



Energy Efficiency Business Support



Geothermal energy

Geothermal energy sourced from the earth and the natural decay of rocks is a promising source of heat

Geothermal heat is still largely untapped in Scotland. Partly due to the country being situated in the middle of the Eurasian continental plate, far from any seismic zones. This makes it a less obvious heat source than in countries like Iceland or New Zealand, where it literally bursts out from the surface of the earth. But if you drill down a little bit, there's significant energy that could be harnessed.

Ground source heat pumps are often marketed, confusingly, as geothermal heat pumps. Actually, they're not using geothermal energy. Rather they use heat that's found in the top layer of the ground – down to about 100metres – that comes from solar warming. In this guide, we refer to geothermal energy as the heat generated from the earth's core and the natural decay of radioactive material in the earth's crust.

There are three main sources from which this heat energy can be tapped: water from disused mines, hot sedimentary aquifers and granite rock. As a general rule, the deeper you dig, the hotter the temperatures. Temperature increases linearly with depth into the earth's crust, something known as the geothermal gradient. There are some exceptions where the energy is much closer to the surface. For the most part though, if you go deeper than a few kilometres, sometimes referred to as deep geothermal, the heat accessed can be more than 100°C. For some projects, this is even hot enough to produce electricity as well as heat. Though generally, higher temperatures are required.

Shallower geothermal systems access heat from a few hundred metres depth to a few kilometres. The heat accessed at these depths may need to be raised using heat pumps installed at the surface, depending on the required delivery temperature. While it's a renewable source of energy, care needs to be taken in design of the well so that heat isn't extracted at too great a rate. Otherwise the resource will cool over time.

Some geothermal research projects are already underway in Scotland. In the Gorbals in Glasgow, digging of the first borehole got underway in December 2018 as part of a 15-year research project. The project aims to test the potential of geothermal energy from disused mines under the city. Run by the Natural Environmental Research Council (NERC) and British Geological Survey (BGS), the project is based at the newly opened Glasgow Geothermal Energy Research Field site in the east of the city. A number of boreholes are being dug at various depths to research whether or not such energy schemes can be scaled up and run sustainably long term. Smaller mine water schemes in Shettleston and Lumphinnans in Fife have already been running successfully for over a decade. The British Geological Survey believes geothermal heat from mines has the potential to provide 40 per cent of Glasgow's heat requirements.

The UK's first geothermal plant was started in Southampton in the late 1980s. A borehole was dug in the middle of town at a depth of 1800 metres with the water

rising naturally to within 100 metres of the surface. It's then pumped to a CHP-powered heat station where heat pumps transfer the heat to clean water for use around the city. It provides 18% of the heat required for the district heat scheme. The remainder is a combination of natural gas and fuel oil.

Also on the south coast, the Eden Project in Cornwall has been granted planning permission for a 4MW geothermal power plant. This will access heat from underground granitic rock. Known as an engineered geothermal system (EGS), it involves the drilling of two boreholes, each around 25cm wide, into the rock to a depth of about 4.5km. Cold water is injected down one borehole, picks up heat from the rock, by way of a fracture reservoir, and is pumped back up to the surface in a second borehole at about 180°C. The heat is removed and the cooler water flows back down again to be re-heated in an endless

process. This is known as a two well, or doublet, system. The heat generated will be used to provide electricity and heat for 4000 houses.

A recent feasibility report for the Aberdeen Exhibition and Conference Centre highlighted the possibility of using single well boreholes, where water flows down and back in closed-loop pipes. This deep geothermal single well (DGSW) system is a simpler method than the two well system. Ultimately, ground conditions determine which system is best suited.

Geothermal energy is hugely exciting and promises much. However, it's early days and there's still a lot of research required before it's used on a widespread basis. Geothermal systems are eligible for Renewable Heat Incentive (RHI) payments. ●



AT A GLANCE

- Good potential for accessing untapped energy
- Still a lot of research needed
- Early schemes show promise
- Suited to large scale projects