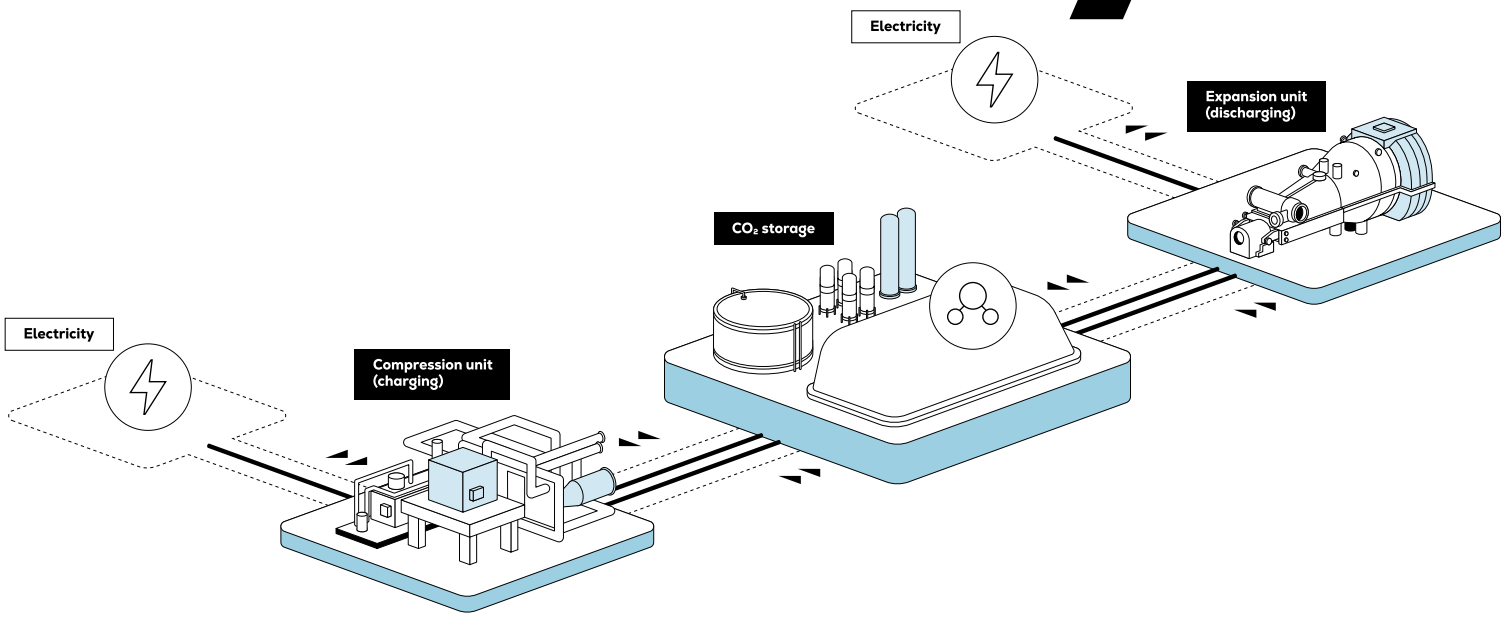
Carbon dioxide battery storage

Energy Industries

CO_2 battery



Benefits at a glance

- High round-trip efficiency of up to 75 %
- Fully closed, emission-free CO_2 cycle with no material degradation
- Compact footprint and no geological constraints
- Long lifetime and flexible operation for multiple daily cycles
- Ideal for renewable integration, grid stability, and industrial decarbonization

Everllence

CO_2 battery

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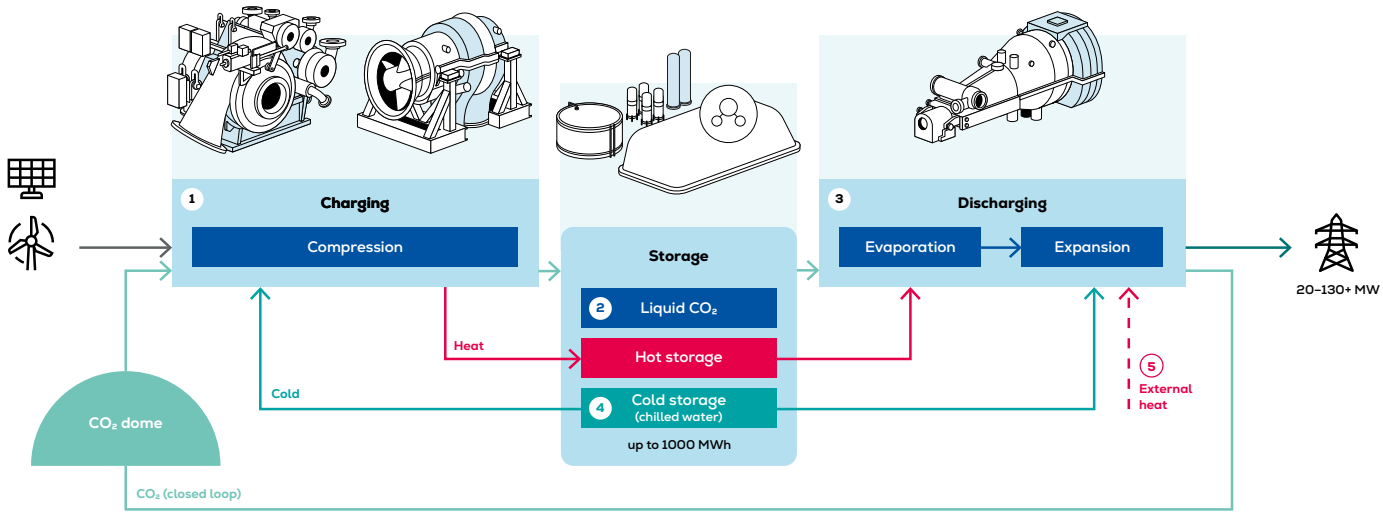

General

The CO_2 battery is an innovative long-duration energy storage technology that uses carbon dioxide in a closed-loop thermodynamic process. It stores electricity by compressing and liquefying CO_2 and releases it again through expansion – highly efficient, site-independent, and emission-free.

Technology

During charging, off-peak or excess renewable electricity powers an Everllence compressor that compresses CO_2 from the atmospheric dome. The heat generated during compression is stored in a thermal energy storage system (TES), while the CO_2 is liquefied and kept in pressurized vessels at ambient temperature.

When electricity is required, the liquid CO_2 is heated, evaporated, and expanded through an Everllence expander to drive a generator. The expanded gas then returns to the dome, completing the closed thermodynamic loop.

This process delivers stable, high-efficiency energy storage with round-trip efficiencies up to 75 % and discharge durations of around 10 hours – providing true grid-scale flexibility.

Cryogenic and thermal solutions

In cooperation with leading partners, Everllence designs complete thermal energy storage and cooling systems. These include solid-filler TES for compression heat recovery and chilled-water systems for cold storage – key to achieving the CO_2 battery's outstanding efficiency.

Future-ready and sustainable

The CO_2 battery uses a closed, recyclable medium that operates safely at moderate pressure and temperature ranges. It can integrate seamlessly with waste-heat recovery, renewable power plants, or hydrogen systems. With scalable units from 20 MW to 130 MW and up to 1 GWh capacity, it enables emission-free, long-duration energy storage for a resilient, decarbonized grid.

Why Everllence

Everllence combines more than a century of turbomachinery expertise with cutting-edge energy storage innovation. Our compressors and expanders form the technological core of the CO_2 battery – delivering efficiency, flexibility, and reliability for tomorrow's carbon-neutral power systems.

Everllence turbomachinery for CO_2 batteries

Compressors

Everllence provides high-performance compressors engineered for demanding CO_2 applications. Our portfolio includes radial, integrally-geared, and combined axial/radial designs, handling suction flow rates up to 500,000 m^3/h and pressures up to 250 bar (3625 psi). Advanced thermal management and dynamic control enable reliable operation across varying load profiles.

Expanders

Everllence expanders and turbines are designed for inlet temperatures up to 540 °C (1,004 °F) and pressures up to 150 bar (2175 psi). They achieve outputs up to 180 MW per train, ensuring high efficiency and long service life in cyclic operation. Our axial and radial gear expander configurations are optimized for CO_2 properties, combining robustness and precision performance.

Contact

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