



1922 Business, Energy and Industrial Strategy Backbench Committee

INQUIRY 2:

Deep geothermal and Mine Water: Valuable new sources of low carbon heating.

Rt Hon. Dame Andrea Leadsom MP, Chairman

Jo Gideon MP, Vice Chairman, House of Commons

Rt Hon. Lord Peter Lilley, Vice Chairman, House of Lords



Research and Secretariat support provided by The Purpose Coalition

“Deep geothermal has the potential to help us go green, spread the investment to do that more widely and create jobs and opportunities in left behind towns and communities. The decarbonising challenge is so great we need to be using all the tools we have and I hope government can look closely at how deep geothermal is racing ahead in other countries and take steps to ensure it can do the same here. I want to thank the Committee for taking the time to listen to industry and those pioneering this technology and for recognising it’s potential. The committee has put forward some concrete ways forward for the UK.”

Dr Kieran Mullan MP

“As the UK transitions to Net Zero I firmly believe that geothermal energy from abandoned coal mines presents a perfect opportunity to heat communities throughout the old coalfield areas. Not only would this be a great way to produce an endless amount of heat at constant prices but it would also be a wonderful legacy to the mining industry that kept the whole of the UK warm for hundreds of years.”

Lee Anderson MP

Opportunities from deep geothermal and mine water heat

Deep geothermal and mine water heat have the potential to help drive the government's levelling up and net-zero ambitions, create new jobs and tackle regional inequalities. Key political benefits include:

- 1** The legacy of the UK's proud history of coal mining can be to produce low carbon baseload heat for homes and businesses into the future.
- 2** Under our net-zero strategy, it is recognised that decarbonising home heating is one of the bigger challenges. Deep geothermal and coal mine heat could play a strong role.
- 3** The geographic location of disused coal mines and the geology of the UK is strongly correlated with the priority areas for levelling up. The prospect for jobs and growth in these areas is very compelling.

Setting the scene

Britain's energy trilemma remains in the headlines as government and industry aim to find a balance between keeping the lights on, keeping energy bills down, and decarbonising.

The Committee's second inquiry took place over two evidence sessions on Tuesday 10th May and Tuesday 24th May, with the aim of exploring new sources of low carbon heat to improve Britain's energy security. Meetings were open to all backbench Conservative MPs.

The Committee took evidence from industry and policy experts, as well as Members of Parliament on the potential of both deep geothermal and mine water to provide new sources of heat for homes and businesses. The Committee concluded that these technologies can complement other zero and low carbon sources, and taken together can play their part in improving Britain's medium term energy security.

Policy Proposals

The Committee heard a number of policy proposals during the sessions, and concluded that taxpayer funding should not be taking the risk on the development of geothermal resources. Private sector investors should however be encouraged to take investment risk on both technologies, and this could be done via a proactive government policy towards geothermal, which could include:

- 1.** BEIS could develop a new tariff or Contract for Difference (CfD) to ensure a guaranteed price for both deep geothermal and mine water heat, giving confidence to the private sector to invest in such projects. A previous government tariff was withdrawn, but witnesses advise a new tariff would be strongly welcomed.
- 2.** BEIS could provide additional funding to the British Geological Survey to enable further technical mapping of suitable areas for deep geothermal exploration. The Coal Authority could also be funded to increase their capacity to support the development of mine water heating.
- 3.** DLUHC could encourage local authorities to consider geothermal resources when assessing local energy needs, particularly for new housing developments.
- 4.** BEIS could develop licensing permits for geothermal exploration, similar to the way licenses are awarded for oil and gas.

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An introduction to deep geothermal and mine water heating

Dr Kieran Mullan MP (Crewe and Nantwich) and Lee Anderson MP (Ashfield) made the case for deep geothermal and mine water heat respectively, based upon their own constituency interests. The Committee is extremely grateful to them for their knowledge and experience in this subject.

Deep geothermal

Deep Geothermal remains a relatively new technology in the United Kingdom. Deep geothermal energy utilises the high temperatures and pressure deep inside the earth, with water and/or steam carrying geothermal energy to the Earth's surface. This carries heat with temperatures typically ranging from between 50°C and 150°C. There are currently no fully operational deep geothermal plants in the United Kingdom, but there are two close to completion in Cornwall.

The technology has been extensively utilised abroad, such as in Iceland, where deep geothermal accounts for 90% of heating supply. Iceland's unique geology provides advantages but the technology is also further ahead in other comparator countries where it is supported by the state in a variety of ways which is causing the UK to fall further and further behind.

Suitable regions for this deep drilling have been identified through British Geological Survey data and more research is being done to further specify the most promising sites. Whilst drilling deep geothermal wells does create tremor risks these are typically at a level well below the level at which they are noticed by residents as the process is absent of the high pressures deployed for extracting shale gas. No problematic tremors were identified during the drilling phases of the Cornwall sites and the technology has widespread support from environmental groups. This will need to be explained to local communities to secure their support.

Mine Water Heating

Mine water heating makes use of warm water lying within disused mine works across the UK. The water has been warmed by natural processes. Upon the closure of many coal mines across the UK, mines were generally sealed. Water has, however, reentered over time. This has produced a bed of water under the surface of the earth which has been naturally warmed, and can be used in order to heat buildings, or for agricultural use.

A relatively shallow well is drilled into the disused mine works, water extracted and put through a heat exchanger to avoid contamination. The temperature of the water is between 12°C and 20°C, so could be used in industry, particularly in, for example, poly tunnels or large warehouses that require only low temperature heating. For home heating, mine water heat would need to be combined with a heat pump in order to boost the overall temperature.

The Levelling Up story

As part of the UK's transition to net-zero, different natural resources can be harnessed in different parts of the country. The Committee agreed that it is important the government does not try to 'pick winners' in terms of new energy sources, but rather explores a variety of opportunities with different potential across the country.

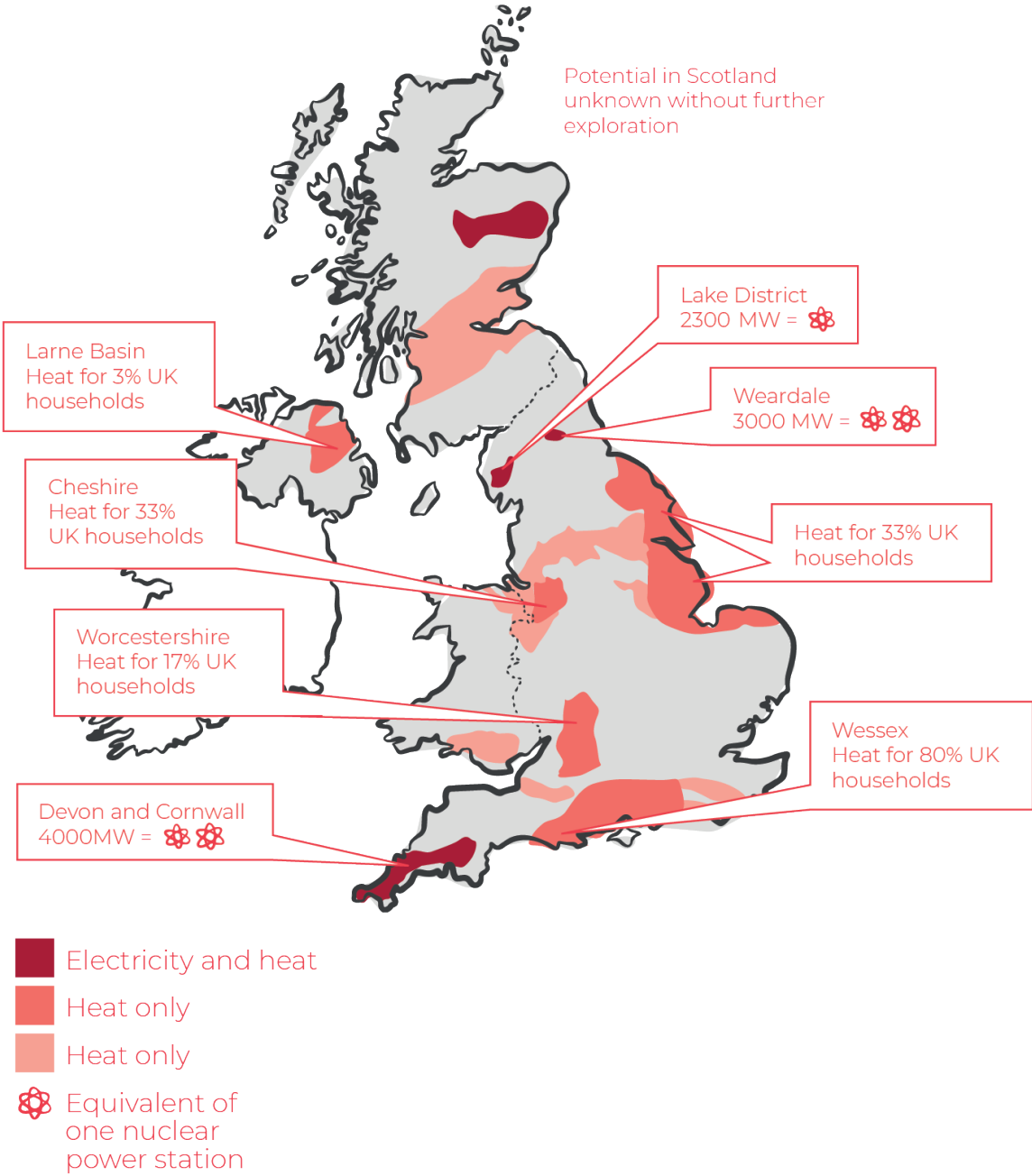
Mine water heating is a potential resource in all parts of the country with a mining heritage - the Midlands, South Yorkshire, North East, central belt of Scotland and Wales. There is a high correlation with the levelling up priority areas, and also a positive story in terms of using an old legacy carbon intensive industry for generating new, low carbon heat.

Deep Geothermal resources are potentially available across the country but with an emphasis on places such as the South West, North West and East, Scotland and Northern Ireland. Projects could bring jobs and growth as well as low carbon heat sources right across the UK.

Figure 1: Map of reported coal mine entry points
SOURCE: Coal Authority, 2022



Figure 2: Map of geothermal potential across the United Kingdom. SOURCE: Eden Geothermal, 2022.



Developing the domestic market

The Committee heard examples of projects for both deep geothermal and mine water heat in the United Kingdom, and abroad. There are a number of new low carbon technologies currently vying for the public's attention, with the best known being solar panels and wind farms.

It is therefore clear that the benefits of emerging heat sources such as deep geothermal and mine water heat will need to be made clear to consumers to provide reassurance of its safety and effectiveness.

Throughout the inquiry it was clear that an effective way of using heat from deep geothermal or mine water is in new housing developments, allowing the heat network to be built as part of the wider development, and thereby reducing the capital outlay that would arise from retrofitting existing buildings.

The Committee heard examples of the Heerlan mine water project in the Netherlands, and of a new development in Gateshead, in the North East of England. These projects heat 2,500 and 1,200 homes respectively. Such implementation has the benefit of creating an immediate domestic market and encourages consumers to 'buy in' from day one.



Case Study Heerlen, Netherlands Mine Water Heat

The Committee heard direct representation from Rene Verhoeven, an Independent Consultant in the Netherlands, as an example of where mine water heat is working in practice.

The project in Heerlen heats around 2,500 homes, with mine water at between 15 and 30 degrees extracted for heating. A heat pump then provides a further boost, if necessary, ensuring a total acceptable level of heat.

The Netherlands has introduced an energy price cap. As a result, consumers do not pay more than they would with heating from a gas boiler. The Committee heard how the scheme lends itself during construction for use in new housing, because of the need for a whole heat network to be established.

Case Study Gateshead, United Kingdom Mine Water Heat

The Committee also heard a case study from Gateshead, in the North East of England, where the local Council has worked with the Coal Authority and government in order to provide mine water heating for 1,250 new homes.

The project utilises a key aspect of Gateshead's traditional mining heritage - something which is a source of pride for local communities and which symbolises the transition from traditional forms of energy, towards new low carbon source of heat.

The Council received a £6m government grant in order to be able to double the size of its heat network, installing 5.5km of new heating pipes in the town centre to supply 1,250 houses, a care home, Gateshead International Stadium as well as some council-owned buildings.

Regulatory reform

The committee heard from a number of witnesses who made clear there is a need for regulatory reform, in order to develop licensing permits for heat energy to secure investor confidence in the long term.

In December 2021, the government signalled its intention to appoint Ofgem as the heat networks regulator. The Committee agreed that it is important the regulator works with the government as a matter of urgency in order to design a regulatory framework to attract the necessary investment, whilst ensuring customers pay a fair price.

It was suggested, and the Committee generally agreed, that the regulator and government should consider developing licencing permits in the same way as permits are awarded for oil and gas.

Collaboration with local authorities

The Committee heard from a number of witnesses who made clear the importance of local authority collaboration and empowerment in the implementation of new heat sources, as demonstrated by the case study from Gateshead. The Committee heard extensive evidence from Stoke on Trent City Council, who have conducted a seismic survey across the city in order to establish a target for geothermal heat.

A number of Committee witnesses suggested that the Department for Levelling Up, Housing and Communities should provide direct support to local authorities to be able to give greater consideration to both deep geothermal and mine water heat when considering their local energy generation needs, and in developing a local authority housing plan.

Case studies demonstrate that these new forms of heat generation are likely to be most effective when implemented alongside new developments, and as such, the Committee strongly urges the government to work closely with local authorities in order to ensure the effective and smooth implementation of new low carbon sources of heat in order to improve Britain's energy security.

Community consent

The Committee was also in general agreement of the importance of community consent and reassurance in the transition towards new sources of heat and energy, particularly in light of previous concerns over the process of hydraulic fracturing.

Industry representatives of both geothermal and mine water heat reported little or no community concern over such projects. However, the Committee was in agreement that as such projects are expanded and receive greater attention and scrutiny, it would be important to provide reassurance over the safety and sustainability of such projects. The Committee notes, in particular, that geothermal projects could face similar opposition to that experienced by drilling for shale gas. A public reassurance campaign will need to take place within local communities who adopt deep geothermal, in particular.

Costs and subsidies

During both evidence sessions, it became clear that there is a need for the government to provide an incentive in order to get new heat source technologies up and running, given the high start-up costs and potential risks associated with investment by the private sector.

As with any new energy source, incentives made available by the government will play a significant role in developing the UK market for both deep geothermal and mine water heat. The government has precedent for providing subsidies to emerging energy technologies, including solar and wind.

The geothermal industry estimates it needs a £1.1bn government investment over the next 25 years for 30 initial sites across the United Kingdom, including in Cheshire, Cornwall and in Northern Ireland, with the potential to meet approximately 20% of the UK's current heat demand, as well as to strengthen energy security.

Value for money for taxpayers

There was significant concern from members of the Committee to ensure costs to the taxpayer were kept to a minimum, and to avoid a situation whereby government takes the vast majority of investment risk, whilst private developers benefit from the profits.

The Committee generally agreed that a Contract for Difference (CfD) scheme could be used for the development of deep geothermal and mine water heat. The government should consider allowing these technologies to bid into the existing CfD auctions.

It should be noted that - in comparison to mine water heat - deep geothermal energy is a relatively new technology in the United Kingdom. Given the logistical challenge of drilling deep into the earth's surface, costs - and potential risks - are higher. The committee noted that any government subsidy would need to reflect this.

Pricing structure for consumers

The Committee notes and understands that the development of new heat technologies are unlikely to reduce bills for consumers in the short term without wider energy market reform. The development of geothermal and mine water heat are crucially about improving Britain's energy security and providing a new, long-term source of baseload low carbon heat. Over time, we would expect costs to reduce as the technologies become more widespread.

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With thanks to:

Dr Charlotte Adams, Principle Manager, Mine Water Heat, The Coal Authority
Dr Corinna Abesser, Head of Geothermal Research, British Geological Survey
Richard Bond, Innovation & Engagement Director, The Coal Authority
Stephen Bowler, CEO, Igas Energy PLC
Gareth Farr, Head of Heat and By-Product Innovation, The Coal Authority
Prof Jon Gluyas, Executive Director, Durham Energy Institute
Augusta Grand, Executive Director, Eden Geothermal Limited
Dr Ryan Law, Founder & CEO, Geothermal Engineering Ltd.
Lisa Pinney, CEO, The Coal Authority
Rene Verhoeven, Independent Consultant

And the following Parliamentarians who contributed extensively to our sessions:

Dr Kieran Mullan MP, Crewe and Nantwich
Lee Anderson MP, Ashfield