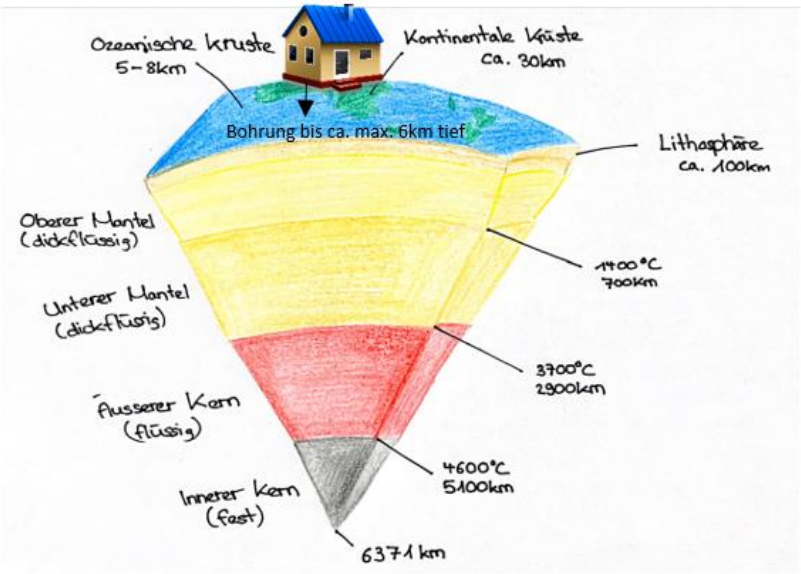
"Stored deep under us and ready to release"

Expression

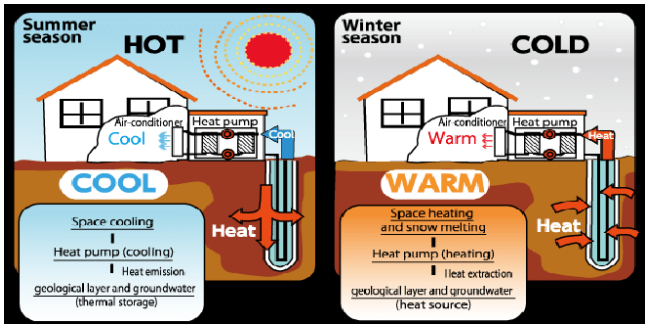
The term "geothermal energy" refers to energy stored in the subsurface in the form of heat. At a depth of about 15 meters, the surface temperature remains constant throughout the year. In Switzerland, the temperature below the surface generally increases by around 30°C for every kilometer of depth. The temperature at a depth of 5'000 metres is about 160°C. At depths greater than 1'000 meters, significant amounts of heat above 40°C can be used. This geothermal heat can be obtained using various methods.



Methods

Vertical ground heat exchangers, groundwater wells, geothermal structures (foundation piles, diaphragm walls) and hot tunnel water are often used in combination with heat pumps for heating and sometimes cooling purposes.

With the help of deep wells, sufficient resources can be extracted for direct use (i.e. without the need for heat pumps) for heating, especially for supplying district heating networks. At temperatures above 100°C, it is also possible to generate electricity and use the waste heat for heating purposes. If groundwater is not available (in an aquifer), heat and electricity can be harvested from dry rock crystal layers with the help of advanced geothermal power plant technology.



Simple scheme to illustrate the heating / cooling process of a geothermal heat pump

History

Geothermal energy has been in existence for billions of years. However, history says that geothermal energy has been in use for about 10'000 years, starting with the Paleo-Indians who used the hot springs and natural pools for cooking, bathing and warmth.

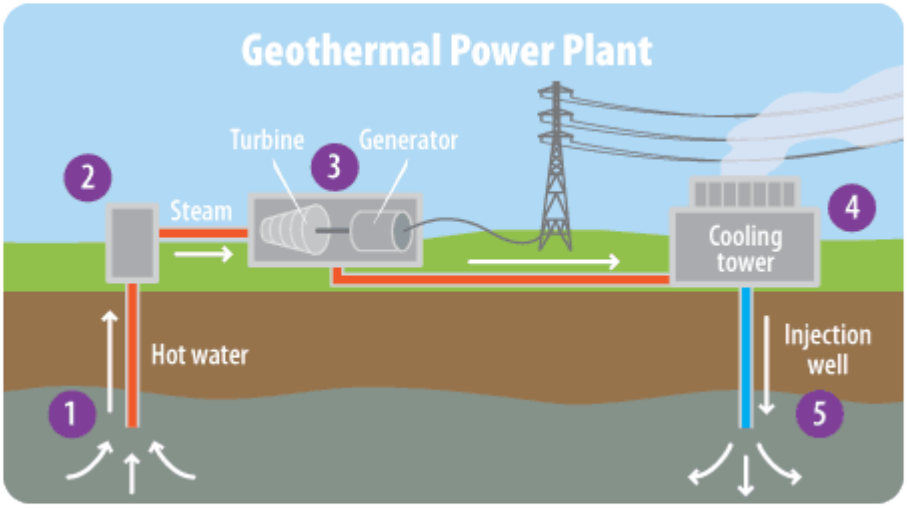
In 1904, with the development of an experimental plant, the first generation of geothermal power occurred in Larderello, Italy. Check out the history and images of the first geothermal power plant of the world:

SwissEduc - Stromboli online - Larderello, Italy

The first commercial application of the technology was in 1913, when a plant with an output of 250 kilowatts (kW) was built. The geothermal power plant began operations in New Zealand in 1958 and Geyser in Northern California in 1960. The plants in Italy and the United States are dry steam plants, producing only steam in low-permeability reservoirs. In New Zealand, on the other hand, HPHT water is naturally produced from a mixture of 80% superheated water and 20% steam. The steam directly from the ground is immediately used to generate electricity. It is piped to the power plant. Instead, superheated water from the bottom is separated from the mixture and flashed into steam. Most geothermal power plants are currently of the latter "wet steam" type.

Future plans

Geothermal resources can be integrated into all types of electrical power generation systems, from large, interconnected continental transmission grids to onsite use in small, isolated villages or autonomous buildings.



1. Hot water is pumped from deep underground through a well under high pressure.
2. When the water reaches the surface, the pressure is dropped, which causes the water to turn into steam.
3. The steam spins a turbine, which is connected to a generator that produces electricity.
4. The steam cools off in a cooling tower and condenses back to water.
5. The cooled water is pumped back into the Earth to begin the process again.

The technology roadmap for Geothermal Heat and Power offers a strategic plan to maximise deployment of these energy resources by 2050. It projects that 1,400 TWh (Terra Watt hours; 1TWh = 1'000'000'000 KWh (Kilo Watt hours)) of electricity per year could come from geothermal power by 2050, up from 67 TWh at the moment, what meens a multiplication of 20 compared to today! A huge potential!

State of the art in Switzerland

Can energy sourced underground help the small Alpine nation meet its ambitious energy and climate goals? Despite concerns over deep drilling triggering earthquakes, Swiss cantons and cities are pushing ahead with a range of new geothermal projects.

At the ultra-modern Lancy-Bachet station in central Geneva, passengers wait for the next Léman Express cross-border regional train. Dim lights loom and the carriages slow to a halt. Unbeknownst to travellers, the heat generated by the train and its screeching brakes is being captured under the rails and in the tunnel walls and will be used to heat and cool nearby apartments and offices.

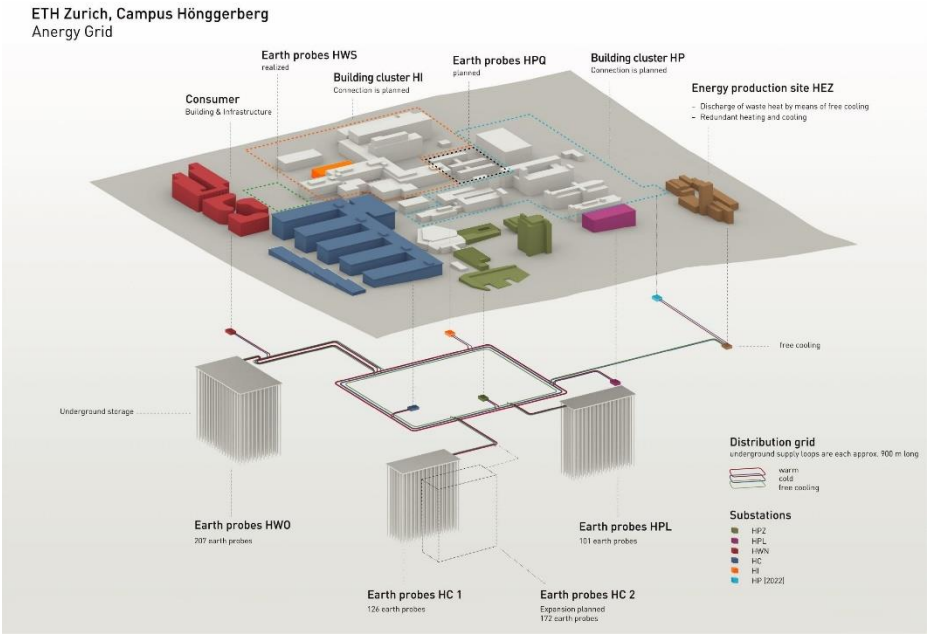
The system – currently a pilot project - works thanks to polyethylene pipes filled with heat transfer fluid that are embedded in a 100-metre section of the new tunnel. This energy source is connected to a heat pump that can produce heat and cold, which is injected into the district heating network.

It's one of several innovative geothermal projects popping up across Switzerland to help meet ambitious energy and climate goals. In Geneva the government wants new buildings to run 80% on renewable energies in the future. And by 2035, 20% of the canton's heating needs should come from geothermal sources.

Currently, geothermal activities are limited to extracting and stocking thermal energy mainly with vertical ground heat exchangers, groundwater wells, geothermal structures and hot tunnels. These are normally used in combination with a heat pump for heating – and in some cases, cooling – purposes.

Across Switzerland almost 15% of Swiss heating systems in homes, offices and other buildings use such geothermal heat pumps. In 2019, the Federal Energy Office registered 102,000 underground probes in use, representing the "highest concentration per square kilometre in the world".

Swiss showcase projects:



ETH Zurich won the 2020 Swiss Watt d'Or Energy Prize for its dynamic underground energy storage system at the Hönggerberg campus.

Hot underground water is used at the Lavey-les-Bains thermal baths in canton Vaud. A geothermal project is being studied to create electricity to power 900 homes in the village.

Conclusion

Geothermal energy is one very important option for the future, the potencial is huge, because it's just there, deep under us! The energy has not to be produced, just to earn it.
Since in our country is the rule a few years now, to replace an old oil heater by an alternative / more efficiency and environment-friendly heating system, shows Switzerlands politics a brave decision. With such a huge step into an eco-friendly future, we mentioned to really like to improve our economical aims. Not really cheep for all the ground-owners here, but an important sign for the future.

Sources

Geothermie in der Schweiz

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