Earth Energy
accessible
reliable
renewable

HEAT PUMPS

This architecturally designed home is heated with a vertical ground source heat pump.

Queenstown Family Home Heated from 120 m Underground.

Ground source heating was a natural choice as a heating solution when Ian Adamson designed his family's energy efficient home in Queenstown.

Ian Adamson installed a ground source heating system in his new family home near Dalefield in 2011.

As an architect, Ian has a unique insight into the construction industry, and knew what he wanted to achieve when building his own home.

He says it was vital to ensure that his family were warm and comfortable all year round, but sustainability and environmental considerations were equally as important.

The home was designed to be as energy efficient as possible. High levels of insulation are a feature of the home, well beyond minimum specifications set in the building code.

It has also been designed to take advantage of a sheltered northerly aspect, with concrete slabs acting as thermal mass areas by gaining and storing the sun's energy.

Given the focus on energy efficiency during the design phase, when it came to a heating solution, ground source heating was a natural choice.

KEY BENEFITS:

- Vertical system requires very small installation area
- Maintains high heating efficiency even when air temperatures are low
- All rooms in the home are heated evenly
- Low running costs, noise and visual impact

KEY FEATURES:

- System installed in 2011
- 2 x 120 m deep bore holes, closed loop system
- 11 kW system providing hot water to underfloor heating pipes and hot water for domestic use
- Heated area: 280 m^2
- 5kw photovoltaic solar system installed on the roof in 2014 to provide greater efficiency

Water is circulated in small iron pipes adjacent to the plants to provide heat to the plants.

"WE LIKE THAT WE ARE USING A FULLY RENEWABLE RESOURCE BY ACCESSING LATENT ENERGY FROM THE GROUND."

Ground source heating remains highly efficient, even when outside air temperatures plummet.

"The extremes of our climate here in Queenstown and a belief in sustainability have strongly influenced our decision to run with ground source heating," Ian says.

"We wanted a highly efficient heating solution with low operating cost and without the hassle of chopping wood or ordering diesel or wood pellets. Ground source heating was a good fit. We also like that we are using a fully renewable resource by accessing latent energy from the ground."

While the site was large enough to install a horizontal captor field, Ian opted for a vertically installed, closed loop system.

"The benefit of a vertical system is that we were able to install without any major disruption to existing landscaping, it didn't affect our construction schedule and hasn't tied up a large area of land.

"I was initially concerned about the drilling process and resulting mess, however it was the complete opposite with the rig in and out in six days, complete with holes grouted. All slurry was collected and removed from site."

The system consists of two bores, 12 metres apart, drilled to a depth of approximately 120 metres.

A 'U' shaped pipe was installed in each bore before they were sealed and capped.

A water/glycol solution is circulated through these pipes to gain heat from the earth. As the site is not over an aquifer and there is no risk of groundwater contamination, resource consents from the local council were not required for this project.

Having been through a few winters, Ian and his family are impressed with their heating system.

"We have moved from a smaller house where you tend to heat spaces you are occupying, to now running the entire house at 20°C, with bedrooms around 18°C. The system is completely self regulating and hassle free."

Ian says choosing an installer was an important decision in the process. He engaged Heated Ltd. to install an 11 kw Bosch system.

"It is a big investment, so we wanted it done right. We liked that our installer has a direct association with the manufacturer of the heat pump unit. We had the confidence that it would be installed right the first time.

In 2014, Ian installed a 5kw photovoltaic solar system on the roof, to provide even greater energy efficiency in his family home.

A drilling rig is needed on site to install a vertical ground source system.

Ian Adamson
Home owner and Architect

Warren and Mahoney Architects
Queenstown
New Zealand
Phone: +64 (0)3 450 2291
Email: ian.adamson@wam.co.nz

New Zealand requires reliable, renewable energy sources into the future. The Government is supporting GNS Science in fostering increased use of renewable resources. By 2025, the Government's Energy Strategy aims for direct use of geothermal energy to account for more than 12 PJ/year.

For more information visit our website:
www.gns.cri.nz/earthenergy
or contact us:

Wairakei Research Centre
114 Karetoto Road,
Wairakei 3377
Private Bag 2000,
Taupo 3352
New Zealand
Phone: +64 7 374 8211
Email: earthenergy@gns.cri.nz

GNS SCIENCE TE PŪ AO