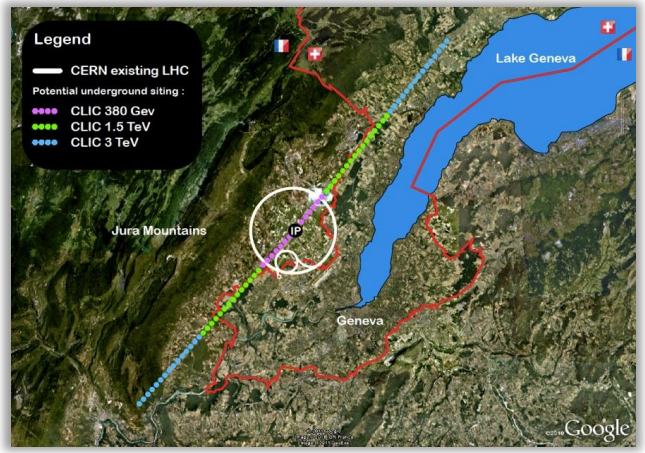
Timeline for the European Strategy updaet ~2019-20, goal:

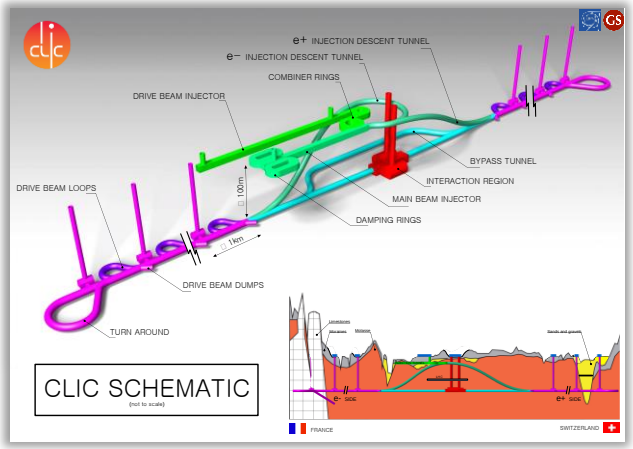
- Cost and power optimised 380 GeV machine (~11 km) (drivebeam and klystrons) upgradeable to 3 TeV

Goal for next strategy update: Present a CLIC project that is a "credible" option for CERN beyond LHC, a Project Implementation Plan.

Guidelines used internally:

- Adapt to physics results – LHC mostly - taking into account LHC at 13-14 TeV as results become available (be flexible)
- Physics no later than 2035, solid luminosities from Higgs/top at 380 GeV to 3 TeV (staging)
- Initial costs compatible with current CERN budget level (order LHC+50%) (staging)
- Upgradable in 2-3 stages over a 20-30y period, without major (max 3-4 years) operational breaks, and with upgrade costs also in reasonable agreement with current budget level.
- Cover accelerator, detector, physics





Parameter	Unit	380 GeV	3 TeV
Centre-of-mass energy	TeV	0.38	3
Total luminosity	$10^{34}cm^{-2}s^{-1}$	1.5	5.9
Luminosity above 99% of √s	$10^{34}cm^{-2}s^{-1}$	0.9	2.0
Repetition frequency	Hz	50	50
Number of bunches per train		352	312
Bunch separation	ns	0.5	0.5
Acceleration gradient	MV/m	72	100
Site length	km	11	50

A CLIC facility implementation

2020-2024

- **Project Preparation (modules, klystrons, beams, etc)**
- **Det & Phys preparation**
- **Non collider physics (using CLEAR+ (MB like) and/or CLIC zero(DB))**
- **CLEAR and CLEAR+**
- **CompactLIght and other EU proj,**
- **LNF 1 GeV**

2025-2042

- **CLIC 380 GeV, DB or klystrons, construction and operation**
  - **Structures**
  - **Modules**
  - **Klystrons**
  - **Magnets**
  - **Technical systems in general**
  - **System tests CFT3, ATF ..**
  - **Parameters and optimization**
  - **WBS and cost/power**
  - **CE and CV**
- **Physics and detector**

2043 ->

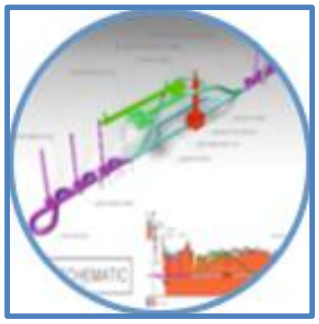
- **Expand to unknown energy**
  - **Drivebeam extensions to 3 TeV**
  - **Novel Acc. Technologies**
- **Physics and detector**

Other: Resources available, Governance, Industry basis, related X-band projects, Outreach, Availability/risks/critical parameters, Document layouts and teams

Main activities

http://clic-study.web.cern.ch/content/clic-accelerator-activities

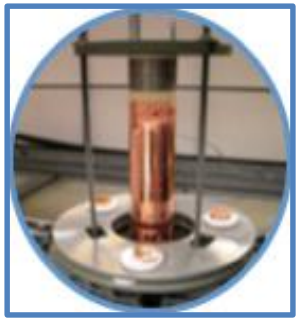
Project wide studies:
- Overall project planning
- Cost, power, schedule, staging
- Civil engineering, conventional systems



Parameters and Design

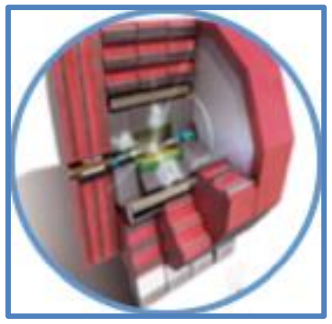
Integrated Baseline Design and Parameters
- Integrated Modeling and Performance Studies
- Feedback Design, Background, Polarization
- Machine Protection & Operational Scenarios
- Electron and positron sources, Damping Rings, Ring-To-Main-Linac, Main Linac - two-Beam Acceleration, Beam Delivery System
- Machine-Detector Interface (MDI) activities
- Drive Beam Complex

Experimental verification
- CTF3 Consolidation & Upgrades
- Drive Beam phase feed-forward and feedbacks
- Two-Beam module string, test with beam
- Drive-beam front end including modulator development and injector
- Modulator development, magnet converters
- Drive Beam Photo Injector
- Low emittance ring tests
- Accelerator Beam System Tests (ATF and FACET, others)



X-band Technologies
- X-band Rf structure Design
- X-band Rf structure Production
- X band collaborations
- Novel RF unit developments (high efficiency)
- Installation and Operation of High power Testing Facilities
- Basic High Gradient R&D

Technical Developments
- Damping Rings Superconducting Wiggler
- Survey & Alignment
- Quadrupole Stability
- Warm Magnet Prototypes
- Beam Instrumentation and Control
- Two-Beam module development
- Beam Intercepting Devices
- Controls
- Vacuum Systems
- Beam Transport Equipment



Detector and Physics
- Physics studies and benchmarking
- Detector Optimisation
- Techncial developments

Project Organisation

Over the last year the LC study organisation has changed in preparation of the European Strategy Update report. We put more emphasis on implementation studies related to the entire CLIC machine.

We still have the project organised in four main activities, each with a group of individual WPs and WP leaders:

1. Beamdynamic and design - D.Schulte
2. X-band included high off klystron studies - W.Wuensch
3. Linac systems: Main Linac module and Drive Beam front end - S.Doebert
4. Technical systems and studies - N.Catalan

General work-packages and budgets – S.Stapnes:

The studies at ATF2 and in light sources are WPs under General activities. ILC/LCC support activities likewise.

CTF3 closedown and CLEAR preparation are also under this general heading with WPs lead by R.Corsini.

Oher types of implementation studies are supported under this heading (last paragraph previous slide)

Project Organisation

Five new implementation working groups preparing for the ESU have been started (https://indico.cern.ch/category/4337/) – some of which also existed ahead of the CDR in 2012:

1. Civil Engineering & Infrastructure and Siting WG (CEIS) (lead J.Osborne) (mandate)
2. Cost, Power and Schedule (lead S.Stapnes) (Detailed costing of a 380 GeV machine - DB and klystrons - plus additional stages beyond)
3. Main Linac Hardware Baselining (lead C.Rossi) (Optimised module technical design and surrounding infrastructure in the tunnel, considering the entire lifetime of a module including commissioning, installation, conditioning, operation, rework, replacements etc.)
4. Baseline parameters and design (lead D.Schulte) (Designs and parameters for 380 (DB and klystrons) GeV, 1.5 TeV and 3 TeV)
5. Novel Accelerator methods for future stages of CLIC (lead E.Adli) (mandate)

The WGs have ~10-15 core members as needed to cover the subject, and meet every 4-6 weeks in open meetings (to all coll. members). Costing meetings are closed.

See implementation meetings every Friday 9-11 at indico link above.

Resources – MTP

Description	2017 Budget	2018 Foreseen	2019 Foreseen	Total Activit 2017-2019	
TOTAL CLIC GENERAL	4'420	4'000	3'850	12'270	TOTAL CLIC GENERAL
TOTAL CLIC PD	549	428	109	1'086	TOTAL CLIC PD
TOTAL CLIC LS	2'040	1'700	400	4'140	TOTAL CLIC LS
TOTAL CLIC TD	1'020	620	100	1'740	TOTAL CLIC TD
TOTAL CLIC XBT	4'160	1'966	300	6'426	TOTAL CLIC XBT
TOTAL	12'189	8'714	4'759	25'662	REQUEST GRAND TOTAL (2017-2019)

MTP 2017 represents no significant change compared to last year
Key investments foreseen 2017-19 in good agreement with budget
Personnel/team will be the most critical part:

- Collaborators and CERN staff - until well into 2019
- Fellows (increasingly difficult to recruit next two years)
- PJAS, COAS more flexible

CLIC, FCC become one tentative budget line from 2020 (future projects)

Main meetings ahead

- HG 2017 in Valencia 13-16 June 2017
- Americas LC WS 26-30/6 SLAC 2017
- Project meeting ~mid September
- A CLEAR day also in September ? Combine ?
- LCWS 2017 (October 23-27) – Strasbourg
- Project meeting in December
- CLIC workshop January 22-26 January 2018