

Breaking New Ground

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Ireland has ambitious targets for renewable heating by 2020. We are looking at reaching 12% of our thermal energy from renewable sources according to the Irish Government's Energy White Paper - Delivering a Sustainable Energy Future for Ireland. In 2007 we were at 3.4%. This is a formidable target so as a country, we need to get moving. But is the answer just beneath our feet?

In Ireland, the occurrence of any one of three scenarios will spark major change in thermal heating:

- the Russian Companies turn off the gas line to Europe;
- the EU CO₂ credits increase in price, severely limiting coal;
- the barrel of oil price increases significantly.

We are very vulnerable to external changes beyond our control. As fossil fuels become scarcer around the world over the next thirty years, the consensus view among experts is that prices will increase for gas, coal and oil.

A new exciting trend is to move toward geothermal energy, which is heat energy that resides in the ground. A comprehensive MIT-led study of the potential for geothermal energy within the United States found that mining the huge amounts of heat that reside as stored thermal energy in the Earth's hard rock crust could supply a substantial portion of their electricity. This would be at competitive prices and with minimal environmental impact. This study is concerned with deep geothermal drilling. The power stations tap into the hot core of the earth, especially in geothermal hot spots along tectonic plate boundaries. This is an option; drilling companies are looking into this technology for use in Ireland.

Domestic

However, there are domestic geothermal heat pumps on the market. Widely used in rural America and popular in Scandinavia and Germany, this technology extracts heat from the earth close to the surface. It is solar energy which has been absorbed by the earth's surface over thousands of years. The earth's crust, the outermost shell of the planet, is a good insulator. Below approx 10m deep, the

ground temperature will stay at 11°C to 13°C. In effect, the heat is lying below our feet.

Efficient Heating

Electricity drives heat pumps which extracts this heat. The geothermal heat pump is effectively a circulating liquid operating in a similar fashion to a fridge. It moves heat from one source to another. For heating a room, the ground is the heat source and the room is the heat sink. A plastic pipe is installed in the ground in a vertical or horizontal loop. Antifreeze liquid, such as Freon, is pumped through this closed loop pipe. A heat exchange occurs across the pipe. The Coefficient of Performance, COP, can be as high as 6. This is a measure of the amount of useful heat extracted for the electricity used. Stated in other words, putting in one unit of electrical energy can yield an output of six units of heat energy. This is very encouraging as a typical electric heater has a COP of only 1.

Geothermal heating systems are often used with under floor heating systems. This means toasty floor tiles as heat rises from the floor. This type of system generally provides a lower temperature, more comfortable heat than other forms such as oil boilers. It can be switched on automatically during the night to heat the tiles underfoot. With the large surface area, greater than a radiator, it does not have to reach very high temperatures to heat the room. A 1m² radiator may have to reach 70°C to adequately heat a room. Whereas a heating system with a ground space of 3m² may only need 30°C to heat the same room. These lower heating temperatures can be advantages in some buildings, such as a crèche or nursing home, as there is no longer the danger of skin burns. The flipside of this is that under floor heating works well with tiles, but not so well with carpets or wooden floors.

Benefits

The benefits of widespread implementation in Ireland are numerous. Carbon taxes are expected in the next budget which will drive up the cost of heating home using fossil fuels. Used in conjunction with a sufficiently insulated building, a geothermal heat pump is an efficient, cost effective and environmentally friendly form of heating. It has the significant advantage over intermittent renewable energy such wind and solar, as they can run continuously day-and-night if needed. The condenser which sits above ground runs very quietly. It has minimal visual impact, as the heat transfer occurs below the ground. The initial cost is can be more expensive than traditional heating – between €12,000 and €16,000. But the expected life-span is about twenty years. On the whole, the payback period looks to be about 10 years depending on numerous factors,

such as your daily heating needs. After that period, savings go straight into the owner's pocket.

Concerns

These advantages must be offset against various considerations when installing the ground source heat pump. Domestic sites are widespread but must be assessed individually for suitability. The ground element would ideally be set in a south-facing direction so the sun's energy can replenish the soil's heat. Also a well-irrigated area is also preferable as this will help the heat transfer. A second consideration is that repair work will be more costly. Albeit a growing technology, this is a relatively new technology to Ireland. Consequently, repair services will take time to come into full operation.

Conclusion

As the geothermal heat pump continues to grow in popularity, the initial costs and repair costs will decrease. This is a technology that holds a lot of promise which will help us meet our targets to move away from thermal heating, and provide for a safer, more independent heating system in Ireland.

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