

Future Energy Frontier Facilities and Snowmass

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Future Colliders

- Today there are two areas where new colliders are especially important
 - **“Higgs factory”** – a collider (most probably e^+e^-) with a center of mass energy 250 GeV and above and high luminosity to study the Higgs boson properties
 - **“~100 TeV”** pp collider to get to the “next energy frontier” an order of magnitude or so above LHC
 - Study distances up to $\sim 10^{-19}$ cm and particles masses up to ~ 50 TeV

Colliders Projects Under Development

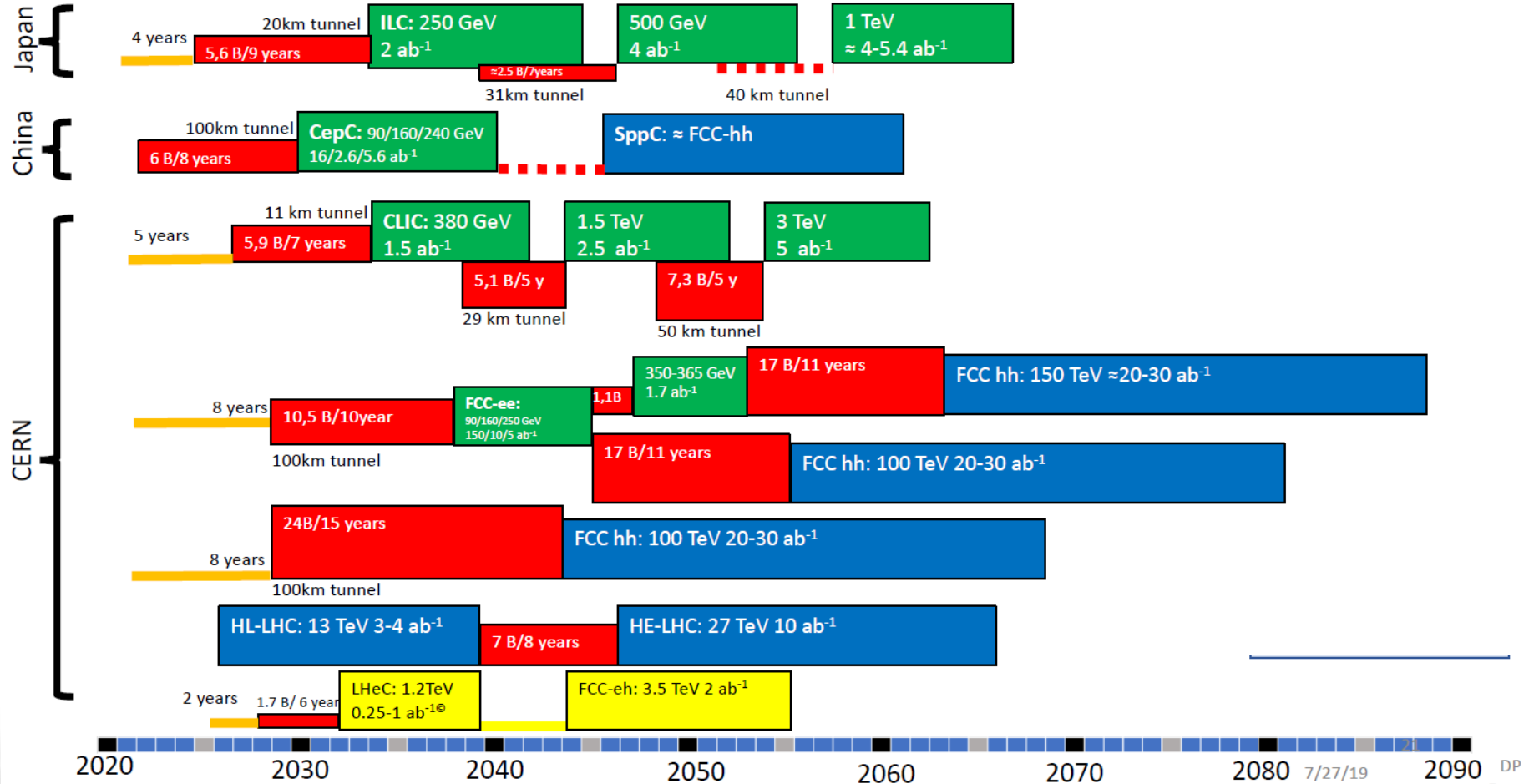
- **ILC - International Linear Collider**
 - 250 GeV linear e^+e^- collider (can be upgraded to ~500 GeV)
 - Higgs factory (and top quark factory after upgrade)
 - Location – Japan. Start of construction ~2023? Estimated cost \$5B
- **CepC – Circular Electron Positron Collider**
 - ~250 GeV circular e^+e^- collider (the tunnel could be later used for pp collider)
 - Higgs factory
 - Location – China. Start of construction ~2021. Estimated cost ~\$5B
- **CLIC – Compact Linear Collider**
 - 380 GeV linear e^+e^- collider (with potential upgrade up to ~2 TeV)
 - Higgs factory and top factory
 - Location CERN. Start of construction – after 2030. Estimated cost \$6B
- **FCC – Future Circular Colliders**
 - 350 GeV e^+e^- and/or ~100 TeV pp
 - Higgs factory and/or next energy frontier
 - Location – CERN. Start of construction – after 2030. Estimated cost - \$11B e^+e^- and \$24B pp

Future Colliders Timeline

Possible scenarios of future colliders

- Proton collider
- Electron collider
- Electron-Proton collider

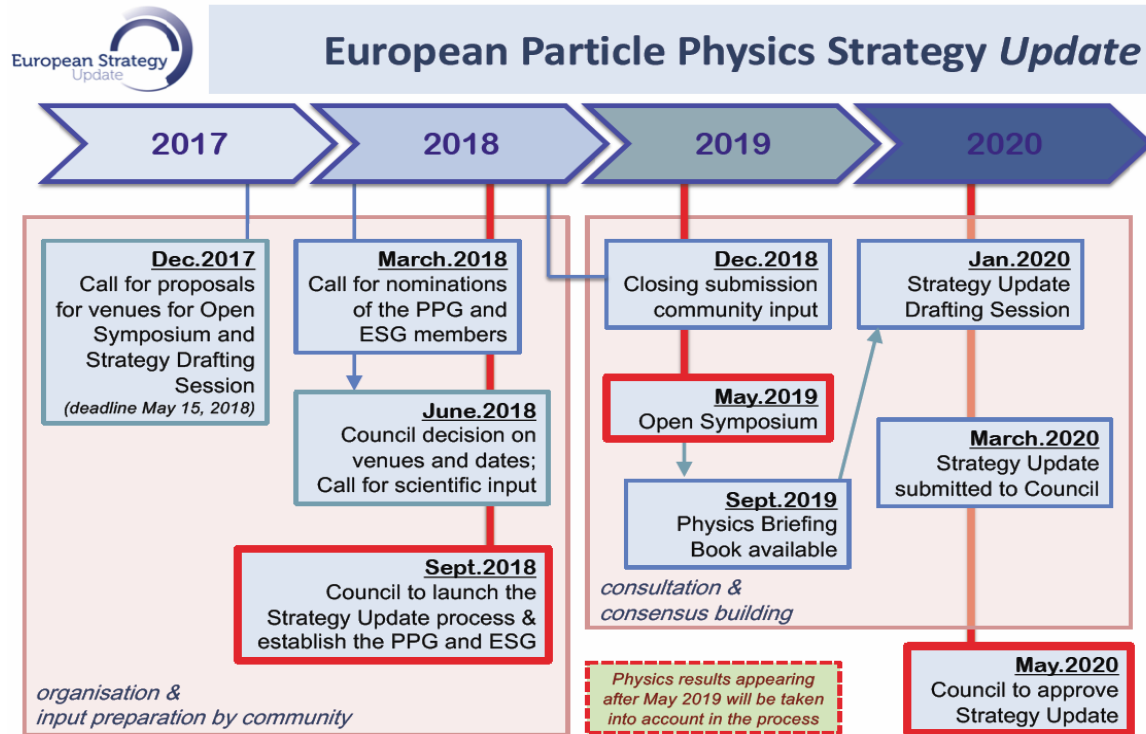
- Construction/Transformation: heights of box construction cost/year
- Preparation



Discussions Topics

- How US should engage in the existing energy frontier proposals (in other regions)?
- What is status of high field magnet program in US?
- Why not to propose next large collider in US?
 - What is the process to initiate such proposal?
- Why we are not developing muon collider scenario?
- Can we re-use some of the existing detectors to reduce cost of future collider experiments?
- Why new colliders are so expensive?
- How to coordinate energy frontier participation in Snowmass?
- And many, many others!

HEP is Highly International



Europe, Japan, other countries/regions are developing plans which we have to monitor closely and in many cases be an active participants

Timeline for the Coming Snowmass/P5 Planning

- Will start at April 2020 APS meeting
- Developing proposals, workshops, interactions inside the community
 - Between April 2020 and July 2021
 - Organized by conveners of various study groups
- “Snowmass Meeting”
 - July 2021, location TBD
- Snowmass written summary
 - By late 2021
- P5 process
 - During 2022
- Snowmass/P5 outcome and guidance to the funding agencies
 - By early 2023

Concluding Remarks

- Next HEP planning process is about to start
 - It is important to participate to shape the future of our field!
- DPF with partner APS units is working on finalizing working groups
 - Call for conveners nominations was issued
- The process is guided by DPF – not funding agencies or laboratories
- All of us have to start getting engaged and working on future proposals
 - Meenakshi proposes to have a survey among ULA members on how to develop participation in Snowmass