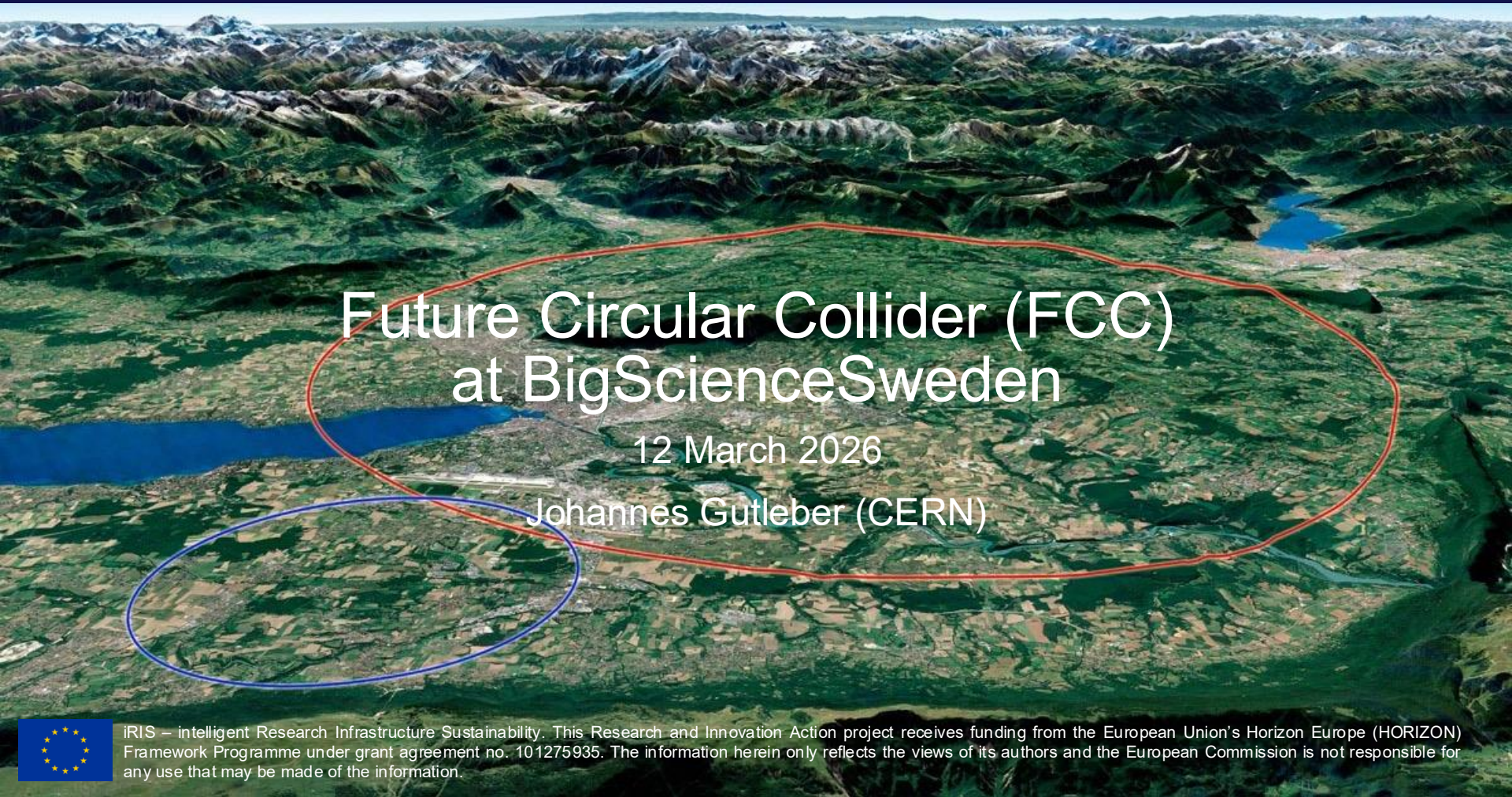


Future Circular Collider (FCC) at BigScienceSweden

12 March 2026

Johannes Gutleber (CERN)

iRIS – intelligent Research Infrastructure Sustainability. This Research and Innovation Action project receives funding from the European Union's Horizon Europe (HORIZON) Framework Programme under grant agreement no. 101275935. The information herein only reflects the views of its authors and the European Commission is not responsible for any use that may be made of the information.

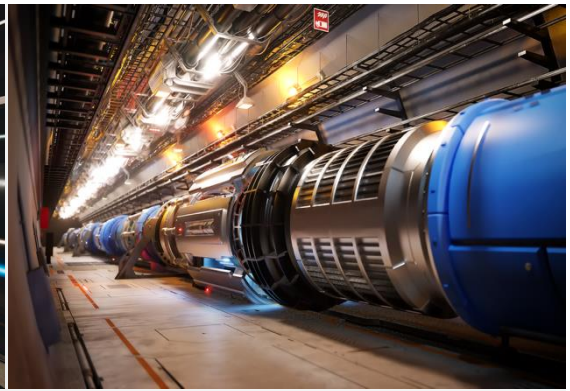
Future circular colliders to expand our horizons

Explore with
extreme resolution
(**FCC-ee**)

Probe matter deeper with
unprecedented energy
(**FCC-hh**)

One programme – two phases

- The FCC provides a scientific research programme until the end of the century.
- 2 phases: **FCC-ee (electron-positron)** followed by **FCC-hh (hadron-hadron).**
- 2 colliders subsequently **use the same tunnel.**



2050 – – – – – – – – – – – – – – – 2065 – – – – – – – – – – – – – – – – – 2100

FCC-ee FCC-hh

Layout

cern.ch/fcc-overview

"Synthèse des contraintes et opportunités": https://zenodo.org/records/14773243

4 experiment sites

- **PA** Ferney-Voltaire, Ain, France
- **PD** Nangy, Haute-Savoie, France
- **PG** Charvonnex/Groisy, Haute Savoie, France
- **PJ** Vulbens, Haute Savoie, France

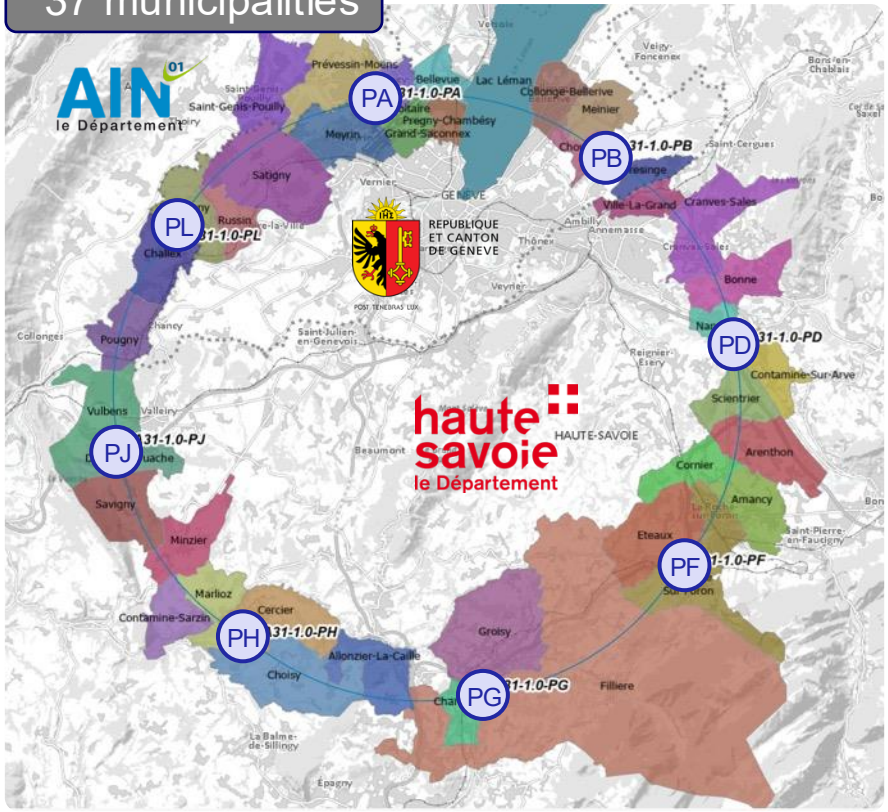
4 technical sites

- **PB** Presinge, Geneva, Switzerland
- **PF** Eteaux, Haute-Savoie, France
- **PH** Cercier/Marlioz, Haute-Savoie, France
- **PL** Challex, Ain, France

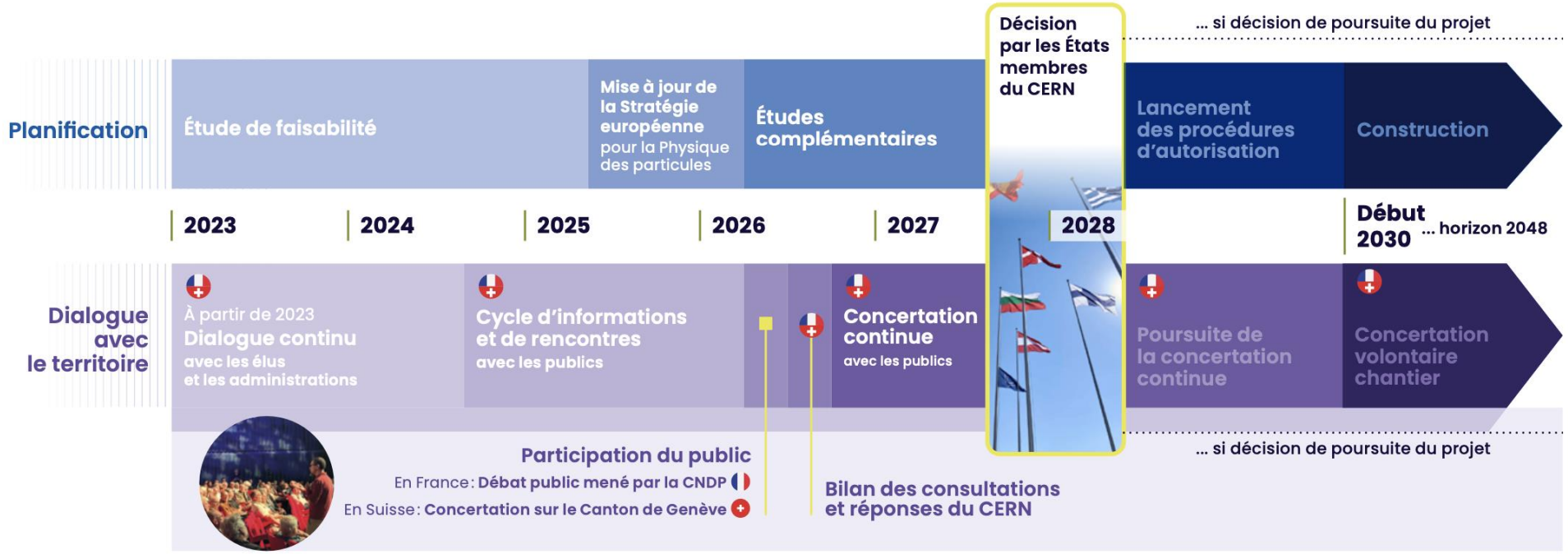
Injector site

- **PM** Prevessin, Ain, France

37 municipalities



Timeline towards a construction project



Actions communes ou parallèles, à la France et à la Suisse

Engagements 2024-25, public consultation 2026

Obtaining a social license is legally mandatory and key to implementation success

So far:
1500 people
11 info sessions
2 public meetings
5 hours interactive sessions in each municipality with a surface site

Public consultation in France and Switzerland from June to October 26



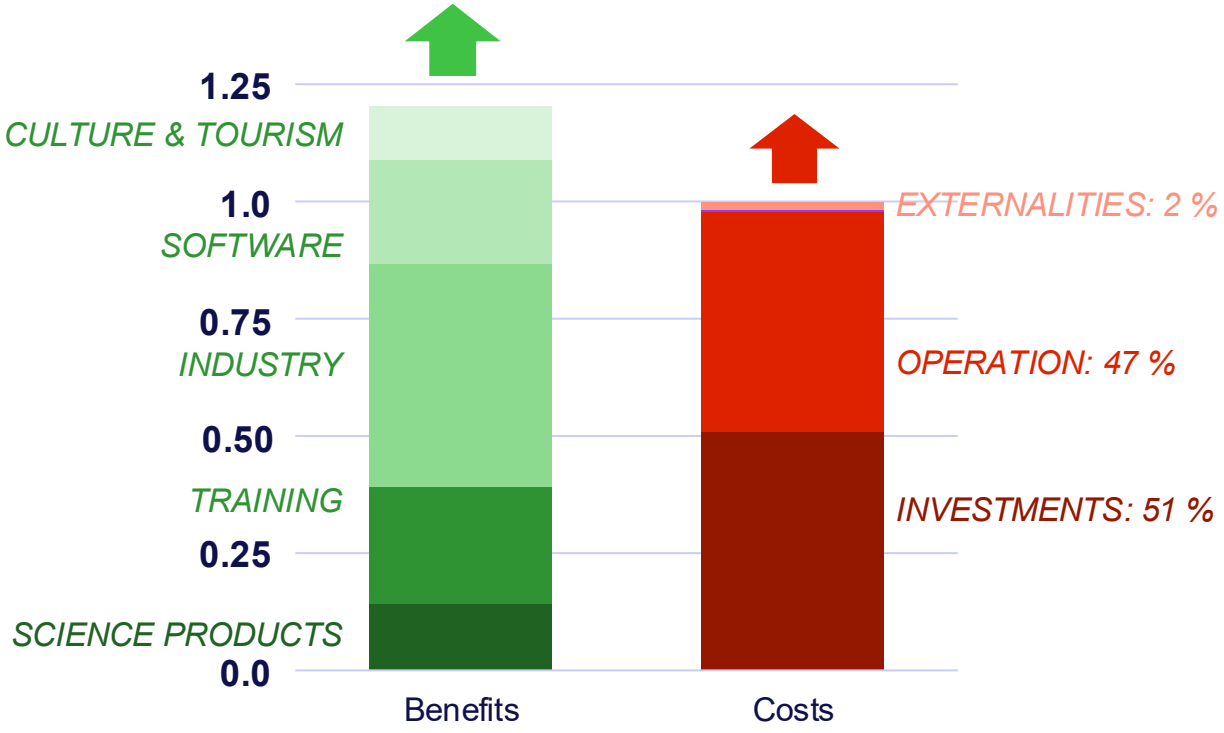




Continuous accompanying engagement until construction and beyond.

Socio-economic performance

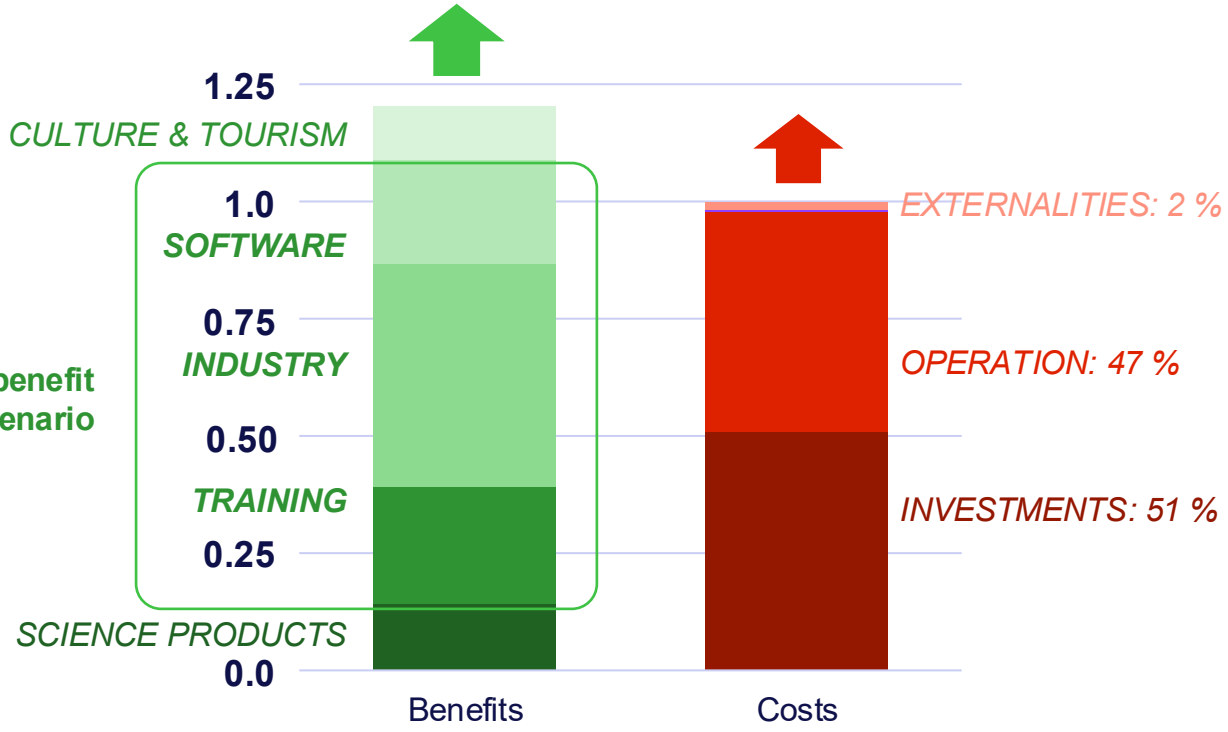
Work towards returns for participating countries and regional impacts in a global project now



Socio-economic performance

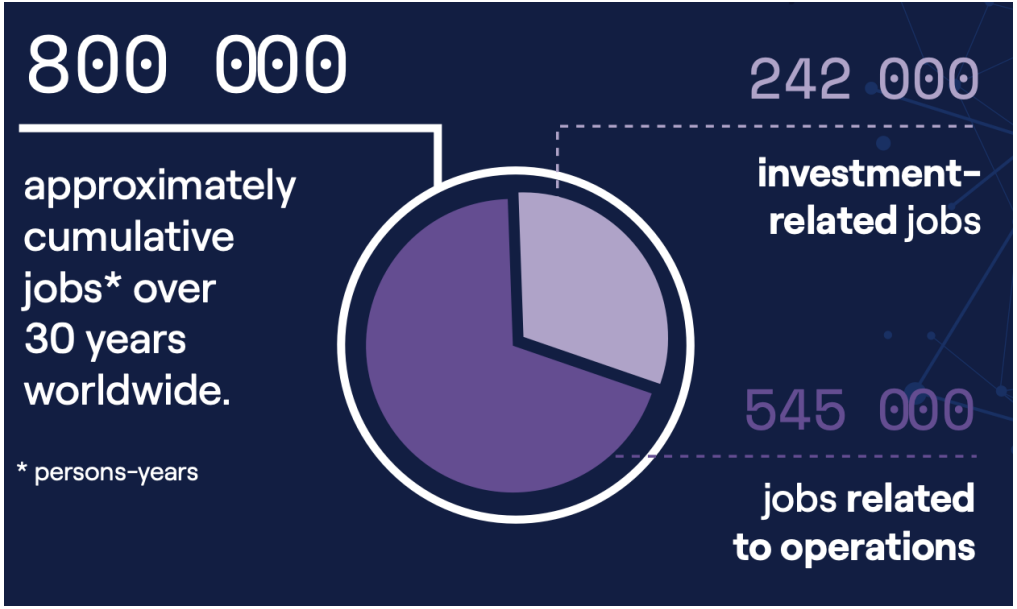
https://doi.org/10.5281/zenodo.10653395, V3.0, 15 May 2025

19 bn CHF combined incremental benefit with respect to the counterfactual scenario

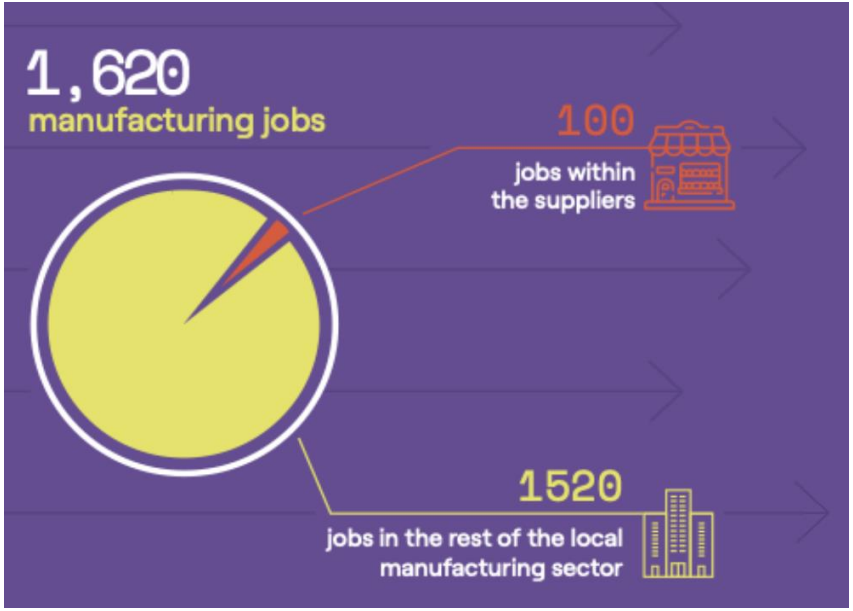


Job creation

WIFO IO table based value-added analysis and person-years job creation at a global scale.



Regional job creation analysis by LSE: Superconducting RF manufacturing leads to sustained high-tech job creation. **Each 1 direct employee sustains 15 more regional jobs.**

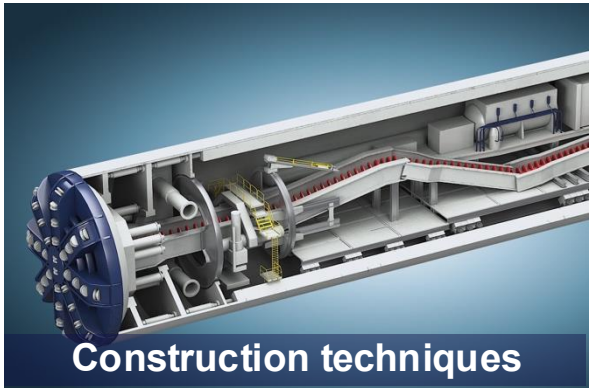


https://doi.org/10.5281/zenodo.7986138

https://doi.org/10.5281/zenodo.7553423

Preparatory phase needs: now > mid 2030ies


Subsurface investigations


Construction techniques


Site architecture & design


Low carbon concrete


Excavated materials re-use

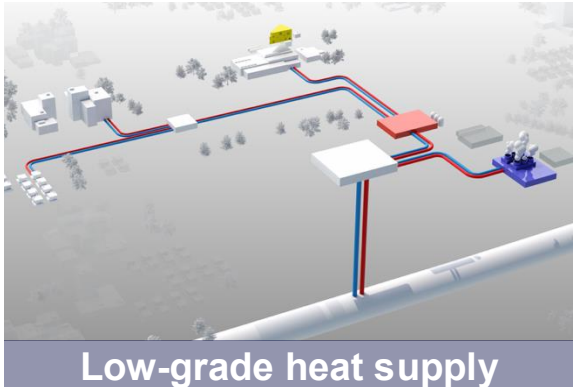

Excavated materials re-use

Technology R&D&I needs: now > 2040ies


Precision mechanics


Radiofrequency powering

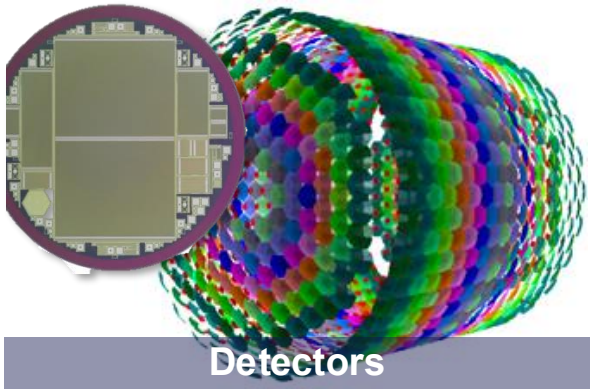

Electrical systems


Low-grade heat supply

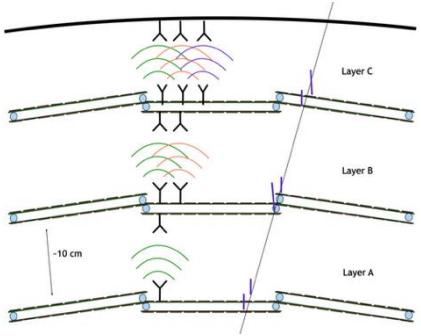

Waste water treatment


Cryogenics & cooling

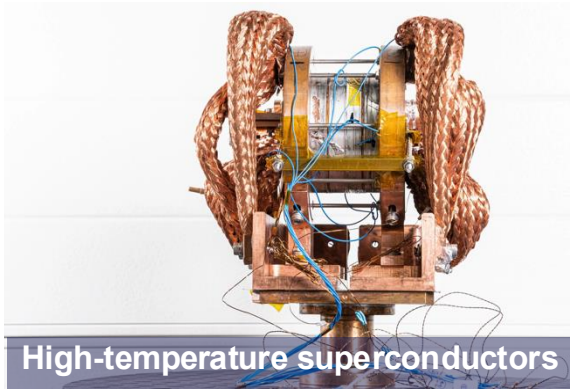
Fundamental R&D and infrastructure needs



Detectors



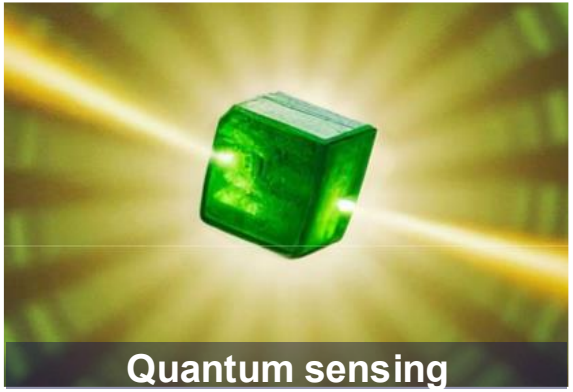
Electronics & embedded AI



High-temperature superconductors

Prototyping & testing facilities

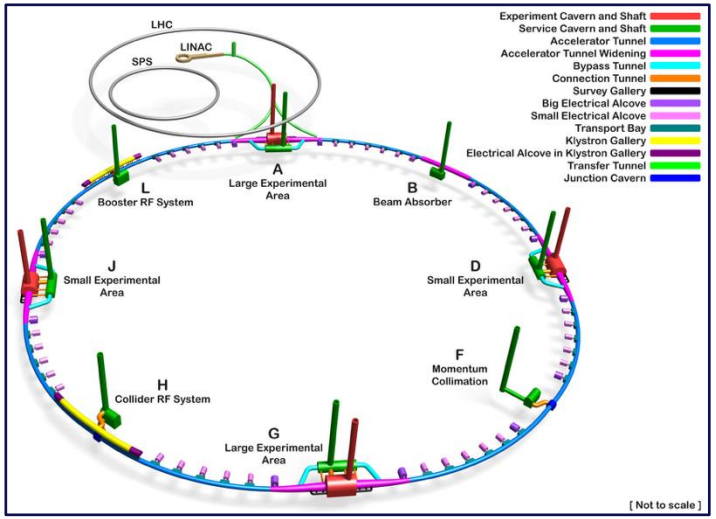
Infrastructure access

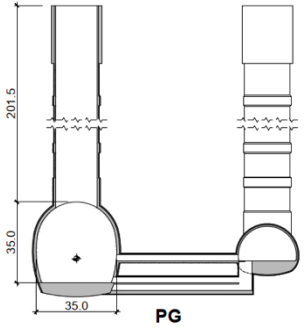


Quantum sensing

Design and preparation of civil works

- 8 x 11.3 km linear underground structure
- 12 shafts with 12 to 16 m diameter and 200 to 400 m depth
- 12 caverns, order of 30 m x 30 m x 60 m
- 8 surface sites with 4 to 8 ha
- Injector complex, half buried and multi km transfer tunnels
- Management (analysis, quality, accounting, tracking, …), transport, deposit and re-use of 16.5 Mt excavated materials





Upcoming contracts:

- Hydrogeology, faults
- Detailed geology and geotechnology (100 boreholes)
- Design including safety plans
- Preparation of construction
- Multiple lots for site investigations (~ 5), for designs and for construction works

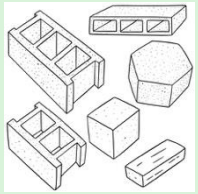
Excavated materials management

- 16,5 Mt (8 million m^3) excavated materials.
- 95% is molasse, a heterogeneous, sedimentary rock for which no complete re-use scenario exists today.
- **Deposit** in quarries is in principle **feasible, but is expensive**
- Truck transport is a societal challenge

<u>Upcoming contracts</u>

- Materials on-site pre-treatment, treatment and off-site processing design and planning
- Temporary storage configuration and requirements
- Alternative transport scenario development (conveyors, railroad)
- Specific re-use scenario developments for TRL 8 and 9

Credible re-use pathways being studied



Traditional channels

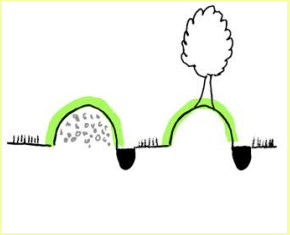
- Use of sand and limestone for concrete production
- Innovative construction materials

Use inside and in vicinity of the project

- Landscape design
- Unpaved tracks, rural and forest paths

Creation of new land

- Wasteland refurbishment
- Polluted soil treatment
- Creation of leisure areas and parks
- Improvement of acid soils



Territorial developments

- Quarries renaturation
- Noise barriers
- Raised hedges
- Covered road tranches

Trials for pathways with a potential of more than 2 Mm^3 planned at OpenSkyLab

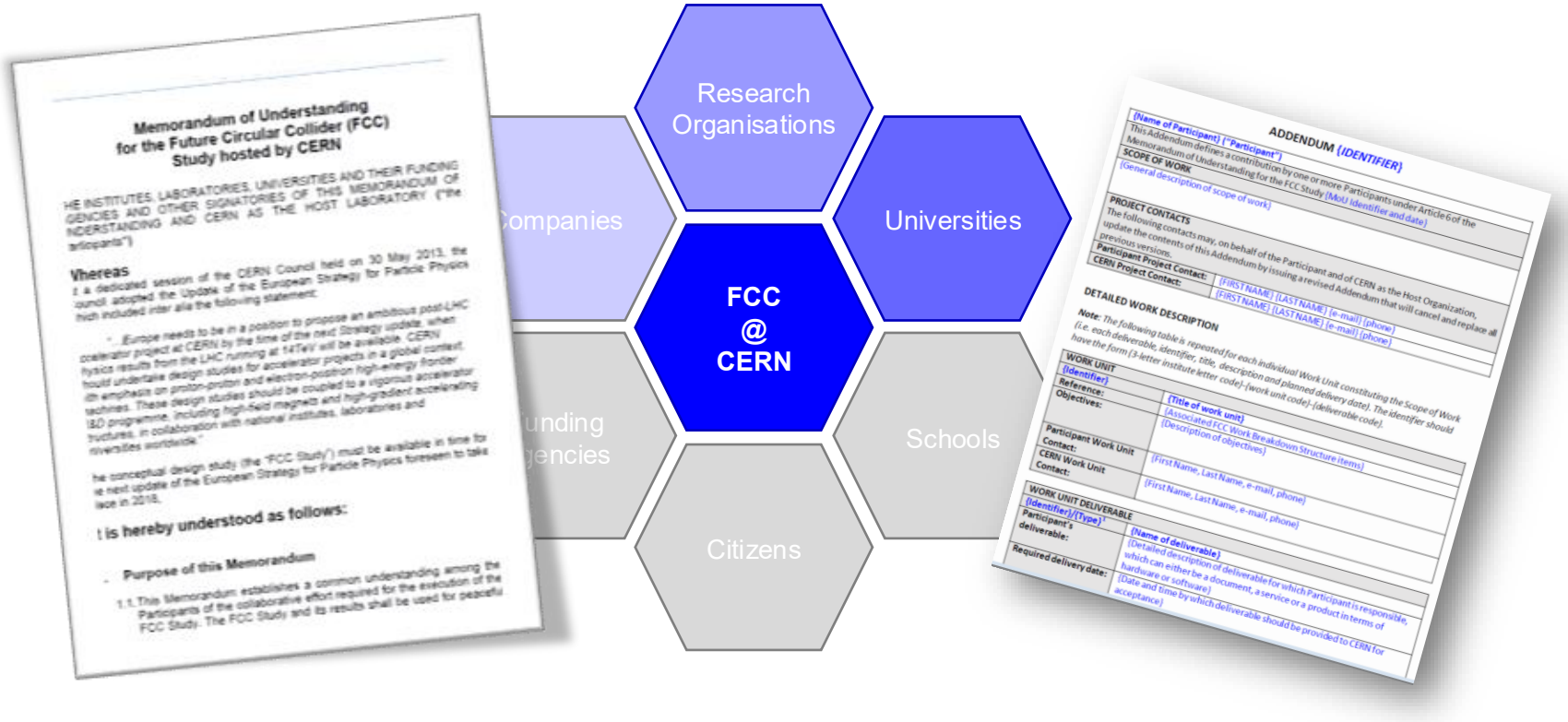
FCC “ONE”

OPEN NETWORK ENVIRONMENT

One for Science
One for Innovation
One for the World

https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy_en

FCC ONE (Open Network Environment)



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