

Sustainability Studies for Future Linear Colliders

IPAC2023: Venice, Italy (May 7-12): SUSTAINABILITY STUDIES FOR FUTURE LINEAR COLLIDERS (B. List (DESY), S. Michizono (KEK), T. Saeki (KEK), S. Stapnes (CERN), M. Titov (CEA Saclay))

The environmental credentials of future colliders are increasingly in the spotlight, because of their size and complexity, and will be under scrutiny for their impact on the climate. Therefore, sustainability has become a prioritized goal in the design, planning and implementation of future accelerators; approaches to improved sustainability range from overall system design, optimization of subsystems and key components, to operational concepts. A direct quantification of the ecological footprint, be it greenhouse gas emissions during construction and operation, or consumption of problematic materials, is currently performed only sporadically, mostly through translation of electricity consumption into equivalent CO₂ emissions. Two large electron-positron linear colliders are currently being studied as potential future Higgs-factories, the CLIC at CERN and the ILC in Japan. These projects are the central elements of the recently approved EU / EAJADE (Europe-America-Japan Accelerator Development and Exchange) program. A direct societal impact is expected through EAJADE WP4 (Sustainable Technologies for Scientific Facilities), where methods to reduce the power consumption of accelerator technologies and systems will be studied, as well as alternative lean accelerator concepts, and smart integration of future accelerator infrastructure with the surrounding site and society (e.g. Green ILC concept). This talk will highlight past achievements and address the EAJADE WP4 future program.

Draft Talk outline:

- Introduction (ILC/CLIC), overall LC sustainability considerations (2 slides)
- LC systems: ILC/CLIC system power calculation – re-baselining different energies (1 slide)
- Power management / components: SRF, high efficiency klystrons, magnets (2 slides)
- EAJADE project – work related to sustainability (2 slides)
- Power & energy – ILC/CLIC (1 slide)
- Power modulation – running on renewables (FR past study) – 1 slide
- Green ILC Concept, regional revitalization, community development (2 slides)
- Sustainable construction – FR past study (1 slide intro)
- ARUP studies preliminary (1 slide) – will we have something by that date (1 slide) ?
- Next steps and plans for sustainability (ILC/CLIC) studies (1 slide)
- ILC ITF framework studies (1 slide)
- Summary and Outlook (1 slide)