2020 United Kingdom Country Report

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1. Introduction

Figure 1.1 The Dawdon mine water treatment scheme that is being developed to supply mine water heating to a new housing complex in the northeast of England. Photo credit: The Coal Authority

In March 2020 Covid 19 restrictions were first imposed in the UK in order to limit the spread of the virus. This resulted in three lockdowns during the year, which had a very serious effect on the economy, including the geothermal sector. Restrictions on gatherings of people and movement within the UK meant that business meetings and conferences had to be held by video conferencing, although many were cancelled or postponed.

The most advanced project in the UK is the United Downs Deep Geothermal Power project (UDDGPP). This project, led by Geothermal Engineering Ltd., is the first commercial project in the UK to develop deep geothermal for power generation. The project aims to utilise the natural permeability of the Porthtowan Fault in the Carnmenellis granite in Cornwall. Drilling commenced in November 2018 of two deviated wells to intersect the fault at two different depths in order to create a closed loop circulation system vertically along the fault. The first well, UD1, has a drilled length of 5275 m (5057 m total vertical depth) and is the production well. The second well, UD2, has a drilled length of 2393 m (2214 m total vertical depth) and will act as the injection well. During the early spring of 2020 injection tests proved promising, but full hydrotesting of the wells has been continually delayed by the Covid 19 restrictions and full testing will not be completed until early 2021. A second, deep geothermal project at the Eden project in Cornwall is situated on the St Austell granite. The project is being developed by Eden Geothermal Ltd., which has shareholders comprising Eden Project Ltd., EGS Energy Ltd. and BESTEC (UK) Ltd. The project is also targeting a deep crustal fracture and an initial well to a depth of 4.5 km will be used to heat Eden's Biomes, offices and greenhouses. Covid 19 restrictions have also held up progress, but the site has been prepared for drilling, which is due to commence in the spring of 2021.

There is increasing interest in the UK in utilising the waters within disused mine systems for their geothermal potential. Although in many cases the temperature of the water will be at normal ground water temperatures, the very high abstraction rates that are possible make disused mine

systems ideal for large-scale open loop ground source heat pumps. At some former colliery sites pumping of the mine waters is already underway for environmental reasons and so they are ideal for geothermal development. Farr et al., 2020, published a research paper on mine water temperatures, which highlighted that at some pumped sites, near surface groundwater temperatures can be raised up to 20 ºC. A company in northeast England, Lanchester Wines, have developed two schemes to heat warehouses from mine waters that have a total installed capacity of 6.5 MWth. Abandoned mines fall under the jurisdiction of The Coal Authority (CA) who are developing geothermal heating schemes at a number of their pumped sites. The three most advanced comprise;

Seaham Garden Village

This is a new development of housing, a school, shops and medical and innovation centres that will have district heating supplied from the Dawdon treatment scheme. The pumped mine water is at a temperature of 18-20 ºC and has a potential heating capacity of 6 MWth.

Hebburn Minewater District Network

This development involves drilling around 300-400 m into the mine workings of the former Hebburn colliery to heat council owned buildings in the town.

Gateshead District Heat Network

In Gateshead, an existing heat network is to be expanded and supplied from the groundwaters within disused mine workings beneath the town. The development is being funded from a grant of £6M from the UK government's Heat Networks Investment Project (HNIP).

The Department for Business, Energy and Industrial Strategy (BEIS) has been supporting the development of district heat networks. This comprises support through the development stages by the Heat Networks Delivery Unit (HNDU) and projects seeking capital support from the Heat Networks Investment Project (HNIP). A number of projects include a geothermal component.

The Glasgow Geothermal Energy Research Field Site (GGERFS) is now operational and available to third party researchers. The infrastructure comprises 12 wells equipped with high resolution monitoring technology. It will enable the UK science community to study the low-temperature mine water geothermal environment at shallow depth.

Single borehole co-axial scheme development has been mainly put on hold, but a research grant has been awarded so that the borehole at Newcastle (previously known as Science Central, but renamed Helix) can be developed to supply heat to commercial and university buildings and around 450 homes.

The geothermally heated Jubilee Pool at Penzance in Cornwall has now opened to the public. The pool consists of a partitioned sub-section of a seawater pool that is heated with an open loop ground source heat pump supplied from a 400 m deep borehole at an inlet temperature of 25 ºC.

In February, the British Geological Survey organised a stakeholder meeting in London to discuss the barriers to deep geothermal development in the UK. This resulted in a briefing paper (Abesser, 2020, https://www.bgs.ac.uk/download/science-briefing-note-deep-geothermal/) that has been distributed to government and business.

Table 1. Status of geothermal energy use for electric power generation and direct uses in Mexico in October 2020.

Electricity		Direct uses	
Total Installed Capacity (MW_e)	0	Total Installed Capacity (MW_{th})	9.5
New Installed Capacity (MW_e)	0	New Installed Capacity in 2019 (MW_{th})	6.5
		Total Heat Used (GWh/yr)	33.3
		Total Installed Capacity Heat Pumps (MW_{th})	776
		Total Net Heat Pump Use [GWh/yr]	1285*
		New capacity installed in 2019 (MW)	57#

These data are from a forecast made in April 2020 based on market trends.

* in calculating the net heat pump use it has been assumed that the hrs/year heating equivalent full load is 1800 hrs/year for domestic systems and 1500 hrs/year for commercial systems.

2. Changes to Policy Supporting Geothermal Development

In March 2019 the government announced a Future Homes Standard to be introduced in 2025. The standard includes a ban on all fossil fuel heating in new homes. It is anticipated that much of the heating requirement will be met from air and ground source heat pumps, district heating and direct electrical heating. Therefore, there is likely to be an increase in the development of heat networks via geothermal sources, which is supported by the HNIP and HNDU funding schemes. In order to ensure market growth beyond the lifetime of HNIP, the Government has also published "Heat Networks: ensuring sustained investment and protecting consumers"[1] which sets out three priorities for the market framework: ensuring consumers receive sufficient protections; building investment in the sector; and maximising the potential decarbonisation benefits of heat networks.

Incentives for renewable heat from geothermal are paid through the Renewable Heat Incentive (RHI) scheme. Rates for domestic and non-domestic GSHP and deep geothermal heat in 2019/20 were:

- Non-domestic GSHP has a 2-tiered tariff comprising 9.68 p/kWh for the first 1314 hours of use (tier 1) and 2.89 p/kWh thereafter (tier 2), paid for 20 years.
- Domestic GSHP tariff is 21.16 p/kWh payable for 7 years, but note that new build properties other than self-build are not eligible.
- Deep geothermal (defined as from a minimum depth of 500 m) tariff of 5.00 p/kWh for 20 years.

[1] https://www.gov.uk/government/publications/heat-networks-developing-a-market-framework

The RHI is due to end between 31 March 2021 and 31 March 2022. In July 2020 the government launched a consultation for the successor scheme to the RHI.

Geothermal continued to be eligible to compete in the Contracts for Difference under pot 2 (less established technologies). Contracts for Difference is a mechanism by which the government buys power from renewable technologies with 15-year contracts.

3. Geothermal Projects Development

3.1 Projects Commissioned

No new projects were commissioned in 2019.

3.2 Projects Operational

The only operating deep geothermal project is in the City of Southampton which contributes heat to an inner-city district heating network. This scheme has been under maintenance, and therefore at reduced capacity.

4. Research Highlights

UK geothermal research is largely concentrated on developing the potential of less conventional resources as deep hot sedimentary aquifers are only found in a few regions and often not in regions of high heat demand. Much research is undertaken within the Higher Education sector, usually as part of PhD programs.

4.1 Selected publications

Abesser, C. (2020) DEEP IMPACT: UNLOCKING THE POTENTIAL OF GEOTHERMAL ENERGY FOR AFFORDABLE, LOW-CARBON HEATING IN THE UK. Science Briefing Note, British Geological Survey. https://www.bgs.ac.uk/download/science-briefing-note-deep-geothermal/

Farr, G., Busby, J., Wyatt, L., Crooks, J., Schofield, D. I. and Holden, A. (2020). The temperature of Britain's coalfields. *Quarterly Journal of Engineering Geology and Hydrogeology*, https://doi.org/10.1144/qjegh2020-109, pp 14.

Parkes, D., Busby, J., Kemp, S. J., Petitclerc, E. and Mounteney, I. (2020). The thermal properties of the Mercia Mudstone Group. *Quarterly Journal of Engineering Geology and Hydrogeology*, https://doi.org/10.1144/qjegh2020-098, pp 10.

Watson, S. M., Falcone, G. and Westaway, R. (2020) Repurposing Hydrocarbon Wells for Geothermal Use in the UK: The Onshore Fields with the Greatest Potential. Energies, **13** ,3541 (http://dx.doi.org/10.3390/en13143541)

5. Other National Activities

5.1 Geothermal Education

There are no specific higher education courses devoted to the exploration and utilisation of geothermal energy in the UK. However, earth science and renewable energy university courses will often have modules on aspects of geothermal energy.

5.2 Conferences

Major conferences were cancelled or postponed in 2020.

5.3 Useful Websites

Contracts for Difference
https://www.gov.uk/government/policies/maintaining-uk-energy-security--2/supporting-pages/electricity-market-reform

Renewable Heat Incentive
www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx

http://www.energysavingtrust.org.uk/scotland/Generating-energy/Getting-money-back/Renewable-Heat-Incentive-RHI2

Renewable Energy Association Deep Geothermal Group
www.r-e-a.net/member/deep-geothermal

Ground Source Heat Pump Association
www.gshp.org.uk/

6. Future Activity

Interest and awareness in geothermal continues to increase, but funding to develop projects remains challenging.

7. References

BSIRA 2020. Heat pumps market analysis 2020 - United Kingdom. Report 100945/12

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