Proceedings World Geothermal Congress 2026
Calgary, Canada, June 8 – 11, 2026

Making national geothermal data and information accessible to support exploration and characterisation for heat decarbonization in the UK

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Keywords: UK Geothermal Platform, summary layers, GIS map, open data

INTRODUCTION

Geothermal energy roadmaps, white papers and inquiry findings in the UK and globally have frequently recommended improving data availability and accessibility, as one part of unlocking geothermal investment at scale (Abesser et al. 2023; IEA 2024). Between 2023-2025, the British Geological Survey (BGS) and collaborators had a focus on making legacy geothermal data digitally available, as well as collaborative work to make national scale geothermal and other geoscientific information more accessible to a range of users. These include release of a digital UK Geothermal Catalogue of over 11,800 data points (Fellgett and Monaghan, 2024), as well as a UK Geothermal Platform (https://ukgeothermalplatform.org/) containing over 90 layers of data and information. The Platform includes summary layers for four geothermal technologies that provide play analysis, mapping and risking for non-specialist users involved in district heating network planning, heat zoning planning and heat policy (Lawley et al. 2025). In addition, a ground source heat pump screening tool has also been released for England that incorporates subsurface, building type, heat demand, CAPEX and OPEX information to assist pre-feasibility studies (https://gshpscreeningtool.co.uk/).

1.1 UK geothermal challenges, status and potential

In common with many countries, heat decarbonization (including cooling and thermal energy storage) in the UK is a major challenge (UK Government, 2022; CCC, 2025). In recent years, there is increasing interest from industry, public sector and government in the role that shallow and deep geothermal energy technologies could play as part of heat decarbonization to meet net zero targets (e.g. Northern Ireland Executive, 2021) and improve energy security.

Currently in the UK, utilization of shallow geothermal resources with Ground Source Heat Pump (GSHP) systems is the dominant type of geothermal exploitation. In 2024, the UK was reported to have an estimated smaller scale GSHP (<50 kW) installed capacity of 813 MW_{th}, representing an annual production of 1059 GWh/yr (Robinson et al. 2025). There is growth in larger capacity GSHP projects (>500 kW_{th}) supplying both new and retrofit systems to hospitals, campuses and district heating networks (EA, 2024). Mine water geothermal is a particularly active technology area in Great Britain with 6 operational projects and many more in exploration and development stages (e.g. Mining Remediation Authority 2023). There is also growing focus on low enthalpy geothermal and underground thermal storage (e.g. Jackson et al., 2024). There is an increasing interest in the development of medium and deep geothermal resources in the UK. A hot sedimentary aquifer project has been awarded £35 million grant funding (University of York, 2025) and several others are in exploration stages. The last few years have seen the construction of a power plant at the United Downs Deep Geothermal Project (Olver and Law, 2025) and heat utilization at the Eden Geothermal Project in Cornwall, England (Eden Geothermal, 2025). Monaghan et al. (2025) provides an overview of UK geothermal activity and policy at April 2025.

Geothermal energy utilization is feasible across of the majority of the UK. It offers a range of possibilities, with shallow closed-loop GSHPs suitable for nearly all locations, and shallow open-loop GSHPs also well-demonstrated across large regions. Deep geothermal projects are more favorable at certain locations across UK nations, either in hot sedimentary aquifers, or using engineered geothermal systems (EGS) in higher heat flow granites (e.g. Cornwall, North Pennines). Geothermal technologies are available for different geologies, depths and scales, providing options for various project locations, sizes and economics, tailored to subsurface conditions and user needs.

2 NATIONAL DATASETS AND MAPS

2.1 UK Geothermal Catalogue of temperature, thermal conductivity and heat flow

The UK Geothermal Catalogue of temperature, heat flow and thermal conductivity was published in four reports between 1978-1987 (Burley and Edmunds, 1978; Burley and Gale 1982, Burley et al. 1982, Rollin, 1987) as part of the geothermal energy programme.

The first digital version of the legacy catalogue was released under Open Government Licence in 2024, comprising around 77% of the original catalogue following a basic set of validation, verification and intellectual property rights checks (BGS, 2024). The release comprises spreadsheets of measured temperature, measured thermal conductivity and calculated heat flow linked to the national 'single onshore borehole index' identifier and original data source. An accompanying user guide describes the variable quality and limitations of the dataset (Fellgett and Monaghan, 2024). The first release comprises 11,821 data points derived from 743 sites. A second open release is in progress, that includes legacy data with more complex copyright data that has been resolved since the first release, as well as data newer than 1987.

2.2 Legacy maps, models, reports

Extent maps of depth, modelled temperature of target geology, along with regional models of theoretical or technically recoverable heat are important in characterising and highlighting deep geothermal opportunities and estimating their potential. As a first step, legacy maps and models are available to view for deep geothermal plays, including hot sedimentary aquifer targets.

National scale heat flow (Busby et al. 2009), temperature maps (Busby et al. 2009; Busby and Terrington, 2017) and a thermal properties map are available as viewable 1km-sided hex-cells (BGS 2025a,b). Digital copies of the 65 plus reports from the 1980's geothermal energy programme have also been made available on the BGS publications viewer (https://webapps.bgs.ac.uk/data/Publications/series.html?code=WJ/GE). The reports cover regional studies of geophysics, temperature measurements, heat production data for granites, geochemistry, initial maps and older theoretical potential resource estimates, as well as the results of drilling seven deep geothermal test wells across the UK.

2.3 UK Geothermal platform

In 2024-2025, the UK Government Department for Energy Security & Net Zero (DESNZ) funded development of the UK Geothermal Platform (https://ukgeothermalplatform.org/), delivered and maintained by BGS. This is a freely available geothermal energy national information hub. It has some commonalities to similar platforms from other countries (ThermoGIS Netherlands, GeotIS Germany etc.) in containing geoscientific information, as well as synthesised layers of geothermal potential. The new Great Britain summary layers use multicriteria calculations, aspects of play analysis, mapping and risking providing geospatially-varying heat outputs for non-specialist users (Lawley et al. 2025). They were specified with the aim of feeding into the UK Government heat networks national zoning model, and to make geothermal energy options more visible to clean heat and heat policy decision makers.

The summary layers are for those interested in using geothermal energy who need an overview of the geothermal potential of a wider area of interest. For example, a set of public sector buildings or a university campus site. They are not for detailed planning of projects and are presented in 1 km sided hex-cell maps (Figure 1) that vary geospatially according to variations in geology, heat flow, bedrock thermal conductivity etc. across Great Britain. They provide a map overview of geothermal energy potential for four technology options and an overview layer:

- Overview layer – including levelized cost estimations from Arup (2025)
- Closed loop GSHP array
- Open loop GSHP doublets
- Deep geothermal - hot sedimentary aquifer (hydrothermal) for direct use heat
- Deep geothermal, petrothermal/EGS – granites (qualitative only)

The summary layers in the UK Geothermal Platform include information in each hex-cell on the type of geothermal technology, thermal output (kW), annual thermal output (kWh), undisturbed ground temperature (ºC), descriptive geothermal technical feasibility, confidence descriptor and geology of target.

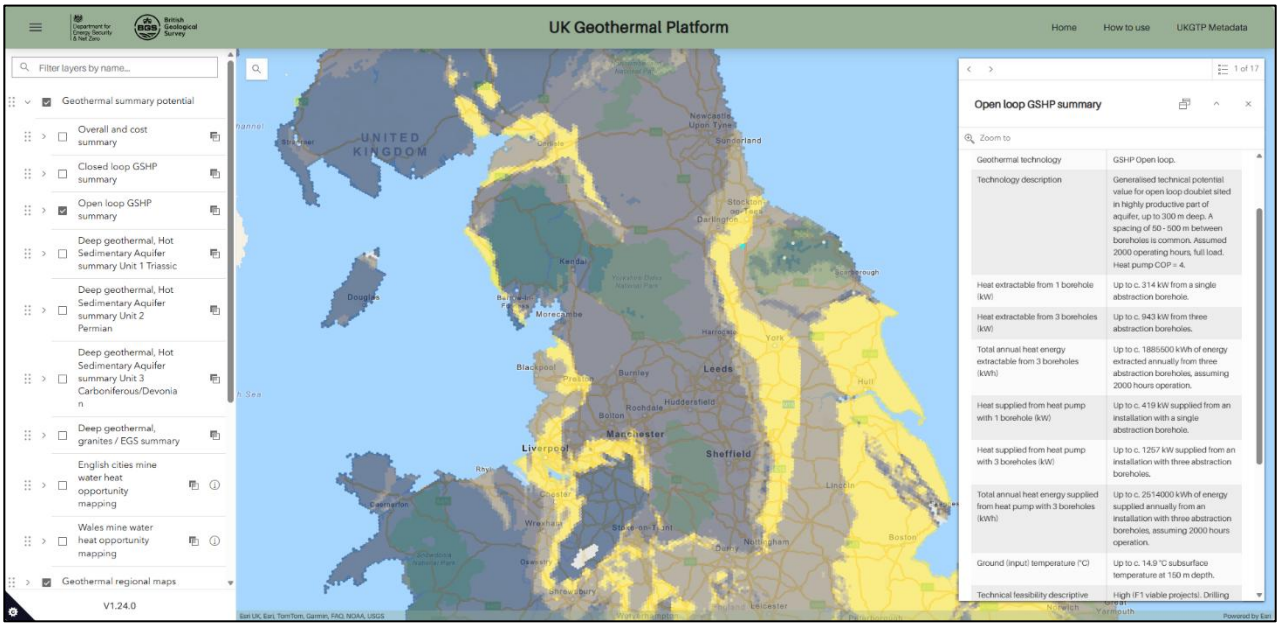


Figure 1. Example of the open loop GSHP summary layer in the UK Geothermal Platform BGS©UKRI 2025. Contains DESNZ Summary layer data and Ordnance Survey data © Crown copyright and database rights 2025. Basemap © ESRI UK, ESRI, TomTom, Garmin, FAO, METI/NASA, USGS, powered by ESRI.

Specialists can also use the UK Geothermal Platform to access a range of geothermal and geoscientific information for site-specific feasibility studies or regional assessments. The platform has a map explorer, a metadata catalogue for data search, access and download, as well as links to reports, tools and regulatory guidance. This first release of the UK Geothermal Platform makes information from seven organisations accessible in around 90 layers. It includes geothermal data and models such as mine water heat opportunity maps from the Mining Remediation Authority, the legacy maps and models described in section 2.2 above, hydrogeology information from environmental regulators and borehole, well and seismic data from the UK Onshore Geophysical Library. The platform makes locating and viewing datasets from these different organisations easier.

2.4 GSHP screening tool, including buildings demand data

An online screening tool for England to guide initial feasibility studies using vertical closed loop borehole GSHP technology has been developed by Energy Systems Catapult, BGS, NHS England and DESNZ ((https://gshpscreeningtool.co.uk/). The tool includes input data of building type, heat demand and land available for drilling an array of vertical boreholes. It estimates typical heat outputs from closed loop boreholes (100 or 200m depth) based on the BGS heat flow and bedrock thermal properties maps, the ground elevation and local geology, along with a choice of full load equivalent operating hours and building load inputs. It then produces a screening level output, geology description, planning prognosis, drilling prognosis, thermal output prognosis with indicative CAPEX, OPEX and CO_2 savings compared to a counterfactual technology (e.g. air source heat pump).

3 CONCLUSION

Taken together, the data and information make geothermal opportunities in the UK more visible and provides underpinning information for investors, developers, consultants, Government policy makers and researchers to understand the options and data gaps. As interest rises in shallow and deep geothermal technologies for heating and cooling, data has been made more available and accessible to support geothermal exploration and characterization for heat decarbonization in the UK.

Acknowledgements

Much of the legacy data described in this report comes from a large multi-year programme of work, summarized as ‘the 1980s geothermal programme’ by numerous BGS, University and other contributors from 1977-1991. Those contributors are sincerely acknowledged for establishing this significant foundation to geothermal energy in the UK. K Rollin, J Busby, S Self and others contributed to digitizing the results of the programme. The wider team that has worked on the UK geothermal platform are also acknowledged including S Raveendran and P Tvaranavicius. The work was funded by Natural Environment Research Council (NERC UKRI) National Capability

funding, the UK Geothermal Platform by DESNZ, the NHS England GSHP screening tool by the Innovate UK Knowledge Asset Fund and by DESNZ. This manuscript was published with the permission of the Executive Director of the British Geological Survey (UKRI).

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