

# Robert Gordon University

## Garthdee Campus, Aberdeen, UK



### Key Facts

- Vertical Closed Loop
- 66 Bores to 200m
- 900 kW Heating
- 900 kW Cooling
- Free Cooling
- 8 Heat Pumps
- Main contractor Miller Construction
- Hybrid system
- Completed 2013

### GI Energy

- Specialists in providing sustainable energy systems for heating, cooling & electricity.
- Design of hybrid solutions using our unrivalled experience, expertise & market leading product range.
- Full energy system solutions.



The stunning new development designed to underscore Robert Gordon University's ambition to raise its global profile is remarkable in many ways, not least the low carbon footprint of the central campus building.

The stylish new main campus building which has a superb setting on the banks of the River Dee houses the largest commercial Ground Source Energy System (GSES) in Scotland, recently commissioned by GI Energy.

By drawing on the heat stored naturally underground - and returning excess heat from the building to the ground - the GSES provides a truly renewable form of heating and cooling that dramatically cuts the building's carbon footprint.

Its performance is expected to outstrip conventional forms of heating and air conditioning: for every kilowatt of power required to run the system, up to five kilowatts of heating and up to six kilowatts of cooling should be provided.

Consequently the amount of CO<sub>2</sub> produced is far lower than for conventional heating and cooling, creating the potential for considerable carbon savings - a prime attraction for the university which, in common with other universities, has to meet tough statutory obligations to reduce its carbon footprint.

Ground Source Energy Systems work by exploiting the fact that heat from the sun is stored in the earth. They consist of an array of underground pipes linked to a series of heat pumps. Liquid pumped through the pipes extracts heat from the surrounding ground. It is then passed through the heat pump which brings it up to a temperature high enough for central heating. For cooling, the system is simply used in reverse. GSES systems are especially efficient when both heating and cooling is required, as heat is cycled between the ground and the building then back again.

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The pipes – commonly known as “earth loops” – can be arrayed horizontally a few metres below the surface or sunk in deep boreholes. They can also be submerged in lakes or reservoirs or (low pressure) underground aquifers. A technique developed by GI Energy and Cementation Skanska also allows them to be incorporated within the foundation piles of a building.

Robert Gordon University in Aberdeen – voted Best Modern University in the UK 2012 is moving all of its teaching to its Garthdee campus which it aspires to become the ‘best riverside campus in Europe’.

The extensive grounds were generously donated in the 1950s by Scottish architect Scott Sutherland during his lifetime. He handed over the house in which he had lived for many years and helped to fund its extension in order for it to accommodate the School of Architecture of the then Robert Gordon’s College where he himself had studied. The Scott Sutherland School of Architecture and the Built Environment has been based in the house for more than half a century.

The £115 million redevelopment of the Garthdee Campus has been designed by BDP architects and the centerpiece of the 120 acre site is a new building for the School of Art and Architecture which is arranged as two shallow plan linear teaching blocks grouped around an internal street and courtyard space.

With Aberdeen being known as the “granite city” unsurprisingly the ground underneath the site was solid granite rock which, although hard to drill through and abrasive, had other advantages.

John Mackintosh, Engineering Manager, of GI Energy, said: “Granite has really good thermal conductivity. It’s very dense, so is ideal for geothermal systems. Despite it being a hard and difficult rock to drill, it’s all very consistent, so we know what to expect and get good, stable results.

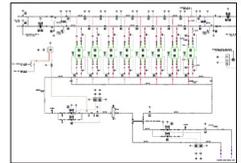
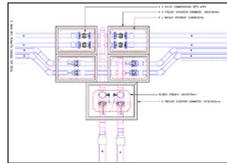
“From the modeling we are expecting a Co-efficient of Performance of up to 5 for heating and up to 6 for cooling.”

All of the building’s cooling and its base heating



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load are provided by GI Energy’s GSES system, which can provide 900 kilowatts of heating and 900 kilowatts of cooling. Back up heating is supplied by conventional gas boilers.

GI Energy, which as the market leader and pioneer of the use of Ground Source Heat Pump systems in the UK has built up considerable expertise in drilling, sunk 66 boreholes to a depth of 200 metres to accommodate the earth loops. These were buried underneath the three car parks created adjacent to the main campus building.

There are eight heat pumps – all reversible – and the performance of the whole system is controlled and remotely monitored by GI Energy’s bespoke computerised control system in order to optimise its performance. Sensors throughout the system take readings and the control system can switch each pump individually between heating and cooling mode, depending upon factors such as the external and internal air and ground temperatures.

Chris Davidson, Director of Development at GI

Energy, is expecting the GSES at the BREEM excellent rated Garthdee main campus building to provide “exceptional” Co-efficients of Performance.

He explained: “The local granite rock acts as an inter-seasonal energy store, absorbing the summer heat that is rejected from the building and storing it for re-use in the winter period when heating is required.

“Ground Source Energy Systems have an enormous role to play in reducing carbon emissions and providing energy efficient heating and cooling.

“They have become even more attractive since the Government nearly tripled the level of Renewable Heat Incentive payments for large GSHP heating systems and should provide considerable savings on running costs in the long run.

“The question for developers now is – why would you not want to benefit from a Ground Source Energy System?”

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