British Gas

Partnering to support Sainsbury's environmental ambition

New technical and commercial developments proudly pioneered by British Gas and Geoscart, establish a strong platform for broader adoption of Ground Source Heat Pumps in both new-build and retrofit projects delivering a significant contribution to UK energy efficiency and sustainability objectives at a national scale.

"We have set ourselves a number of stretching targets under our 2020 plan including the target to reduce our operational carbon emissions by 30% absolute. To do this we're now building and running highly sustainable, low carbon stores"

Paul Crewe, Head of Sustainability, Energy and Engineering

Heating and cooling in buildings is recognised as one of the key challenges in working towards Britain's low-carbon future. Commercial premises alone use 75 terawatt-hours (TWh) of energy for space heating plus 14 TWh for hot water, while at the same time using 27 TWh for cooling annually. A large amount of this thermal energy is lost in process, or by exhaust, when it could be utilised elsewhere.

Supermarkets, in particular, represent a key opportunity for energy savings, due to their 24/7 energy intensity across both store refrigeration and heating: essential to both the food quality and the customer comfort.

Sainsbury's is a big business, serving 23m people a week from around 600 supermarkets and a further 600 convenience stores. But it wants to serve more. Its ambitious plans for growth saw 93,000 m^2 of floor space added to its estate last year.

Sainsbury's 20x20 Sustainability plan, an initiative based on 20 commitments to be achieved by the year 2020, puts environmental commitments at the heart of every aspect of the business.

The commitment to reduce absolute operational carbon emissions from the estate by 30% (compared with 2005 levels) is by far the biggest 20x20 challenge. That equates to a 65% reduction in emissions for every square metre of existing floor space, including distribution centres, stores and offices.

One of Sainsburys latest initiatives is to drive the wider adoption of energy efficient ground-coupled heating and cooling technology, working with Geoscart and British Gas. The technology allows for renewable and efficient thermal energy management, reducing overall electricity use while eliminating the need for gas. Conceptually it changes the way we think about waste heat – as an asset, to be recycled. The Renewable Heat Incentive (RHI) has enabled this innovative approach to kick start the largest Ground Source Heat Pump installation programme in the UK.

Geoscart works by integrating all of a site's heating and cooling/refrigeration systems via geo-exchange, so that heat can be transferred and stored. This process is done by applying an enhanced closed-loop borehole heat exchanger design to provide maximum onsite energy capacity with minimal site impact within the urban environment.

The system is based around a closed circuit of water-based working fluid that flows through a series of steel-cased coaxial boreholes embedded in the ground beneath the building.

geoscart™

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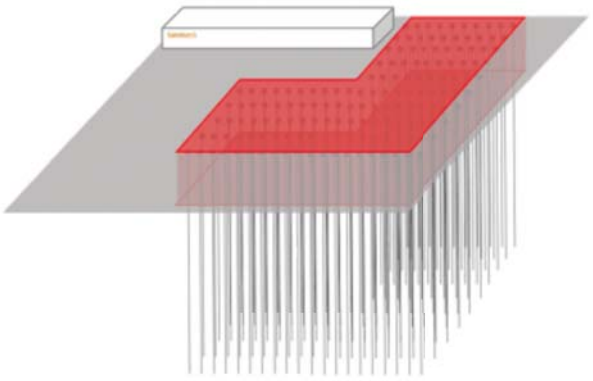
The basic borehole design was adapted from oil and gas techniques, using closed-loop, steel-cased, coaxial (i.e. "tube-in-tube") boreholes, replacing the traditional ground-source plastic "U-tube" design. The key benefits are that each borehole is more efficient, able to go deeper (>200m) and at angles (as opposed to vertical), thus requiring fewer boreholes and reducing required land areas for the same installed capacity.

Typical ground-source

150 x vertical U-tube boreholes

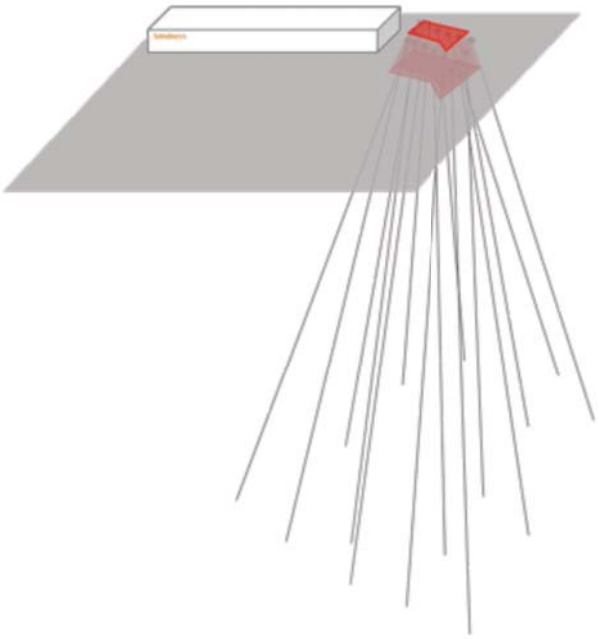
Extensive field of boreholes requiring free land (>3000m2) and giving greater risk of thermal interference after long-term operation.



Geoscart

12 x angled coaxial boreholes

'3D' subsurface architecture allows maximum geothermal reach and separation from minimal surface area (<350m2).



The fluid, depending on building demand, serves either as a cooling medium for the building's refrigeration and air-conditioning systems (improving performance compared to standard air-cooled systems), or as a heat source for ground source heat pumps (taking advantage of the stored waste heat from cooling). Therefore both systems see significantly improved efficiencies, while mutually benefiting each other.

A key advantage of geo-exchange technology is its fundamental sustainability, as long term onsite energy infrastructure. Once installed, the ground array is simply a closed loop fluid circulation system, and should remain viable for periods of over 50 years.

The contract is a "long-term leasing" model where the sites would benefit from a 15-year fully-financed lease contract. They include a fixed quarterly rental, maintenance charge, together with an additional performance incentive. British Gas sub contract Geoscart to install and maintain the Heat pumps for Sainsburys and act as technology guarantor for the contract.

Monitoring has confirmed actual achievement of energy savings targets. This technology alone delivers a saving of over 30% in total store annual energy use and a 25% reduction in total carbon emissions.

Ground source thermal exchange has widespread potential in both heating and cooling, with the clear opportunity to replicate this technology to other building types with similar demands.

Key benefits

- Up to 25% reduction in total carbon emissions.
- Over 30% saving on energy usage.
- Large scale ground source heat pump opportunity leveraging the Renewable Heat Incentive (RHI).
- Unlocking infrastructure finance terms from the banking sector, which in turn enables commercial rollout at scale.