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Heat pumps vs boilers: the key things you need to know

We've answered your burning questions about how heat pumps and boilers differ in technology, cost and other important areas

27 Mar 2024



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A switch from traditional fossil fuel heating to renewable, low-carbon alternatives is on the horizon for all UK homes.

Heat pumps are one such alternative, and the government has said that it expects them to be the main way many of us heat our homes in the future.

To reach national Net Zero carbon emissions targets, at least half of UK homes will need to have heat pumps by 2050. But less than 1% currently have these installed, while 80% of UK homes have a gas boiler.

Whether you're considering making the switch to a heat pump now, or just interested in how they work, here's our run down of the key differences between heat pumps and gas boilers, and what it's like to own one.

If you're in a position to install one now, you can head straight to our guide on [air source heat pumps](#).

How do heat pumps and boilers work?



Domestic boilers burn gas (or oil or LPG) to heat water. This water, which is contained in a closed loop system, is circulated to every radiator around your home by an electric pump. As it returns to the boiler, it is reheated by the burners and recirculated until your home reaches its desired temperature.

A heat pump-based central heating system works in a very similar way, and also uses an electric pump to circulate hot water around your radiators.

But heat pumps don't burn fuel; instead they use a refrigerant fluid to collect heat energy from the outside air or ground, and use a cycle of compression and expansion to concentrate this heat energy. This in turn heats the water in the closed loop system, which is circulated around your radiators.

More on: [how a heat pump works](#)

Heat pumps aren't new. They already heat 16% of Europe's residential and commercial buildings. You also likely have a heat pump in your home already: fridges, freezers, air conditioners and heat pump tumble dryers all use very similar technology.

Home energy management company Heatio told us that: 'Misinformation is the biggest challenge with heat pumps in the UK. A heat pump is nothing more than an incredibly efficient electric boiler: it heats your home and water, but far more efficiently, reducing your bills and increasing energy security.'

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An introduction to heat pumps



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'Heat pumps have been around for years and Europe is fitting them in countries far colder than ours in the millions, while we still have a steep curve to go to meet the UK's target of 600,000 installations a year in the next five years.'

If you currently have a combi boiler, you will generally also need to install a hot water tank or cylinder when you switch to a heat pump.

A hydronic heat pump can't produce instant hot water in the way that a gas combi boiler can, so you need to have a hot water storage cylinder that can be brought up to temperature gradually by the heat pump, with a built-in immersion heater for back-up.

If you have no room inside your home, the cylinder can be installed in a garage or other outbuilding, or there are horizontal models designed to be installed in the loft space (although in either case placing it in an unheated space may decrease its efficiency). Alternatively, you could install a heat battery, which is generally smaller than a hot water cylinder. If you use relatively little hot water, another option is to install a heat pump for your heating system only, and add an instantaneous water heater for your hot water requirements.

Find out more: [would a heat pump work for your home?](#)

Are heat pumps more expensive than boilers?

For most people, upfront costs will be higher with a heat pump. A new boiler will cost between £500 and £3,000, or up to £4,500 including installation. The Energy Savings Trust says that air source heat pumps tend to cost between £14,000 and £19,000 to install (before any grant funding). Power, brand, and installation needs can impact costs.

However, the government is currently offering grants of £7,500 to those wanting to install a heat pump, through the Boiler Upgrade Scheme (BUS). This brings the cost of installing a heat pump down significantly – so much so that depending on your requirements you could, if you're lucky, find yourself able to install one for as little as £500 in upfront costs, which is less than the average boiler.

Read more about the [Boiler Upgrade Scheme \(BUS\)](#) for replacing boilers with heat pumps, and [how to save money on buying a heat pump](#).

For your heat pump to run most efficiently, you may well need to make home improvements.

For example, you may need new larger radiators. That's because heat pumps send water through your system at lower flow temperatures (the temperature of the water before it is sent to your radiators) than boilers. You may be advised that you need a larger overall radiator surface area in order to heat a home well. You may not need to change your radiators: this should be determined by a heat loss survey before a heat pump is installed.

It's advisable to minimise heat loss through your walls, roof and floors before installing a heat pump. A property that leaks more heat would require a heat pump with a larger output, so it's best to reduce this as much as possible.

You don't have to take a fabric first approach (ensuring your home is well-insulated before installing a heat pump). Setting up your home for maximum efficiency will allow you to get the best value from your heat pump from the beginning. But you can schedule your home improvements in stages rather than attempting to do everything at once, which would stagger the costs and disruption for you. As you make the relevant changes, your heat pump would run more efficiently.

Even if you're not buying a heat pump right now, it's wise to insulate your property as best you can anyway. Insulation lowers your heating and cooling costs no matter what technology you're using, and also makes your home more comfortable. One common misconception about heat pumps vs boilers is that insulation only matters if you're getting a heat pump.

If you are buying a new boiler, there are grants available for [free or subsidised boilers](#) too, although not everyone is eligible for these schemes.

Find out more: [why insulation matters](#)

If you do buy a gas boiler, make sure it's from a reliable brand. Discover the [best gas and oil boiler brands](#).

Are heat pumps better for the environment than boilers?

In short, yes. They're considerably more efficient to run, and they're powered by electricity rather than gas. While not all electricity currently comes from renewable sources, more than 40% of the electricity in the National Grid does, and this is increasing over time. More than 54% currently comes from zero carbon electricity. Switching energy use from gas to electricity is an important tool in the decarbonisation of our homes.

The vast majority of UK adults (78%) surveyed by us in 2023 said they were concerned about climate change. 82% recognised their role to reduce their own impact. Switching to a more environmentally friendly form of heating, such as a heat pump, is one of the most impactful things you can do to reduce your own personal carbon footprint.

Make changes for the planet and your pocket. [Sign up for our sustainability newsletter – it's free, monthly](#).

Which are more efficient: heat pumps or boilers?

Modern condensing boilers are labelled between 92-94% efficient. Older boilers (pre 2005, when new regulations came in) are significantly less efficient.

Heat pumps are much more efficient than boilers: on average three times more efficient in fact. This means they can produce more heat output with less energy input.

For every one unit of energy it uses, a typical heat pump produces between 2.5 and 4 units of heat, or even 4.5 units, making heat pumps 250-400% or 450% efficient.

This varies in different conditions. Although they will continue to heat your home, they can be less efficient in very cold weather, for example. Your heat pump installer should calculate your Seasonal Coefficient of Performance (SCoP), to give you a realistic idea of costs and efficiency for the whole heating season.

Setup is crucial, making the difference between a cold home and an inefficient heating system and a warm, efficient one. The best boiler or heat pump in the world won't do the best job if installed or used poorly.


In either instance, make sure that your installer explains to you how to control your heating system. Heating experts The Heating Hub claim that 'most newly installed boilers run 10-25% under their A-label efficiencies because 99% of installers have not been trained to set condensing boilers up correctly.'

Use an installer that has been thoroughly vetted, such as a Which? Trusted Trader.

Find a trader you can trust

What do you need?

Where are you looking?



You can also check out our guide to [lowering your boiler flow temperature](#) which may be able to save you money.

Follow any maintenance advice recommended by your boiler or heat pump installer, and check out our guides to [getting the best boiler service](#) and [how boiler controls can save you money](#).

Will a heat pump cost more to run than a boiler?

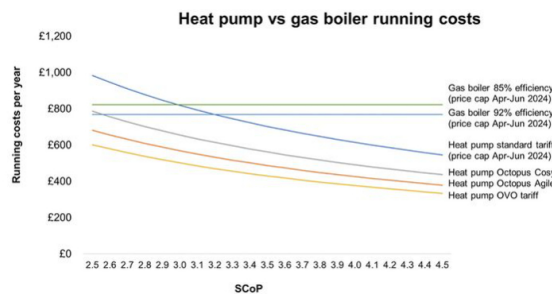
Heat pumps can currently be more expensive to run than gas boilers because they use electricity, and electricity bought at the price-capped rate is more expensive per unit than gas.

That said, energy companies are increasingly starting to offer specialist tariffs that significantly reduce the cost of electricity used for operating heat pumps.

Dr Jan Rosenow, principal and director of European programmes at the Regulatory Assistance Project (RAP), told us that: 'It is possible to save significant amounts of money in running costs.'

'A household could save more than 50% on running costs with a heat pump compared to a gas boiler. But this requires the heat pump installation to be of high quality, the efficiency of the heat pump to be high and the customer to be on a heat pump tariff.'

Dr Rosenow also provided the graph below, showing how heat pump and boiler running costs compare across a range of tariffs and efficiencies:



The graph shows that running costs for a heat pump can be less than those for a boiler if you're on a heat pump tariff and your heat pump setup is efficient.

For example, the owner of a heat pump with a SCoP of 4.5 could be paying as little as £379 for the same amount of energy that would cost £823 a year from a gas boiler.

This is based on:

- a total household gas use of 12,100 kWh
- 2% of this is used for cooking, so 10,038 kWh used for heating and hot water
- price-capped gas costs of £0.0604/kWh, so £769/year from a 92% efficient gas boiler or £823/year from an 85% efficient gas boiler
- price-capped electricity costs of 24.5p/kWh
- standing gas charges of £109.5/annum
- specialist Octopus electricity tariff of 17p/kWh (for heat pump owners)
- specialist OVO electricity tariff of 15p/kWh (for heat pump owners)
- specialist Octopus Cosy electricity tariff of 19.6p/kWh (for heat pump owners)

Will a heat pump be noisier than my boiler?

Unless your boiler is malfunctioning, it likely doesn't make much noise day to day. You might well have seen some headlines about noisy heat pumps and be worried that this will be an issue for you.

The good news is that a well-functioning heat pump should not make a disruptive level of noise.

Which? Trusted Trader [Heatable](#) explains that, while variations in design from model to model will affect noise output, 'heat pumps are generally not that noisy'. Air-source heat pumps create between 40 and 60 decibels on average: a similar noise level to a dishwasher or microwave.

If your heat pump gets noisier with time, you should get it looked at, as this could indicate a problem, in the same way as unusual boiler noises could indicate a fault.

Check out our guide to [common boiler problems and repair costs](#) if you're hearing odd noises from your boiler.

Will a heat pump leave me colder than my boiler?



Not if it's set up correctly. Even in very cold weather, heat energy still exists in the ground and air. Heat pumps can still take this energy and use it to provide heat for your home.

Heat pump installers Heat Geek explain that: 'If you hear of people struggling to heat properties with heat pumps because it's cold, that's because the lower temperatures show up any design, installation and commissioning flaws.'

A large-scale survey of 2,500 heat pump owners and 1,000 gas boiler owners conducted by innovation agency [Nesta](#) and Eunomia Research and Consulting found that heat pump users are highly satisfied with their heat pumps, viewing them to as safe, reliable, quiet heat sources that are effective for space heating and producing hot water. It found similar satisfaction levels between heat pump and gas boiler users.

The survey did find that heat pump users were likely to feel less satisfied than gas boiler owners when it came to 'ease of use and control', as heat pump users felt less confident. If you're not using your heat pump to its best advantage because you haven't been shown how, then you could find yourself cold, or overpaying in energy bills.

Note that the same applies to a boiler where, again, a lot depends on installation and usage. In either instance, it's important that you fully understand how to get the best out of your appliance.

Find out how [adjusting your boiler controls](#) can keep you warm and save you money.

Can I have a heat pump in a flat?

We put this question to the Energy Saving Trust. Brian Horne, its technical knowledge lead, said that this is possible, but there are more challenges to overcome than with a house.

A standard air-to-water heat pump (the type most commonly installed in the UK at the moment) requires an external space to fit the outside unit. Air-to-air heat pumps may be more appropriate for some situations, especially small flats that can be heated by one or two individual units fitted through external walls.

Horne told us: 'There are also some small internal heat pump systems coming onto the market, taking air from the outside to run an internal unit that provides space heating and/or hot water.'

'Another option for some blocks of flats might be to drill boreholes for a communal ground source system, with liquid from the boreholes piped to each flat which then has its own internal heat pump. This is a technically attractive system but practically difficult to retrofit in a block where different people own different parts of the building.'

The best thing to do if you live in a block of flats is to talk to a few installers in your area, who will be able to give you some ideas about what your options are given your circumstances.

Make sure that you have permission to do this: you'll need to discuss it with the management company if you're a leaseholder or the freeholders if you own a share of freehold.

Where can I buy a heat pump?

All [Which? Trusted Trader heat pump installers](#) have been thoroughly vetted by us.

If you can't get hold of a Trusted Trader in your area, companies offering heat pumps and installations include:

- [British Gas](#) offers a survey, installation and aftercare. Its 'Warm Home Promise' means it

will give you your money back if your heat pump doesn't reach an agreed temperature for your home. In practice, this just means fitting a system that's the right size, but it doesn't guarantee a specific level of efficiency.

- [EDF Energy](#) partners with a company called CB Heating, which installs Daikin heat pumps with a five-year warranty.
- [E.ON Energy](#) is a Which? Trusted Trader offering Daikin, Mitsubishi and Samsung heat pump installations with seven-year guarantees, as well as an online costs calculator.
- [Good Energy](#) offers Midea heat pumps with a 10-year warranty and remote monitoring, which it claims are '20% more efficient than industry standards on average'.
- [Octopus Energy](#) offers survey, quote, installation and aftercare, including to non-customers. It offers a five-year warranty on parts and labour.
- [Ovo](#) has partnered with installer network [Heat Geek](#) to offer heat pump installation 'from £500 - including the £7,500 Boiler Upgrade Scheme grant'.
- [Scottish Power](#) offers Daikin, Vaillant and Mitsubishi heat pumps with two years of annual servicing from Domestic & General.

MCS also hosts a [database of MCS-certified contractors](#) you can use.

I don't want a heat pump or gas boiler - what are my alternatives?

Other options for homes off the gas grid include oil boilers and LPG boilers.

Biomass boilers are another option, and generally considered more environmentally friendly than oil and LPG. However, they do produce air pollution, and buying biomass fuel from genuinely sustainable sources can prove tricky.

Low and zero emission forms of heating include direct electric heating, such as panel radiators, modern storage heaters and infrared heating panels. These can be made greener if they are powered by electricity generated by your own [solar PV system](#). A [solar thermal system](#) can also provide some or all of your hot water.

You might also consider other forms of renewable heating, such as a thermal store (which stores heat in a large, well-insulated water tank) or heat battery (which stores the heat in a phase-change material).

Our guide to [home heating systems](#) explores each of these in more detail. If you're considering overhauling your heating system, consult a heating engineer for a whole home assessment.

Do you really need a [boiler replacement](#)? Don't commit to a new one before reading our guide to repairs, funding and choosing the best.

This article previously stated that 44% of electricity in the National Grid came from renewable sources, which was a quarterly figure (Q3, July-Sept 2023). It was updated on 5th March to explain that 40.8% is the figure for the year.

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