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Ground source heat pumps

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Just two metres below the surface, the temperature of the ground is a fairly constant 11-12°C. Using a ground source heat pump, we can capture this warmth and use it as a reliable heat source for our homes and other buildings.

Ground source heat pumps aren't cheap (around £24,000 according to the Energy Saving Trust), require a reasonable amount of ground space, and work most efficiently in well-insulated homes.

How do they work?

Ground source heat pumps consist of a buried network of fluid-filled pipes, a compressor and pump unit. The pipework, usually about 100m of it, is buried in loops in trenches (photo, below) or in one or more vertical boreholes. Once the pipework is buried, the surface of the ground can return to being a field, garden, drive etc, and you wouldn't know it was there.

A liquid – typically water with antifreeze – is pumped through the pipework and absorbs the warmth of the ground. A compressor in the main unit of the heat pump raises the temperature of this fluid through compression, and a heat exchanger transfers the warmth to the water that circulates round the central heating system. The heat is then transferred to the property via radiators or under floor heating. The now-cooled water is pumped back out to the buried pipework and the cycle begins again.

The whole system is powered by electricity, so unless this comes from a renewable source such as a wind turbine or solar panel, a ground source heat pump still generates



A heat pump 'slinky' awaiting burial in a trench lined with fine material to avoid damaging the pipework

carbon emissions. However, this is considerably less than those associated with fossil fuel or even direct electric types of heating.

Is my property suitable?

Heat pumps work most efficiently in well-insulated buildings, ones that once they reach a comfortable temperature stay warm and don't lose their heat. So, if you're considering a heat pump, it is very important to make sure your home is well insulated.

It's also important to know that heat pumps produce heat at a lower temperature than conventional central heating systems. In other words, the radiators won't get as hot as most people are used to. For this reason, a larger area is required for the heat distribution: bigger radiators, for example, or, best of all, underfloor heating.

Heat pumps also work best when there are gradual rather than sudden temperature demands on the system. You can't just whack the heating up like you can with a gas central heating system.



A typical domestic pump is the size of a large fridge, so best installed in an outbuilding or basement. It is preferable to site it close to the collector pipes. A good installer will make sure that the heat pump, collector and heat distribution system are sized correctly. An under-sized system won't heat your home properly, while an over-sized one will reduce overall system efficiency and therefore be more expensive to run.

Make sure that the kit you are installing, and your installer, are registered with the Microgeneration Certification Scheme (MCS), and ideally look for an installer that is a member of the Renewable Energy Consumer Code scheme. We recommend obtaining at least three quotes for comparison.

Costs and savings

A typical ground source heat pump costs around £24,000 to install, with the cost varying considerably depending on the size of the system and the additional work required, for example to fit underfloor heating. How much you'll save depends on two things: the type of fuel you are replacing, and something called the Coefficient of Performance (COP) which is a measure of the amount of electricity you put in compared to the amount of heat you get out.

Based on a 4-bedroom detached property the potential yearly savings are (figures from Energy Saving Trust):

System being replaced	Old (G-rated)	New (A-rated)
Gas boiler	£490	£40
Electric storage heater	£2,000	£1,200
Oil boiler	£280	£190
LPG boiler	£1,200	£550
Coal	£1,300	n/a

The initial capital cost will be offset by these reduced fuel bills, and there is little need for service or maintenance (see below).

What's more, you might be eligible for support under the Boiler Upgrade Scheme. If so, you'll get £7,500 (or £9,000, if you live in an off-gas property) off the cost and installation of a ground source heat pump.

And of course, if your home has solar panels, the running costs of the ground source heat pump will be low.

Maintenance

As the system is closed and hermetically sealed (airtight), very little maintenance is required. An annual service of the pump is advisable, and you should ask your installer to show you how to adjust the controls and provide you with a manual. Heat pumps last around 20 years and the ground collectors are expected to last for 70 years so little needs replacing. If something does go wrong, for example a leak of the refrigerant, you would require an engineer with F Gas certification.

Useful websites

Microgeneration Certification Scheme
www.microgenerationcertification.org

Renewable Energy Consumer Code
www.recc.org.uk

Ground Source Heat Pump Association
www.gshp.org.uk

Heat Pump Association
www.heatpumps.org.uk

Boiler Upgrade Scheme
www.gov.uk/apply-boiler-upgrade-scheme



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