

CERN efforts towards Sustainable Accelerators

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Environmental protection: integral part of CERN Objectives

One of the <u>main objectives</u> of the CERN Directorate for the years 2021-2025.

CERN aims to establish itself as a model for a transparent and environmentally responsible research organisation

- -> strong and proactive commitment to environmental protection, along 3 lines:
- Minimise the Laboratory's impact on the environment
- Pursue actions and technologies aiming at energy saving and reuse
- Identify and develop CERN technologies that may contribute to mitigate the impact of society on the environment.

Environment and **sustainability** are crucial aspects of projects and activities in the HEP field.





Current environmental objectives

Priorities are defined taking into account the 17 UN Sustainable development goals.

Most relevant in progress are:

- reducing emissions of fluorinated gases from Large Experiments
- limiting the electrical power consumption
- limiting the water consumption
- reducing the impact of effluent water on receiving watercourses

About CERN

>17 900 people

CERN employs around 3600 people and some 12 500 scientists from around the world use the Laboratory's facilities. The remainder is largely made up of associates and students (page 8).

Energy

1251 gwh

electricity and 64.4 GWh of fossil fuel. The Laboratory commits to limiting rises in electricity consumption to 5% up to the end of 2024, while delivering significantly increased performance of its facilities (page 12).

Emissions

223 800 tCO2e

CERN's direct greenhouse gas emissions were 192 100 tonnes of CO, equivalent. tCO:e. Indirect emissions arising from electricity consumption were 31 700 tCOve. CERN's immediate target is to reduce direct emissions by 28% by the end of 2024 (page

lonising Radiation

< 0.02 mSv

People living in the vicinity of CERN received an effective dose of between 0.7 and 0.8 milliSieverts. mSv, from natural sources. CERN's activities added under 0.02 mSv to this, less than 3% of the naturally occurring background (page 16).

Waste

56% recycled

waste, of which 56% was recycled, and 1358 tonnes of hazardous waste. CERN's objective is to increase the current recycling rate (page 18)

AT A GLANCE CERN AND THE **ENVIRONMENT** IN 2018

Noise

70 dB(A)

noise at its perimeters below 70 dB(A) during the day and 60 dB(A) at night. This corresponds to the level of conversational speech (page 17).

Environmental Compliance

146 monitoring stations

CERN has a state-of-the-art environmental monitoring system consisting of 146 monitoring stations. The Organization reports quarterly on environmental issues to Host State authorities. No serious environmental incidents were recorded in 2018 (page 23).

Biodiversity

There are 15 species of orchids growing on CERN's sites. CERN land includes 258 hectares of cultivated fields and meadows, 136 hectares of forest and three wetlands (page

Water and **Effluents**

3477 megalitres

CERN drew 3477 megalitres of water, mostly from Lake Geneva. The Laboratory commits to keeping its increase in water consumption below 5% up to the end of 2024, despite a growing demand for water cooling of upgraded facilities (page

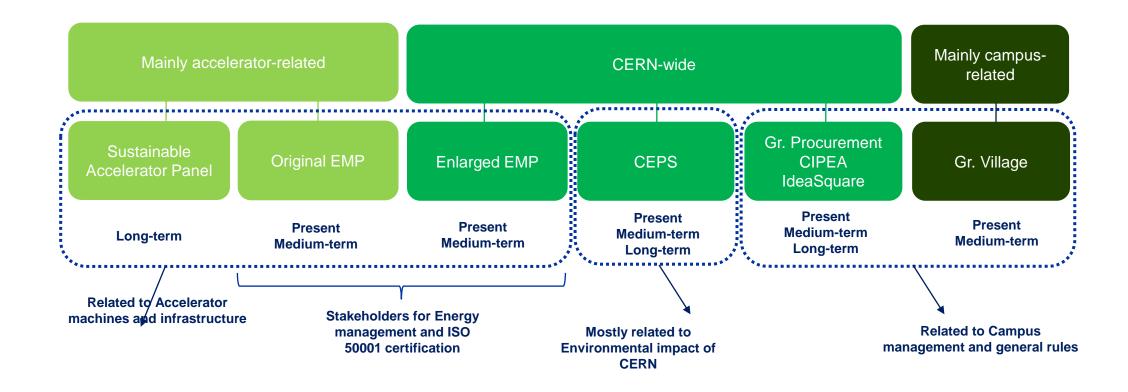
Knowledge Transfer

18 domains

CERN's 18 technology domains have several environmental applications including reducing air and water pollution, environmental monitoring, and more efficient energy distribution using superconducting technology



CERN panels acting on various aspects of sustainability:





Main Activities

Energy management:

- weekly follow-up of consumption and forecasts
- Long term planning of CERN Energy procurement strategy
- Follow-up of ISO 50001 KPIs
- Identification of opportunities for optimisation

CEPS (Environment)

- Management of effluents from site (water, gas...)
- Mobility, procurement and food
- Local environmental impact
 - hazardous substances
 - **Biodiversity**
 - Noise
 - Conventional and Radioactive waste
- Sponsoring of new projects to take up on opportunities (e.g. waste heat recovery)
- Coordination of the editing of the CERN Environmental report (evolving towards a sustainability report in 2025).





Certificat

N° 2023/103380.1

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AFNOR Certification certifie que le système de management mis en place par AFNOR Certification certifies that the management system implemented by

Organisation européenne pour la Recherche nucléaire (CERN) **European Organization for Nuclear Research (CERN)**

pour les activités suivantes for the following activities:

RECHERCHE FONDAMENTALE EN PHYSIQUE DES PARTICULES.

FUNDAMENTAL RESEARCH IN PARTICLE PHYSICS.

a été évalué et jugé conforme aux exigences requises par

ISO 50001 : 2018

et est déployé sur les sites suivants :

N° SIREN

Esplanade des Particules 1 CH-1211 GFNÈVF 23 9001, route de Saint-Genis FR-01280 PREVESSIN MOENS

445403488

(L'ensemble des activités de l'entreprise sur les sites donnés est couvert par la certification)

Ce certificat est valable à compter du (année/mols/jour)

2026-02-01



Directeur Général d'AFNOR Certification





Main Activities

Green Village

- CERN campus as a testbed for new ideas:
 - Smart energy management
 - Improved waste management
 - Improved mobility (green & smart)
 - https://sce-dep.web.cern.ch/cern-green-village

CIPEA

- Leverage CERN's Innovation potential to society
- Identifies and funds CERN technologies towards an application towards non-accelerator uses
- https://kt.cern/environment/CIPEA

Environmentally Responsible Procurement Policy

- Setting up a new policy for responsible procurement based on ISO20400:2017
- Expected to be released progressively (pilot projects first)
- Will encourage CERN suppliers to improve their products/processes, CERN people to think in advance.



- Liaise with future accelerator projects to develop full lifecycle sustainability as a key consideration at the project inception phase.
 - This should include high-level energy management scenarios.
 - Consider the issue of waste management along the lifecycle at future accelerators;
 also consider end-of-life dismantling.
 - Identify and quantify the potential of energy efficient accelerator technology for use in present and future accelerators.
 - Evaluate the potential impact of accelerator design and novel accelerator concepts in present and future machines and initiate studies where appropriate.
 - Explore the use of sustainable materials and components in accelerator construction and evaluate the impact of adhering to international standards in sustainable procurement.



Applications

- Identify innovative accelerator technology with the potential for use in such applications as power/energy distribution and energy storage.
- Where appropriate, support exchange with external partners to leverage use of inhouse technology in a sustainability context.

Disseminate

 Collate and publicize CERN's efforts in the sustainable accelerator technology domain; publicize CERN's efforts and track developments at sustainability related conferences and workshops.



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Collaborate

- Monitor and support exchange with partners engaged in alternative forms of energy generation (e.g. ITER, MYRRHA).
- Explore and exploit where appropriate links into external programmes such as Horizon.
- Overall, act as forum and focal point for the diverse efforts in accelerator sustainability at CERN and provide a contact point for interaction with external partners.

The work of the panel is parallel with the ongoing efforts of EMP and Energy Coordination, close communication should be ensured by membership. Given the domains of interest indicated above, the panel is ATS centric and reports to the ATS director.



GOALS FOR 2023

- Understand the needs of Studies for future projects
 - What is required to prepare an input for the next European Strategy
 - What topics to be studied in common, taking into account the different level of maturity.
 - Is there work necessary that is not being done by any of them?
- Make an inventory of efforts ongoing in the ATS sector
 - Known are High efficiency Klystrons, HTS and permanent magnets
 - Consolidation projects
 - Energy management strategy
 - Lifecycle assessment of equipment



GOALS FOR 2023

- Identify other technologies to be supported
 - Energy Storage
 - ...

- It is not forbidden to look at what else we can do today
 - Will remain open to bottom-up ideas



Medium-Long term goals

- Help Studies to critically review and harmonise their input to the next European Strategy
 - Eventually also for other processes, such as Snowmass
- Prepare a communication strategy to communicate at technical level (conferences, events...) CERN's effort
- Participate to communicate to the public (with HSE and IR).
 - Participate to the sustainability report in 2025
- Coordinate collaborations in sustainability with other laboratories.



Resources and Organisation

The panel has no other resources than your commitment

- Resources for projects are in Studies, operation etc...
- We will support the decision process at ATS management level, but the decision is with the studies and the management.
- We will push for funds to R&D projects if we are convinced they are promising

Meetings every month for the time being

- One slot for Studies: expectations and reports on ongoing activities
- One slot for equipment groups
- One slot for bottom-up ideas
- Personal initiatives and proposals are welcome!



