

Wheatley Energy Focus

Renewable Energy Technologies

Introduction

This document has been produced by Sustainable Wheatley (formerly known as Wheatley Community Action Group) as part of the "Wheatley: Energy focus" campaign. It is intended to provide an overview of renewable energy technologies that are available for your home. However if you wish to look further into installing a renewable energy technology we strongly suggest that you do additional research and contact the organisations listed at the end of this document.

What are the renewable energy technology options available?

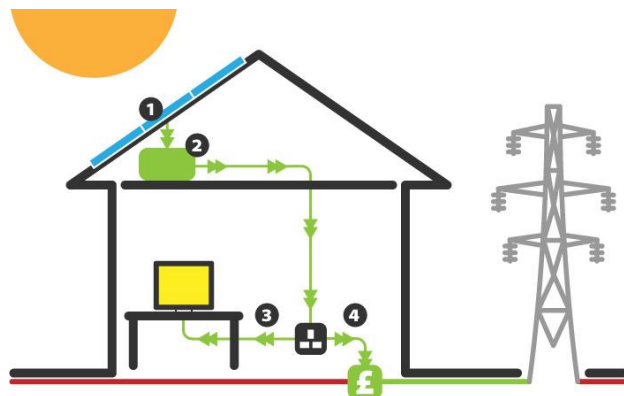
This document contains information on 7 types of renewable energy technologies:

1. Solar Photovoltaics (often called solar panels)
2. Solar Tiles and Slates
3. Solar Water Heating (also called solar panels)
4. Ground Source Heat Pumps
5. Air Source Heat Pumps
6. Wind Turbines
7. Biomass Boilers

We have endeavoured to give an explanation of each of these types and detail potential costs and savings.

1 Solar Photovoltaics (PV)

Solar photovoltaics (PV) capture the sun's energy using photovoltaic cells which convert sunlight into electricity. The cells are made from layers of semi-conducting material (usually silicon) and when light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced but electricity is still generated on cloudy days.



PV cells come in a variety of shapes and sizes and most systems are made up of panels or modules that can be mounted on an existing roof. (However you can also fit solar roof tiles).

PV cells are usually rated in terms of kilowatts peak (kWp) which is the power generated at peak performance in full direct sunlight during the summer.

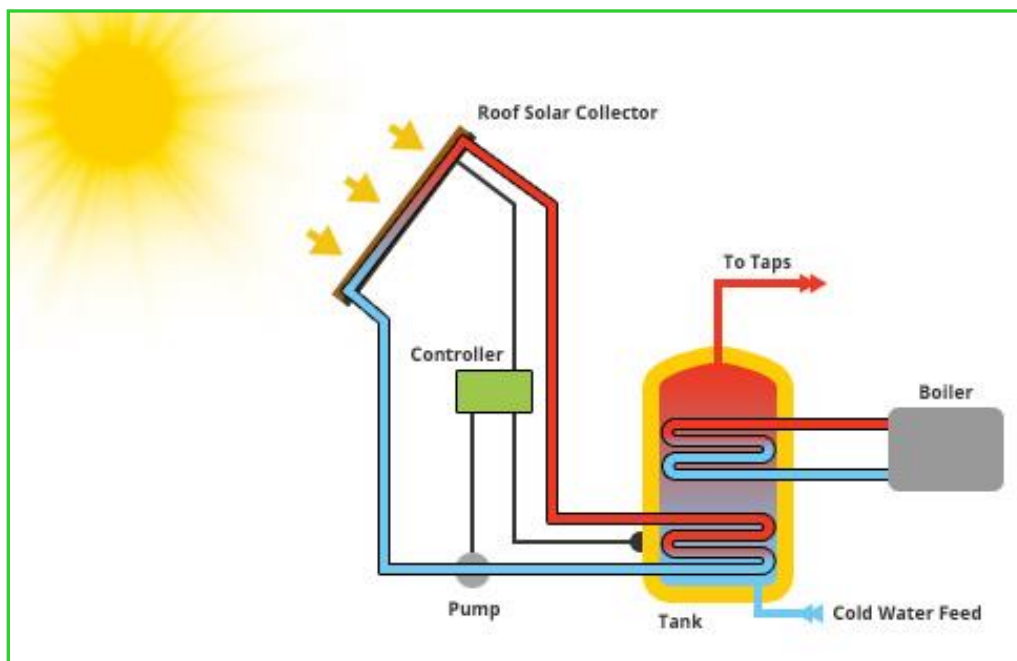
A 3.5 kWp system can generate around 3,000 kilowatt hours of electricity a year – about three quarters of a typical household's electricity needs. Via the Feed-in-Tariff (FIT) scheme you will get paid for both the electricity you generate and use, and for what you don't use and therefore export to the grid. Based on the current FIT you could generate savings and income of around £635¹ a year.

2 Solar Roof Tiles and Slates

Solar roof tiles are designed to be used in place of ordinary roof tiles. A system made up of solar tiles will typically cost around twice as much as an equivalent solar panel system. (Although you will save the money you would have spent on roof tiles or slates). Solar tile systems are not normally as cost-effective as panel systems, and are usually only considered where panels are not considered appropriate for aesthetic or planning reasons.



3 Solar Water Heating



Solar water heating systems use solar panels fitted to the roof to collect heat from the sun to heat up water which is stored in a hot water cylinder. The system could provide most of your hot water in the summer, but much less during colder weather. (A boiler or immersion heater can be used as a back up to heat the water further).

Most conventional boiler and hot water cylinder systems are compatible with solar water heating. But if your boiler is a combination boiler (combi) and you don't currently have a hot water tank, a solar hot water system may not be suitable. If a

¹ Based on a 3.5 kWp solar PV system eligible for a generation tariff of 15.44 p/kWh

dedicated solar cylinder is not already installed then you will usually need to replace the existing cylinder, or add a dedicated cylinder with a solar heating coil.

If the water would otherwise have been heated by electricity at 13 pence per kWh, a saving of 1750 kWh would be worth about £225. If the alternative heating was by mains gas, the saving might be around £75 – £100.

4 Ground Source Heat pumps

Ground source heat pumps circulate a mixture of water and antifreeze around pipes (called a ground loop) which are buried in the garden. Heat from the ground is absorbed into the fluid and then passed through a heat exchanger into the heat pump.

This heat is used to heat radiators, under-floor heating systems, warm air heating systems and hot water in your home. The cooled ground-loop fluid passes back into the ground where it absorbs further energy from the ground in a continuous process. The ground stays at a fairly constant temperature under the surface, so the heat pump can be used throughout the year – even in the middle of winter.



The length of the ground loop depends on the size of your home and the amount of heat you need. Longer loops can draw more heat from the ground, but need more space to be buried in. If space is limited, a vertical borehole can be drilled instead.

The heat pumps need electricity to run, but the heat they extract from the ground is constantly being renewed naturally. Running costs will depend on a number of factors - including the size of your home and how well insulated it is.

As ground source heat pumps are better suited to relatively low-temperature under-floor heating, they are easiest to implement in new houses where it can be designed in as part of the plans.

5 Air source Heat Pumps

Heat from the air is absorbed at low temperature into a fluid. This fluid then passes through a compressor where its temperature is increased, and transfers its higher temperature heat to the heating and hot water circuits of the house.

There are two types of air source heating systems.

- Air-to-air systems provide warm air, which is circulated by fans to heat your home.
- Air-to-water systems heat water to provide heating to a building through radiators or an under-floor system. Unlike ground source heat pumps there are no additional costs for the heat collection system. An air source heat pump is

obviously only feasible where there is a suitable place to put the outside 'evaporator' unit.

Heat Pump Savings	
Existing system	Expected savings pa ²
Electricity	£380 - £610
Oil	£80 - £310
Solid	£100 - £330
Gas	£100 - £130

The system will pay for itself much more quickly if it's replacing an electricity or coal heating system. Heat pumps may not be the best option for homes using mains gas however combining the installation with other building work can reduce the cost of installing the system.

6 Wind Turbines

Wind turbines harness the power of the wind to generate electricity. When the wind blows, the blades are forced round, driving a generator which generates electricity. The stronger the wind, the more electricity produced. Forty percent of all the wind energy in Europe blows over the UK, making us an ideal country for domestic turbines (known as 'microwind' or 'small-wind' turbines). Wind turbines work best in exposed locations, without turbulence caused by obstacles such as trees or buildings.



There are two types of domestic-sized wind turbine:

1. Pole mounted: these are free standing and are erected in a suitably exposed position, often these are around 5 kW to 6 kW in size.
2. Building mounted: these are smaller than mast mounted systems and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1 kW to 2 kW in size.

Wind turbines are eligible for the feed in tariff. However if your turbine is not connected to the local electricity grid (known as off grid) unused electricity can be stored in a battery for use when there is no wind.

Unfortunately domestic small scale wind turbines would not be suitable for property in Wheatley as the average wind speed in this area is below 5 metres per second.

7 Biomass boilers

² The savings depend on the efficiency of the heat pump, and this depends on the temperature difference between the heat "source" (the outside air), and the heat "sink" (the inside air). The lower the temperature difference, the higher the efficiency, and the better the savings.

Wood-fuelled heating systems, also called biomass systems, burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers.

A wood burning stove burns logs or pellets to heat a single room - and may be fitted with a back boiler to provide water heating as well. Wood burning stoves with a back boiler can provide most of the required domestic hot water in a house. Larger models are capable of supporting domestic central heating systems and are more cost effective.



A biomass boiler burns logs, pellets or chips, and is connected to a central heating and hot water system. (Wood chips and pellets³ can be fed automatically into the boiler from a hopper, and only require the ash removed every few days, or in some cases a few times a year).

Biomass Boiler Savings	
Fuel replaced	Expected savings pa
Electricity	£580
Oil	£280
LPG	£720
Coal	£300
Gas	£100

The table shows how much you could save by installing pellet central heating in a typical three-bedroom semi-detached house with basic insulation:

These savings are assuming that there is a constant source of wood fuel available and that there are appropriate storage facilities.

What about financial help?

Renewable Heat Premium Payment? (RHPP)

This is a UK Government scheme designed to help you afford renewable energy technologies for your home. Phase 2 of this scheme runs from 1 May 2012 to 31 March 2013 subject to available funding. The amount received depends on the technology purchased.



It is a condition of the grant that you agree to provide data (with the metering equipment provided) to Department of Energy and Climate Change (DECC) to enable

³ Pellets provide more energy per unit weight than wood chips or logs, partly because they have been dried to reduce the water content. This is typically 8% against the 22% or so normal for untreated wood.

them to evaluate performance. It is also a mandatory requirement that you submit information about how the technology you have installed is performing via online surveys. Refusal to do so will result in your grant being withdrawn or reclaimed.

How you currently heat your home will depend on which technologies you are able to apply for a grant for. For example;

- If you have recently removed a mains gas heating system or currently heat your home with mains gas, you are only eligible to apply for solar thermal
- If you currently rely on oil, liquid gas, solid fuel or electricity then you could also apply for air-to-water heat pumps, ground-source or water-source heat pumps and biomass boilers.

Renewable Heat Incentive (RHI)

The Renewable Heat Incentive (RHI) is another UK Government scheme set up to encourage uptake of renewable heat technologies among householders, communities and businesses. It is the first of its kind in the world. The main thrust of the scheme



concerns domestic central-heating boiler replacements. The tariffs are therefore aimed at reimbursing the extra cost of renewable technologies compared to buying a replacement boiler.

The domestic element of the RHI is expected to be introduced in the summer of 2013 following the Government consultation published in September 2012.

The key proposals in the consultation are:

- Indicative tariff ranges for air source heat pumps (6.9 - 11.5 p/kWh), biomass boilers (5.2 - 8.7 p/kWh), ground source heat pumps (12.5 - 17.3 p/kWh) and solar thermal technologies (17.3 p/kWh).⁴
- Payments are given for householders over seven years for each kWh of heat produced for the expected lifetime of the renewable technology and based on deemed heat usage.
- Tariff levels to be set to provide a better return for householders living off the gas grid.
- Minimum energy efficiency measures must be in place to be eligible for payments

⁴ The equipment must be Microgeneration Certification Scheme certified (government-backed consumer code of conduct - see next page for more detail) and meet the relevant required standards including specific emission limits for biomass systems.

In addition, the UK government are proposing that consumers who have installed a renewable heat installation since 15 July 2009 will also be eligible to apply for the domestic RHI.

Feed in tariffs (FIT)

Feed-In Tariffs (FIT) were introduced on 1 April 2010 to help increase small-scale (up to 5 Megawatts) electricity generation in the UK. The FIT is a guaranteed payment from your electricity supplier (not the Government) for the electricity generated and used as well as a guaranteed payment for unused surplus electricity they can be exported back to the grid. The payments are guaranteed for 25 years for solar PV and 20 years for wind and are fixed at the time of installation (indexed for inflation). The payments are tax free.

The tariff levels were originally calculated to offer 5 - 8% return on initial investment. In Autumn 2011, it became clear that the level of uptake for PV panels was far higher than expected and so the Government announced a reduction in tariffs (called 'degression') for all installations commissioned or registered after 12 December 2011. Existing installations would continue to receive the originally contracted rate.

Since April 2012 properties installing solar PV must have Energy Performance Certificate ratings of at least D in order to get the full tariff; otherwise they will get just 9p per kWh. However, this requirement does *not* apply to other technologies.

The Energy Saving Trust has a simple calculator to allow you to estimate how much you would get under the Feed-in Tariff.

For a household to be eligible for the Feed-In Tariff, Renewable Heat Premium Payments or Renewable Heat Incentive, both the system and the installer will have to be accredited under the Microgeneration Certification Scheme (MCS) or Solar Keymark Scheme



Microgeneration Certification Scheme (MCS)

Set up by the Renewable Energy Association, this is a government-backed consumer code of conduct, approved by the Office of Fair Trading (OFT).

All MCS-certified installers must belong to an OFT-backed consumer code-of-conduct scheme, and the Renewable Energy Assurance Listed (REAL) Assurance Scheme is currently the only one available. The scheme ensures a level of protection against the standard of service that you receive.

Planning

Some properties, such as listed buildings and those in the Wheatley Conservation area may need planning permission. It is worth checking whether or not you do require consent before going ahead with an installation.

Renewable Technologies - Financial Summary				
Renewable Energy Technology	Renewable Heat Premium Payment	Estimated Cost of Installation (All including 5% VAT)	Feed in Tariff: installations occurring from April 2012 to March 2013⁵ (p/kWh)	Proposed Renewable Heat Incentive payments to be launched in Summer 2013. (p/kWh)
Solar thermal hot water	£300	£4,800	N/A	17.3
Air source ⁶ heat pump	£850	£6,000 to £10,000	N/A	6.9 – 11.5
Ground-source or water-source heat pump	£1,250	£9,000 to £17,000	N/A	12.5 - 17.3
Biomass stove and boiler	£950 (Stoves without a back-boiler to provide central heating would not be eligible)	Pellet stove £4,500 (incl installation) Log stove £800 - £2,000 (incl installation) Pellet boiler £11,500 (incl installation)	N/A	5.2 - 8.7 (Stoves without a back-boiler to provide central heating would not be eligible)
Solar PV	NA	*£7,600	15.44 (registered from 1/11/12)	Not included
Wind Turbines	N/A	Roof-mounted £2,000 2.5kW pole-mounted £15,000 6kW pole-mounted system £22,500	21 (registered from 1/12/12)	N/A

*Costs for solar PV have fallen significantly over the last year. The energy Savings Trust recommends getting quotes from at least three installers.

⁵ The data in the tables above is believed to be correct as of November 2012 and is based on publicly available information

⁶ Only air-to-water pumps and only for heating (not heating and cooling)

Further Sources of Information	
The Energy Savings Trust	www.energysavingtrust.org.uk
UK Government Department of Energy and Climate Change	www.decc.gov.uk
National Energy Foundation	www.nef.org.uk
Centre for Alternative Technology	www.cat.org.uk
Solar Trade Association	www.solar-trade.org.uk
RenewableUK	www.renewableuk.com
Office of Gas and Electricity Markets (OFGEM)	www.ofgem.gov.uk
TV Energy (<i>Thames Valley</i>)	www.tvenergy.org
Microgeneration Certification Scheme(MCS)	www.microgenerationcertification.org

Mention of an organisation in this document does not imply any form of endorsement by Wheatley CAG.

Written by Tanya Berman and Paul Bailey, November 2012.

Published by Sustainable Wheatley (formerly known as Wheatley Community Action Group).