**Week 4 – Energy Resources**

**Non-renewable resources**

We get energy from many different types of energy resources, including fuels, food and stores of energy such as batteries or the wind. We can divide energy resources into two categories: **non-renewable** and **renewable**.

* Non-renewable energy resources cannot be replaced once they are all used up.
* Renewable energy resources can be replaced, and will not run out.

**Fossil fuels**

* **Coal**, **oil** and **natural gas** are called fossil fuels. They formed millions of years ago from the remains of living things. Coal was formed from plants. Oil and natural gas were formed from sea creatures.
* The energy stored in the fossil fuels originally came from **sunlight**. Plants used light energy from the Sun for **photosynthesis** to make their chemicals. This stored chemical energy was transferred to stored chemical energy in animals that ate the plants. When the living things died, they were gradually buried by layers of rock. The buried remains were put under pressure and chemical reactions heated them up. They gradually changed into the fossil fuels.
* When the remains of the plants and animals became fossil fuels, their chemical energy was stored in the fuels. The energy is transferred to the surroundings as **thermal** energy and **light** energy when the fuels burn.
* Once we have used them all up, they will take millions of years to replace, if they can be replaced at all. For this reason, we call fossil fuels **non-renewable** energy resources

**Renewable resources**

**Renewable** energy resources can be replaced, and will not run out. Be careful - it is not true to say that they can be re-used.

**Biomass**

Biomass fuels come from **living things**. Wood is a biomass fuel. As long as we continue to plant new trees to replace those cut down, we will always have wood to burn. Just as with the fossil fuels, the energy stored in biomass fuels came originally from the Sun.

**Wind power**

Wind is caused by huge convection currents in the Earth's atmosphere, driven by heat energy from the Sun. The moving air has huge amounts of **kinetic** energy, and this can be transferred into electrical energy using **wind turbines**. Wind turbines cannot work if there is no wind, or if the wind speed is so high it would damage them.

**Geothermal**

In some places the rocks underground are hot. Deep wells can be drilled and cold water pumped down. The water runs through fractures in the rocks and is heated up. It returns to the surface as hot water and steam, where its energy can be used to drive turbines and electricity generators

**Solar cells**

Solar cells are devices that convert **light** energy directly into electrical energy. You may have seen small solar cells on calculators. Larger arrays of solar cells are used to power road signs, and even larger arrays are used to power satellites in orbit around Earth.

**Solar panels**

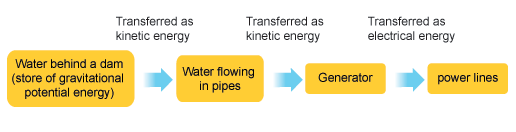
Solar panels are different to solar cells. Solar panels **do not** generate electricity. Instead they heat up water directly. A pump pushes cold water from a storage tank through pipes in the solar panel. The water is heated by heat energy from the Sun and returns to the tank. They are often located on the roofs of buildings where they can receive the most sunlight.

**Water power**

Moving water has **kinetic** energy. This can be transferred into useful energy in different ways. For example:

* wave machines use the up and down movement of waves to turn electricity generators
* tidal barrages are built across the mouths of rivers. As water moves in or out of the river mouth when the tide turns, the kinetic energy in the water is used to turn electricity generators.
* **Hydroelectric power (HEP)** schemes store water high up in dams. The water has **gravitational potential energy** which is released when it falls. As the water rushes down through pipes, this stored energy is transferred to kinetic energy, which turns electricity generators.

**An energy transfer diagram for an HEP scheme:**



**Renewable and non-renewable sources**

What is meant by a renewable energy source?

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What is meant by a non-renewable energy source?

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Put the right resources into the right box

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| --- | --- |
| Renewable | Non- renewable |
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