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10

Essential Guide: Heat Pumps and Far Infrared

How to make your heating clean, green and efficient

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Home Club

Planet-friendly ways to heat your home

Green choices that can reduce bills and cut carbon

One way or another, the UK's homes must be decarbonised over the next 20 years if there is any chance of meeting the government's Net Zero targets to cut greenhouse gas emissions (GHG).
That means finding efficient and low-carbon ways of keeping warm and providing hot water. Net Zero is only one of many goals that need to be met for the threat of climate catastrophe to be effectively neutralised.

Greener heating options explained

Among the leading contenders for green home heating are heat pumps. The UK's scientific advisors, the Climate Change Committee, say heat pumps will play the largest role in decarbonising Britain's heat supply.
An efficient option for some homes that might not be able to choose heat pump technology would be Far Infrared heaters, which we'll explain, but first let's deal with heat pumps.
The main short-term issue with heat pumps up to now really has been one of cost.
That's why an impressive coalition of leading green campaigners, major energy suppliers, and trade associations pushed the government to back a "Fair Heat Deal".
That pressure paid off, with the government launching a grant scheme to help homeowners make the move to heat pumps.
Households will be offered subsidies of £5,000 from April to help them switch.
With the cash, the cost of installing heat pump technology will be more or less the same as buying a new gas boiler.

> "A big advantage of air source heat pumps is their relatively low running costs."

Can all types of homes move to greener heating options?

As an energy technology, heat pumps are very efficient and clean. And abandoning polluting fossil fuel boilers is essential because 40% of UK GHG emissions come from households - up to 25 million UK homes have gas boilers.

For millions of homes, heap pumps could be a great alternative to gas-fired boilers. The main restrictions are whether you have space on the outside walls of the property to install a heat pump (or more). This might make it problematic for people living in flats above the ground floor.

Heat pumps do use electricity to power a part of the operation, they don't burn fossil fuels directly to generate heat. What's more, they work effectively in temperate climates like the UK and deliver heating even when external temperatures are as low as -20 degrees Celsius.

Will going greener cause a lot of disruption?

Heat pumps generally are more efficient and so cheaper to operate than electricity night storage heaters, oil boilers or LPG boilers while they have about the same lifetime cost to run as gas-fired central heating.

In terms of disruption, you should not be much troubled by the installation of air source heat pumps. It should be possible to use the installed radiators, and you might want to ensure that insulation and draught prevention is good.

Obviously, with ground source heat pumps, the main disruption would be the placing of the pipe network in the grounds of the home.

The renewable technology is being installed in a wide range of buildings, notably new construction, as the government announced plans to ban installation of gas boilers in new builds from 2025.

A heat pump is a device that transfers thermal energy from one

> "Rather than warming the air, Far Infrared heaters directly heat objects and surfaces gently."

1. **Up to 25 million UK homes have gas boilers.**
2. **40% of UK greenhouse gas emissions come from households.**
3. **Heat pumps extract thermal energy in the outside air or from the ground, so no fossil fuels are needed.**

1 **Heat pumps** will play a key part in reducing carbon emissions to Net Zero within 30 years.

2 **Heat pumps** have around the same lifetime cost to run as gas-fired central heating.

3 **The government** has announced plans to ban installation of gas boilers in new builds from 2025.

point to another.
We use them all the time, even if we don't know we're doing it – our fridge freezers use this technology through evaporation and cooling of a liquid to reduce the storage temperature.
But recently, heat pumps have become more of a talking point because the technology is being increasingly deployed in the reverse direction - to provide domestic and commercial heating, transferring energy from an exterior source to heat radiators, underfloor heating systems and hot water.

Will the heat feel different from regular gas central heating?

You won't feel any difference in the heat when you switch to heat pumps from gas central heating. The radiators will still heat up and provide the warmth you need.
Heat pumps – either air or ground - are used to extract thermal energy in the outside air or from the ground, and moving it inside where it is compressed and the heat transferred using a series of coils.
An air source heat pump is fitted outside a building and has a system of coils filled with refrigerant liquid. It works by drawing in air via a fan or impeller and the liquid in the coils absorbs heat from the air and evaporates. This gas passes through a compressor which greatly increases the temperature.

Can I keep my old radiators?

You should still be able to keep your old radiators, which will have the heated water pumped into them. The heat is transferred through inner coils in the building and released with the refrigerant flowing back outside to absorb more air heat.
Heat pumps can run at 60 degrees and as most current central heating systems are over-specified homeowners should not need to install bigger radiators in most cases, or have to install underfloor heating, bearing in mind at the same time the need for a highly insulated property.
The system would need to operate continuously during winter months and would need to be site correctly to minimise fan noise. In an older home that cannot be insulated, a back-up heating system might be necessary, such as solar thermal panels for hot water and pellet-burning stove.
We can dive into more detail around air source heat pumps and outline the advantages and disadvantages of what might become one of the main ways we heat our homes as

we move to the national Net Zero target, reducing carbon emissions to the equivalent of zero within a 30 years.

An air source heat pump is fitted outside a building and has a system of coils filled with refrigerant liquid. It works by drawing in air via a fan or impeller and the liquid in the coils absorbs heat from the air and evaporates. This gas passes through a compressor which greatly increases the temperature.

You can choose between two types of air source heat pump. "Air-to-water" heats water which is then circulated around the home through low-flow radiators or underfloor heating systems, and can also heat water in a storage tank for kitchen and bathroom use. "Air-to-air" uses fans to circulate warmed air but are not used for heating water.

What if something breaks, is it easy to fix?

While repairs can be generally expensive, the good news is that heap pumps are reliable and so should stay in good working order.

A big advantage of air source heat pumps is their relatively low running costs but they are not suitable for every home or commercial space.

They work well with underfloor heating but the design and construction of the system needs to be carefully planned together with excellent insulation and airtightness in the property.

Running costs will also vary but there could be substantial savings, particularly in properties off the gas grid.

To take one example, for every 1 kWh of electricity, an air source heat pump can produce 3kWh of heat so if we take the mean average annual demand for most homes as 12,000 kWh, that will need 4,000 kWh of electricity. If we price this at 17p a unit, the annual heating cost is around £680.

Do you need to service a heat pump like a boiler? And does it need a specialist?

It's always a good idea to have an annual service by a qualified engineer, in much the same way as you would have your gas boiler looked after on a regular basis.

Air source heat pumps are cheaper and simpler to install than ground source heat pumps but efficiency is affected by external air temperatures.

Heat pumps need less maintenance than fossil-fuel systems. Some regular checks of the system can be done by you, with a professional service by an accredited installer carried out every three or five years.

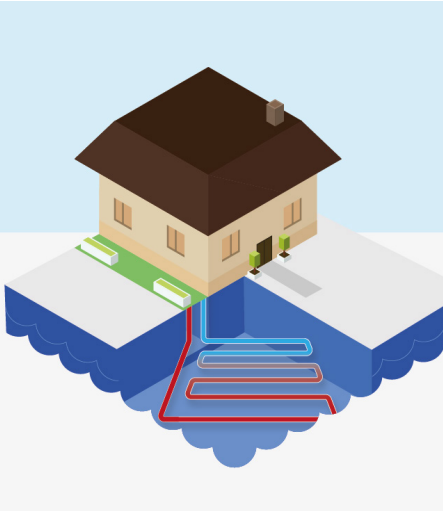
Ground source heat pumps work by taking heat from the ground

> "A heat pump is a device that transfers thermal energy from one point to another."

Ground source options

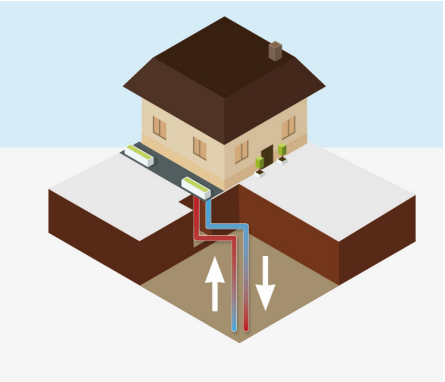
outside or from a body of water, using either closed loop piping for the ground or open loop piping for water.
For the ground-based system, a water and anti-freeze mix is pumped around the buried piping array, and absorbs heat from the sun that is captured in the earth.
This is extracted using compression and expansion technology.
How much heat is harvested is determined by the amount of piping as well the type of soil.
For example, clay holds more heat that sand.

There are two types of installation, depending on the space available and the particular type of ground condition.
A horizontal array has the piping laid in a closed loop serpentine pattern, buried in a trench that is usually 1.2m deep with either straight or slinky pipe construction.
A large garden space is required for this set-up. For example, 500m² to provide energy for a 10kW solution in clay soil, with double the space if the soil is sandy.



Vertical array

With a vertical array boreholes are drilled into the ground and each connected at the top in a closed loop.
Again, the amount of energy needed and the soil conditions will determine how many boreholes are needed as well as their depth.
You would need at least three boreholes drilled to a depth of 70-100 metres for an 8kW heat pump.
Heat can also be extracted from lakes or ponds, as long as the body of water is large.
The pump is installed in the property and these range in size from a large filing cabinet to a model that can fit under a kitchen sink.



Cost and paybacks

The cost of installing a typical ground source heat pump system in a 3 to 4-bedroom house would usually be well over £10,000 – with a general guide of £1,200 per kW capacity, and bearing in mind the effect of different soil conditions as well as house structure. Air to water heat pump costs usually start from £7,000 and go up to £18,000.
If you are switching from gas, the ongoing savings are regular but small, while a typical home moving from electricity could save more than £500 a year.
An added incentive is that a heat pump should run for 20 years and more, compared with the 10 to 15-year average working life of a gas boiler.

How will I now get my hot water (tanks and combi boilers)

A correctly specified heat pump can supply more than enough heat for both space heating and hot water. And remember that heat pumps provide the following benefits:

- Fewer carbon emissions
- No fuel storage space needed
- Safe – no combustion or dangerous gases.
- Less maintenance
- Increased property value
- Cooling in summer
- Liked by planning authorities

Is funding available?

The government is offering a number of grants, including the Boiler Upgrade Scheme, which will offer up to £5,000 off the price of air-source heat pumps. This replaces the Renewable Heat Incentive scheme, ending on March 22.

Homeowners in England and Wales will be able to get £5,000 off the cost of a new air source heat pump from April 2022 – and £6,000 off the price of a ground source heat pump.

Ground source heat pumps can save money on energy bills when compared to other heat sources from gas to direct electric heating and oil, with lower maintenance costs.

> "Households will be offered subsidies of £5,000 to help them switch to heat pumps."

The scheme is "first-come, first-served," and you need to register your interest with air or ground source heat pump installers. The grant will reduce the average cost of an air source heat pump from £7,000 to £2,000, making it cheaper than a new gas boiler.

But remember, just 90,000 homes will be able to take advantage of the grant over the next three years.

Far Infrared heating

Another zero-emissions option is Far Infrared heating, which works in a very different way to standard solutions like central heating and storage heaters. Those forms of convection heating are highly inefficient in that they simply heat the air, which causes constant movement. As the air rises it cools and is also dispersed by draughts and other flows.

Far Infrared heating is a stylish and energy-efficient option for the home that gives you highly controllable comfort.

An increasingly popular choice are the Far Infrared panel heaters that look great and are a versatile solution where conventional heating is either not possible or desirable.

Far Infrared heaters directly heat objects and surfaces in a gentle way, rather than warming the air - convection heaters require up to 40% more energy to heat the air than a Far Infrared panel heater.

The direct warming properties of Far Infrared help to raise the "thermal mass" in a room as the

heat is retained and released from the walls and ceilings. This means that the room continues to provide a high level of comfort when the heaters are switched off. Far Infrared can save up to 60% in energy compared with older technologies, like night storage heaters.

Dust and debris

There is an additional benefit with Far Infrared particularly when set against storage heaters that warm cool air at the base so making it rise. In that process, dust and allergens are stirred up and circulated around the room. Night storage heaters tend to collect a lot of dust and debris over their lifetime, which is near impossible to clear effectively.
Asthma sufferers and those with other types of breathing difficulties have reported a positive difference and the Far Infrared systems are also helpful for those with allergies, including "multiple chemical sensitivity" (MCS). The gentle radiation from Far Infrared also makes people feel good, with a very comfortable warming effect. This is because the skin readily absorbs Far Infrared waves and it has been likened to the feeling of a warm sun on your skin.
Far Infrared heaters are suitable for all types of home and can be installed as a complete heating system or as needed in each room.

1. **Far Infrared** heaters are a versatile solution where conventional heating is either not possible or desirable.

2. **Convection heaters** require up to 40% more energy to heat the air than a Far Infrared panel heater.

3. **Asthma sufferers** and those with other types of breathing difficulties have reported a positive difference and the Far Infrared systems.

Don't worry if there are more questions radiating from you.

Drop your Carbon Mentor a WhatsApp.