

21/06/2022

CLIC Tunnel Thermal Heat Recovery

Summary Meeting

Attendees:

Yung Loo (Arup), Alex Chen (Arup), Steinar Staples (CERN), John Osborne (CERN), Liam Bromiley (CERN)

Apologies:

Serge Claudet (CERN)

Technical Report Findings

AC: Provided a presentation of the geothermal tunnel technical report.

Q&A/Discussion

LB: What is the recommended baseline scenario?

AC: To enhance the tunnel performance, use the tunnel as a warm tunnel (need to determine the machine/equipment temperature and corresponding effect on ambient tunnel air temp), or use heat recovery system to recharge tunnel in summer months if cooling opportunity is implemented. With optimisation it may be possible to achieve 20 - 30 W/m² of energy recovery from the tunnel.

SC: What is the comparison with the existing closed loop boreholes at P8/Ferney?

AC: Different scenario with a higher energy output 10MW, paid for by community.

JO: Possibility that community can pay for the borehole connections to CLIC.

AC: 10MW in the LHC scenario, makes external funding more viable. Location of the heat exchanger near to heat demand also makes it more viable. CLIC thermal heat tunnel needs to define locations before further investigation into the funding.

JO: Thermal gradient in the rock? Paper received from A. Moscariello potential contradicts existing information on geothermal gradient.

AC: Arup have a local contact with a professor in Switzerland for the local based knowledge on the geothermal gradient (LB to forward on the paper to Arup for reference)

SS: Happy with the level of detail in the report. Two further directions for the investigation. 1. Significant amount of equipment in the tunnel that can generate heat. So potential to be used as a warm tunnel is high. 2. The project needs a full CO₂ footprint analysis of the civil engineering. The initial study into the tunnel thermal capacity will be good to provide additional benefits to the feasibility studies of CLIC and other tunnels.

YL: Potential to present the savings of CO2 with different construction methods and concrete grades etc. Using databases of material knowledge to calculate CO2 savings.

JO: Can these case studies be applied to specific needs of particle accelerators?

YL: Values based on the material specifications, so can be applied regardless of infrastructure type.

JO: Have we got access to data from Japanese linear colliders in terms of CO2 consumption?

SS: We need a whole database for all the materials in the linear colliders to review what the significant targets are and where potential CO2 reductions can be achieved.

YL: Arup Tokyo office has link with the ILC Japan, could lead to knowledge share of the embodied carbon and construction opportunities.

SS: What is the typical warm tunnel heat load?

AC: Crossrail tunnel was treated as a warm tunnel in the studies, only for heating purpose. Temperature is seasonal, 16 - 33 degrees winter to summer. (Figure 10 of the technical report)

AC: Sprayed concrete lining opportunity? Improved speed of construction of the pipe system.

JO: Segmental tunnel lining preferred for main tunnel construction due to TBM excavation and lining. Sprayed concrete only used in service tunnels, caverns, alcoves, etc.

SS: Workshop on sustainability of accelerators end of September 2022, opportunity to present the findings of the report for CLIC thermal heat recovery.

AC: Arup invited to Geoscience conference next year (<https://www.geolsoc.org.uk/EGC-2023>), may be an opportunity to present the CERN CLIC study as an example. TBC.

Meeting closed.