Geothermal Energy

1. Geothermal power

The centre of the earth is about 6000°C hot. In general, the temperature rises one degree Celsius for every 36 metres you go down. A few kilometres down, the temperature can be over 250°C and in volcanic areas even higher. The name "geothermal" comes from the two Greek words "geo" (earth) and "thermal" (heat), so geothermal literally means "earth heat". There are two big ranges of application. Geothermal energy could be used to generate electricity or direct to heat a building. Geothermal energy is often mentioned with renewable energy, but this is a fault. Also when it is hardly impossible to get so much heat out of earth that it will get colder, it is possible to cool down single areas and make them unusable for geothermal energy winning. Strictly technical seen geothermal energy is not renewable, but in practise it is. A special form of geothermal energy is ocean thermal energy conversation (OTEC) where the temperature difference of seawater in different depths is used to generate electricity.

2. Geothermal power station

One of the first geothermal power stations was built at Landrello, in Italy. Geothermal power use hot steam to drive a turbine that spins a generator. This could be done in two ways. The First method is to use steam that comes out of fractures in the earth to directly drive a turbine. The second way is to pump hot water (about 200°C) out of the ground and allow it to boil as it reaches the surface to drive a turbine. The condensed steam is pumped back in the underground. Geothermal power plants are mostly located near geysers or volcanic areas, where molten rock is very close to the surface.

2.1. Advantages

- Geothermal energy does not produce any pollution.
- Once you have built a geothermal power station, the energy is almost free. It only needs a little energy to run the pump, but this can be taken from the energy being generated.
- The available energy is practically unlimited.

2.2. Disadvantaged

- Not many places are available where geothermal power stations could be built, because you need suitable rock in depth and rock where you can drill through at the surface.
- It could happen that geothermal sites "run out of steam".
- Hazardous gases may come up from the underground.

3. Geoexchange

Geoexchange systems use the Earth's natural heat to heat or cool a building or to produce hot water. The system itself only requires a small amount of electricity and so it has very low operating costs. The Earth's temperature remains relatively constant throughout the year and the different seasons.

3.1. How it works

Geoexchange systems contain out of an exchanger, an earth connection – the loop, and an electrical pump. The pump pumps water through the pipes, which are installed in different types of loops under the earth. The water absorbs the heat of the earth and

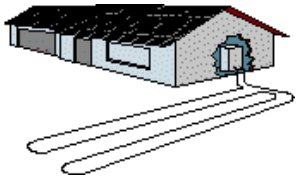
with the help of the exchanger the water, for hot water or for the heating system of the building, is heated. Additional the heat, produced by the pump itself, is also used to heat the water. The length of the loops depends on the type of loop, local climate, landscaping and the soil condition.

3.2. Type of loops

As mentioned above there are different types of loops. The most common versions are horizontal or vertical installed loops. Also often used is an open loop system, which needs a connection to the ground water.

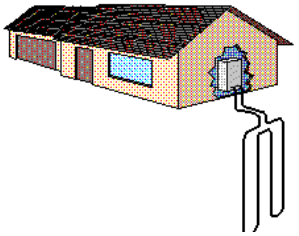
- horizontal closed loop

  A horizontal closed loop is the easiest version of all, because you only need to lay a series of parallel plastic pipes in a depth of 60-120cm under the ground. The best time to do this is before finishing the garden. One disadvantage is that you need a lot of land space.



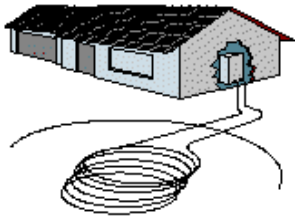
- vertical ground closed loop

  A vertical ground closed loop is installed where no land space is available or for buildings with large heating loads. Also there are not as much pipes as at the horizontal version needed, but they are more expensive. The pipes are dig into the earth until a depth from 45-150m.



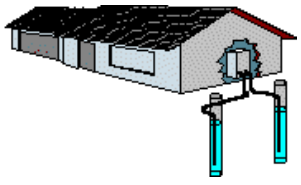
- pond closed loop

  If there is a pond or lake near the home, the easiest and cost-effective method is to lay the pipes in circles on the ground of the pond or lake. This system should be only installed at places where the lowest level never drops below 2m, because the water will get to cold.



- open loop system

  If it is plentiful ground water available it is also possible to build an open loop system. The water is pumped up through a well directly to the house and runs through the exchanger, than it is pumped back into the ground via a second well with a suitable distance to the first one.



All in all it is possible to save up to 30-70 % of the heating costs. And I could confirm that, because I for myself have a open loop system at home and we could save a lot of the heating costs and the system works fine, because I could not remember ever have frozen.

4. References

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- http://www.geoexchange.org/about/how.htm