



Today's Presentation

The Basics of Ground Source / Role of the Drilling Contractor

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Hydracrat

Geothermal Drilling Contractor



About Hydracrat

- Founded in February 1960
- Located in Lanarkshire, Scotland
- Significant drilling background in energy & water markets
- Provide borehole drilling for Ground Source Heat Pumps
- Diverse drill fleet; all designed and built in-house
- Experienced and qualified office team and site crew



Why are we talking about Ground Source?

- Governments around the world working to limit the impact of climate change
- Scottish Government aim to achieve 'net zero' by 2045
- Scot Gov recently published aim to transform 1 million homes to use low and zero emissions heating systems by 2030
- Fossil fuel intensive systems such as gas and oil boilers expected to be phased out
- Heat Pumps are the cleanest, most readily available low-carbon heating technology currently on the market
- Heat Pumps harness heat from a source already available (such as from the ground, water or air) as opposed to generating heat by burning fossil fuels

New rules for low carbon heating in Scots homes

New rules are to be introduced to ensure all new homes built in Scotland use renewable or low-carbon heating.

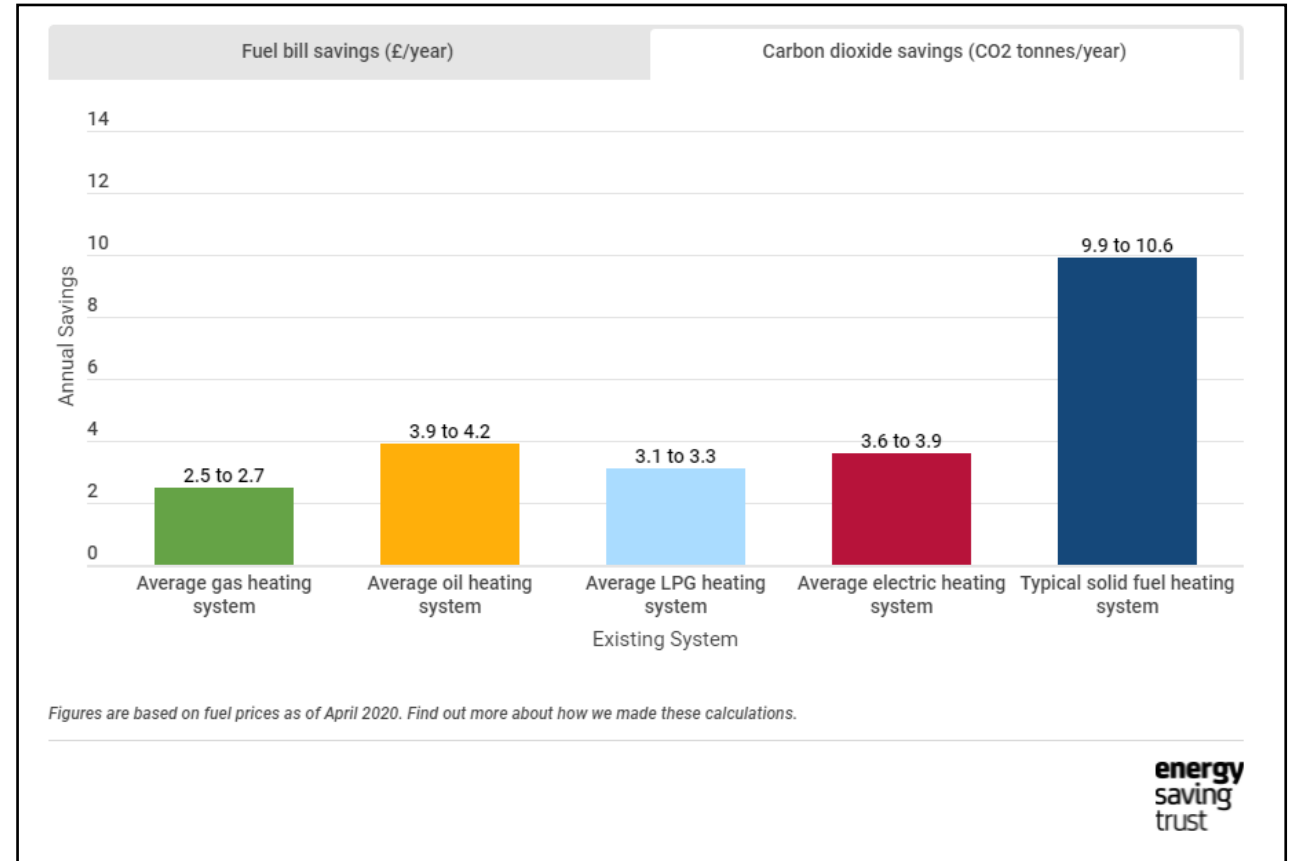
The regulations, being introduced by the Scottish government from 2024, are part of plans to cut greenhouse gas emissions.

Renewable and low-carbon systems will also be phased in for new non-domestic buildings from 2024.

Low-carbon heating is often used to refer to systems that use heat pumps or other alternatives to gas boilers.

Efficiency and costs of heat pump

- GSHPs are one of the cleanest, most efficient heating solutions currently on the market
- COP of a GSHP: 300-400%
- COP of a typical gas boiler: 85-90%
- Typical GSHP installation cost: £14k - £20k
- Running costs variable depending on property, insulation etc
- Funding opportunities are available



The Concept of Ground Source

- Thermal energy provided by sun effectively soaked up by the earth
- Temperature in heated ground rock typically 9-12C to normal drilling depth in Scotland (i.e. down to around 200mbgl)
- Temperature of ground beyond shallow depths is generally consistent regardless of time of day or year
- The heat from the ground can be harnessed to warm buildings in the winter using a GSHP
- Can also provides cooling opportunities
- Renewable, low-carbon source of heat



Methods of Heat Extraction - Horizontal

Straight Pipes

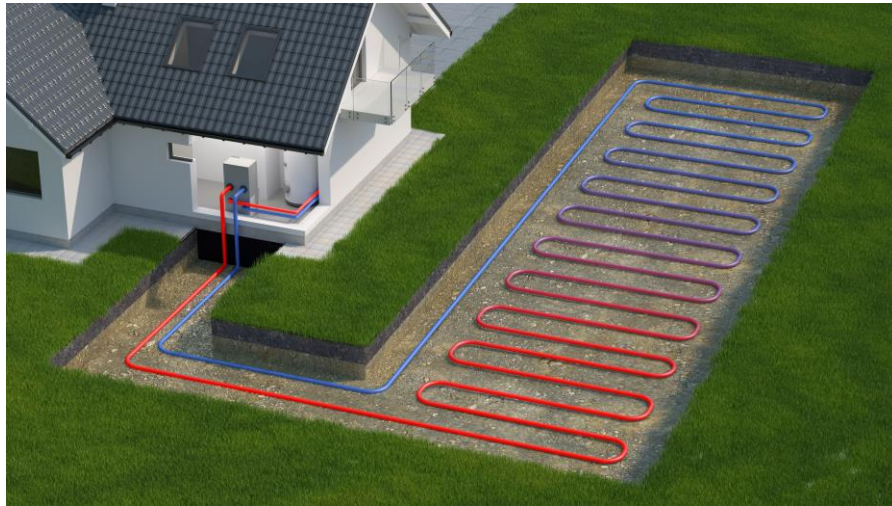
- Straight pipes laid horizontally at shallow depth
- Typically laid over a surface area or trenches
- Liquid containing antifreeze circulates within pipes

Slinkies

- Coiled loops of pipe laid horizontally
- Each line of coil laid in trench dug to shallow depth
- Liquid containing antifreeze circulates within pipes

Horizontal solutions are generally cheaper than vertical borehole solutions but need significantly more land

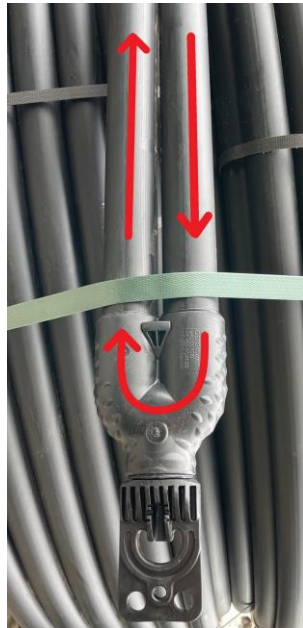
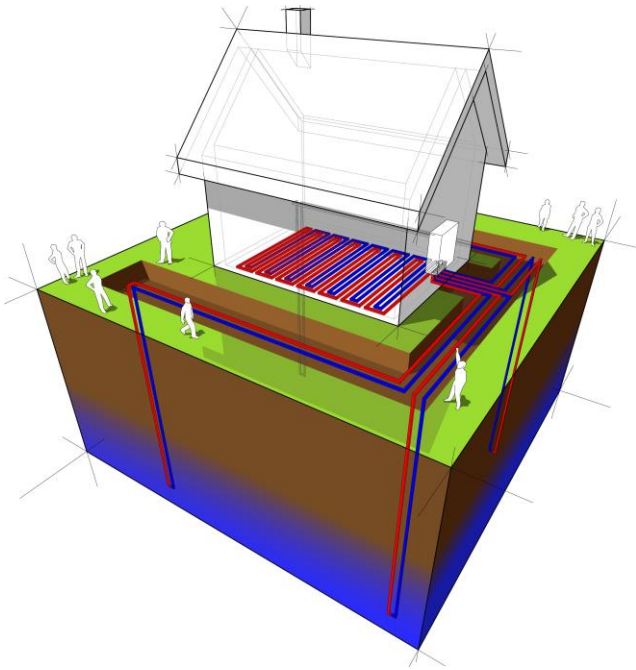
Must be installed in line with GSHPA Standards



Methods of Heat Extraction - Vertical

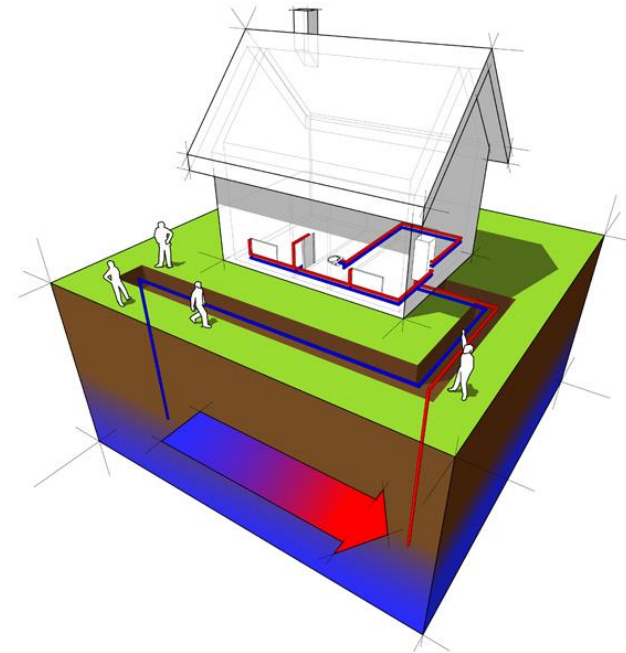
Closed-Loop

- Boreholes drilled into ground to depths up to 200mbgl
- 40mm pipe with a u-bend at bottom installed to depth
- Liquid containing antifreeze continuously circulated around the pipes to harness heat
- Installed in compliance with GSHPA Vertical Borehole Standard



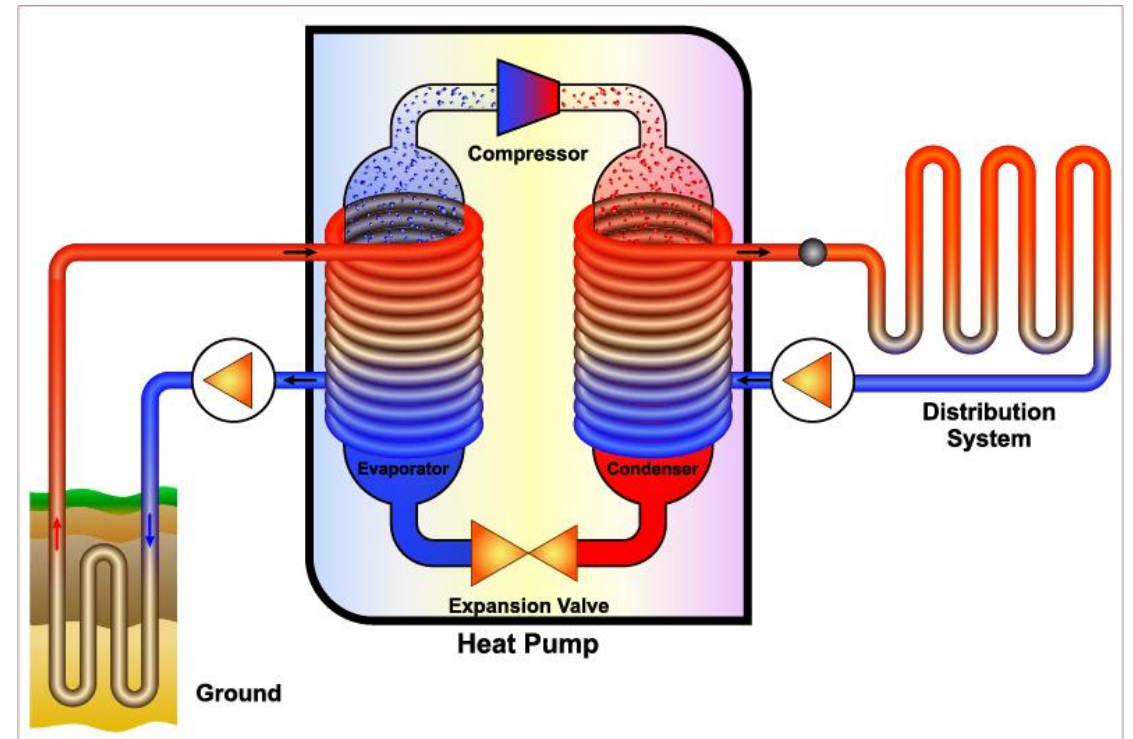
Open-Loop

- Boreholes drilled into underground aquifer or mine workings to harness heat from groundwater
- Groundwater pumped to surface from abstraction borehole, circulated to heat pump before being discharged at a lower temperature via separate borehole(s) located to minimise thermal interference between abstraction and recharge.
- Must comply with CP3 developed jointly by CIBSE, GSHPA, HPA



The Heat Pump

- Located inside building, powered by electricity
- Can provide heating and hot water
- Various sizes of heat pumps which are generally indicated by power output rating (i.e 12kW)
- Sized based on property, insulation, size of radiators/UFH, desired indoor temperature
- Heat pump effectively operates like a fridge in reverse
- Supply and return pipes between heat pump to manifold chamber
- Connection between manifold and sub-surface collector loops
- Vertical / horizontal collector loops installed by contractor



Role of Drilling Contractor - Preparations

- Drilling contractor will drill boreholes for vertical closed-loop and open-loop GSHPs
- Installer / Designer typically engages the services of the drilling contractor
- Installer / Designer provides details of drilling requirements (no. of boreholes, borehole depth, materials) along with drilling conditions and obligations
- Assessment of drilling conditions / constraints
- Drilling contractor prepares price for drilling based on the scope of works, drilling conditions and relevant regulations / statutory obligations
- Site visit before drilling starts
- Drilling contractor prepares Health & Safety documentation (RAMS, underground services)



Role of Drilling Contractor - Practicalities

The drilling contractor will assess and review information on the following prior to mobilisation to site:

- Site access
- Working space
- Borehole positions / spacing
- Underground services (gas, power, water, fibreoptic)
- Trees and roots
- Geology / historic mining activities (Coal Authority)
- Environmental Regulations (SEPA, EA, NRW)
- GSHPA Vertical Borehole Standard / CP3
- Artesian pressure

The driller will then determine the optimal drilling rig, drilling techniques and ancillary equipment for the project, thus enabling calculation of an estimated price.



Role of Drilling Contractor - Drilling Closed-Loop system

1. Mobilise to site
2. Set up at borehole location
3. Drill and case through superficial deposits (drift)
4. Drill through bedrock to target depth
5. Pressure-test loops prior to installation
6. Install collector loops to borehole depth
7. Pressure-test loops after installation
8. Fill borehole with grout
9. Finish off borehole, ready for connection

More than one borehole? Then repeats steps 2-8

Open-Loop System = Different Type of Installation



Benefits of Ground Source

- ✓ Efficient, low-carbon source of heating
- ✓ Consistent source of heating all year round
- ✓ Adaptable – cooling in the summer
- ✓ Heat or cool at night = cheaper electricity
- ✓ Long life span
- ✓ No parts visible externally
- ✓ Energy security
- ✓ Local / national supply chain





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