

A photograph of a modern, multi-story building with large glass windows, illuminated from within. The building is set against a twilight sky with soft colors. In the foreground, there is a paved area and a grassy lawn. Several tall flagpoles with white flags bearing the Stiebel Eltron logo are positioned in front of the building. The overall scene is well-lit, suggesting an evening or dusk setting.

STIEBEL ELTRON

Ground Source Heat Pump Systems (GSHP)

NZGA Winter Seminar 2024

Overview

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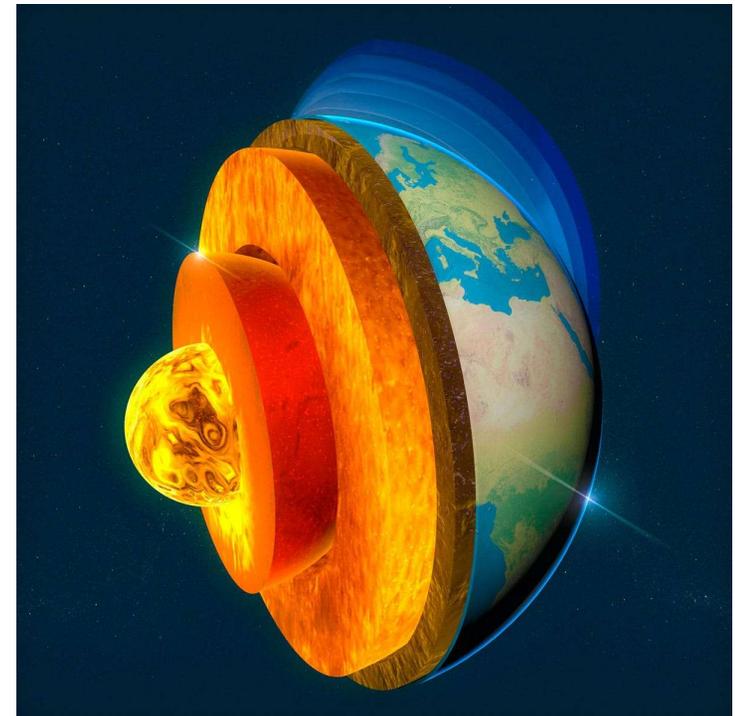
What is Geoheat?

Definition

Utilization of geothermal energy natural heat stored within the Earth for direct use applications

Involves harnessing the Earth's thermal energy to provide heating solutions without the need for converting it into electricity first (in most of the cases)

Heat originates from the Earth's core and is naturally replenished - sustainable and renewable energy source



Source: www.techexplorist.com

What is Geoheat?

Different types of applications

Direct use for electricity generation – $T > 150^{\circ}\text{C}$

Application – Steam Power Plants, Combined Heat and Power (CHP) Systems

Direct, or non-electric, use of geothermal energy involves utilizing the Earth's heat immediately for heating and cooling purposes without heat pump or power plant – $T < 150^{\circ}\text{C}$

Applications - heating swimming pools and baths, space heating, agriculture, aquaculture, industrial processes etc.

Indirect use by heat pumps (Geoexchange systems/Ground Source Heat Pumps) – $T < 100^{\circ}\text{C}$

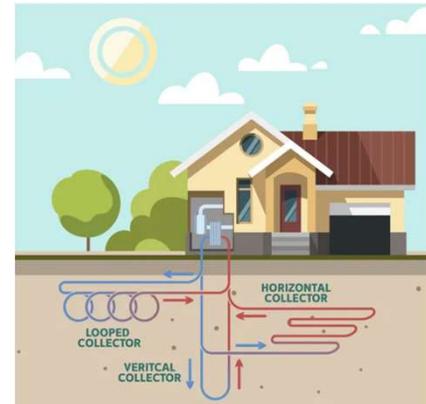
Applications – space heating & cooling, DHW production, light commercial heating applications



Source: EECA



Source: Den Edryshov, shutterstock.com



Source: Thermal Associates

What is Georexchange/Ground Source Heat Pumps?

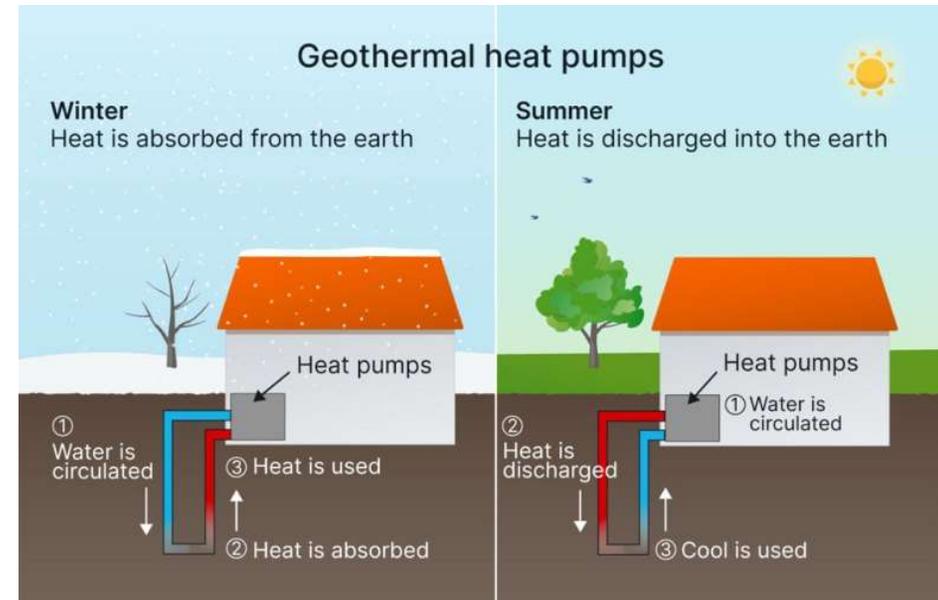
Definition

Georexchange, aka Ground Source Heat Pumps (GSHPs), utilizes the relatively constant temperature of the ground to heat and cool buildings

Leverages the Earth's thermal energy providing efficient temperature regulation for residential, commercial, and industrial properties

In Winter system extracts heat from the ground and transfers it indoors to provide heating.

In Summer process is reversed; the system extracts heat from indoors and transfers it to the ground (like a refrigerator), providing cooling, thus regenerating the ground/source



Source: [Solar Review](#)

What is Georexchange/Ground Source Heat Pumps?

Types of Ground Source Heat Pumps (GSHP)

Horizontal Ground Loops

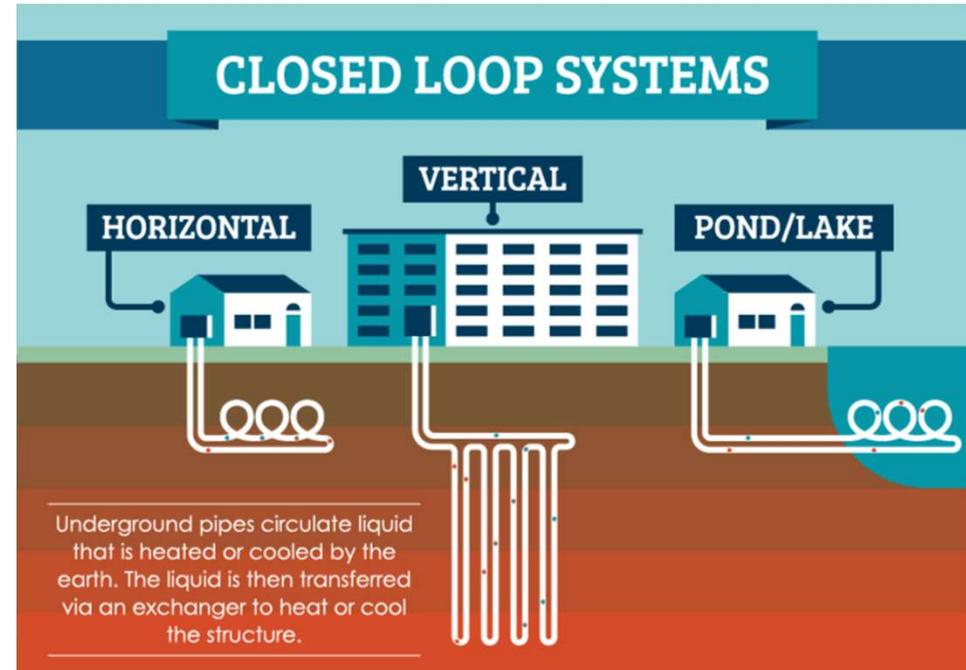
Consist of pipes laid in shallow trenches (1 – 2m) to exchange heat with the ground for heating and (limited) cooling purposes.

Suitable for areas with ample land space with lower installation cost compared to vertical systems.

Vertical Probes

Involve pipes inserted into deep boreholes (100 – 300m) to exchange heat with the earth for heating and cooling applications

Ideal for areas with limited land space with greater efficiency heat exchange and requires less land area.



Source: [Holland Heating](#)

Case Studies

Horizontal Ground Loops – Residential

Residential property in Queenstown

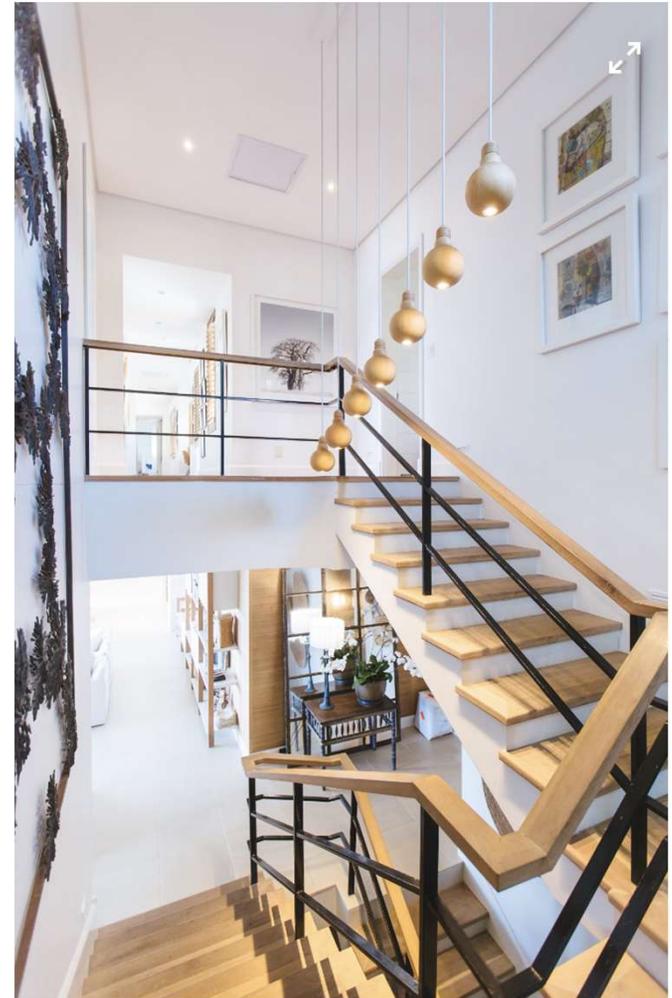
Ground loop configuration – 7 x 100m

Ground area – 450 sqm

Heat demand – 12 kW

Heat extraction from the ground – 9 kW

Seasonal Coefficiency of Performance (SCOP) – 4.8

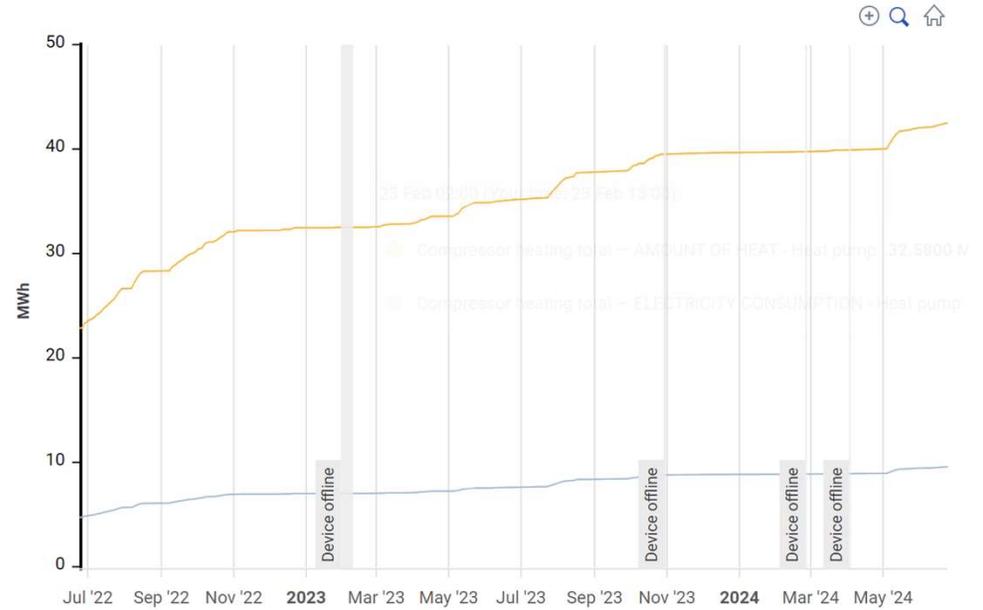
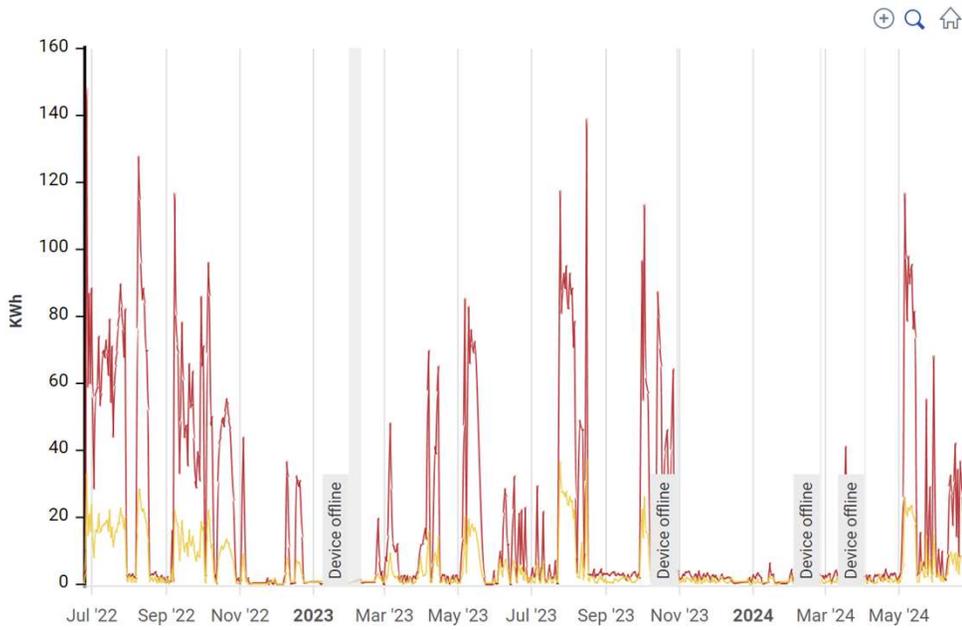


Case Studies

Horizontal Ground Loops



Case Studies



Case Studies

Vertical Probes – Residential

Residential property in Arrowtown

Vertical Probe Configuration – 6 x 100m

Heat demand – 35 kW

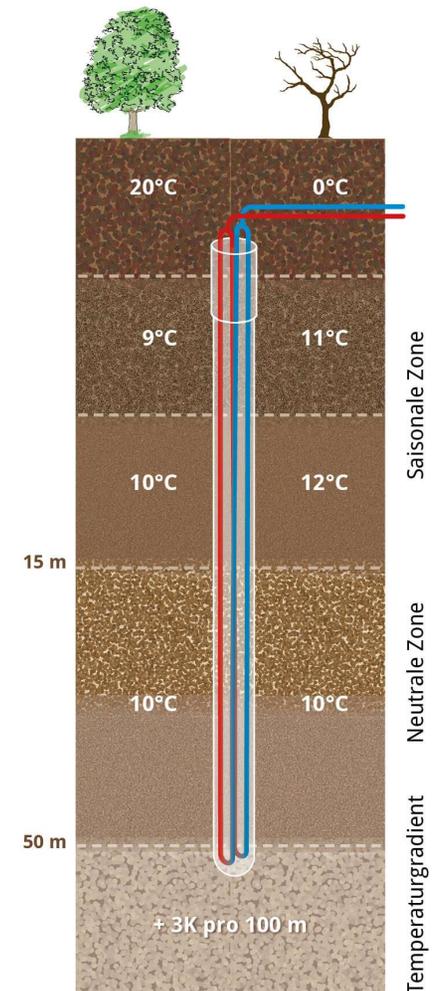
Heat extraction from the ground – 26 kW

Heat dissipation into the ground – 30 kW

Simultaneous Heating and Cooling

Space cooling in Summer which heating the Pool & Spa

Estimated Seasonal Coefficiency of Performance (SCOP) > 6.5



Source: [Bundesverband Waermepumpe](#)

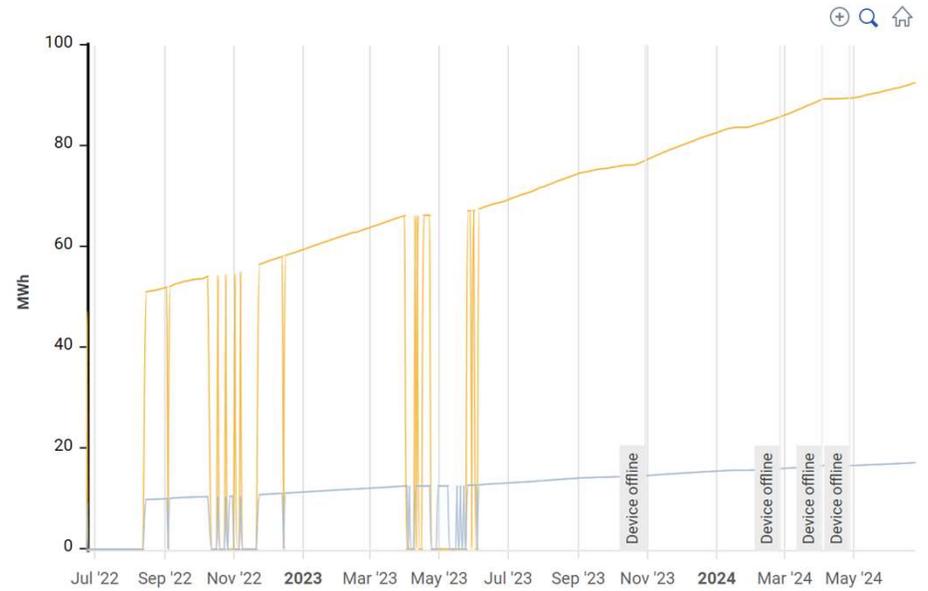
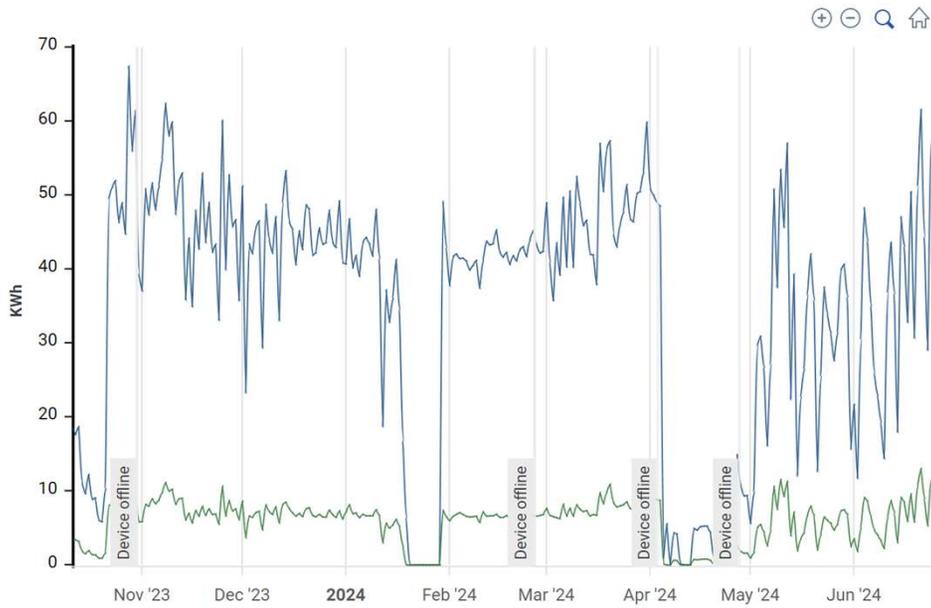
Case Studies

Vertical Probes - Residential Property



Case Studies

Vertical Probes - Residential Property



Case Studies

Vertical Probes – Commercial Property

Canberra Grammar School

Vertical Probe Configuration – 84 x 100m on a sports field

Heating demand – 400 kW

Cooling demand – 450 kW

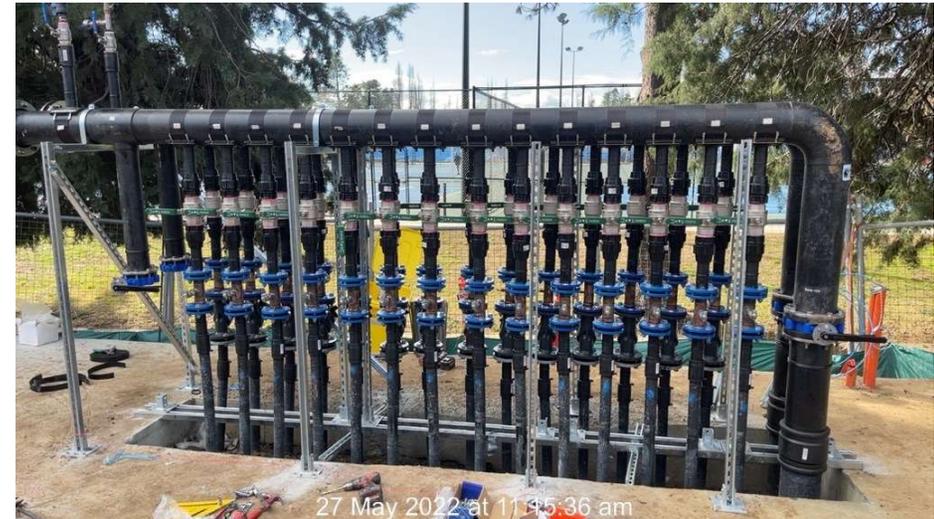
Heat extraction from the ground – 500 kW

Simultaneous heating and cooling

Estimated Seasonal Coefficient of Performance (SCOP) > 6.0 (tbc)



Case Studies



Case Studies



Case Studies – Canberra Grammar School



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