

A buyer's guide to renewable and low carbon technologies



To find out more about
installing renewable energy
call 0800 512 012 or visit
energysavingtrust.org.uk



energy saving trust[®]

Keep up the good work



What are renewable and low carbon technologies?

Renewable technologies are powered by abundant, free sources of energy such as the wind, the sun and even plant and animal matter. Generating energy from renewable sources can help reduce our dependence on non renewable sources like fossil fuels, which take millions of years to replenish. They also produce much less carbon dioxide (CO₂) and other greenhouse gases – a major cause of climate change.

Low carbon technologies are not completely renewable as they may still have carbon emissions associated with it albeit much smaller than conventional fossil fuel burning technologies. An example of this is a heat pump. Whilst the heat from the ground is free and renewable, it still requires an electric pump to operate the system.

It may be possible to generate a significant proportion of your home's heat or electricity requirements from renewable or low carbon technologies. Some of the main options for these technologies are:

- Heat generating technologies – wood fuelled heating systems, solar water heating and heat pumps.

- Electricity generating technologies – wind turbines, solar electricity (photovoltaics), hydroelectricity and micro-CHP.

How much energy do you need?

Before you invest in a one of these technologies, it's essential to find out how much energy you currently use and do as much as you can to reduce it.

It is likely that you currently use more energy than you actually need and that some of your energy is being wasted. Taking some basic efficiency steps will not only help cut down the amount of energy you use as well as fuel bills but will also influence the type of system most suitable for your home. The less energy you need, the easier it is to provide a significant proportion from a renewable or low carbon source.

- A lower energy requirement means you can install a smaller and therefore cheaper renewable or low carbon energy system.
- Accurately assessing your energy use will enable you to identify the most cost effective solution.

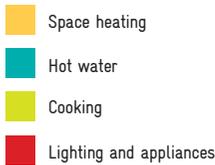
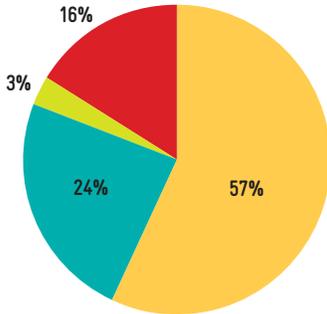
Energy use in your home

In the UK a typical home uses around 21,000 KiloWatt per hour (kWh) of energy a year.

The chart opposite shows the proportion of energy used for different purposes by an average UK house. Older houses often have inefficient structures and less insulation. Therefore they will use more energy to maintain a comfortable temperature than a newly built home. Many homes rely on fossil

**To find out more call free
on 0800 512 012 or visit
energysavingtrust.org.uk**

Proportion of energy used for different purposes by an average UK house



Source: Domestic Energy Consumption in the UK (DECC) 2010

fuels such as gas, LPG or oil to provide energy for heating, hot water and perhaps cooking. Electricity generally powers everything else including lights and electronic appliances, as well as things like pumps in heating systems.

Renewable electricity

Conventional electricity generation from fossil fuels such as coal, oil and gas produces large quantities of carbon dioxide. For every 1kWh of electricity you use, over half a kilogramme of CO₂ is released. Generating your own electricity from renewable sources reduces the amount of conventionally generated electricity you need to buy from your supplier. You can sell back any surplus energy that you don't use to your energy supplier and, in addition, you can be paid for every unit of electricity you generate see the Government Incentive section.



Renewable electricity technologies can provide power in our homes for lighting, electronic equipment and even for the pumps in our heating systems.

Renewable and low carbon heat

Renewable heat technologies can provide heat for hot water, space heating or both. Any heat energy that can be extracted from a renewable or low carbon source will substitute the heat produced by your heating or hot water system from fossil fuels. However, it is important to reduce your heating requirements by implementing a few simple efficiency measures. To start generating your own technology call the Energy Saving Trust on **0800 512 012** or visit energysavingtrust.org.uk





Solar photovoltaic (PV) systems

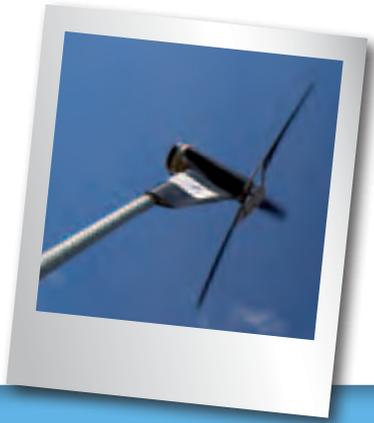
Solar PV modules convert sunlight into electricity for use in the home or to export to the national grid. Typical domestic systems are around 2.2 kW in size, and can provide around 1,850 kWh a year. This is over 40% of the electricity used by a typical household. This technology is one of the simplest to install, it has no moving parts and the Feed-in Tariffs payments can make it a reasonable investment.

Solar PV summary

Technologies	Monocrystalline, polycrystalline and hybrid, panels or roof tiles.
Installed cost	A typical 2.2 kWp domestic system will cost around £12,500, or £5,000 - £7,600 per kWp installed.
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Other financial support	Eligible for Feed-in Tariffs payments – see Government Incentives section. For more information visit energysavingtrust.org.uk
Running costs	None.
Savings	A typical 2.2 kWp system could generate savings and income of £920. Includes FITs payments.
Maintenance	Once installed and commissioned, limited maintenance is required. The inverter may need replacing after 8–10 years.
Space issues	You need a large area of unshaded roof or other appropriate space – typically about 15 square metres – facing somewhere between south east and south west.
Energy availability	Limited electricity provided in winter; most electricity is provided in summer.
Planning issues	Planning is now permitted but with exceptions and limitations. Contact your local planning office for full details.
Installer issues	Choose an installer certified under the Microgeneration Certification Scheme – see microgenerationcertification.org Check the installer is a member of the REAL Assurance Scheme visit realassurance.org.uk for more information.
CO₂ emissions	A 2.2 kWp system will typically save around 1 tonne of CO ₂ per year in the UK.
Other issues	Panels can be heavy, so check that the roof can accommodate the additional weight. Partial shading of an array can affect output significantly.

Wind turbines

Small-scale domestic wind turbines can either be integrated into the local electricity grid or operate as off-grid devices, charging batteries when excess electricity is generated. In a good site small scale domestic wind turbines are an effective renewable energy option in terms of energy output. The best sites are those with an average annual wind speed of at least 5 metres per second and with an unobstructed flow of wind.



Wind turbine summary

Technologies	Horizontal or vertical axis turbines, mostly on freestanding poles but can be mounted on buildings.
Installed cost	Small 1kW building mounted wind turbines cost around £2,000. A typical 6kW pole mounted turbine costs around £22,500.
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Other financial support	Eligible for Feed-in Tariffs payments – see Government Incentives section. For more information visit energysavingtrust.org.uk
Running costs	None.
Savings	A 6kW turbine could generate income and savings of around £3,200. Includes FITs payment.
Maintenance	A regular annual maintenance check is usually required.
Space issues	The greater the distance between a wind turbine and any obstructions such as trees or buildings the better the wind resource and energy output will be.
Energy availability	Dependent upon wind speeds which fluctuate throughout the day and are often lower in spring/summer than autumn/winter. Also very dependent on site.
Planning issues	Needs planning permission from your local authority. It's also advisable to discuss the installation with neighbours.
Installer issues	Choose an installer certified under the Microgeneration Certification Scheme – see microgenerationcertification.org Check the installer is a member of the REAL Assurance Scheme visit realassurance.org.uk for more information.
CO₂ emissions	Savings will depend on local wind speeds. A well sited 6kW installation could save over 5 tonnes of CO ₂ per year.
Other issues	The output of a wind turbine is determined by the wind speed at the site of the turbine, which depends on the location, height, and nearby obstructions. Wind turbines should only be considered if the average wind speed is at least 5 metres per second. You can get an initial indication of this by using our domestic wind speed prediction tool energysavingtrust.org.uk/windspeedtool



Micro-CHP

'Micro-CHP' stands for micro combined heat and power. This refers to a heating technology which generates heat and electricity simultaneously, from the same energy source, in individual homes or buildings. This is an example of a low carbon technology. A typical domestic system is expected to have the potential to generate up to 1kW of electricity per hour once warmed up. This would be enough to power the lighting and appliances in a typical home.

Micro CHP summary

Technologies	Stirling Engine Micro-CHP, Fuel cell CHP technology and Internal combustion engine CHP.
Installed costs	A Micro-CHP will typically cost from £5,500 and can often be installed in place of a conventional boiler (costing around £2,500).
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Running costs	Slightly higher than a new gas boiler, but with the benefit of generating free electricity.
Feed-in Tariff	Micro-CHP is eligible for Feed-in Tariffs and you will earn 10p for each kWh generated by your system. You will also receive 3p for each kWh you export.
Maintenance	Servicing and maintenance costs are estimated to be similar to a standard boiler – although a specialist will be required.
Space issues	Micro-CHP systems are comparable in size and shape to a large domestic boiler.
Energy availability	The main output of a Micro-CHP system is heat with some electricity generation. The heat output will be sufficient to provide all the space and water heating for most normal houses and electricity output is currently up to 1 kW.
Planning issues	Planning permission not normally required. Flues are usually covered under permitted development.
Installer issues	Installers must be Microgeneration Certification Scheme (MCS) registered for the system to qualify for FIT payments and must be Gas Safe registered as with any gas fuelled system.
CO ₂ emissions	Total household CO ₂ emissions may be reduced by displacing grid electricity.
Other issues	Micro CHP is a new technology and there is no independent information yet on their performance in practice.



Hydroelectricity

Hydroelectricity systems generate electricity from running water – usually a small stream. Hydroelectricity systems are also called hydro power systems or just hydro systems. Micro hydro systems can generate enough electricity for lighting and electrical appliances in a home, often with plenty of surplus to sell back to the grid.

Hydroelectricity summary

Technologies	Generally “run of river” schemes – they take water out of a stream, feed it down hill in a pipe and return it lower down river via a turbine. Systems are high, medium or low head depending on the height difference between where the water is taken out and where it is fed back in.
Installed costs	Highly variable, depending on the location and the amount of electricity it can generate. A typical 5kW scheme suitable for an average home might cost £20,000 – £25,000 including installation.
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Running costs	Annual abstraction license fee.
Savings	Extremely variable, depending on nature of site and system. Feed-in Tariffs support available – see Government Incentives section.
Feed-in Tariff	A 15kW system or smaller will get 19.9p/kWh generated plus 3p/kWh for exported electricity (see Government Incentives section).
Maintenance	Costs vary but are usually low as hydro systems are very reliable.
Energy availability	Generally better availability than most other renewable sources. Many will generate electricity for most of the year, but the number of hours will depend on how the system is sized in relation to the stream’s flow.
Planning issues	Will need planning permission from the local authority, and an Abstraction License from the Environment Agency. You should contact both of these at an early stage, as the process can be complex and lengthy.
Installer issues	To qualify for FITs payments the installer must be certified under the Microgeneration Certification Scheme - see microgenerationcertification.org
CO ₂ emissions	Zero.
Other issues	Hydro potential is very site specific. An initial assessment of the potential is essential to determine if the site is worth developing.

Solar water heating

Solar collectors are fitted to your roof where they soak up and retain heat from the sun's rays. Solar water heating systems can usually be integrated into your existing hot water system. System choices and installation times depend on your existing heating system, the amount of storage space you have and the orientation of your roof.



Solar water heating summary

Technologies	Flat plate and evacuated tube collectors (panels on the roof).
Standards	Collectors tested to BS EN 12975 or BS EN 12976.
Installed cost	Typically £4,000 to £6,000.
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Other financial support	The Renewable Heat Incentive (RHI) is due to be introduced in 2011 and will give on-going support to eligible renewable heating installations. For the latest information on RHI visit energysavingtrust.org.uk
Running costs	Virtually none, a small electric pump is usually required.
Savings	A typical solar water heating system will provide over 1,000 kWh of hot water per year, saving around £50 per year in a home with gas water heating. RHI not included.
Maintenance	Minimal annual checks with a service every three to five years.
Space issues	Cylinders are larger than normal and may not fit in some airing cupboards.
Energy availability	Throughout the year but mostly in summer months. Boiler is still required as a top up to meet all your hot water demands.
Planning issues	Generally don't require permission however there are exceptions and limitations.
Installer issues	Choose an installer certified under the Microgeneration Certification Scheme (MCS) – see microgenerationcertification.org Check the installer is a member of the REAL Assurance Scheme visit realassurance.org.uk for more information.
CO₂ emissions	Virtually none during operation. Can reduce household emissions by 260kg CO ₂ per year when replacing gas heating.
Other issues	Best results from roofs facing south. Panels need to be tilted 30–45° from the horizontal. Will not work with some combination boilers – seek advice from your boiler manufacturer.

Wood fuelled heating

A wood fuelled heating system would be a good option to consider if you have no access to natural gas as a fuel and you have sufficient space for the boiler and fuel storage. Many people choose to replace oil or coal burning heating systems with a wood fuelled system.



Wood fuel summary

Technologies	Pellet boilers, pellet stoves, log boilers, log stoves.
Standards	BS EN 303-5:1999 (standard for solid fuel heating boilers).
Installed cost	Around £3,000 for a stove, £11,500 for a complete domestic pellet boiler system.
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Other financial support	The Renewable Heat Incentive (RHI) is due to be introduced in 2011 and will give on-going support to eligible renewable heating installations. For the latest information on RHI visit energysavingtrust.org.uk
Running costs	Often comparable with coal and less expensive than LPG and electric heating.
Savings	Save up to £275, depending on which fuel is being replaced. RHI payments not included.
Maintenance	Ash removal, sweeping the flue.
Space issues	Boilers are larger than conventional alternatives. Large space required for fuel storage.
Energy availability	Wood available throughout the year, large fuel store will help ensure availability.
Planning issues	Planning permission may be needed to add a flue vent or fuel stove, particularly in listed properties or those in a conservation area. Also if you live in a smoke control area, you must install an exempt appliance.
Installer issues	Choose a HETAS approved installer - visit hetas.co.uk Choose an installer certified under the Microgeneration Certification Scheme (MCS) - microgenerationcertification.org
CO₂ emissions	Wood fuel is considered to be 'carbon neutral' as the CO ₂ emitted when it is burned is the same amount that was absorbed during its growth. However fuel transport emissions are not carbon neutral - choosing a local supplier can help minimise this. Can reduce annual household emissions by up to 10 tonnes per year, depending on the fuel being replaced.
Other issues	Log systems require frequent refuelling by hand.

Heat pumps

A heat pump moves heat energy from one place to another – such as from the ground, water or air to your central heating system – and from a lower to a higher temperature. Heat pumps use some electricity but they generate more heat energy than the electrical energy they use and are a good option to consider if you have no access to mains gas as a fuel.



Heat pump summary

Technologies	Ground source (using boreholes or trenches), water source (using a river, well, or lake) or air source.
Installed cost	Air source - £6,000 to £10,000. Ground source - £9,000 to £17,000. Typical costs not including heat distribution (e.g. under-floor heating).
Grants available	Call the Energy Saving Trust on 0800 512 012 for details of any local support available.
Other financial support	The Renewable Heat Incentive (RHI) is due to be introduced in 2011 and will give on-going support to eligible renewable heating installations. For the latest information on RHI visit energysavingtrust.org.uk
Running costs	Electricity used for the pump and compressor of a ground source heat pump can cost around £650 per year for a ground source and £750 per year for an air source.
Savings	A good quality air or ground source heat pump could save you over £500 a year.
Maintenance	Minimal annual checks with a service every three to five years.
Space issues	Trenches can require a large area of land.
Energy availability	Energy provided all year round but most efficient when used with a low temperature heating system such as under-floor heating.
Planning issues	Ground source pumps are now permitted, air source will still require planning permission.
Installer issues	Choose an installer certified under the Microgeneration Certification Scheme (MCS) - see microgenerationcertification.org
CO₂ emissions	Arise from the electricity used by the pump and compressor. A ground source can save up to 5 tonnes a year depending on what fuel is replaced. An air source will save slightly less.
Other issues	Expect a lifespan of 40 years or more. Specialist input is required from a variety of sources so check that the installer will project manage the entire work for you. Good quality installation and appropriate controls are essential to ensure good operation and financial savings.

Government Incentives

The **Feed-in Tariff** started on 1st April 2010 and supports renewable electricity renewable electricity systems including solar PV, wind turbines, microhydro and Micro-CHP. Owners of eligible systems will be paid a set amount (the Generation Tariff) for every kilowatt hour of electricity generated, whether they use it themselves or export it to the grid. They will also receive a lower price (the Export Tariff) for every unit exported, as well as benefiting from reduced electricity bills when using generated electricity on site. Visit our Cashback Calculator energysavingtrust.org.uk/cashbackcalculator to see how much you could be paid.

There are plans to introduce a Renewable Heat Incentive (RHI) scheme in 2011 for heat generating technologies. Owners of eligible heat technologies will be paid an annual sum to reflect the amount of renewable heat they are deemed to have used. For the latest information on RHI visit energysavingtrust.org.uk



How to choose the right option

To choose the most appropriate renewable energy technology for your requirements, you should first check your energy bills to find out how much you are using. You should also find out how much you are spending for each unit (kWh) of electricity and heating fuel (e.g. natural gas) you use. This information will allow you to work out how much you could save if you install a renewable energy system.

Checklist:

- Are you off the gas network and currently using electricity, oil or LPG to provide your heating requirements? Consider heat pumps, wood fuel heating and/or solar water heating.
- Do you have southerly facing, unshaded roof space? Consider solar water heating and solar photovoltaics (PV).
- Is your home in a rural, semi-rural or coastal region and exposed to the prevailing wind without significant obstruction from trees and other buildings? Consider a wind turbine.

To find out more call free on 0800 512 012 or visit energysavingtrust.org.uk

How the Energy Saving Trust can help

The Energy Saving Trust is a non-profit organisation providing free, impartial advice to help you stop wasting energy and money and help fight climate change. To find out what you can do to generate your own energy visit energysavingtrust.org.uk or call us free on **0800 512 012**.

Our advisors will:

- Give you personalised advice on what's practical for your home.
- Put you in touch with local certified installers.
- Tell you about grants and offers available.

All measure costs and savings are correct at time of printing. However financial savings will change as energy prices rise or fall. Please refer to our website for the most recent measure costs and savings.

Energy Saving Trust
21 Dartmouth Street, London SW1H 9BP
Tel. 0800 512 012 energysavingtrust.org.uk
EC323 © Energy Saving Trust January 2011. E&OE.

To start generating your own energy visit

Energy Saving Trust
energysavingtrust.org.uk

Microgeneration Certification Scheme
microgenerationcertification.org

REAL Assurance Scheme
realassurance.org.uk

