The current status and prospects for microgeneration technologies

What are the microgeneration options?

Microgeneration technologies provide heat and/or electricity from a low carbon source. Examples include -

Heat generation

- Solar water heating - systems comprise solar collectors (evacuated tubes or flat plates) a heat transfer system (a fluid in pipes) and a hot water store (e.g. a domestic hot water cylinder). A 4m^2 collection area will provide between 50-70% of a typical home's annual hot water requirement.
- Heat pumps - ground source heat pumps use the warmth stored in the ground to heat fluid circulating through pipes, a heat exchanger extracts the heat and then a compression cycle (similar to that used by refrigerators) raises the temperature to supply hot water for heating purposes. Air source and water source heat pumps operate in a similar fashion using temperature differentials in the air and water (these types of heat pump are not quite as efficient as ground source heat pumps).
- Biomass stoves and boilers[17] - systems can provide space and/or water heating from burning wood (pellets, chips and logs) and non-wood fuels. The biomass fuels are derived from forestry products, energy crops (willow and miscanthus) and waste wood products (sawdust, pallets or untreated recycled wood).

Electricity generation

- Solar photovoltaic (PV) systems generate electricity from sunlight. Small-scale PV modules are available as roof mounted panels, roof tiles and conservatory or atrium roof systems. A typical PV cell consists of two or more thin layers of semi-conducting material, which is most commonly silicon. The electrical charge is generated when the silicon is exposed to light and is conducted away by metal contacts.
- Micro-wind turbines convert wind to electricity. The most common design is for three blades mounted on a horizontal axis, with the blades driving a generator (directly or through a gear-box) to produce electricity. Most systems are mounted on a tall mast, but building mounted turbines are now starting to come onto the market.
- Micro-hydro systems are typically used in hilly areas or in river valleys. Hydro power can be captured wherever a flow of water falls from a higher level to a lower level. This may occur where a stream runs downhill,

[17] Biomass systems for electrical generation and CHP can also be implemented at larger scale. These larger applications are covered by other policy statements.

or a river passes over a waterfall or man-made weir, or where a reservoir discharges water back into the main river. The amount of electricity produced is determined by how much water is available and how fast the flow is.

Combined Heat and Power

- MicroCHP - these technologies use natural gas as a fuel but provide electricity as well as heat. The two main systems use either reciprocating engines or Stirling engines. Fuel cells are also an alternative source of power.

Deployment of all these technologies in the UK is at a very low level (see table above), with the installed base being dominated by solar water heating.

Figure 1 shows the cumulative installations for each technology. It is clear from this graph that in most technologies the installation rate has flattened in recent years, indicating that further action needs to be taken to boost demand once more.

Cumulative installations of each technology 2002-2005

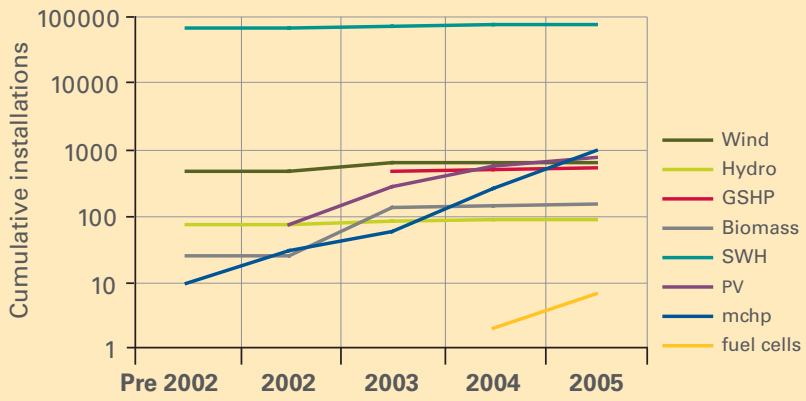

Figure 1 – EST Study: Potential for Microgeneration

Technology	No. Installations
Micro-wind	650
Micro-hydro	90
Ground source heat pumps	546
Biomass boilers (pellets)	150
Solar water heating	78,470
Solar PV	1,301
MicroCHP	990
Fuel Cells	5
Total	**82,202**

The deployment prospects for microgeneration

The early stage of the overall market for microgeneration technologies and the different stages of development of the various technologies make it difficult to accurately assess the future prospects for microgeneration. It is also a very different style of energy provision to the centralised generation assumptions that usually underpin models of future energy sources. And there are all the usual uncertainties relating to future patterns of economic development, social trends and the related demand for energy services. But we can make estimates to approximate the future potential of the different microgeneration technologies.

We commissioned a study from the EST to do just that - predict future uptake, costs and benefits of microgeneration technologies. This provides a first step and as part of the implementation of this strategy we aim to update the study as more information is gathered (building on further analytical work carried out to inform the Energy Review).

Figure 2 shows a summary of expected breakeven points (the point where the price per kWh for the microgenerator is equivalent to today's domestic electricity prices) for different technologies. This figure demonstrates that there are some technologies that are currently cost-effective, but they are not being taken-up, indicating that there are factors other than cost-effectiveness that determine demand. For example, the figure shows Solar Water Heating as one of the last technologies to become cost-effective, yet it accounts for 79,000 installations out of 82,000 and has one of the lowest upfront costs.

The study suggests that 30-40% of the UK's electricity demands could be met through microgeneration technologies, by 2050, with CHP (both fuel-cell CHP and Stirling engine CHP) leading the way, followed by micro-wind and solar PV.

The study projects that costs of all technologies should decrease over time. Particular improvements are made when demand reaches levels that push manufacturers to mass production.

Summary of expected break-even points for different scenarios.

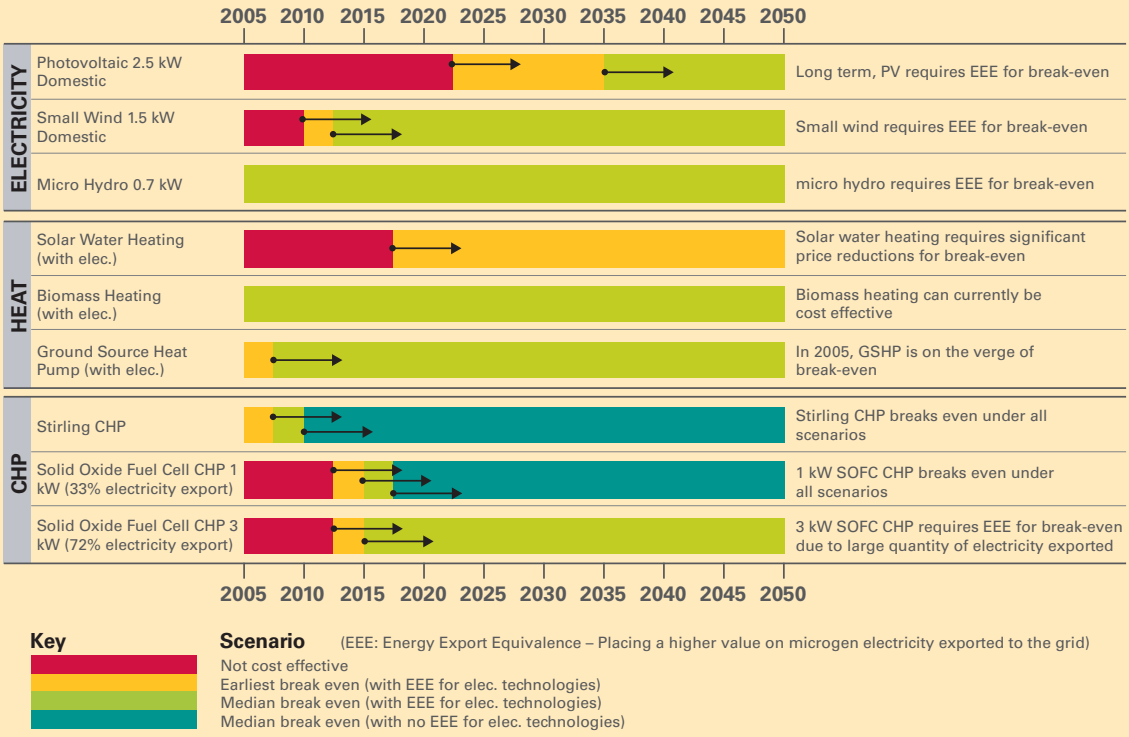

Figure 2 – EST Study: Potential for Microgeneration

Summary Box

- Microgeneration technologies provide both heat and/or electricity from a low carbon source.
- Heat generating technologies include - solar water heating, heat pumps, biomass stoves and boilers.
- Electricity generating technologies include - solar photovoltaics, micro-wind turbines and micro-hydro systems.
- Combined heat and power technologies use natural gas as a fuel but provide electricity as well as heat. The two main systems use either reciprocating engines or stirling engines. Fuel cells are also an alternative system, although less well-developed for the domestic market.
- In 2004 there were approximately 82, 000 installations in the UK. Yet a study commissioned by the DTI from the Energy Saving Trust (EST) suggested that by 2050, microgeneration could provide 30-40% of the UK's electricity needs and help to reduce household carbon emissions by 15% per annum.