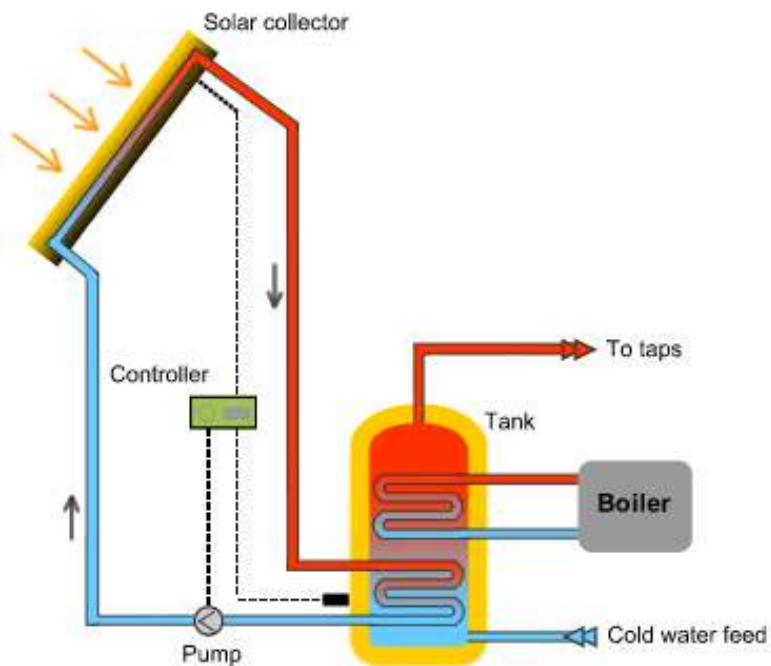


Renewable Energy Sources – An Overview

Definition of Renewable Energy Source; Directive 2009/28/EC of the European Parliament and the Council of the European Union

'energy from renewable sources' means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases

SOLAR HOT WATER

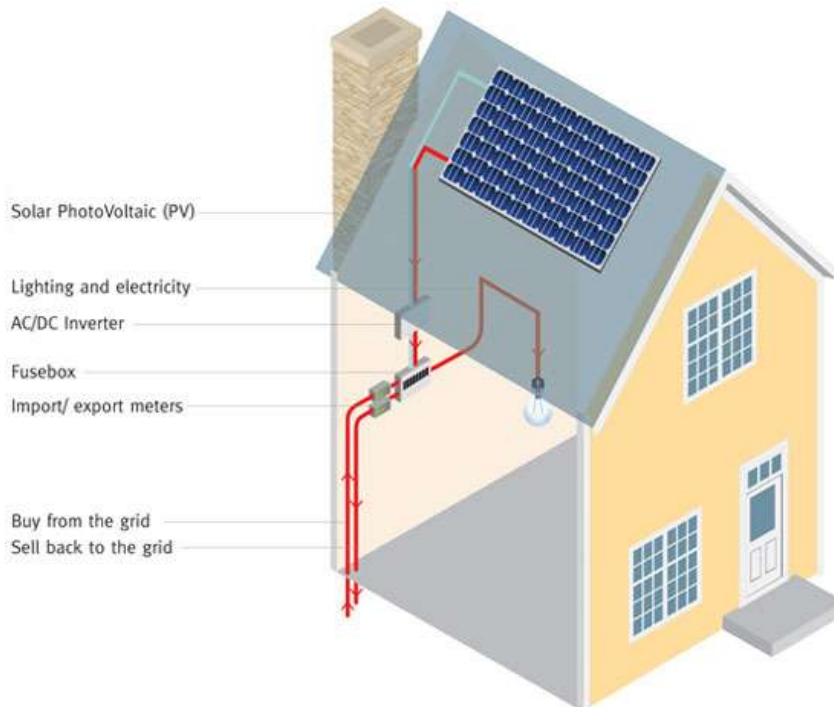


Solar water heating systems use panels (collectors) fitted to the roof to collect the heat from the sun and use it to warm water, which is then stored in a hot water cylinder. A boiler or immersion heater can be used as back up to heat the water further to reach the temperature set by the cylinder thermostat when the solar water heating system does not reach that temperature.

Solar hot water is the renewable technology of choice for most UK households.

- Typical domestic installation needs 2 – 5 square meters of roof space and space to locate an additional water cylinder if required – ensure current boiler is compatible
- Typically provides 40 – 60% annual hot water requirements
- Panels should be sited on a south facing pitched roof, free of shade, at an angle of 20 – 50 degrees.
- Typical cost is £4800
- Low maintenance – check yearly and every 3 to 5 years have a thorough check by an accredited installer

SOLAR ELECTRICITY – PHOTOVOLTAICS (PV)



Photovoltaic cells use light to generate electricity. Solar PV cells can be arranged in panels on a building's roof or walls and can directly feed electricity into the building. With the latest PV technology cells can be integrated into the roof tiles themselves.

Each cell is made from one or two layers of semi-conducting material, usually silicon; when light shines on the cell it creates an electrical field across the layers. The stronger the sunshine, the more electricity is produced.

- Typical domestic 1kW system will cover around 6 to 9 square meters and produces about 750kWh annually (mostly in the summer) – the typical household in the UK uses around 3300kWh.
- A grid connected system will cost around £3 – 4k per kW
- Surplus electricity can be sold back to the grid
- Panels should be sited on a south facing pitched roof, free of shade, at an angle of 20 – 50 degrees.
- Maintenance costs generally low as there are no moving parts
- Panels expected to last 30 years + but inverters likely to need replacing in that time at a cost of up to £2000.

HEAT PUMPS

- A heat pump operates most efficiently when the temperature difference between the heat source and the heat demand is smallest. For that reason they are most suited to powering under floor heating systems which typically run at 36 – 40°C.
- To be environmentally beneficial, the whole system must be properly specified and the house very well insulated.
- Generally they are not recommended for homes on the gas network as they use electricity to run.

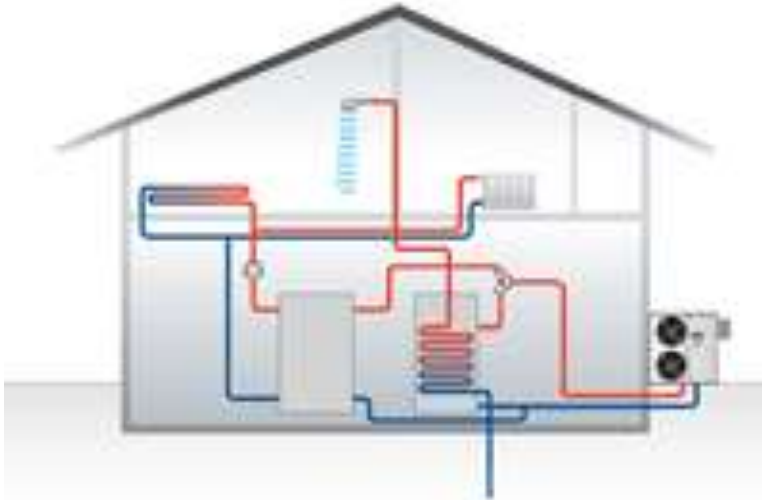
GROUND SOURCE HEAT PUMPS



Ground source heat pumps draw heat from under the ground using either a borehole or a series of pipes laid a few metres below the surface. This heat is mainly solar energy that has been absorbed by the ground. At about 2 metres down the ground stays at about 10°C all year. This heat is absorbed by the water / antifreeze mix in the pipes which is then pumped through a heat exchanger in the heat pump. The heat pump boosts this low grade heat to the temperature needed to heat a home. Ground loop fluid, now cooler, passes back into the ground where it absorbs further energy from the ground in a continuous process while heating is required.

- Typical installation costs are around £9 – 17k
- Can lower fuel bills if replacing electric heating
- Low maintenance

AIR SOURCE HEAT PUMPS



Air source heat pumps extract heat from the outside air. The heat is absorbed into a fluid which is pumped through a heat exchanger in the heat pump. The heat pump boosts this low grade heat to the temperature needed to heat a home.

- Typical installation costs are around £6 – 10k.
- Can lower fuel bills if replacing electric heating
- Low maintenance

BIOMASS

Biomass most often refers to organic matter such as timber and crops grown specifically to be burnt for heat and power. It is sustainable and generally carbon neutral however to be truly carbon neutral we need to make sustainable use of plants or trees as fuel and replant them as we harvest them; the carbon is then reabsorbed in a continuous and virtuous cycle.



Biomass boilers generally burn wood pellets, chips or logs. Log burning stoves and boilers have to be fed by hand however some pellet and chip burners use automatic fuel feeders which refill them at regular intervals from storage units called hoppers.

An automatic fed pellet boiler for an average home will cost around £11k including installation and fuel store.

- Cannot be used in a smokeless zone
- Will need space to store fuel
- Installation must comply with safety and building regulations
- Reduced CO₂ emissions compared to a solid fuel system or electric heating

WIND TURBINES



Wind turbines use large blades to catch the wind. When the wind blows the blades are forced round, driving a turbine which generates electricity. The stronger the wind the more electricity is produced. Domestic wind turbines can be roof mounted or mast mounted however turbines near roof ridges will receive only weak turbulent air. Roof mounted turbines can also resonate and produce vibrations in the building.

To get the best from a turbine it needs to be located where it will receive the strongest possible wind; ideally on a smooth hilltop with a clear open stretch.

Micro wind turbines are most often used to charge batteries which run small scale electrical applications in remote locations.

- Typical cost of a roof mounted micro wind turbine is around £2k
- Mast mounted turbine will cost around £15 – 24k
- Will require planning permission
- Wind energy very site specific
- Low maintenance – check every few years

COMBINED HEAT AND POWER (CHP)

CHP generates heat and electricity simultaneously from the same energy source. The most proven type is the internal combustion engine, modified to run on natural gas or heating oil and connected directly to an electrical generator. Heat is then taken from the engine's cooling water and exhaust heat manifold.

CHP plants are usually sized to meet the base heat load with additional boilers to top up heat at times of peak demand. The electricity generated is often the by-product. However, the electricity is worth more per kWh than the heat, and the price obtained for this electricity is often the key factor in the economic viability of a scheme.

CHP plant is available in all capacities from large CHP plants where electricity output feeds into the national network and the heat is used locally, through building or community sized CHP plant, to micro CHP that effectively replaces the boiler of a single home.

MICRO CHP



Micro CHP units are new to the market in the UK however field trials have been carried out and currently the Baxi 'Ecogen' unit is touted as the first widely available wall-hung domestic micro-CHP boiler in the UK.

- Electricity generation is a by product of the heat
- Easy installation; similar in size to a conventional boiler
- Most cost effective in houses with large heat demands
- Expensive – typical cost is £5k +

New to the Market

Passive Solar Air Heaters

Passive solar air heaters take external air, warm it and blow it into a property, thereby providing a free to run form of warm air space heating powered entirely by the sun.

One UK supplier – Solarventi – makes the following declaration;

The units effectively operate in the same way as positive pressure ventilation systems. There is a single inlet vent which allows the warmed dry air into the property; this displaces the older stale and damper air throughout a property, and as it does so, it drags the humidity out of the fabric and content of a building, lowering the internal RH quite noticeably. So, apart from actually putting genuine heat energy into a property, they also make existing space heating systems operate more efficiently as they do not have to spend time warming up the water vapour in the air.

- Only the larger units are likely to make a contribution to space heating
- Easy to install and free to run – powered solely by the sun
- Available as an air – solar water hybrid panel
- Fairly inexpensive; the smallest unit is £325 rising to £2550 for the hybrid panel
- Can be wall or roof mounted



All reference information is sourced from:
www.energysavingtrust.org.uk
www.therenwableenergycentre.co.uk
www.cat.org.uk
www.solarventi.co.uk
www.baxi.co.uk