

September 2020

DEEP IMPACT: UNLOCKING THE POTENTIAL OF GEOTHERMAL ENERGY FOR AFFORDABLE, LOW-CARBON HEATING IN THE UK



Dr Corinna Abesser

British Geological Survey, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB, United Kingdom

Contact: cabe@bgs.ac.uk

The UK was the first G7 country to sign a net-zero carbon target into law. This is an especially challenging goal when it comes to reducing the carbon cost of heating. Currently, 44 per cent of the UK's energy demand is for heating homes and other buildings, which accounts for 37 per cent of the UK's greenhouse gas emissions. Thus, a transition to renewable, decarbonised heat will make a major contribution toward our net-zero ambition.

Deep geothermal energy exists in many parts of the UK. Where they coincide with towns and cities, geothermal resources can provide affordable and secure low-carbon heating to thousands of homes, offices and other buildings. In some parts of the UK, deep geothermal can also supply low-carbon electricity. However, this geothermal potential is largely unfulfilled in the UK. Evidence from countries that have successfully developed this resource shows that some key policy interventions and incentives are required to kick-start the utilisation of low-carbon, sustainable heat from deep geothermal sources. Once up and running, however, the industry can be economically sustainable.

'Deep geothermal energy exists in many parts of the UK . . . can provide affordable and secure low-carbon heating'

Challenges being addressed

The potential benefits that deep geothermal energy can bring to the UK are considerable. They include a substantial contribution to the reduction in CO₂ emissions associated with heating homes and other buildings, reduction in fuel poverty, economic impetus and job creation.

So far, development of deep geothermal resources in the UK has been very slow. Experience in other countries endowed with similar resources suggests that some key policy interventions and incentives are needed to provide initial encouragement for upscaling the utilisation of the geothermal heat resource.

Proposed solution

The success of geothermal developments in countries such as Germany and the Netherlands is closely linked to their governments' commitment to supporting this technology through policies, regulations, incentives and initiatives. This success is specifically linked to the availability of a long-term, stable regulatory framework and the willingness of the state to share economic risks during the early stages of development.

'... success of geothermal developments ... is closely linked to ... **governments' commitment to supporting this technology**'

Recommendations

Government support is particularly crucial at the onset of geothermal development in order to encourage and channel financing from the private sector. This support can be reduced once the market becomes more established and investor confidence grows.

In order to deliver benefits from deep geothermal development, a number of policy interventions are recommended. These include:

- risk-sharing and funding support, for example through public insurance schemes, long-term guarantees for financial incentives and effective interventions to achieve renewable heating targets

- streamlined regulation and the development of a national licensing system for geothermal energy
- quantifiable targets that link the advancement of geothermal energy to government net-zero goals and policy
- publicly funded geothermal research and exploration, along with data-sharing obligations, that enable a rapid increase in early stage geothermal exploration, innovation and technology development

Evidence

Exploitation of deep geothermal energy is based on established technologies that are already employed in countries such as Germany, France and the Netherlands. All have a similar geology and geothermal potential to the UK. In these countries, large-scale exploitation of geothermal energy from depths of more than 500 m underground heats homes, offices and public buildings via district heating networks. Deep geothermal also provides energy for industrial sites such as food processing and, in some cases, electricity generation.

‘... deep geothermal energy **reduced** ... **carbon emissions** ... (and) provides **considerable economic stimulus**’

Utilisation of deep geothermal energy reduced Germany’s carbon emissions by more than 1.7 Mt CO₂ equivalent in 2017. It is estimated that the geothermal industry also provides considerable economic stimulus to the German economy (€13.3 billion and more than 22 000 jobs since 2000).

Supporting information

Geothermal energy is the energy stored in form of heat below the Earth’s surface. Its potential is inexhaustible and comparable to that of the Sun. A number of ways exist by which geothermal energy can be subdivided, but experts have yet to agree on standardised definitions. In this briefing paper, we have adopted the definition of the UK government, which refers to heat resources derived from a depth of more than 500 m as ‘deep geothermal’.

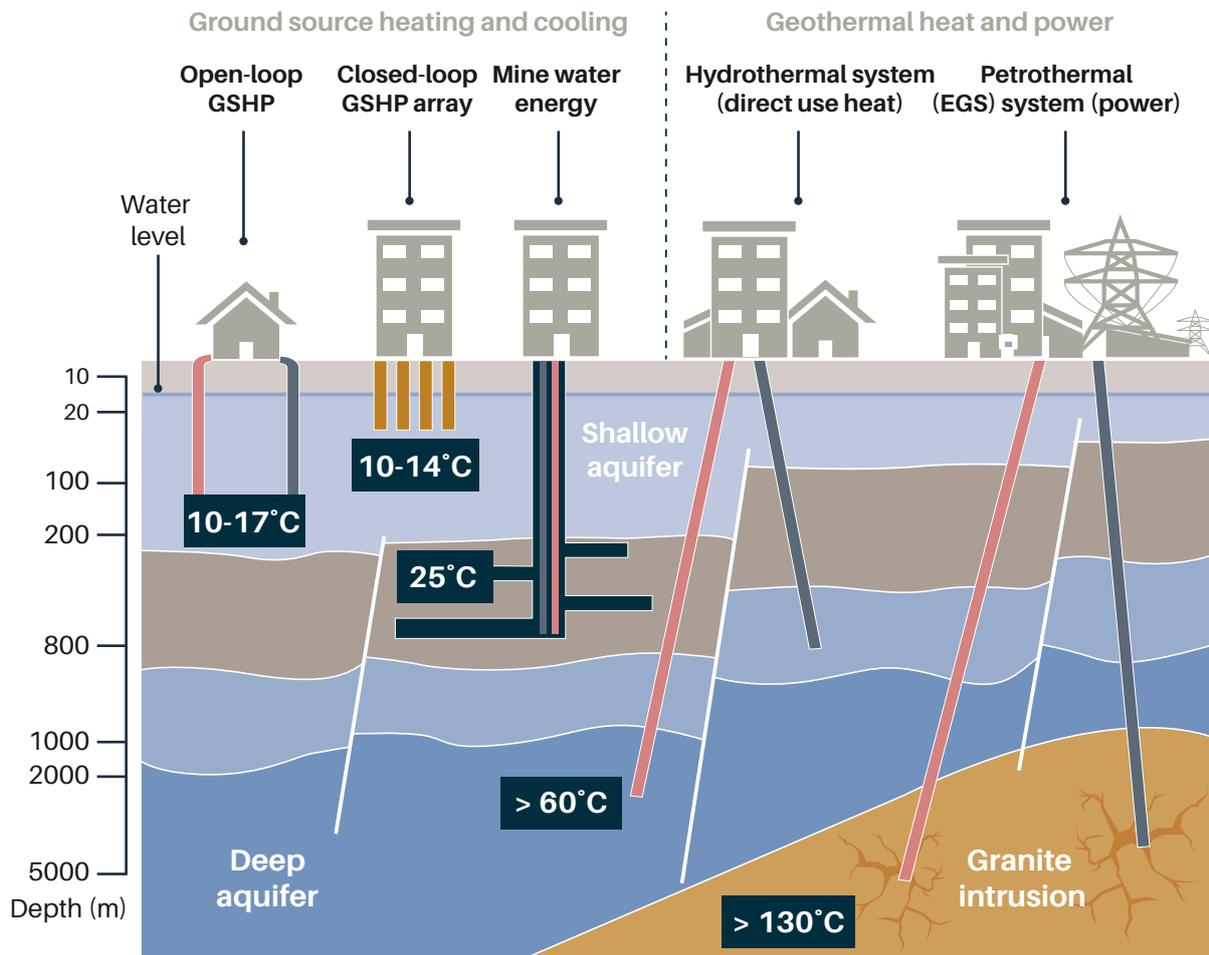


Figure 1 Different ground source (left) and deep geothermal (right) energy technologies.

Energy is extracted from two main types of deep geothermal systems: hydrothermal systems, which directly use heat only, and petrothermal systems (also referred to as enhanced geothermal systems or EGS), which use heat to generate electricity (Figure 1).

Further details

Abesser, C, Busby, J P, Pharaoh, T C, Bloodworth A J, and Ward, R S. 2020. Unlocking the potential of geothermal energy in the UK. British Geological Survey Open Report OR/20/049. 22pp. (Nottingham, UK: British Geological Survey.)