

# Renewable energy



About 23% of all solar energy reaching the Earth goes into powering the **water cycle**. This is the process by which water evaporates from seas and lakes and condenses to form clouds, which produce rain, allowing the water to flow back through rivers and seas.

Most of the energy we use in our power-hungry world is generated using fossil fuels.

- Fossil fuels are not going to last forever. Some forecasts expect the world's oil fields to start running dry in the next 40 years.
- Fossil fuels pollute: when burnt, they release carbon dioxide (CO<sub>2</sub>) gas into the atmosphere. This gas is believed to be a major cause of the climate change scientists are observing around the world.

We have to reduce our use of fossil fuels and find alternative sources of energy. In the UK, renewable energy already accounts for just over 3% of the electricity we generate. The UK government is committed to increasing that to 10% by 2010. With global energy consumption predicted to increase by over 50% in the next 20 years, the future must be renewable.

**Hydroelectricity** is generated using water from rivers. In a dammed river, water is held in a reservoir or lake, then released through the dam gates and used to spin turbines. The turbines are attached to generators, which produce electricity.

Crops such as willow trees can be grown for **bio-energy**. If these crops are carefully managed, they are 'carbon neutral': burning them produces CO<sub>2</sub>, but only the same amount of CO<sub>2</sub> they removed from the atmosphere as they were growing. The burning biomass creates heat, which is used to produce steam, which drives a turbine to produce electricity. Plants (biomass) store a huge amount of energy through photosynthesis, which can we can use either by burning or decaying plant matter, to make bio-energy.

An anaerobic digester can turn some biomass, such as animal dung and human waste, into **biogas**, a mixture of methane and carbon dioxide. This gas can then be burnt to power a turbine and generator, which produce electricity.

**Wind energy** is created by the uneven heating of the Earth's surface. Wind turbines use the wind to turn a large propeller. The propeller is attached to a generator, which produces electricity. Wind farms can be built on land or at sea.

**Geothermal energy** comes from the layer of molten rock beneath the Earth's crust (the mantle). Surveys identify reservoirs of water trapped deep below ground amongst hot rocks. Boreholes are then drilled into the reservoir to bring the hot water to the surface. We can use this water in a steam turbine to generate electricity, or for direct heating.

**Tidal energy** is created by the moon's gravity producing the tides by pulling large bodies of water towards it as the earth spins.

A tidal barrage is a dam containing a series of gates and turbines. The gates are opened to allow the tide to flow in through the turbines, which turn the generators and produce electricity. When the tide lowers, the water held by the dam is released, running through the turbines and turning the generators as it escapes.

The LIMPET (Land Installed Marine Powered Energy Transformer) uses **wave energy** to turn turbines and generate electricity. It is installed on the Scottish island of Islay. Waves force air into a concrete chamber built into the shore, which is then forced through two turbines connected to a generator.

The sun provides energy indirectly, in the form of wind, waves, hydroelectric and bio-energy. **Solar energy** can also be captured directly:

- **Passive solar design** reduces the need for artificial light and heating.
- **Active water heating** can provide hot water for homes using collector panels and heat exchangers.
- **Photovoltaic panels** convert sunlight into electricity.

**Waves** are created by the wind. One way of using the energy stored in waves is Pelamis: a floating series of large cylinders joined together with hinges. At sea, sections of the Pelamis move with the waves, powering hydraulic motors, which generate electricity.

A **tidal stream** generator works like an underwater wind turbine. It uses fast sea currents that flow as tides move in and out. Sea currents turn turbines, which turn the generators that generate electricity.

**It's Only Natural**

See [www.dti.gov.uk/renewables/schools](http://www.dti.gov.uk/renewables/schools)