

Geothermal in Agriculture and Food Sustainability in the UK

Significance

Geothermal can play a significant part in decarbonisation of the UK agriculture sector. Heat from the ground is available everywhere and can be extracted providing clean 24/7 baseload energy that can be used commercially using existing resources, skills and extensive expertise. This can provide a sustainable energy source for heating, cooling and, if suitable conditions exist, electric power. Technology in the geothermal sector has advanced significantly over recent years drawing on extensive knowledge in the Oil & Gas industry.

Technical aspects

Agriculture requires significant energy in the UK, around 25,000 GWh per annum, 37% of which is used for direct heating and 61% of this is used to protect crops through greenhouse heating and humidity control, and to heat & cool buildings. Energy consumed by UK Agriculture accounts for 21% for food production; ~2.1 quadrillion Btu of energy per annum equivalent. This energy is consumed through growing and harvesting of crops, as well as raising livestock. The importance of reducing energy costs and encouraging local produce to be accessible and economic is becoming a concern; as an island, the UK can focus on becoming more sustainable and less dependant on imports. This in turn will significantly reduce our carbon emissions. In the last 15 years, the Netherlands has shifted from net importer to net exporter of flowers, plants and vegetables developing >£8bn business from climate controlled glasshouses, many running on heat from geothermal energy.

Commercial advantages

Geothermal provides baseload 24/7 heat, providing UK farmers and land owners a lucrative business opportunity, with lower energy running costs, creating jobs, and providing taxable revenue from local grown produce which could also be exported. This can contribute to significantly lowering carbon emissions and reducing the UK's logistical carbon footprint, the final cost to the end consumer, and supporting farming in the UK to be import independent within 10 years.

Community sustainability

Local community engagement can support all year-round local produce grown within the UK. We have seen during the COVID pandemic and lockdowns how the growth in demand of locally grown produce at farm shops, fish, meats, fruits and vegetables has increased ten fold. Agriculture can become a key part of our economy creating up to 50 direct and indirect jobs per hectare of land.

Policy & regulatory implications

UK has over 500 onshore Oil and Gas wells covering some 100 sites where wells toward the end of their productive life could be reused, harvesting the in-place heat with no environmental impact. Many are virtually shovel-ready projects already located in rural agricultural locations. Companies like CeraPhi Energy and UK Oil & Gas plc are working on pilot projects to reuse former oil and gas wells for this purpose. At present, the Oil & Gas Authority (recently renamed as the North Sea Transition Authority) manages all wells through to end of life. This means at the end of their productive use the wells would normally have to be closed. There is currently no provision to change the usage of such assets from an oil or gas well to a geothermal well within the regulatory framework.

Way forward & solutions

We recommend: i) Fast-track approvals between OGA, BEIS and the Environmental Agency to allow controlled transfer of non-productive onshore oil and gas wells to become clean energy geothermal assets used for agriculture heat networks, and ii) Geothermal requires stand-alone recognition and a regulatory framework which reflects the cost base and risks, and reflects the renewable energy transition; this should not fall under current Oil and Gas regulations once wells have met certain safety and environmental criteria.

Example: new geothermal greenhouse completed in Sandikli, Turkey (photo courtesy of Hortidaily)



Key takeaways

Typical 1 hectare (Ha) greenhouse development:

1 MW electricity p.a.
0.5-0.6 MW heat p.a.

Target heat price:
£22-35/MWh

Target electricity price:
£55-90/MWh

Typical lead time:
24-36 months

Targeted lead time:
12-18 Months

CO2 reduction per Ha p.a.:
500,000 kg CO2 Ha

Jobs created per Ha:
5-10 direct - full time
30-40 indirect - contract/part time

Potential revenue p.a.
Geothermal - >£100m
Farming - >£1bn

Shovel-ready opportunities:
>500 existing wells in UK onshore have potential

New expansion opportunities:
Existing sites serve as great development opportunities due to existing oil and gas relationships with land owners

"Within just six years of tapping into geothermal heat from beneath their feet, the Dutch were exporting \$111bn worth of agricultural goods, including \$10bn of flowers and \$7.4bn of vegetables"

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