

Turning up the heat on the UK's ground-source heat-pump industry

After years of growth, the UK's ground-source heat-pump industry has stalled. Signe Hansen talks to leading industry figures who say it is back where it was 10 years ago and is playing catch-up with the rest of Europe

GI Energy worked alongside Arup to provide a ground-source closed-loop system for the heating and cooling at the V&A Dundee museum

In May, a report from the Public Accounts Committee (a select committee of the British House of Commons) revealed that the UK's Renewable Heat Incentive (RHI), a government supported scheme designed to encourage building owners to install renewable heat sources via cash payments, has failed to achieve the anticipated development of the ground-source heat-pump (GSHP) industry.

The Ground Source Heat Pump Association (GSHPA) goes further, asserting that the size of the market for GSHP actually reduced following the launch of the RHI, in 2011, and has not yet fully recovered.

Talking to *GeoDrilling International*, GSHPA vice chairman, Bean Beanland, says there are a number of reasons behind the disappointing development including unrealistically cheap gas and oil, over-rewarding of other renewable technologies, and a lack of investment in training and expertise.

"We're trying to progress the UK industry to a quality position where, overall, 95 per cent of systems work really well on first commissioning. That's what is achieved in Sweden and the rest of Europe, but they've taken 70



years to get there; we're trying to achieve it in 10," he says, citing the fact that across Europe, GSHP have been widely deployed for 70 years, whereas the first modern borehole-based GSHP in the UK was not installed until 1995.

Following the report, some changes to the RHI have been implemented including tariff guarantees for non-domestic RHI applicants and assignment rights allowing domestic applicants to assign RHI payments to third-party investors.

However, leading figures within the industry say a much wider

approach is needed if the UK is to realise its potential for decarbonising heat through the use of GSHP.

COST REALISM

The majority of new builds are not qualified for RHI, but even with retrofitted RHI-eligible systems, overall cost-competitiveness is a critical factor. Adding to this challenge are the low prices of fossil fuels (a new study, performed by researchers at the Overseas Development Institute, Oil Change International, the International Institute for Sustainable Development, and the Natural Resources Defense Council, shows that the G7 countries subsidise the oil, gas and coal industries by at least US\$100 billion annually).

"We [the GSHP industry] get criticised because we get massive subsidies, and they are significant, but they are still dwarfed by the hidden fossil fuel subsidies," says Beanland.

GSHP in the UK

The UK's first modern borehole-based GSHP was installed in Devon, in 1995. It was a closed- (water) loop system in a new build house. The configuration consisted of a single closed-loop borehole connected to an American reverse-cycle water-to-air unit. The system is still running with the original heat-pump.

The UK market quickly went from one per year to 10, 100, 1,000 per year, and was approaching 10,000 per year, in 2010, when the market collapsed.

Since the RHI was implemented, in 2011, activity has slowly increased and is now getting back to where it was 10 years ago.

“Politicians say we can decarbonise and reduce bills, but if decarbonised heat was cheaper, we would be doing it already – someone’s got to pay for it.”

Undeniably, when it comes to new builds, most UK developers reject GSHP in favour of low-cost installations, in most cases regular gas boilers.

Michael Chendorain, Arup’s global lead for geothermal and hydrogeological engineering, explains: “Capital expenditure is relatively high for ground-source projects, including upfront costs for testing the subsurface ground properties/conditions – which is often required to de-risk projects and to perform detailed design and cost estimation.”

Robin Curtis, director and GSHP specialist at GeoScience, confirms this and says that the fact that GSHP have lower running costs and longer life spans than gas boilers is of little interest to most developers. “Apart from developers with very strong commitments to environmental issues, most will go for the standard lowest-cost option. They are not that interested in running costs – because it’s the occupier/owner of the property who will pay.”

INVESTING IN QUALITY

The unwillingness to invest time and money in high-quality designs and drilling programmes is one of the major problems faced by, and within, the UK’s GSHP sector.

“One of the problems is that there is a relatively poor understanding of the need for high-quality design,” says Beanland.

He continues: “If you install a fossil fuel boiler, your margin of error in terms of system design is huge; you can put in almost anything and it’ll still work, whereas with heat-pumps, the margin of error is much tighter.

“This means we have to re-educate the whole industry to get all plumbing installers to a point where they understand the physics of heat-pumps and can routinely install high-quality systems.” ▶

Why GSHP

The UK’s mild climate and wet ground conditions provide favourable conditions for GSHP. Utilising the heat/chill from the ground, GSHP use less electricity, have low on-site carbon emissions and are significantly cheaper to run than direct electric heating systems.

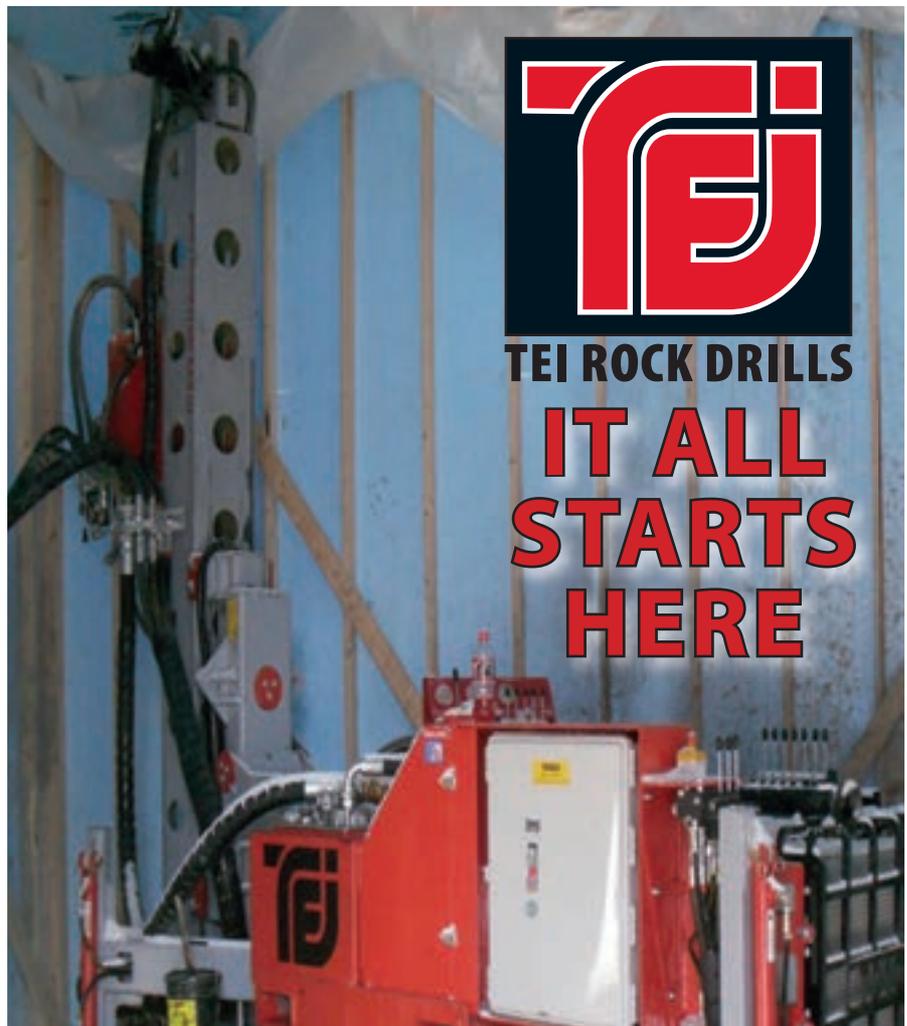
Heat-pumps can be reversed to provide cooling in summer.

GSHP require less maintenance and have

longer life spans than combustion-based heating systems. The ground-heat exchanger element has a design life of over 100 years.

Through the RHI, Ofgem currently pays a tier-one rate of 9.36p/kWh generated for the next 20 years for commercial buildings, and 20.46p/kWh of eligible heat for seven years for domestic buildings.

Further reading: www.gshp.org.uk



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Though not noticeable, the stunning newly opened V&A Dundee museum in Scotland has a GSHP installation

► His colleagues in the industry agree that the most crucial element in re-energising the market is training and a willingness to invest in the available expertise.

Curtis stresses the importance of contractors being pointed towards competent and experienced installers, while Chendorain says post observation and knowledge sharing are essential to building confidence.

FOCUS ON CARBON EMISSIONS

Without financial inducement, people within the industry believe other initiatives are needed to increase demand, induce growth, and strengthen expertise within the UK's GSHP supply chain.

Based on past experience, Curtis believes that tightening building regulations, re-imposing local planning conditions, and tightening air-pollution controls would all help the sector.

"The biggest driver for commercial GSHP in the UK in urban settings was the Merton Rule in London – a locally applied planning constraint requiring 10 per cent of a building's energy to be generated on-site," he says.

A stronger focus on onsite carbon emission would also increase the attractiveness of GSHP compared with other subsidised technologies such as biomass and biogas. However,



the Merton Rule and similar initiatives were all abandoned, and the RHI has only increased the lead of the biomass industry.

Curtis goes on to suggest: "The RHI has failed to deliver the envisioned number of GSHP – it may have delivered in terms of biomass – which suggests that something has been out of balance in the tariff structure and/or that the degression of tariffs did not occur fast enough to redress the imbalance."

Another significant point, stressed by both Curtis and Beanland, is the lack of understanding of the ability of GSHP to progressively move toward lower, and ultimately, to zero CO₂.

"What we have to remember is that a good heat-pump system has a low carbon emission factor today, but the fact that the national grid is being decarbon-

ised means that year-on-year that same heat-pump is producing ever-lower carbon emissions and will eventually be carbon zero," says Beanland. Heat-pumps are also NO_x, SO_x and particulate zero emitters at the point of use.

To support the understanding of this fact, the GSHPA has developed a web app showing the real-time CO₂ emissions of GSHP (in the UK) compared to other heating systems.

However, Beanland stresses, he is confident that the GSHP industry in the UK will get back on track. "Overall, I and most of my colleagues in the UK heat-pump sector, are optimistic for the future. This doesn't mean that there are not hurdles and challenges to face, but the end game is worth the effort and we are seeing improvements all the time, even if just baby steps." ▼

GeoScience assisted Baystar with the design of a lake-based, surface water-source heat-pump (SWSHP) system at St Cuthmans Retreat Centre in Sussex. The collector system in the lake supplies two heat-pumps that can deliver 120kW for the main building

