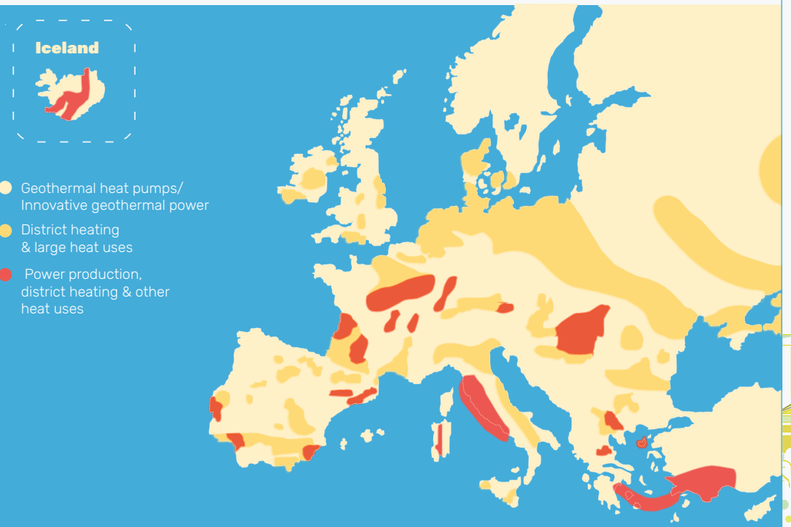
Geothermal energy is...

...Everywhere in Europe

Geothermal energy can be produced anywhere. The average temperature at shallow depth is a constant at around 10-15 °C. The deeper underground, the higher the temperature.



Available around the clock
Geothermal energy is always available to meet consumers' demand 24h a day, every day of the year.

Able to satisfy about **25% of heating and cooling** needs by 2030.

One of the cheapest renewables in the long-term
After an initial installation investment, the operating costs are very low and predictable.

A way to **cut the EU's greenhouse gas emissions** by more than half by 2030.

Suitable for the energy transition of any sector
Geothermal energy is the only renewable source that can contribute to the decarbonisation of the electricity, heating & cooling, and transport sectors all together.

A job creator. By 2030 it could create 350,000 direct and indirect jobs

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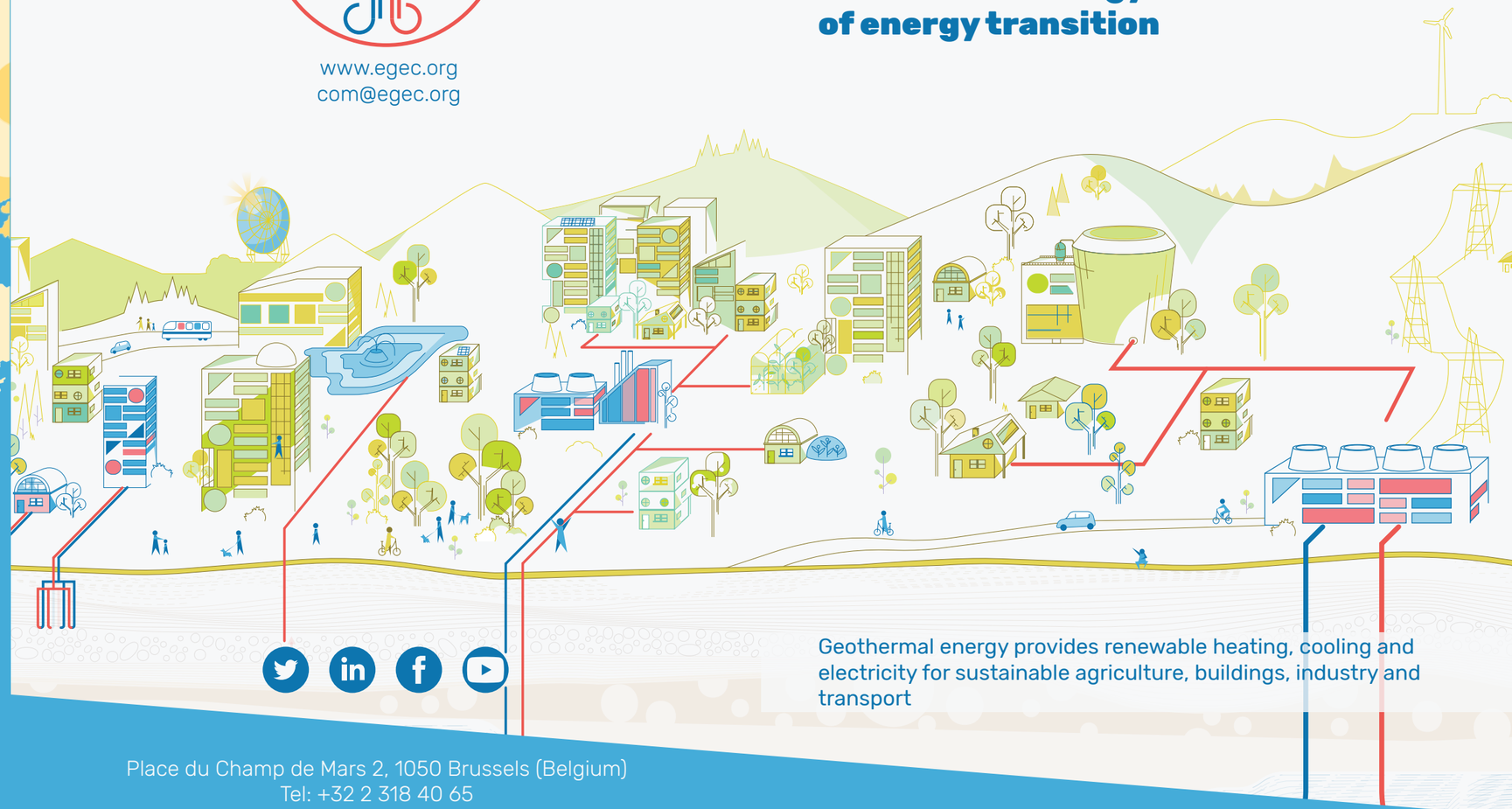
EGEC GEOTHERMAL

Geothermal energy: The bedrock of energy transition



Geothermal energy provides renewable heating, cooling and electricity for sustainable agriculture, buildings, industry and transport

Place du Champ de Mars 2, 1050 Brussels (Belgium)
Tel: +32 2 318 40 65

What is Geothermal energy?

Geothermal energy is the heat stored beneath the Earth's surface. It is an endless source of renewable energy, which is available all the time, every day, everywhere.

It can be used for heating, cooling, electricity and energy storage for countless uses in buildings, industry and agriculture. Geothermal energy is also a sustainable source of strategic minerals such as lithium.

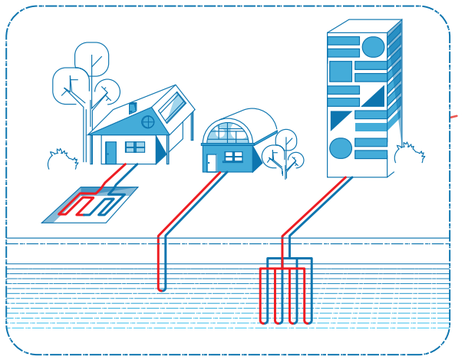
This makes it the most versatile and reliable renewable energy source.

Geothermal heat pumps

A geothermal heat pump turns the heat under the surface of the earth into heating, cooling and hot water for use in any kind and size of buildings, from homes to offices, schools, swimming-pools, shopping centres and public buildings.

The whole system is very simple and can be installed almost anywhere throughout Europe. The installation of boreholes allows the exchange of geothermal energy between the ground and the building (simply by circulating groundwater or a brine through pipes). The heat pump ensures the temperature is right to meet heating, cooling and hot water needs.

Geothermal heat pumps provide the most efficient and cheapest energy in Europe, because they operate using constant underground temperature.



Depth: **5-500 m**
Average temperature between 10-150 m:
2 °C - 21 °C

Geothermal district heating & cooling

In a large geothermal heating system, geothermal energy comes from an underground reservoir of water and hot rocks and is transported through a distribution network into buildings or processed by industries.

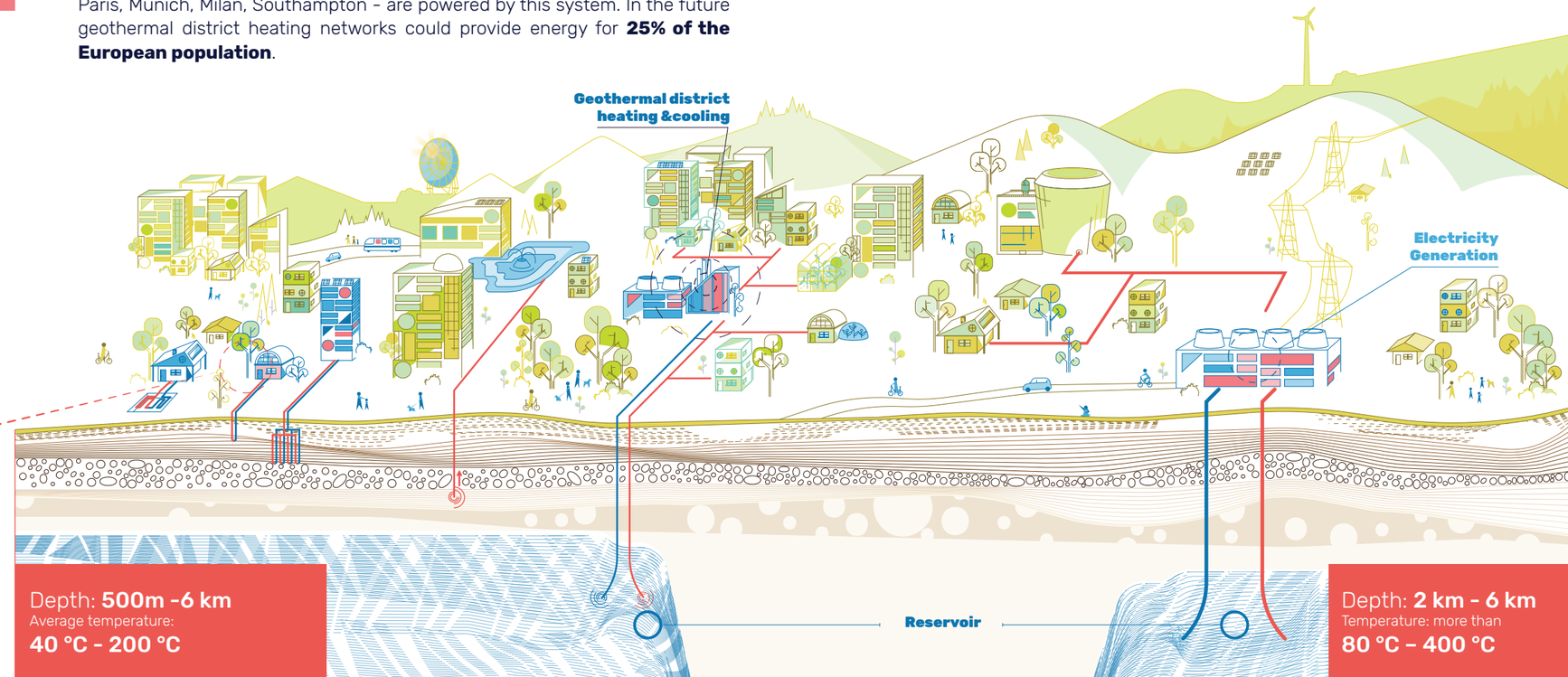
A geothermal district heating and cooling system meets the energy demands of buildings and industrial users alike. From a community scheme to an entire city, so it can be tailored to suit different needs: residential buildings, greenhouses, industries, offices, and countless others.

Drilling at a depth of **1 to 3 km** is potentially enough to install geothermal heating networks everywhere in Europe. Today many European cities - such as Paris, Munich, Milan, Southampton - are powered by this system. In the future geothermal district heating networks could provide energy for **25% of the European population**.

Geothermal electricity

Geothermal power plants require high temperatures in deep reservoirs to produce electricity. But temperature and depth can vary widely according to the different regions and the characteristics of the site.

Geothermal energy comes from wells drilled into the earth to reach a reservoir. Steam or hot water are piped to the surface to power a turbine that generates electricity. A geothermal power plant has a capacity ranging from 1 to 40 Megawatts electric to produce baseload electricity. It is available 24 hours a day, every day of the year, to match consumer demand while providing grid stability.



Depth: **500m -6 km**
Average temperature:
40 °C - 200 °C

Depth: **2 km - 6 km**
Temperature: more than
80 °C – 400 °C

Geothermal energy in industry

Heating is by far the largest form of energy used in industrial processes. Currently the majority of industrial heat comes from fossil fuels. Switching to renewables would dramatically reduce emissions in this sector.

Geothermal heat production provides a continuous energy supply at many temperature levels, for different loads and capacities, at low cost. This makes it particularly suitable for a vast range of industrial processes.

Geothermal energy has also been used extensively in the agricultural industry for the last three decades, notably in greenhouses for vegetables, flowers and fruit production.

"Industries need different temperatures for their processes. Geothermal energy caters to most of them."

Uses of geothermal energy in industry

Paper
Production of pulp, paper drying
140°C -160°C

Cement
Cement drying
130°C - 150°C

Gypsum
Drying or calcination of gypsum
125°C – 180° C

Agriculture
Greenhouses, Fish farming
40°C - 100°C

Food & beverages
Food processing
38°C - 93°C

Food & beverages
Fruit wine making
40°C - 90°C

Chemicals
Production of bulk organic chemicals
70°C

Food & beverages
Soft drinks, food and fish drying
42°C -72°C

Chemicals
Production of several chemicals (nitric, adipic and glyoxylic acid, sodium bicarbonate and more)
20°C-80 °C

Spas & Balneology
Thermal mineral water baths or pools
25°C – 50°C

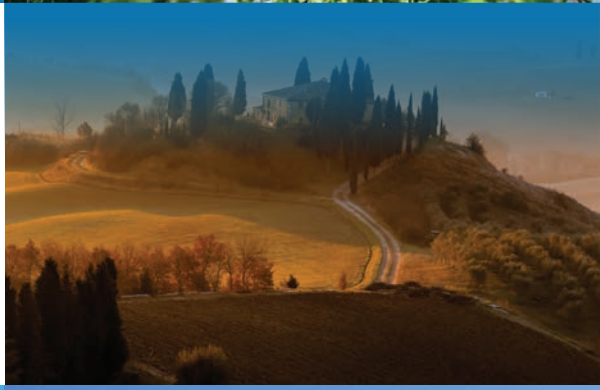
Examples of geothermal energy in industry

Geothermal greenhouses in Netherlands

The Dutch horticultural sector has already installed 11 geothermal systems with 130 MWth capacity and more are underway.

Agri food sector in Tuscany with SlowFood (Italy)

Here there is the world's first 'Food Community' whose members use renewables (geothermal in this case) and local raw materials to make their products.



Roquette Frères biorefinery (Beinheim, France)

24 MWth at 160°C for a biorefinery converted from fossil fuels with an innovative geothermal system located at Rittershoffen, France.

Geothermal energy in buildings

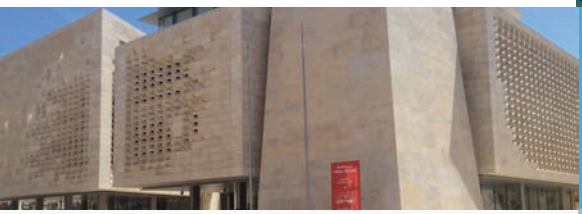
PUBLIC BUILDINGS

Geothermal heat pumps are the most efficient type of heating system and are suitable for any kind of buildings. As the energy below ground is constant, geothermal heat pumps require very low electricity input to work. Heating and cooling can also be supplied to buildings and cities through smart geothermal district heating and cooling systems.

Geothermal energy is highly reliable. This is why so many public buildings, like schools, hospitals, government offices, as well as retailers, banks and heritage sites, rely on it.

European Parliament
(Brussels, Belgium)

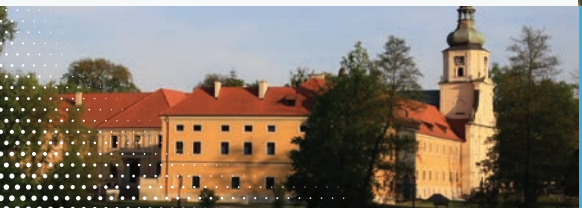
Bundestag
(Berlin, Germany)



Parliament of Malta
(Valletta, Malta)

NATO Headquarters
(Brussels, Belgium)

Photo credit: NATO



Rudy Wielkie Cistercian abbey
(Poland)

SCHOOLS AND ACADEMIA

HOSPITALS

HOUSES

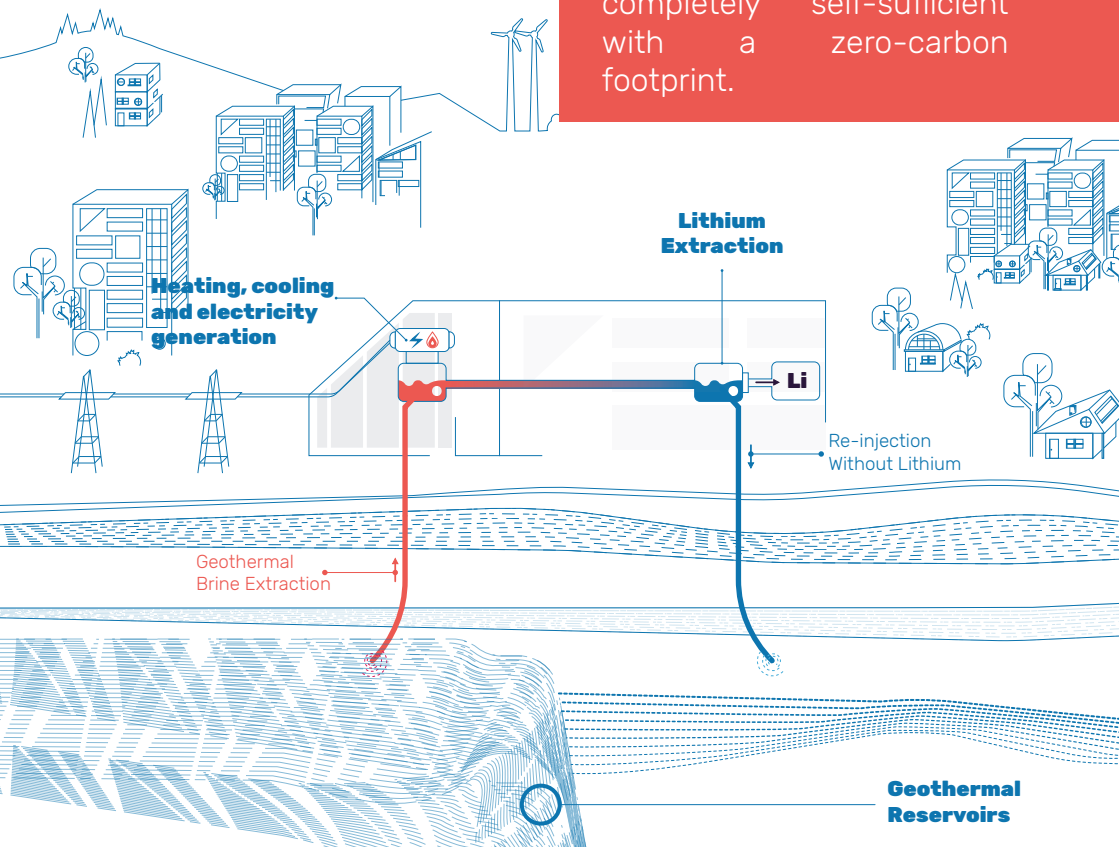
OFFICES

COMMERCE

Geothermal energy in clean mobility

Geothermal power plants can produce lithium as a by-product. This is an essential raw material for rechargeable batteries in electric vehicles and energy storage.

Lithium-rich brine is pumped to the surface from geothermal reservoirs. The heat carried by the brine is used to produce renewable energy. But the heat and electricity needed to extract raw lithium can come from the geothermal energy plant itself, making the process completely self-sufficient with a zero-carbon footprint.



Geothermal energy is the foundation of the European electro-mobility value-chain, from zero-carbon footprint lithium extraction to processing, battery manufacturing and e-vehicle assembly. Lithium battery plants are planned in countries with rich geothermal resources such as: **Germany, France, Poland, Slovakia, Czech Republic, United Kingdom**.

Geothermal lithium investments could meet the **e-mobility** needs of the whole European Union, reducing dependency on polluted lithium imported from other continents.

Geothermal electricity

Electricity production from geothermal energy has its roots in Europe. The initial test was performed in Larderello (Tuscany Region, Italy), where the first commercial power plant was officially inaugurated in 1913. Since then, the development of geothermal power technology has been continuous. This has taken place predominantly in countries with high temperature areas such as Italy, Iceland, Turkey, as well as in France, Germany, Austria, Croatia, Hungary and Portugal.

However, thanks to new developments (namely with low-to-medium temperature system technology), geothermal electricity has also been produced using lower temperatures. Further to this, with other new innovative technologies in development, geothermal power can **potentially be produced anywhere in Europe.**

Why is geothermal power one of the most reliable clean energy sources?

The advantage of geothermal power plants is their **"base load capability"**, which refers to the fact that they can operate continuously throughout the entire year at maximum output. However, they can also be designed to be **dispatchable** – meaning that the output of the energy production can be switched off or on and be moderated according to demand. Accordingly, they can respond efficiently to system operators' needs. For example, changes between 30% to 100% in 15 seconds can be achieved with proper management of the turbines.

In contrast to other renewables, therefore, geothermal power plants are not only **highly reliable but also 100% flexible** in their availability under all circumstances.

Geothermal electricity plants

Generating electricity, base load and locally

(Larderello, Tuscany - Italy)

Conventional geothermal plants use naturally heated steam or hot water from hydrothermal reservoirs to produce electricity.

Producing combined heat and power

(Munich, Germany)

Geothermal resources can be used for the combined generation of heat and power, and be connected to local district heating systems.

New generation of technologies such as the EGS plant

(Soultz-sous-forêts, France)

This technology uses the high temperature of rocks with artificial water injection to create a hot water reservoir. With these new technologies, geothermal electricity generation will be possible everywhere, going deep enough to reach the required temperature.
Beyond conventional resources, these unconventional geothermal resources, the offshore resources, and the reused oil and gas wells, can significantly contribute to geothermal electricity growth in the future.