



LOW CARBON HEATING AND
COOLING FOR SUSTAINABLE
BUILDINGS WITH GEOENERGY

HEAT AND COOL YOUR BUILDINGS WITH **CELSIUS ENERGY**

Reduce your carbon emissions with geothermal energy

Building heating and cooling are responsible for 25% of greenhouse gas emissions worldwide.

Reducing this carbon footprint has become an obvious priority. Companies are increasingly embracing firm, ambitious climate commitments.

Celsius Energy, a Schlumberger startup, offers a heating and cooling solution using geoenery. It allows property owners to meet **2020 environmental regulation and décret tertiaire [French commercial building energy consumption law] requirements** by offering them a turnkey solution and assisting them from the design to launch of their project.

By combining several existing technological processes, including proven industrial star-shaped drilling technology, Celsius Energy makes underground energy available everywhere. This includes in dense urban environments and in both new constructions and renovations.

Celsius Energy allows you to reduce your CO2 emissions from heating and cooling your buildings up to 90% and to cut your energy bill by 60%.

Our mission is to connect buildings to the earth to develop low-carbon constructions on a large scale and minimize climate change.



OUR SOLUTION

Our systematic approach for low-carbon buildings allows us to provide an integrated turnkey solution, from design to implementation, to make geenergy within everyone's reach.

The following are managed under a single brand:

- preliminary dimensions,
- design,
- drilling,
- technical installation,
- and finally, digital control of the system.

Our smart digital control system allows the property manager to simply and independently ensure optimum performance throughout the system's life and to monitor and manage its energy consumption and performance.



«Celsius represents a credible solution that operates today, is profitable and protects the environment».

Bertrand Piccard,
Founder of the Solar Impulse Foundation



This installation was financed with the support of ADEME and Region Île de France via Fonds Chaleur as up to 91 200 € on a total amount of 428 000€ (21,30%).

Fonds Chaleur is a major tool financing and expanding renewable heat, contributing to France's energy independence.

OUR ECOSYSTEM

We are part of Schlumberger, which provides us with support from its expertise in drilling optimization and efficiency and its experience with complex systems and digital integration. Our solution was recognized by the UN as one of the 50 most promising future climate solutions

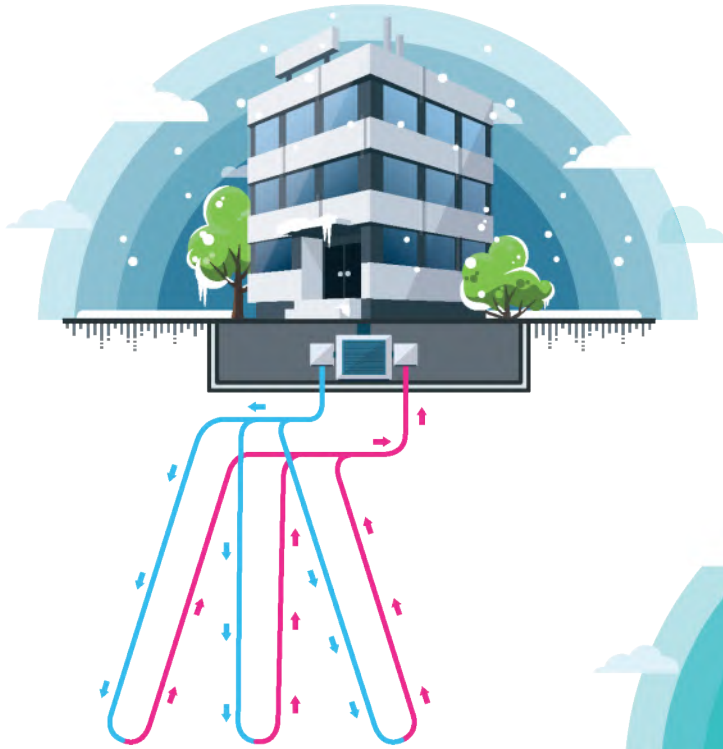
It was selected from among the low-carbon building solutions by the Sekoya and IFPEB/Carbone 4 platforms. We are also one of the 1,000 efficient, profitable solutions to protect the environment selected by Bertrand Piccard's Solar Impulse Foundation.



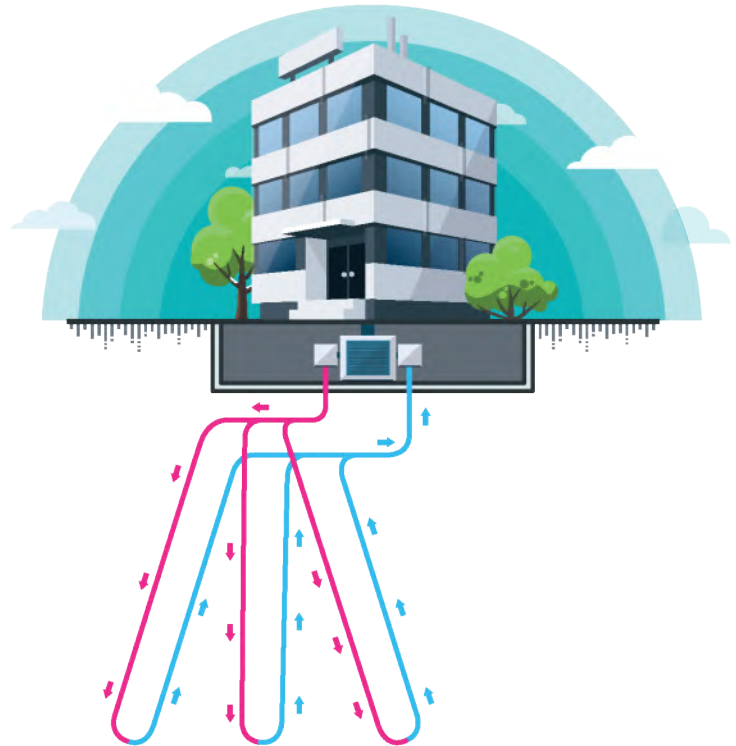
SEKOYA



WINTER



SUMMER



THE PRINCIPLE

Celsius Energy installs heat exchangers underground at a depth at which the temperature is constant year-round: cooler than the surface in the summer and warmer than the surface in the winter. These heat exchangers consist of plastic tubes inserted into closed-loop wells drilled in a star-shape (enabling a small footprint) in which a heat transfer fluid circulates and is heated or cooled by the Earth.

In the winter, the system captures heat from the ground and transfers it to the building to which it is connected by a heat pump.

In the summer, it is the opposite. The heat from the building is transferred underground.

The summer/winter cycles preserve the thermal balance underground. No materials are injected into the ground.

CASE STUDY: THERMAL RENOVATION OF A BUILDING IN CLAMART, FRANCE



Schlumberger is the leading global provider of petroleum services for oil and gas exploration and production industries. This multinational organization, founded in 1926 by brothers Conrad and Marcel Schlumberger, operates in more than 120 countries and has an important technology center in Clamart, France.

Schlumberger aims to achieve a net-zero carbon footprint by 2050. Thermal renovation of its property holdings is an obvious, quick way to progress toward this goal. Schlumberger is the parent company of Celsius Energy.

Building B1 in the Clamart campus, shared by Schlumberger and Celsius Energy, became the pilot project for its infrastructure decarbonization policy. Moreover, Celsius Energy needed a facility that can serve as a model and base for ongoing development of its products.

This building was built in 1959 and renovated in 1992. It has five floors, each with 40 offices, with a total area of 3,000 m². Before thermal renovation, it was heated with gas and cooled with traditional air-conditioning units, which require regular maintenance, consume

substantial amounts of gas or electricity and emit CO₂. It is located on a large campus owned by the company in a business park. Clamart is an industrial and residential suburb southwest of Paris, with moderate European climate and distinct season changes.

Celsius Energy applied its turnkey solution to this renovation project. It defined, designed and built a geoenery system to cover 100% of the building's heating and cooling needs, including short-term peaks.

The installation consists of an underground heat exchanger, heat pumps and a digital energy management system. The overall system is managed independently by an embedded computing system.

Within the context of this project, Celsius Energy conducted a preliminary simulation of the building needs and thermal properties of the soil, then drilled and equipped a well for initial measurements. The data collected allowed it to arrive at a final scoping of the installation.

Lastly, Celsius Energy acted as project manager, coordinating the drilling provider's and heat pump manufacturer's work.



An image of the location where traditional shallow vertical wells would have been placed.



Illustration of the small footprint of the 10 geothermal wells in a star-shaped arrangement designed by Celsius Energy for this project.



Dashboard view with principal parcels in over time of energy delivered (heating and cooling), electricity consumed and renewable underground energy produced.

| | |
|-----------------------|--|
| Project Manager | SCHLUMBERGER |
| Typology | Offices |
| Surface | 3.000m ² |
| Initial system | gas + A/C units |
| Geoenery installation | 10 deviated probes 155 m deep |
| Geoenery production | Heat: 167 MWh/year Cold: 131 MWh/year |
| CAPEX Project | 500.000 € |
| Savings | -89% CO₂ -42% final energy |
| Duration | 6 months Sept. 20 - Feb. 21 |

The Celsius Energy team developed a dashboard to display overall system performance in both real time or historically.

The building was thermally renovated in 6 months and the system started operating in February 2021. The new system reduced energy consumption by

more than 60% compared to the building's previous heating and cooling system.

An approved independent provider performed a Life Cycle Assessment, comparing it to other heating and cooling solutions. The impact over 50 years of the construction and operation of the entire system was

assessed with respect to 15 different environmental aspects. For equal heating and air-conditioning capacity, the Celsius Energy system produced 89% less CO₂ emissions than a traditional system would have produced, based on gas heating combined with an air-conditioning unit.



The drill site.



The pyramid covers the starting point for heat exchangers. An installation by the artist matali crasset completes the site enhancement.



The technical room with the heat pump in the center.



Does your project meet one of these two criteria?
Area > 1.500 m²
Or
Heating and/or cooling needs >100 kW
LET'S STUDY YOUR PROJECT!

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celsiusenergy.com

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