



HEAT PUMPS

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JUST-Systems

Why should I care about heat pumps?



Heating homes is one of the biggest sources of emissions in Reading.



Most homes still use gas boilers, which burn fossil fuels.







If you're thinking: “What can I do to genuinely cut my carbon footprint?” — heat pumps do reduce emissions from domestic heating, and may be a powerful option, **for some**, now.



The push for heat pumps in the UK is based on an expectation that changes in the costs of energy will increasingly favour heat pumps over gas boilers.

Is a heat pump for me?



Is it for me? This will depend on several factors we will explore today:

-  Heat loss in your home, e.g. insulation & draught-proofing
-  Ability to afford upfront costs / eligibility for grant
-  Ability to afford small additional running costs in short-term (+ explore tariffs options, e.g. time-of-day tariffs)
-  Ability to take longer-term view of costs to invest in a lower-carbon future (heat pump running costs likely to be lower than gas in future).

What is a heat pump?

Naturally, heat flows from a hot source to a cold sink. A heat pump transfers heat from a lower temperature heat source to a higher temperature heat sink using an external energy source.

Think of it as a fridge in reverse:

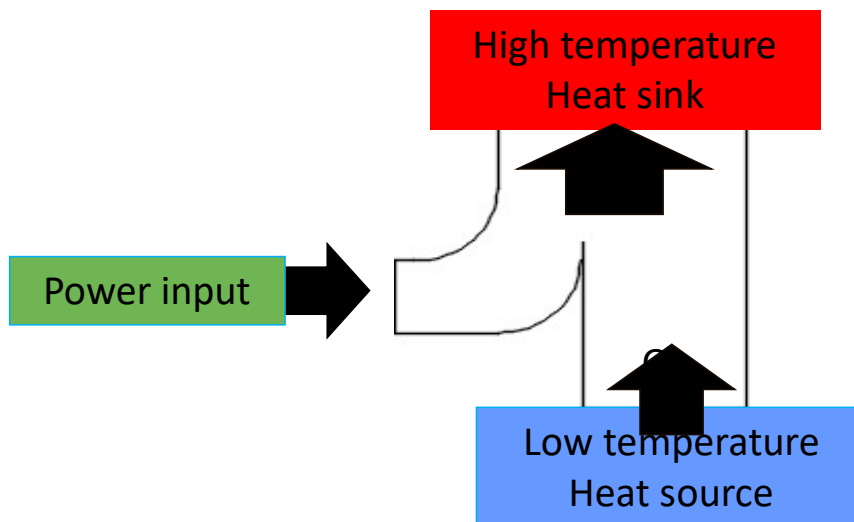
-  It extracts heat from the air, ground, or water outside and 'steps it up' to warm your home
-  It runs on electricity, not gas. As the grid gets cleaner, your home gets greener.

The science of a heat pump

The amount of heat that can be transferred is greater than the energy needed to drive the cycle.

3 Units of heat to be produced

1 Units of electricity to be used



Coefficient of Performance (CoP):

$$\frac{\text{Produced heat}}{\text{Electricity input}} = \frac{3}{1} = 3$$

2 Units of heat to be extracted from environment

Heat pumps vs gas boilers

Heat pumps can be 3x more efficient than gas boilers.
They use less energy overall, with much lower emissions.

For the **same heat output** (e.g. 3 units of heat):

A gas boiler needs: 3.5 units of energy

A heat pump needs: 1 unit of energy

Result: Up to **60–80% less CO₂ emissions** than a gas boiler

Assumptions: CoP of heat pump=3, Efficiency of boiler=86%



Types of heat pump technology

Heat pumps can be categorised based on:

- The source that heat is being extracted from and
- The sink that heat is being transferred to

Source/Sink outside the building

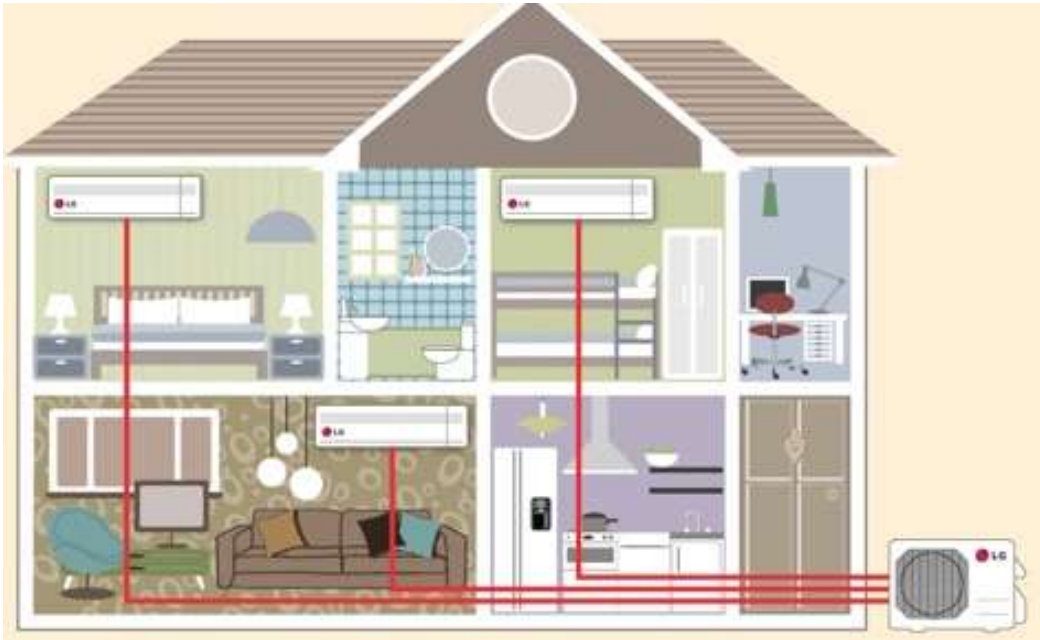
Air
Water
Ground

Source/Sink inside the building

Air
Water

Types of heat pump technology

Air source heat pump:



Air To Air Heat Pump

Types of heat pump technology

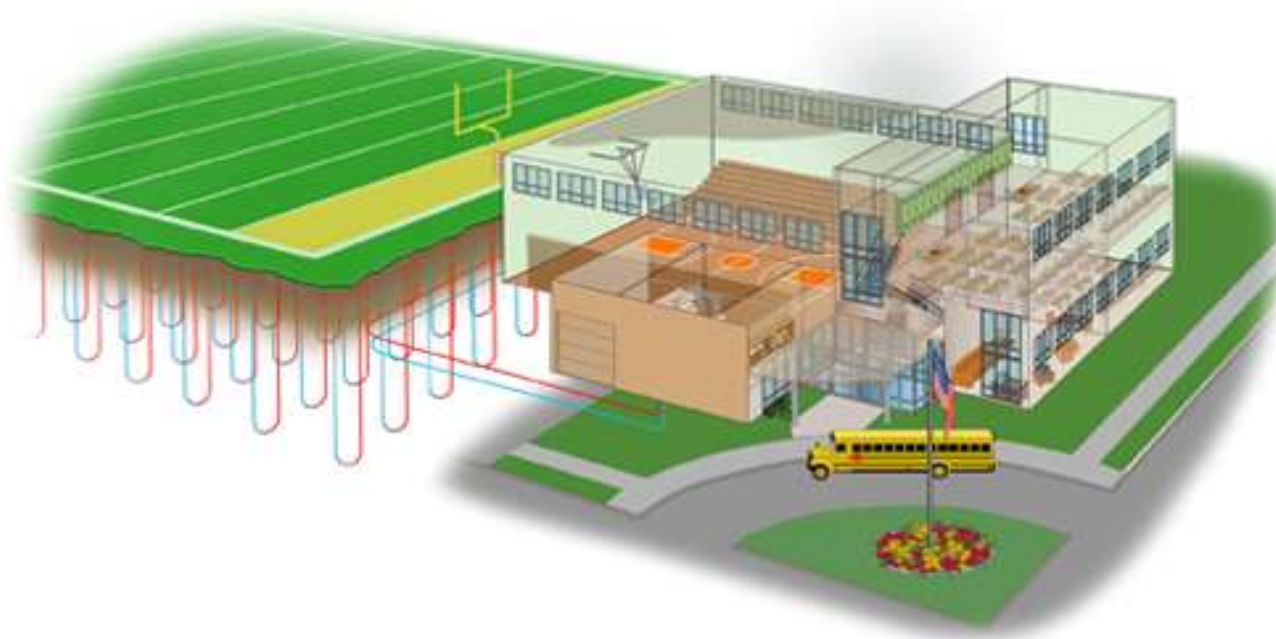
Water source heat pump:



Water to water heat pump

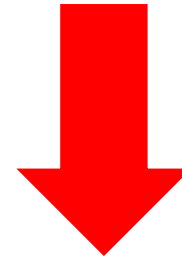
Types of heat pump technology

Ground source heat pump:



Comparing ground and air source heat pumps:

- Air source heat pump has **lower installation cost** than ground source heat pump.
- Air source heat pump has **lower energy performance** compared to the ground source heat pump.



Comparison of heating systems:

Assumptions:

Heat demand: 6000kWh (unit)/year

Energy price From 1 July 2025

Electricity : **25.73** pence per kilowatt hour

Natural gas : **6.33** pence per kilowatt hour

Heat pump COP_h : 3

Efficiency of the boiler: 90%

Efficiency of the electrical heater: 100%

CO₂ emission factor for natural gas: 0.19 kgCO₂/kWh

CO₂ emission factor for Electricity : 0.125 kgCO₂/kWh

Comparison of heating systems:

Assumptions: (Note 1)

- Energy consumption and energy related CO₂ emissions associated with the operation of heat pumps can be about 60%-80% less than gas boilers.
- The energy cost associated with the operation of heat pumps can be about 10%-30% more than gas boilers.

Note 1: These figures depends on the type of system and also unit price of electrically and natural gas.

Comparison of heating systems:

Conclusion? Heat pumps are much better on carbon but incur extra running costs compared with gas.

Heating system	Energy consumption (kWh)	Energy cost (£)	CO ₂ emissions(kg CO ₂)
Gas Boiler	$6000/0.9=6666$	$6666 \times 0.0633=422$	$6666 \times 0.19=1266$
Electrical heater	$6000/1=6000$	$6000 \times 0.2573=1544$	$6000 \times 0.125=750$
Heat pump	$6000/3=2000$	$2000 \times 0.2573=515$	$2000 \times 0.125=250$

What will make heat pumps as cost-effective as gas boilers?

From July 2025 the electricity-to-gas price ratio: $\frac{25.73}{6.33} = 4.06$






To make the operation of heat pumps as cost effective as gas boilers this ratio should become equal or lower than CoP of heat pump (typically 3)

In a nutshell:

- Electricity is 4 times more expensive than gas
- Heat pumps are 3 times more efficient than gas boilers
- But boilers are inefficient so this offsets some of the extra cost, which will likely come down over time anyway due to changes in the price of gas (forecast to go up) and electricity (forecast to come down)

Before you install a heat pump:

Recommended actions to reduce heat demand:

-  Insulate loft
-  Insulate cavity wall
-  Considering double glazed windows
-  Enhance air tightness (be careful of mould)
-  Consider zonal control

New rules from 29th May 2025

- **Installation location:** Within 1m of the property boundary is allowed.
- **Bigger allowed unit size:** Air source heat pump on a dwellings house jumps from 0.6m³ to a generous 1.5m³.
- **Up to two heat pumps :** Detached houses can now install up to two air source heat pumps.
- **Inclusion of Air-to-Air Systems (with cooling):** Air-to-air heat pumps that also provide cooling are now included.
- **Noise Standards Update:** The rules now reference the updated MCS 020 standard, ensuring installations meet the latest requirements for noise and noise assessments. Good news for both homeowners and neighbours.

Support and funding:

Boiler Upgrade Scheme:

- £7,500 towards an air source heat pump
- £7,500 towards a ground/water source heat pump
- £5,000 towards a biomass boiler

Note: Through Microgeneration Certificate Scheme (MCS)
certified installers

Support and funding:

Enhance the airtightness by DraughtBusters:

- Improving the airtightness of the building (but ventilate)
- Reducing the energy demand and hence energy bill

Note: you can be referred to receive this service by:

The Council's Energy Support Team:

energysupport@reading.gov.uk / phone: 0118 937 2222

Reading Citizens Advice: phone: 0808 278 8719

Summary

Even though electricity costs more:

- heat pumps use much less and the cost difference is narrowing
- emissions are much lower.

Before installing: improve insulation, seal draughts and check windows

Can you live with the small increase in energy costs in exchange for much better emissions performance, and ride out the increases until we get closer to parity?

Remember to keep shopping around for tariffs that allow you to save on energy costs at cheaper times.

What are energy suppliers doing to support time-of-use tariffs?

Thanks for your attention



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