



Construction and the Built Environment – Unit 1

1.4 Technologies and Materials (2 of 2)

Renewable technologies use natural energy from sources such as sunlight, wind, rivers, and seas to produce electricity. These sources are inexhaustible.

Non-renewable fuels, such as oil, coal and gas, will run out at some point soon.

Advantages of renewable energy include:

- Reduced air and water pollution.
- Zero carbon emissions – no carbon is released into the atmosphere.
- Once established, renewable energy technologies incur no further fuel costs.
- Surplus electricity can be sold to the National Grid.
- The development of new energy technologies can create job opportunities.

Limitations of renewable energy include:

- The initial cost of setting up renewable energy technologies can be high.
- Electricity production can be inconsistent, as the sun doesn't always shine and the wind doesn't always blow.
- Energy storage can be challenging, although battery technology is continually improving.

Solar photovoltaics is the **conversion of light into electrical power**. A photovoltaic (PV) cell, commonly called a solar cell converts sunlight directly into electricity. A device called an inverter converts the direct current (DC) electricity generated by the solar panel to the alternating current (AC) electricity used by the consumer.

Solar thermal generates energy indirectly by harnessing energy from the sun to heat fluid, in order to generate either heat or electricity. To produce the electricity, steam produced from heating the fluid is used to power generators.

Wind turbines are designed to harness the power of the wind to generate electricity. Wind turns the propeller-like blades of a turbine around a rotor, which then turns a generator that creates electricity.

Heat pumps absorb heat from the ground, air, or water surrounding a building. The heat generated can be used to regulate the building's temperature or heat a water supply.

Ground source heat pumps consist of a network of water pipes buried underground and a heat pump at ground level. A mixture of water and anti-freeze is circulated through the pipes, absorbing the naturally occurring heat stored in the ground. The mixture is compressed and passed through a heat exchanger, which extracts the heat and transfers it to the heat pump.

Air source heat pumps take the air from outside and convert it into heat that can be used to provide warmth for radiators or hot water tanks. As long as the temperature is above $-18^{\circ}\text{centigrade}$, enough heat can be drawn out of the surrounding air to provide heating to a building.

Water source heat pumps use the heat from natural sources such as lakes, ponds, rivers, springs, wells and boreholes. The water is pumped from the water source by a suction pump and the heat energy is then extracted for domestic use. Even during winter, natural water sources maintain a constant temperature that can be exploited by this technology.

Rainwater harvesting (RWH) involves collecting rainwater from surfaces, such as roofs. The harvested water is typically not used for drinking but serves purposes like flushing toilets, running washing machines, and watering gardens.

Grey water reuse refers to the collection of wastewater from showers, baths, washbasins, and washing machines. Used for toilets and garden watering.

Hydro-generation of electricity captures the energy of natural water sources, such as rivers and oceans, and converts it into electricity.