Guide to heat pumps & the RHI

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Heat Pumps and the Renewable Heat Incentive - A quick and easy guide

What's in this short guide?

1. What is a heat pump and how does it work?

As the name suggests a heat-pump transfers or *pumps* heat from one place to another. Notice the use of the word “pump”- heat is not generated but rather is moved.

Heat pumps can work with radiators or underfloor heating systems.

The heat pump performs the same role as a boiler in a central heating system, but it uses ambient heat from the ground or air, rather than burning fuel to generate heat.

What’s so good about Heat Pumps?

They’re incredibly efficient, especially Ground Source Heat Pumps which are 400 to 500% efficient.

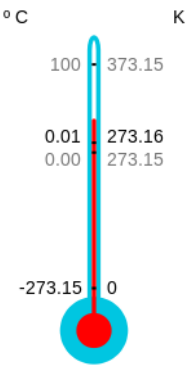
The energy bill savings are significant, and the technology qualifies for the Government’s domestic Renewable Heat Incentive (RHI) scheme with a couple of exceptions.

Simply put, a heat pump is a device that uses a small amount of energy to move heat from one location to another. You’ve probably got a heat pump at home already – your fridge. A fridge takes the heat put of the items inside and pumps this heat out to cool the items down.

The back of your fridge is warm when it is operating because it is pumping extracted heat to the outside.

To turn water into ice you might say you need to cool it down – another way to think of this is to extract the “heat” from the water until it turns to ice.

In fact, it is even possible to extract “heat” from ice. It is only when the temperature of absolute zero (minus 273 degrees C) is reached that nothing could be colder and no heat energy remains in a substance.



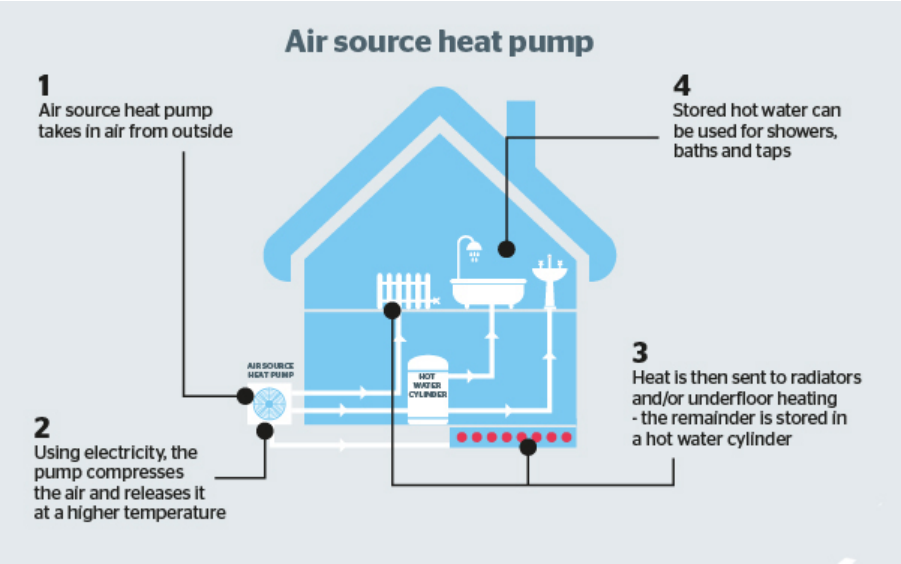
The benefits of heat pumps

- much lower fuel bills - roughly half the cost of heating with oil boilers
- potential income through the UK government's Renewable Heat Incentive (RHI)
- low carbon emissions
- no potential for carbon monoxide poisoning
- no fuel deliveries needed
- can heat your home as well as your water
- minimal maintenance required

Heat pumps are recognised as a renewable energy technology for hot water and heating in the UK. This means that these systems are favoured in planning permission applications for compliance with Part L building regulations.

1a. Air source heat pumps (ASHPs)

An Air Source Heat Pump (ASHP) uses a fan to draw air over a heat exchanger which looks very similar to a car radiator. The heat exchanger then transfers its heat to a compressor where the heat energy is greatly amplified and then transferred to the radiators or underfloor heating.

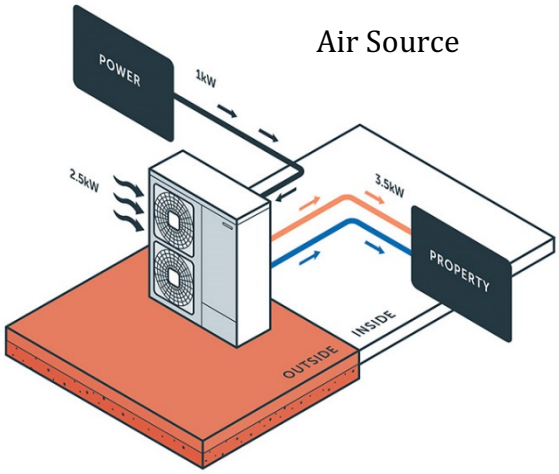


1b. A Ground Source Heat Pump (GSHP) system works in a similar way to an ASHP but harnesses natural heat from underground by pumping water in pipes set in the ground. The water in the pipes is heated as it circulates, the heat pump then increases the temperature, and the heat is used to provide home heating and hot water.

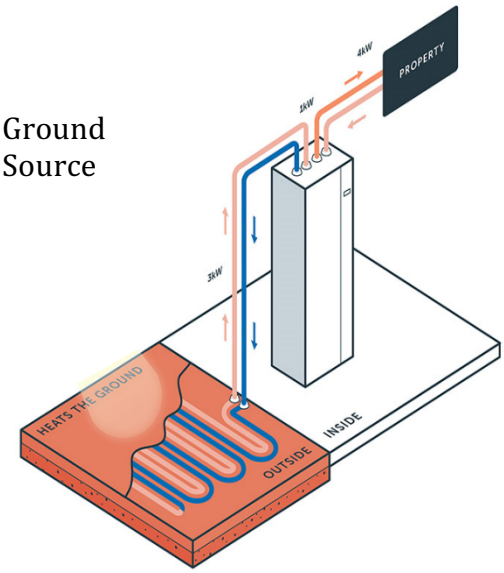
Ground Source Heat Pumps have a higher efficiency than their Air Source counterparts as the temperature of the ground is fairly stable at around 7 degrees or so year-round.

Air source products must work with the ambient temperature which could be anything including minus temperatures which is when the heat pump has to work hardest and therefore the efficiency is not as great as a Ground Source system.

Air Source



Ground Source



2. Space for Heat Pumps

In general, air source heat pumps need less space than ground source heat pumps. Let's take a look at the general overview, although details are dependent on the make and model of the system which is determined by energy requirements, budget, and property design.

2a. Space for Air Source Heat Pump systems

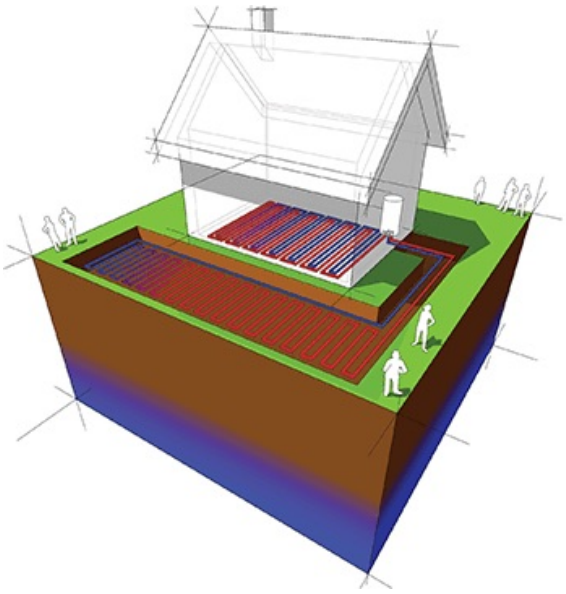
Air source heat pumps need more space than a wall-hung boiler, and a hot water cylinder is always required if the heat pump id to provide for the domestic hot water needs. Utility rooms, garages, basements and even detached outbuildings can make a good plant room.

An ASHP fan system will need to be placed on the outside of the property.

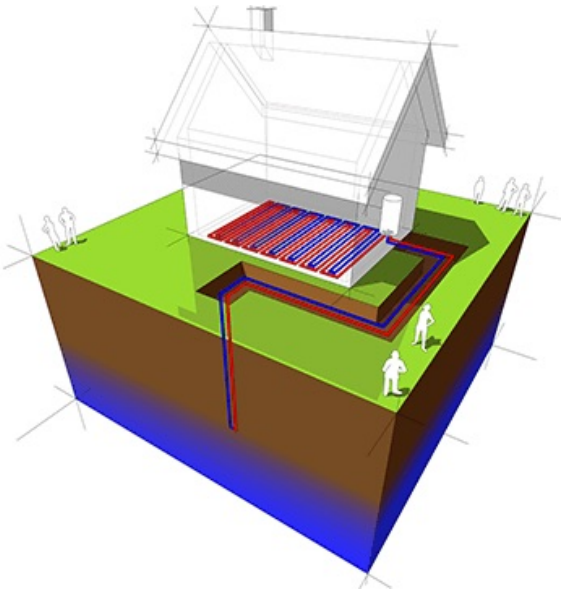
2b. Space for Ground Source Heat Pump systems

The heat pump itself is typically the size of a fridge or fridge freezer

The pipes for Ground Source systems in the ground which supply the heat can be installed in a number of different ways as shown in the image below. Boreholes (typically 75 to 100 metres deep) can be expensive whilst Horizontal Trenches usually require a significant amount of land.



Horizontal Trenches



Boreholes

3. Which type of heat pump system should I consider?

There are a number of factors to consider including:

Budget

Ground source heat pump systems are more expensive to install than the air source variety but are more efficient and receive a much higher Government Incentive via the Renewable Heat Incentive (RHI) administered by Ofgem. *Details of the RHi are covered later in this guide.*

Generally speaking, because Ground source systems receive this high level of Government Incentive they are usually cost neutral or better even before any energy savings are considered. For this reason many systems are financed through loans which are repaid via the RHI, and in many cases the RHI gives the owner an additional supplemental income so it is a very compelling proposition.

Precise costs are dependent on manufacturer, model, and size of system.

Payback

Payback is something to consider when contemplating a heat pump system. As noted above, ASHPs and GSHPs are both eligible for payments via the Governments RHI which is payable over 7 years for domestic systems. Over the 7 year period Ground Source Heat Pumps always win out over air source heat pumps. However, if replacing another fuel source such as Oil or Gas the greater efficiency of heat pumps over fossil fuel systems mean that significant energy savings can be achieved. In fact compared to an Oil boiler, a Ground Source Heat Pump system can more than halve the energy bill.

You can calculate your potential earnings and savings using our RHI calculator.

Aesthetics, location and planning

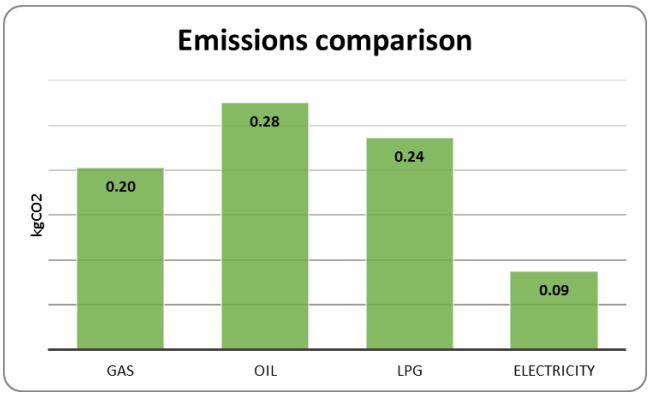
Installing a heat pump (of any kind) is usually considered as a permitted development, so planning permission is not required. That said, if you live in a listed building or a conservation area you should contact your council to clarify local requirements.

Air source systems are usually located outside a building whilst Ground Source systems are usually located internally.

Air source systems have some restrictions to their placement with regards to neighbouring properties primarily due to the noise emitted by the Air Source Heat Pump although this is very low at around 40 to 60 decibels (dB) and is not likely to cause any concern.
Planning standards assume that background noise is consistently under 40 dB. Compliance with planning laws mean that an ASHP should be under 42 dB from an assessment position equidistant to the space between the system and a neighbouring property.

Maintenance
Heat Pumps require very little maintenance but it is still prudent to have them inspected every two years or so to ensure the system is still in good order.
Maintenance is not a legal requirement for landlords as it would be for Oil or Gas boilers.

Carbon Savings



Heat Pumps:

- don't burn fossils fuels
- have low running costs
- are environmentally friendly
- are very energy efficient
- produce no on site emissions

Sources: MCS product database and Energy Related Products Directive

Heat Pump Facts

- Ground Source Heat Pumps are around 460% efficient - the best gas or oil boilers are only around 90% efficient
- Ground Source Heat Pumps provide the lowest running costs of any heating system
- Heat pumps can work with radiators and under floor heating
- There are no deliveries of fuel required and no emissions on site
- The numerous benefits are listed by the Energy Savings Trust
- They attract the highest level of Government Incentive for heating systems via the RHI

4. What do heat pumps mean for building regulations and SAP ratings?

Part L (2013) of the Building Regulations has five key requirements which house-builders must meet in new dwellings. Here's an overview:

1. Requirement 26A requires dwellings to achieve or better a fabric energy efficiency target, in addition to the carbon dioxide target.
2. Regulations require an overall 6% CO2 savings across the new homes build mix, relative to Part L (2010).
3. The feasibility of high efficiency alternative systems must be taken into account before construction commences. This includes heat pumps.
4. House-builders should limit heat gains and losses with good insulation in roofs and walls.
5. The provision of fixed building services which are energy efficient, have effective controls, and are commissioned to optimise power consumption.

SAP ratings

An integral element of Part L (2013) is the SAP rating of a new home. This is the Standard Assessment Procedure, which is the Government-approved method for assessing the energy efficiency of a new home. Assessments are carried out by accredited professionals at the design stage of a new dwelling, and any new home must pass the SAP rating; otherwise the house cannot be sold or let.

SAP ratings are based on a number of factors, including how well the fabric of the building retains heat, solar gain, quality of construction, and commissioning of systems. A higher SAP rating (100 is the maximum) means lower running costs for householders.

The characteristics of a dwelling with a good SAP rating include:

- High efficiency heating system
- High quality (and well installed) building fabric with low U-values
- Minimal thermal bridging (reducing heat loss through junctions with external walls)

The use of heat pumps (and other renewable tech) makes compliance with building regulations and higher SAP ratings much more likely. The reduced carbon emissions from this technology will help a building reach a lower carbon emission rate than the maximum (kgCO2/m2/year) in the SAP calculations

5. The Renewable Heat Incentive (RHI)

The Renewable Heat Incentive (RHI) is a cash payment scheme which pays for every unit of heat generated through renewable sources, in a similar way to the Feed-in Tariff but limited to heat generating technologies such as Heat Pumps or Solar Thermal Panels. The domestic tariff is guaranteed for 7 years and will rise in line with the consumer price index (CPI).

The Renewable Heat Incentive continues until March 2021

The current tariff levels (as of March 2018) for the domestic and non-domestic RHI are as follows:

Domestic Renewable Heat Incentive	RHI tariff pence / kWh	Tariff lifetime (years)
Ground Source Heat Pumps	20.46	7
Air Source Heat Pumps	10.49	7

Non Domestic Renewable Heat Incentive	RHI tariff pence / kWh	Tariff lifetime (years)
Ground Source Heat Pumps	9.36 (Tier 1) 2.79 (Tier 2)	20
Air Source Heat Pumps	2.69	20

As of September 2017, the Government introduced a cap on the amount of renewable heating generation above which Domestic RHI will not be paid:

- The cap for ASHP installations is 20,000 kWh per annum which would return £1489 in year one and a total of £11,331 *(based on a seasonal coefficient of performance of 3.5 and CPI of 2.76%)*
- The cap for GSHP installations is 30,000 kWh which would return £4,714 in year one and a total of £35,859 *(based on a seasonal coefficient of performance of 4.3 and CPI of 2.76%)*

How the renewable heat incentive is calculated

The domestic RHI tariff is paid per kWh (kilowatt hour) of renewable heat generated from the system for seven years, capped at 20,000kWh for air-source systems and 30,000kWh for ground source systems. Tariffs are estimated, rather than metered, and for heat pumps the calculation will use a heat demand figure based upon the property's Energy Performance Certificate (EPC) combined with a calculation about efficiency (Seasonal Coefficient of Performance - SCOP). The more efficient the system the higher the payments.

Tariffs for heat pumps will only be paid on the renewable portion of the delivered heat because heat pumps use electricity to generate heat. The efficiency will be based upon the Seasonal Coefficient of Performance (SCOP) of the system which is recorded in the Microgeneration Certification Scheme website using data from the Energy-related Products (ErP) Directive.

- **Example – Ground Source Heat Pump installed in a typical 3-4 bedroom house**
  Total annual Energy demand (taken from the EPC) = 25,000kWh
  GSHP seasonal co-efficient of performance (SCOP) of 4.3
  GSHP tariff: 20.46 p/kWh
  Eligible heat demand = 25000kWh x (1-1/4.3) = 19,200 kWh's
  Total annual RHI payments = 19200 kWh's x 20.46p = **£3,928**
  RHI paid over 7 Years = £29,880 (at CPI 2.76%)

The commercial (or non-domestic) RHI tariff provides financial support for the lifetime (20 years) of the qualifying installation. Payments are made quarterly and are based upon the actual heat output of the system i.e. the system is metered. An Eligible Heat Output (EHO) figure in kWh is calculated through the provision of meter readings at three monthly intervals. This is the amount that will be multiplied by the tariff rate to determine the payment amount.

6. Frequently asked questions

What types of scheme are there?

There are two types of Renewable Heat Incentive, the commercial or non-domestic scheme and the domestic scheme.

How does it work?

For Domestic Installations:

An eligible system is installed in the property. Eligible technologies include solar thermal systems, ground source heat pumps and air source heat pumps.

Certain insulation standards, such as a minimum of 250mm loft insulation and cavity wall insulation (if applicable), must be met to be eligible for the payments.

An Energy Performance Certificate (EPC) must be generated. To join the Domestic RHI, your property must be capable of getting a domestic EPC. The EPC is the proof required that your property is assessed as a domestic 'dwelling'. Without one, you won't be able to apply .

An estimate of the amount of renewable heat generated will be made. This is based upon the efficiency of the pump and the energy demand figures in the EPC.

A fixed amount is then paid based upon the calculated estimate. This is paid for seven years and is adjusted in line with the Consumer Price Index (CPI).

Important note: *the domestic RHI is not intended for new build properties unless they are defined as self-build or custom build. However new build properties may be eligible under the non-domestic RHI scheme.*

Non-domestic RHI

If your heat pump system is in commercial, public or industrial premises, you would apply to the Non-domestic RHI. This can include small and large businesses, hospitals, schools, and organisations with district heating schemes where one heating system serves multiple homes.

Eligible installations receive quarterly payments over 20 years based on the amount of heat generated; heat production is metered and you will be required to submit meter readings throughout the duration of the scheme.

Am I Eligible?

All domestic air source and ground source heat pumps or solar thermal installations of MCS accredited products

installed after 15th July 2009 by MCS registered installers should be eligible for RHI payments.
The Owners of the system whether in an existing home or a new build, self built property will be eligible. This includes privately owned homes, second homes, private landlords, social landlords, self build new homes and third-party owned systems.

What do I need to do?
You will need to ensure your installation is MCS approved.
You will need an Energy Performance Certificate (EPC), which will be used to calculate your renewable heat and identify any required improvements to the property.
The above does not apply to non-domestic systems

How do I receive the payments?
Domestic RHI payments (administered by Ofgem) will be paid quarterly for seven years and the tariff will change annually in line with the Consumer Price Index (CPI). Tariffs for new applicants may decrease subject to the budget management mechanisms set by the Government.

How to apply for the Renewable Heat Incentive

How to apply for the Domestic RHI scheme

You can apply via the Ofgem website . Before you start, you'll need the following to hand:

- Your Microgeneration Certification Scheme (MCS) certificate number
- Your Energy Performance Certificate (EPC)
- Your bank details
- Your metering questions, if you need to be metered
- Invoices or records stating both the cost of the system and labour to install (these can be approximations and will not affect your payments or eligibility).

How to apply for the Non-domestic RHI scheme

You can also apply for the Non-domestic RHI via the Ofgem website . The process is more complex than the Domestic RHI application, but Ofgem have produced their own handy guide, which you can download here . This provides step-by-step instructions for applying to the Non-domestic RHI scheme.

If you have any questions about either scheme please don't hesitate to contact us

7. Heat Pump Summary

1. Cost savings
Heat pumps will save energy and money. How much exactly? It depends, of course. When compared to other alternative energy, heat pumps also come out cheaper. For example, if there is no gas supply, a heat pump is cheaper than a Solar PV and boiler combo.

2. Financial support
The domestic and commercial RHI payments incentivise the switch to renewables, and heat pumps qualify. You can determine your estimated RHI payments using our domestic RHI calculator.

3. Environment
Heat pumps are better for the environment. For every 1 kWH in, the homeowners get 3 - 5 out. The greener the electricity supply to the heat pump, the greener the system overall. The household can generate its own green electricity onsite (via solar panels, for example), or buy electricity from green energy companies to create a 100% green utility.

4. Planning permission
Councils and planning authorities aim to reduce the impact of homes on the environment. When evaluating planning permission requests, they look for this as a green light. Installing a heat pump is better for the environment than alternative heating, and will serve in your favour when applying for permission on a new, renovated, or extended property.

5. Ease of installation and maintenance
Heat pumps are no longer the futuristic phenomenon they once were. They are straightforward to install, cheap to maintain, and they have a long lifespan (20 – 30 years).

6. They're simply more comfortable
Heat pumps are actually better for home comfort than traditional heating, especially when combined with underfloor heating. The heat pump will heat a home constantly through the day, without the worries of wasting oil or gas.