

Releasing Our Geothermal Potential





Mining the UK's geothermal potential: towards a local carbon neutral heating solution

25% of the UK built environment lies above abandoned coal mines

Over half of UK energy demand is used to produce heat.

Most of this is produced using gas.

We currently import more than half of the gas we use.

This raises concerns about climate change and future energy security. We need to find alternative sources of low carbon heat.

Geothermal energy comes from heat produced at the Earth's core. It is normally associated with volcanic regions such as Iceland or New Zealand. However volcanoes are not essential for geothermal energy. Away from volcanic regions, most countries can access geothermal albeit at lower temperatures.

Temperature increases by 25-30°C with each kilometer depth. This means that a well drilled to 2km would reach a temperature of 50-60°.

The key thing is finding water at depth, which is essential for bringing heat to the surface.

The UK has a range of geothermal sources

Deeper than 1km, temperature 35°C or more:

- Sedimentary basins
- Radiothermal granites
- Buried cave (karst) formations
- Onshore and offshore hydrocarbon wells

Shallower than 1km 12-20°C:

- Flooded abandoned mines

Using heat from former coal mines

Upfront cost and perceived risk is the biggest barrier to deep geothermal development. Technology exists to drill deep wells but it is difficult to predict how much water is present at depths of over 1km.

Abandoned mines are shallower than deep geothermal systems, this means that development risks are significantly reduced because we know former mining infrastructure can flow water through existing tunnels and shafts.

Using heat from water warmed in abandoned mines provides a unique opportunity for the UK. Not only to decarbonise heat supply, but also as a means of revitalising communities affected by the decline of coal mining, through building a sustainable local source of energy to heat homes, community facilities and businesses.

25% of the UK built environment lies above abandoned coal mines.

Flood water from abandoned coal mines could provide enough geothermal energy to meet the UK's heat needs for over 100 years.

Existing geothermal systems in UK and Europe

There are over 30 mine energy projects operating globally at a range of scales and for a range of applications, this demonstrates the versatility and longevity of this energy source.

Heerleen in the Netherlands

has been operating a district mine energy systems for over a decade this receives international renown for its innovative 'demand-supply' system www.mijnwater.com/?lang=en. The renewable energy source has served as a heat source (for heating) and heat sink (for cooling) since 2008. The water, collected from five wells, is transported via an underground exchange station and pipe network and is currently supplied to six locations in Heerleen.

Lanchester wines

in the North East of England is the first business in the UK to draw heat from disused coal mines to heat over 30,000m² of warehouse in Gateshead. www.lanchesterwines.co.uk/what-we-do/sustainability Durham University has connected Lanchester Wines with the Heerleen project in the Netherlands to help them optimise the performance of their system.

A way forward

Research is needed into the best way of integrating mine water energy into existing and new energy systems. This work is being carried out at Durham in partnership with the Centre for Energy Systems Integration (CESI) led by Newcastle University.

Development of policies and governance is required to promote the development of mine energy and the sale of heat. This requires re-thinking how heat is used and supplied to ultimately reduce our reliance upon natural gas and decarbonise heat.

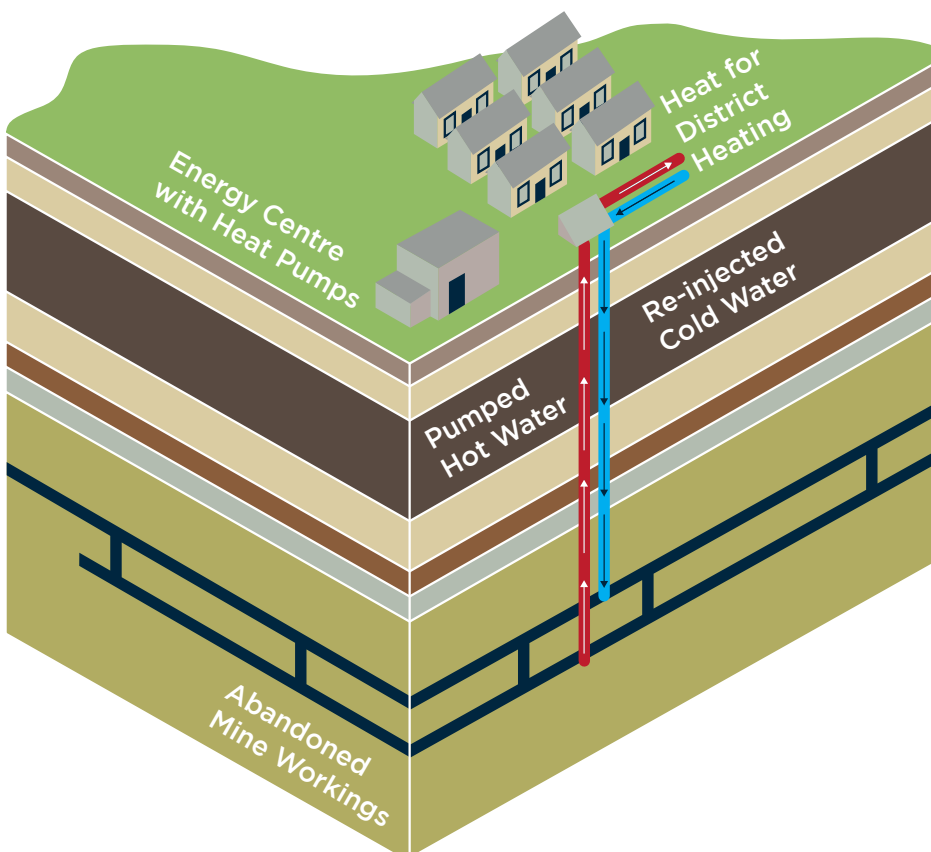
Heat from mine water has huge potential to support clean growth elements of the industrial strategy. Provision of low carbon heat for local homes and businesses could create employment opportunities through regeneration of redundant coalmines and their local communities and through developing heat storage systems and facilities.

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'we are the first business in the UK to draw heat from disused coal mines – we have capability to draw over 110 litres of water a second.'

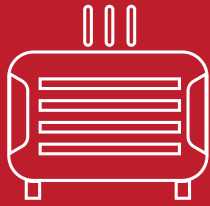


Our recommendations:

1. The Government must urgently develop a clear strategy for decarbonising heat supply as a key element of its plans to meet the UK's carbon reduction plans under the Climate Change Act and Paris agreement commitments.
2. Review local and national planning policy to include geothermal for all new developments where possible
3. License geothermal in a similar way to oil and gas to attract investment and reduce development risk
4. Extend Contracts for Difference to cover large heat schemes as well as electricity generation projects
5. Develop new regulation for heat so that heat markets can develop whilst consumers are protected.

The Heat Beneath Our Feet

How abandoned coal mines could provide a source of low-carbon heat for the UK



Over 50% of UK energy use is to produce heat

Most of this is produced using gas. Low-carbon sources of heat are needed to help address climate change.

Over 50% of the gas we use to generate heat is imported

This raises concerns about energy security.



100+ years of heat from former coal mines

Flood water in abandoned coal mines could provide enough geothermal energy to meet the UK's heat needs for over 100 years.

Heat from mine water

Warm mine water can be pumped through heat pumps to extract the heat, before being returned to the ground.



Tried and tested

Mine energy is already tried and tested. There are over 30 mine energy projects operating globally, on a range of scales.