

Written evidence submitted by the Geothermal Energy Advancement Association (GEAA)

1. What is the Geothermal Energy Advancement Association? GEAA advocates development of geothermal energy sources through increased investment and awareness of this sustainable source for near zero-carbon heat, power & minerals derived from the Earth's shallow crust.

2. GEAA is a not-for-profit organisation registered and headquartered in the UK, offering leadership, dialogue & information for the energy transition and reaching Net Zero. It supports the role that geothermal energy can play in transitioning to a future in which fossil fuels make a much-reduced contribution to global energy demand.

3. GEAA has 19 Founder members including leading UK universities, companies, consultancies, investors, service suppliers, institutes. Our LinkedIn community comprises over 825 people who are senior energy professionals, executives, CEO's, academics, students, scientists, technologists, consultancies, media, entrepreneurs, regulators, and officials. Detailed information can be found at <https://www.geothermal-advancement.com>

What role can geothermal technologies take in the transition to Net Zero in the UK?

4. GEAA views geothermal in terms of resources and markets:

- **resource opportunities**
 - shallow low grade (low enthalpy) heat available everywhere, also mine waters, 5-40°C
 - repurposing of oil & gas wells to extract heat, 40-150+°C
 - high temperature heat (high enthalpy) with heat and power generation potential, 90-315+°C
 - dissolved minerals in geothermal waters, 50-250+°C
- **market opportunities**
 - heating & cooling
 - factories, offices, schools, hospitals, airports, horticultural, prisons, warehouses, homes
 - where suitable conditions exist, produce electric power, green hydrogen
 - strategic, critical & valuable elements, particularly lithium for vehicles

5. Geothermal advances the transition to Net Zero by offering low to zero carbon heat & power that forms a by cost-competitive, low to zero carbon, baseload solutions principally to the UK's heat demand (particularly for domestic, agricultural, and commercial requirements). There are also opportunities to create unlimited low to zero carbon baseload electricity at competitive pricing. It can be cheaper and cleaner than nuclear, much safer, and more efficient than hydrogen, and provides constant energy, unlike wind or solar. Geothermal therefore offers a safe, clean, affordable energy solution.

6. The last few years have witnessed extraordinary innovation, both downhole and at surface.

The solutions are now diverse, covering a wide temperature range (5-350°C), multiple reservoir types (fractured, unfractured, igneous, sedimentary), different fluid types (producing, injecting, circulating), and different loop configurations (single, multiple, closed loop, open loop, shallow, deep). In addition, there is pioneering work in universities on deep plasma drilling and the use of CO₂ as a working circulating fluid. The traditional deep geothermal approach typically involves two well bores – a producer and an injector. However, recent technological innovation using closed-loop solutions on a single well offers very significant potential for cost reductions and a step-change in economic use of geothermal energy in the UK.

7. Closed-loop technology offers a ‘geothermal-anywhere’ solution that does not impact the sub-surface by way of fluid injection or extraction. This avoids the possible minor seismicity issues that may sometimes occur during hydraulic stimulation. The technology also minimises issues of corrosion or mineral scale deposition and reservoir contamination. It can be deployed in wells anywhere in the UK.

8. The surface and atmospheric footprint of geothermal is extremely small (as energy available per square foot), compared to, for example, solar which requires acres and acres of precious land space to be covered over, and onshore wind which not only requires land but also disturbs the low-level air environment. The extremely small surface footprint of geothermal means that it becomes almost invisible to communities. Geothermal technologies can therefore be more easily accepted and adopted by local communities in the UK when properly informed about what is planned to be done.

9. The technology is advancing rapidly in re-purposing of oil and gas wells that are close to, or past, the end of their production life. Whilst not all the UK’s old oil & gas wells may be suitable, many will be. More work is needed but initial estimates indicate 50% of past wells could be retrofitted to produce geothermal. For the UK, with its significant legacy of used wells, this turns an existing liability into an exciting future asset. Success would not only make the UK a world-leader, but it would also create a tremendous export opportunity for engineering and technical services.

10. Using UK geothermal resources will lessen the need for expensive energy imports such as natural gas, oil, and refined oil products. The production of geothermal energy does not require the use of strategic high value minerals such as cobalt, lithium and rare earth metals, or copper. As a result, the impact of supply chain issues, cost and the geostrategic considerations are lessened. This highlights how geothermal heat and power can be a key part of home-grown energy security, in a world where energy security is now accepted to be a key risk to economic prosperity.

What barriers (technological, regulatory, or otherwise) are there to deploying operational geothermal technologies in the UK?

11. Lack of awareness of geothermal potential remains a major issue. This is slowly changing in the UK with GEAA becoming a key voice on geothermal as a source of heat, power, and critical minerals

that may exist in geothermal waters. One of GEAA's products are Geothermal Briefing Notes (GBNs). GBNs are design to be a 1-pager on a specific aspect of geothermal. These are prepared by groups of experts within GEAA and written in a clear and simple style such that anyone can read and learn about geothermal. GBNs are freely available through the GEAA website. This effort would be significantly enhanced by additional financial support, participation, and encouragement for GEAA.

12. Limited investment in UK geothermal is occurring, currently. Geothermal needs investment support to provide evidence of commercial scale-up, not in one-or-two locations, but countrywide. The geothermal sector is much less understood and less well known than alternative renewable industries. This is hampering the development of new geothermal technologies and expansion of existing technologies. For example, the opportunity to retrofit and re-purpose old oil & gas wells and extend their life cycle is now, and must be done soon, before those wells are permanently cemented-up and abandoned forever.

13. Government support to advance rapidly is needed. If geothermal were to receive similar UK Government support, grants and subsidies as has been given in recent decades to the fossil fuels, wind, and solar sectors, geothermal would advance rapidly, and be able to deliver an energy contribution at scale. For example, the tremendous achievements in offshore wind, which are a vital part of Government targets, would not be as advanced had it not been for the support received at the outset. At the current time, it is impossible for geothermal to compete with, say, the fossil fuel lobby groups.

14. A new National Centre for Geothermal is essential. Without immediate support of UK research funding bodies, the UK will fall far behind its technological competitors in geothermal – particularly Europe, USA, and China. The creation and need for a National Centre for Geothermal Research and Technology is long overdue.

15. The regulatory situation needs urgent and fundamental change. There is no clearly defined UK regulator for geothermal heat and power, nor for critical minerals that may exist in geothermal waters. At the current time, there is no single statutory body to approach to get clear and simple regulation, licencing or permitting. Rather one must approach multiple bodies that were not created to address geothermal, and use regulations not intended or drafted for use in the geothermal sector. Urgent attention to improve geothermal regulation would be beneficial to all.

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GEAA Chair of Founding Members

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