Training Module - Geothermal energy

EnergyEfficiency4SMEs Project

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Date, Location

Co-funded by the European Union

ENERGY EFFICIENCY 4SMES

A European Project

- **European Program: LIFE**
- **Length** : 36 months (Nov 2022 - Oct 2025)
- **Total Budget** : 1,84 M€
- **Consortium** : 23 partners from 10 different countries
- **Coordinator** : Eurochambres
- **Structure of the project**: 8 WP
- **Targets** : SMEs from 3 sectors:
    - Hospitality and restaurants (NACE codes I 55 to I 56.3.0)
    - Agri-food Industry (NACE codes C10 to C11.0.7)
    - Metals Industry (NACE codes C24 to C25.9.9)

DEMYSTIFYING GEOTHERMAL ENERGY

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- Definition: where does geothermal energy come from?
- Uses of geothermal energy
- Heat pumps
- The main stages in a geothermal energy project

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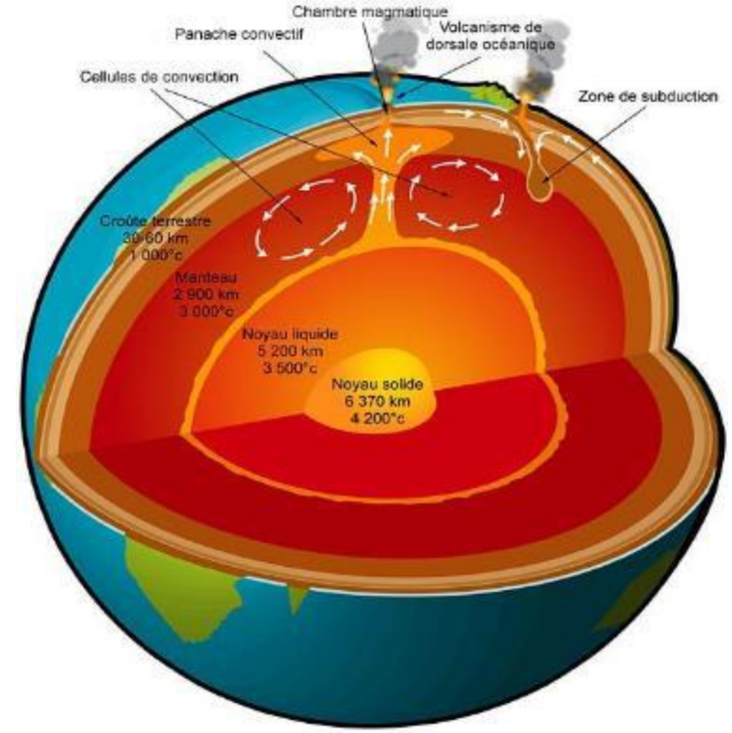
DEFINITION

Geothermal energy is a renewable energy source that harnesses the heat stored beneath the Earth's surface to produce electricity and heat.

This form of energy is derived from the Earth's internal heat, which comes from the :

- Primitive heat during the formation of the planet (meteorite impact, accretion)
- Disintegration of radioactive elements



Consequences

- Temperature at the centre ± 6000°C
- Very slow evacuation of this heat (in billions of years)
- Temperature gradient from the surface to the centre + 3°C /100m

99%
of the earth's mass
> 1000°C

Geothermal energy is the harnessing of heat from the subsoil at various depths.

GENERAL PRINCIPLES

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Geothermal energy harnesses the heat in the ground, hot rock and groundwater for a variety of energy uses.

It can be used:

- **Directly** for heating buildings, producing domestic hot water, etc.
- **Indirectly** to generate electricity.

GENERAL PRINCIPLES

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What kind of geothermal energy are we talking about?

- Deep geothermal energy, at depths ranging from a few hundred metres to a few kilometres. It exploits the geothermal water present in underground water tables to supply heating networks and, in some cases, to produce electricity.

- Surface geothermal energy, at maximum depths of a few hundred metres. It is used to produce renewable heat and cooling, using an intermediate device called aHeat pump (PAC) or even a direct supply (principle of passive cooling by geocooling).

It represents 70% of the installed capacity of the surface sector in France and 70% of heat production.

USE OF GEOTHERMAL ENERGY BY COMPANIES

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The use of geothermal energy in business can offer a number of advantages, particularly in terms of reduced energy costs and environmental benefits...

❑ Heating, cooling and air-conditioning buildings

- Businesses can use geothermal energy to maintain comfortable indoor conditions in their facilities in both summer and winter.
- These systems harness the heat in the ground to heat buildings in winter and remove excess heat in summer, which can lead to significant savings in energy costs over the long term.

❑ Hot water production

Geothermal energy can also be used to produce hot water, for example for sanitary or cleaning needs in industrial facilities or hotels.

❑ Industrial processes

In some cases, geothermal heat can be used directly in industrial processes, for example for drying or heat treatment in the food industry.

USE OF GEOTHERMAL ENERGY BY COMPANIES

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- Greenhouses and agriculture

  Farming businesses can use geothermal energy to heat greenhouses, encouraging crops to grow all year round, reducing climatic risks and enabling more frequent harvests.

- Electricity generation plants

  requires significant initial investment and in-depth feasibility studies.

Summing up, the use of geothermal energy in business can offer a sustainable and economically viable energy solution to meet heating, cooling and electricity production needs, while helping to reduce the company's environmental footprint and reinforce its brand image as a player committed to sustainable development.

ZOOM ON HEAT PUMPS

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Operations using heat pumps on shallow aquifers (less than 200m deep), known as "groundwater heat pump" operations.

These operations exploit the thermal potential of surface groundwater resources. At the depths in question (less than 200m), the average temperature of the water is around 13°C to 20°C. The heat extracted therefore needs to be raised to a higher temperature in order to be used, hence the use of a heat pump (PAC).

Groundwater heat pumps can be used to cover heating and/or domestic hot water needs and, given the cost of the underground works to be installed, are designed for large buildings **(indicative floor area of 2,000 to 25,000 m2).**

This technique is mainly used **in large and medium-sized tertiary buildings (offices, healthcare buildings, hotels, large shopping centres) as well as collective housing. The agricultural sector, with the heating of greenhouses, is also a prime target**.

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Very low-energy geothermal energy is therefore suitable for all types of building: new, existing (and even very old), residential, tertiary, agricultural and industrial, from single-family homes to buildings of several tens of thousands of m2. It is also ideally suited to eco-neighbourhoods, as it can be coupled with networks (known as tempered water loops) designed to serve several buildings to cover heating and cooling needs simultaneously.

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Setting up a geothermal energy project requires :

- ❑ careful planning
- ❑ a thorough understanding of the technical, economic, environmental and regulatory aspects.

By following these steps, you can set up an efficient and sustainable geothermal energy project that :

- ❑ meets your company's energy needs
- ❑ contributes to the transition to clean, renewable energy.

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Whatever the type of geothermal energy envisaged, the approach to setting up the project remains relatively similar. The typical layout will include :

Phase 1: Opportunity analysis → **Examine the merits of the project through an opportunity analysis.**

It should make it possible to assess the level of interest in the project and, if possible, to specify the nature and cost of the feasibility study to be undertaken. It is carried out jointly by a thermal engineering consultancy (size of the needs of the users to be connected, temperatures in the network, etc.) and a specialist in the hydrogeology of deep aquifers (possible aquifer reservoirs, depths, order of magnitude of available flows and temperatures).

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Phase 2:
feasibility study

Confirm the value of the project and define it before it is carried out.

The aim of the feasibility study is to enable the project owner to decide whether or not to go ahead with the project, and to define the optimum economic solution.

It provides detailed answers in terms of

- technical
- economic
- financial
- aspects.

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Phase 3: Administrative and financial arrangements

The necessary administrative files are drawn up and forwarded to the relevant departments. Compliance with regulations, obtaining authorisations and permits, seeking public funding if necessary...

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Phase 4:
Carrying out the work

Move on to project implementation with the help of a project manager.

Launching the works, assisted by a project manager.

Use qualified contractors to drill the geothermal wells and install the equipment and install the equipment in accordance with the plans.

Comply with safety standards and environmental regulations throughout the construction process.

THE MAIN STAGES IN A GEOTHERMAL ENERGY PROJECT

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Phase 5:
Operation and management of facilities

Ensuring the long-term future of our facilities.

- ❑ Test and commission the geothermal system to ensure that it is working properly.
- ❑ Establish a follow-up plan to monitor the system's performance over time and make any necessary adjustments.

Training and awareness-raising
- Train operators and end users in the operation and maintenance of the geothermal system.

ADVANTAGES OF GEOTHERMAL ENERGY

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- ❑ Energy available locally, 24 hours a day, 365 days a year
- ❑ Independent of daily or seasonal climatic variations
- ❑ Low greenhouse gas emissions
- ❑ Discreet energy that takes up little land
- ❑ Surface geothermal solutions that use the same equipment to produce heat as well as cold or cooling, without contributing to urban heat island effects.

But there are challenges and limitations

- ❑ High initial drilling and installation costs.
- ❑ Limited availability of exploitable geothermal sites.
- ❑ Potential geological and environmental risks.

FUTURE PROSPECTS

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Geothermal energy is constantly evolving with the development of new technologies, such as improved drilling techniques, the exploitation of deeper geothermal reservoirs and the development of high-efficiency geothermal systems.

It will play a growing role in the transition to more sustainable, low-carbon energy systems.

Geothermal energy offers a clean, renewable source of energy with significant potential to meet current and future energy needs, while helping to combat climate change.

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