

Borehole Drilling



Component parts of the Heat Pump



Advantages of Geothermal Energy by Vertical Boreholes and Heat Pump Installation Method

- Payback to cover initial installation costs for domestic house estimate 5 years based on average household temperature at 20° C.
- Thereafter savings per annum of 50-65% **less** than oil heating system (Source Technology Ireland, November 2002).
- No polluting emissions - contributing to a better environment for the future.
- Delivers up to 4 kw of heat for every 1 kw of electricity consumed.
- Lessen dependency on diminishing natural resources of Oil, Gas and Solid Fuel.

Further Information

Sustainable Energy Ireland
www.sei.ie

Irish Geothermal Association
Spa House, Mallow, Co. Cork

International Ground Source Heat Pump Assoc.
Geo-heat Centre, Washington State
www.igshpa.okstate.edu

International Geothermal Association
<http://iga.igg.cnr.it/ireland.php>

Accel Training Programme Geothermal Energy
G.T. Skills Contact:-
Gareth Jones, Project Manager
Geothermal Skills
7 Dundrum Business Park
Windy Harbour, Dublin 14
Tel: 01 2964667

G. T. Skills provides specialist training to users, installers and designers etc involved in Geothermal Energy in Ireland

Government Grant towards renewable energy totalling €27m. Details of scheme and application forms are available from Sustainable Energy Ireland website. www.sei.ie

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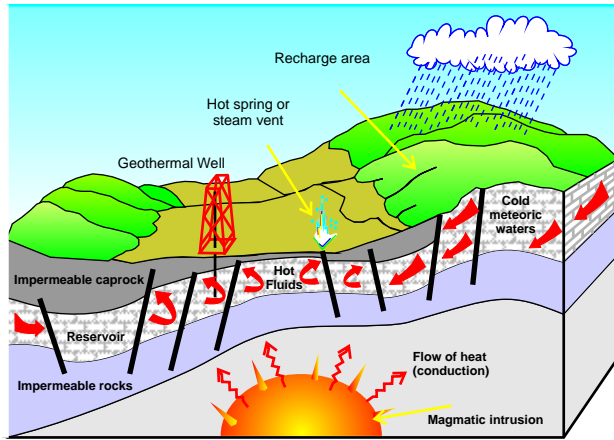
GEOTHERMAL ENERGY



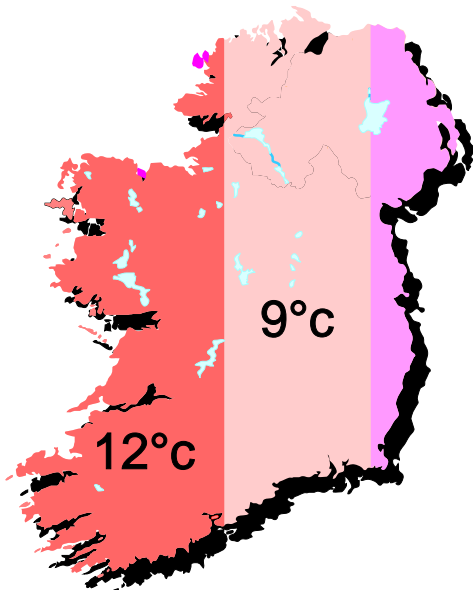
Don't sit on it - Tap into it!

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Where is Heat Energy derived from?



The above diagram describes the mechanism in underlying geothermal systems. Heat is supplied at the base of circulation system. Cooler recharge water from the surface of the earth's gravity feeds downwards through the earth's sub-layers and through a process of fluid convection, hot fluids rise to the upper part of the system ie entering into the groundwater table. It is estimated that shallow groundwater in Ireland has a temperature range between 9° & 12° c.



Ireland is sitting on Geothermal Energy

How to 'Tap' into Geothermal Energy

The essentials of a Geothermal solar system consist of two main parts:-

1) A Geothermal Collector Arrangement

To provide a steady flow of heat from the geothermal Solar reservoir eg. Groundwater. The collector system may comprise:-

- Horizontal Array: i.e. a quantity of lay flat pipe generally under soil 1mtr below ground level. The pipes carry anti freeze agent which abstracts soil temperatures through a process of conductivity, **OR**
- Vertical Borehole: One or more drilled boreholes, with a geothermal borehole collector pipe system and geothermal probe i.e. cone shaped fitting at the bottom of the pipe. The open hole is generally back-filled at annulus to the installed collector pipe with a suitable pea shingle (gravel) or high conductivity setting grout.

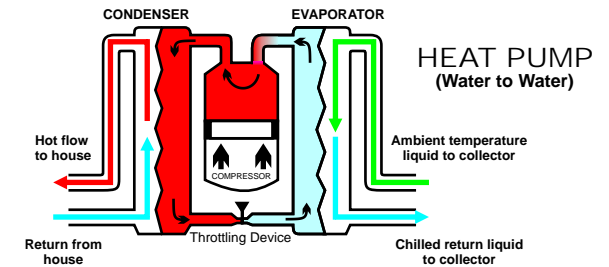
2) The Heat Pump

A heat pump is a refrigeration unit which is used to pump heat from one place to another. When a heat pump is running there is a cooling effect on one side and a resultant heating effect on the other. In the same way as a domestic refrigerator pumps heat from inside the unit for cooling, a geothermal heat pump gently cools the earth and pumps heat into your house. Heat pumps are generally designed for brine-water systems in which there are three circuits. On the cold side is the geothermal collector in which liquid is circulated to extract heat from a source. The second is the refrigerant circuit inside the heat pump which is pumped by a compressor causing a cooling effect on the cold side and a heating effect on the hot side. The third is the internal distribution circuit i.e. underfloor heating, radiators and domestic hot water.

Although heat is transferred from one circuit to another, the contents of the circuit never mix. A refrigerant gas has an extremely low boiling point. When the liquid is circulated through the geothermal collector, the liquid passes through the cold-side heat exchanger and is cooled by the colder liquid refrigerant through a heat exchanger known as the evaporator. This causes the refrigerant to vaporise and passes upward to the compressor which then

pressurises the vapour and causes high temperature. The gas is then pumped through the hot-side heat exchanger known as the condenser which transfers heat to the internal distribution circuit.

As the water absorbs heat from the refrigerant gas it causes it to condense like condensation on a window. It turns back to liquid form and passes through an extremely small opening in the throttling device and undergoes a sudden drop in pressure and resultant drop in temperature. This cold boiling liquid is pumped into the bottom of the evaporator where the whole process is repeated.

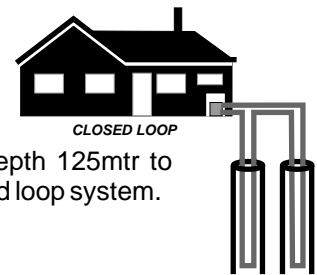


Vertical Borehole Installation

Subject to site hydrogeology, this will determine the type of collector system to install:

Closed Loop:

Geothermal pipes installed in vertical borehole eg estimate depth 125mtr to 150mtr bgl within a closed loop system.



Open Loop:

Submersible pump pumping direct water feed from source within a high yielding vertical borehole into heat exchanger unit to extract heat energy transfer and discharge "cooled" water into either open drain or pump into second discharge well.

