A guide to small scale renewable technology

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Executive Summary

- For most organisations between 20% and 40% of their electricity costs are from inefficient lighting. Carbon footprint and energy costs can be reduced by installing devices including energy efficient light bulbs, occupancy sensors and daylight sensors.

- About 60% of heat in most offices/buildings is lost through the building fabric. Energy and money can be saved by installing more efficient boilers, insulation, windows/glazing and ventilation/air conditioning systems to minimise heat loss and reduce the amount of heating energy required throughout the year.

- Rainwater harvesting can improve resource efficiency and save on costs to provide water for non-potable uses (e.g. toilet flushing, washing machines, grounds irrigation and car/fleet washing). Rainwater is collected from the roof and channelled via a series of pipes into a storage tank through a filter system. The time taken to pay off the price of a commercially installed rainwater harvester is thought to be between 2 and 5 years. This is dependent on variables such as the size of the system, the amount of water collected and the price charged by the local water supplier.

- The use of renewable energy offers numerous benefits. Not only is there no CO_2 production but payback times for micro-renewable installations are usually lower than their lifetime due to power savings or the selling of excess energy back to the national grid.

- Heat energy stored in sunlight can be harnessed in solar thermal systems, via solar collectors, to provide hot water and central-heating. Power savings for Solar Hot Water (SHW) systems vary with size and collector type but a typical domestic system is able to save 1,000–2,000 kWh per year and provide 80-100 % of the total hot water demand during summertime. SHW systems can cost between £2,000-£5,000, depending on the size and type of solar collector installed.

- Solar energy can be converted into electrical energy using photovoltaic (PV) cells comprised of modified or 'doped' semi-conducting materials. Power efficiency and electrical output of different PV cells vary due to the nature of these materials. Installation costs of PV systems are relatively high and vary according to PV materials used and system efficiency. A typical domestic system would cost approximately £4,000-£6,000 with installation costs for businesses/commercial use is expected to be significantly higher.

- Wind turbines convert mechanical energy into electrical power using air flow to rotate their rotor blades. Micro-scale wind turbines can be used in urban areas, mounted on rooftops and sides of buildings. The minimum speed required to generate electricity is approximately 2.5 - 4 m/s. The cost of domestic wind power is typically about £2,500 to £5,000 per kW of energy produced.

- Biomass is a fuel obtained from organic matter taken from plants or organic products. The use of biomass is still considered to be 'carbon neutral' because CO2 emitted during electricity/heat generation is balanced by the CO2 stored in plants/products, during biomass growth. The most economically efficient way of producing heat from biomass is the combustion of 'woody' materials in the form of

logs, woodchips or pellets. Boiler systems range in size from heater/stoves (2–12kW) to larger scale boilers (greater than 15 kW) or automatic wood chip boilers (20-1,000kW+), suitable for larger buildings and multi-dwelling developments.

- The current movement towards using renewable and sustainable energy has renewed interest in hydropower, particularly small-scale systems (less than 5MW power) due to their relatively lower expense and impact on the surrounding environment. Choice of hydropower scheme largely depends on site–specific features. Basic requirements for micro-scale hydropower site are reliable water-flow and sufficient "head" (i.e. a drop through which water loses elevation and therefore potential energy). Capitals costs of such schemes are site specific, depending upon on the amount of existing hydropower infrastructure and additional civil work required.

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