

# Future Tunnels LCA Study

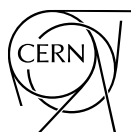
## MEETING MINUTES

### LCA SCOPE MEETING

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European Organization for Nuclear Research  
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**Delivery Slip**

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## 1. ATTENDEES

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**Arup:** Yung Loo, Matt Sykes, Richard Knights, Suzanne Evans, Reihaneh Hafizi, Jin Sasaki

**CERN:** John Osborne, Steinar Stapnes, Benno List, Liam Bromiley

## 2. AGENDA

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- Arup scope of carbon assessment.
- Arup cost estimate for undertaking the study.
- Discussion on details of CLIC and ILC.
- Further questions/discussion/AOB.

## 3. MINUTES

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**All:** Introduction round table.

**JO:** Short specification was provided previously to Arup for the LCA to be undertaken, studying the linear colliders of CLIC and ILC future tunnels carbon footprints.

**JO:** Arup are to provide a scope of works and an offer price to undertake the study.

**SE:** Presented slides on the LCA scope. A1-5 up to construction, B1-9 operational use, C1-4 end of life, D benefits beyond (e.g. geothermal opportunities).

**JO:** What is PAS2080 standard?

**MS:** UK document for managing carbon in building and infrastructure. Link: <https://www.ice.org.uk/news-insight/news-and-blogs/latest-news/news/what-is-pas-2080-2022-version/>

**SE:** Data still required to formulate the assumptions. Arup would like CERN to provide as much information on the CLIC/ILC proposals as possible, to ensure an accurate study. Are there any previous environmental reports from other CERN projects?

**SS:** Not sure there is much previous documentation.

**SE:** Any data from typical energy use of CERN infrastructure? To identify the carbon cost in use (B1-9).

**SS:** Study should mostly focus on the LCA of civil engineering up to construction. These future projects are likely to be operational no sooner than 2040, so energy production and use will have changed significantly, so detailed calculations of carbon in operation are not so relevant at the moment. Perhaps a discussion/conclusion at end of technical report on operational carbon impacts and opportunities may be worthwhile. Focused on future trends and direction of the energy industry? CERN and ILC will have to follow best practice for reducing CO<sub>2</sub> emissions as publicly funded bodies.

**MS:** Arup will set up the study around the civil engineering focus, but provide opportunity for discussion on B, C and D sections of the LCA framework and future trends. Study can be arranged so that when operational data is available, further LCA outputs can be produced.

**SS:** End of life stage is a big unknown. Not so simple when equipment and tunnel will be radioactive for some time. Secondary use for tunnels is not clear at this time. Suggestions welcome.

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- RH:** Would be good to understand the opportunities for reuse. If data available on operational energy, then Arup can make assumptions and add to report. Also need more detail of construction methods, transport, materials, etc. In particular for the ILC.
- JO:** Potential for the railway transport study from FCC to be applied to CLIC due to the same region.
- SE:** Question regarding the choice of the environmental impact categories proposed in the LCA scope.
- BL:** Provided range of categories to promote discussion. Arup should focus only on the most significant and relevant, Perhaps just CO<sub>2</sub>eq for this study?
- RH:** Would be good if Arup could understand the required standards of reporting carbon studies, EU, Japanese, USA, Swiss, French....? For compliance and benchmarking.
- BL:** Study is to be initiated by CERN, so should be focused on EU standards as the most applicable. Standards for ILC in Japan is unknown/undecided. But perhaps using same benchmarking standards for ILC would allow for direct comparison between CLIC and ILC.
- SE:** LCA outcomes to study the 3 different tunnel options, 5.6 m CLIC beam drive, 10 m CLIC Klystron and 9 m ILC. Study/model can be set up parametrically to allow for later inputs and to provide some future proofing to the model.
- YL:** Presentation of cost of study, circa 75k CHF.
- SS:** Cost proposal likely to need reassessing, 50k CHF is a target cost for CERN. Could be split into two contracts (1 for CLIC and 1 for ILC).
- YL:** Possibly 75% CLIC and 25% ILC towards the study.
- JO:** Talks on contract and cost to be discussed further.

## 4. MAIN ACTIONS

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- CERN to provide data and assumptions where possible. Construction methods, materials, transport, energy use in operation etc.
- Contract and cost likely to be split in two between CLIC and ILC. To be discussed further.
- Arup to focus on LCA framework A1-5 primarily. With further discussions on LCA framework parts B, C and D where Arup can offer insight towards future trends and opportunities.
- Arup to use EU carbon benchmarking.

## 5. REFERENCES

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<https://www.ice.org.uk/news-insight/news-and-blogs/latest-news/news/what-is-pas-2080-2022-version/>

<https://www.nature.com/articles/d41586-022-03551-5>

<https://indico.cern.ch/event/1193771/contributions/5027428/attachments/2527986/4348824/FututeAcc-env-workshop-Oct22.pdf>