

# Setting the Scene: Linear Colliders in the Landscape of Future Projects

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# What I learned from the LHC

- Contrary to a simplistic mantra, “pp machines for discoveries and  $e^+e^-$  machines for in depth studies” a la Sp $\bar{p}$ S and LEP, experiments at the LHC can perform in depth studies thanks to
  - collider providing huge statistics with luminosities and/or energiesand
  - advanced detector technologies, analysis methods and physics understandings, which allow to exploit the data in a difficult experimental environment.

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and from the other inputs

Observed manifestations of physics beyond the Standard Model **do not provide a clear guideline for the energy scale to be aimed at.**

## Another observations from the LHC worth noting could be

- LHC had been approved initially with a reduced (and not very realistic?) scenario as a CERN affordable machine, but **could be reinstated to its full capacity through additional resource contribution from the non-member state laboratories worldwide.**
- **Overall scientific programme of a laboratory could be severely constrained** due to a large flagship project, e.g. contentious delays in construction affecting the planning of other projects and no beam was available (except for nuclear physics) for several years at CERN due the budget constraint. Fortunately, there were other operational colliders, such as B-factories, Tevatron, HERA (till 2007),....

## Another observations from the LHC worth noting could be

- LHC had been approved initially with a reduced (and not very realistic?) scenario as a CERN affordable machine, but could be reinstated to its full capacity through a visible resource contribution from the non-member state laboratories worldwide.
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## And from the real world

- **Tough competition**: Increased number of science disciplines is able to spend and asks for a large amount of funding (may be rightly so?).
- **Cost** in increasing collider energies **is getting higher and higher**. With a simple “explorer’s” spirit, arguing cost vs promises, benefits, dreams, risk etc. is getting difficult.
- Increased social and geopolitical polarisation **is encouraging conflicts between different poles** rather than healthy competition and certainly not truly global cooperation.
- Impact on **the environment and climate changes** will remain as (real) issues.

# For the coming discussion on the future collider, we need to

- consider **maintaining continuity** in the collider programme.
- keep healthy **diversity in the other programme**.

## After those considerations,

- **The first-step** is “**timely**” realisation of an “**affordable**” collider capable of “**meaningful**” in-depth studies with the least known particles: H, t, W and Z (inverse order of the discovery times) to avoid/minimise the gap with the HL-LHC.
  - “**meaningful**” could easily becomes subjective.
  - **The first step should not constrain the next step**, given the uncertainties in the time scale and outcomes of the first step, but....
  - Introducing a global aspect affects “**timely**” and “**affordable**”, as **bi-directional multi-body interactions**.

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- Followed by **the second-step**: Most likely, **exploring higher energy scales**, on which hopefully the first step will provide a better clue.
  - **The first step should take this step into account.**



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Starting with a linear collider provide a such scenario?

The following talks may give  
an answer!!!