



## RENEWABLE TECHNOLOGIES

# Making the most of new energy sources

In the first of a three-part series, *Stephen Andrews* of Ecoskies Training looks at the opportunities available to electrical contractors in this new but expanding market

Since the industrial revolution, we have become increasingly dependent on fossil fuels such as oil, coal and natural gas to heat our homes, provide us with electricity and to transport us ever increasing distances. These fuels have taken millions of years to form but more importantly are finite resources.

Burning fossil fuels to produce energy results in greenhouse gases trapping solar radiation within the atmosphere and this causes climate change. We have also seen dramatic rises in the cost of gas, oil and other fossil fuels over the last 18 months. By

becoming more energy efficient and embracing renewable technologies we can reduce our fuel bills and help save the environment.

### Financial pressures

As most renewable energy is derived from the sun and other natural forces, it is not depleted through use and produces few or no greenhouse gases. Once installed most renewable technologies have much lower running costs and can produce free energy.

While the UK is a major energy

consumer, we are way behind many other developed nations in the installation of renewable technologies.

A legacy of cheap and abundant North Sea gas has afforded us so many advantages that even in the face of rising prices and the obvious benefits of sustainable energy, lack of knowledge of sustainable solutions hampers demand. With domestic gas prices up 46 per cent on a year ago and further price increases expected shortly, financial pressures and changing attitudes are slowly causing a shift in the way we heat and power our homes.

There has been a slow response to renewable installations. Many consumers are unaware of the options available that could reduce their energy bills and their carbon footprint.

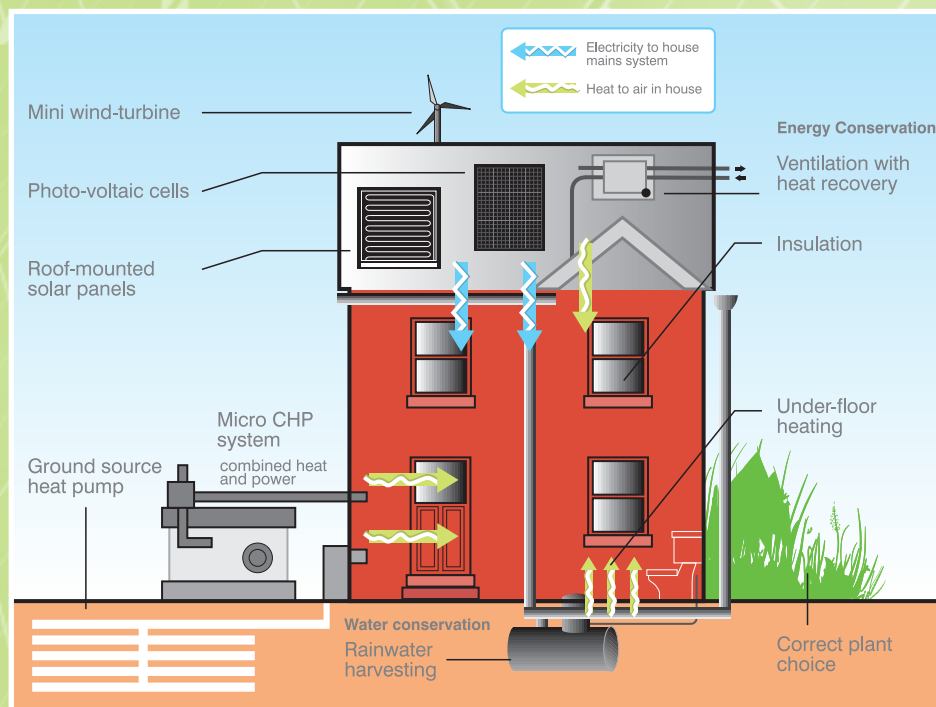
Even with this slow uptake, the outlook for an installer entering the market continues to be positive with a 32 per cent growth in the market last year and a 40 per cent rise predicted this year. In addition more local authorities are implementing the Merton Rule and insisting on renewable energy installations on new build properties.

### Sustainable homes

According to consultants Mott Macdonald, the renewable energy market is currently worth around £350 million a year and is likely to grow to between £15 billion and £19 billion a year by 2020. The market is ready to gather size and momentum if only it gets a little push.

A recent report by Sponge Sustainability

*The greener house using renewable technologies.*



**CONTINUED ON PAGE 20**

Network shows that attitudes are changing and that the public is ready to embrace renewables not as an alternative but as the energy source of choice. Sponge research findings for housebuilders revealed that: homeowners are concerned about how much electricity, gas and water they use. While 45 per cent of respondents state that energy efficient or water saving features were fairly or very important when choosing their current home, 73 per cent say it would be fairly or very important in choosing their next home; homeowners hold positive associations with sustainable homes, seeing them as modern, attractive, high-tech, fashionable, and good value – in comparison with old-fashioned, ugly, low-tech and poor value. Homeowners are prepared to pay extra to live in a sustainable housing development. According to the report, two thirds of homeowners would be prepared to pay a monthly charge for sustainability services.

### Environmental standards

Homeowners are becoming increasingly interested in sustainable housing. Four out of five believe that sustainable homes can help combat climate change. There is a general willingness to adopt sustainable lifestyles; however this has to be time and cost effective. Homeowners expect developers to build to high environmental standards, more than half (52 per cent) are prepared to pay more. Lack of information is seen as a key barrier in driving demand for sustainable homes. Seventy per cent of homeowners claim to know little or nothing at all about sustainable homes.

In the self-build market it is estimated that 85 per cent of properties are having some form of renewable technology installed. While this market is generally the first to embrace new ideas, we commonly see these same technologies becoming mainstream within a short period.

Twenty five years ago double glazed windows were seen as high-tech, now you would find it almost impossible to sell a new-built house without them – even though double glazing will take 128 years to pay for itself in energy saving costs alone.

With the education of consumers about the benefits of these technologies and greater availability of competent installers, coupled with economies of scale driving down the price of the products, I can see the day in the not too distant future when not having a solar panel on your roof will be seen as unusual or even frowned upon as wasteful of money and squandering the earth's resources.

### The market explained

There are many renewable technologies on the market or in development. Following is a brief explanation of the most popular.

### Photovoltaics (PV)

Photovoltaics are solar panels converting the sun's radiation directly into electricity. They do not need hot sunny days to function effectively – just a reasonable level of light.

There are two main installation types: battery charge systems powering low-voltage applications or grid-tied systems contributing to your home energy production, feeding the DC electricity generated through an inverter, harmonising the output with your mains and feeding directly into your electrical system. The vast majority of installations are grid-tied systems.

There have been some concerns about the capital cost of PV systems and payback periods. Cost is an issue but it needs to be kept in perspective. The typical cost of a 0.75 kWp solar pv system fully installed is £4000, less than two per cent of the cost of the average home in England (£205,000). A system of this size could generate half of your electrical consumption over a year, so could theoretically save you half your electricity bill.

In reality it will save around 25–30 per cent or approximately £250 per year – based on current energy prices – as much of the electricity generated will be produced during the day when electricity consumption is lower. More importantly though, studies have shown that a competently installed renewable energy source can add around eight per cent to the value of your home. In addition once installed there are no running

costs or maintenance bills – all the energy generated is completely free.

The Gleeson Homes development at Norfolk Park in Sheffield is an example of how solar PV helps homes sell for more money than those without. Gleeson chose to offer homebuyers the choice of “reduced electricity bills for life” by incorporating solar PV tiles on two homes within the development. These two low carbon homes protect homebuyers against rises in energy prices by generating 800 kilowatt hours (kWh) or units of electricity every year.

Gleeson Homes analysed homebuyers' interest in the homes against an otherwise identical, conventional townhouse as part of this pilot project. The three-bed townhouses with solar tiles sold at a premium of 8.6 per cent (£140,000 compared to £128,000 for the property next door). The results demonstrated that there is significant demand from homebuyers for homes with lower energy bills.

### Solar hot water systems (SHW)

Solar hot water systems employ solar collectors to capture energy from the sun which is then used to heat domestic hot water. It is a common misconception that you need to live in a hot climate in order to benefit from solar hot water production. Most of the solar panels on the market rely on light energy rather than heat energy, so the key factor determining efficiency is the amount of light available.

In the UK we have around 1000kwh/m<sup>2</sup>/pa of solar energy falling on our rooftops going to waste. By using a solar collector to harness this energy we can convert it into heat to provide us with hot water.

*A solar system for cooling and heating installed in Essex*





Typically 2.5m<sup>2</sup> of solar collectors will provide the average household with (nearly) free hot water for eight months of the year and save 30–40 per cent of your hot water costs for the other four months.

A good quality solar system will cost around £3000–£4500 fully installed but requires very little in the way of maintenance and has a working life expectancy of around 25 years.

Running costs are also very low, the only energy required is to power a circulating pump and electronic controller.

## Heat pumps

Heat pumps work by extracting the latent heat from the environment – in a similar way to a refrigerator or a freezer system in reverse, by pumping a refrigerant gas with a very low boiling point (around -4 °C) around a refrigerant circuit.

The gas is able to extract considerable heat from very low temperatures in much the same way as the back of your fridge gets warm when cooling the inside. The gas is then compressed adding more heat energy and raising temperatures to around 60 °C. Due to the lower output temperatures, heat pumps work best when coupled to an underfloor heating system.

Heat pumps operate at between 250 per cent to 450 per cent efficiency meaning that for every 1kw of energy used you receive between 2.5kw and 4.5kw of energy back.

There are three main types of heat pumps in use at the moment.

## Air-source

Air-source heat pumps work by extracting heat from the outside air and operate

efficiently down to about -7 °C. They are the cheapest and easiest to install as they require no ground works, though are usually not as efficient as ground or water source heat pumps. There are also small scale air-source heat pumps available, designed for domestic hot-water systems, around the same size as an air-conditioning unit.

## Ground-source

Ground-source heat pumps work by extracting heat from the ground which remains constant throughout the year, usually by means of a large area of looped pipe installed in trenches or in a bore hole 80–120m deep.

## Water-source

Water-source heat pumps work in the same way as ground-source pumps but the collector loop is placed in a large body of water or a stream. Water source heat pumps generally give the best return on investment as they have greater efficiency than air-source pumps but without the cost of ground works.

A typical heat pump installation will cost between £5,000 and £10,000 installed, depending on the system chosen. They are not free to run but typically are 10 per cent cheaper than mains gas, 35 per cent cheaper than liquefied petroleum gas and 25 per cent cheaper than oil at current prices. They do not need any annual servicing and have an estimated working life of 20–25 years. So total overall lifetime running costs including installation are considerably cheaper. The domestic hot water air-source pump costs around £700, plus installation.

## Micro-wind turbines.

Small wind turbines have had a rough ride in the media recently, mainly due to poor quality products being miss-sold. The UK has an excellent wind resource, being the most consistently windy place in Europe. We are fortunate that three-quarters of the potential energy wind is available between November and April when our energy consumption is at its greatest.

Most domestic wind turbines start generating at fairly low wind speeds – typically five mph, so you do not need a particularly windy day to benefit from them. For example; an efficient 1.5kw turbine could produce up to 1200kwh per year in a suitable location that equates to a third of the average domestic electricity consumption.

Small-scale wind power has by far the cheapest capital cost per kw of any method of generating electricity. A 1.5kw turbine with inverter and brackets etc will cost you around £2000, plus installation, which should take less than a day.

Wind turbines are best suited to exposed locations where there are no obstructions to cause turbulence. Heavily built-up areas are generally not the best sites for turbines unless they can be mounted on a high pole, as buildings and trees can seriously disrupt the air-flow to the turbine.

In the next issue of *The Competent Person*, Steve will look at renewable technologies in more detail. For information on Ecoskies visit [www.ecoskies.com](http://www.ecoskies.com)

Three wind turbines on the roof of the Ecoskies training centre in Chesterfield.



Work on a geothermal system.