

Energy Resources Notes

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An energy resource: a substance or system that can be used to obtain energy, either for electricity generation, heating, or transport.

Energy resources fall into two different categories. They are either **renewable** or **non-renewable**.

A renewable energy resource: one that is being produced at a faster rate than it is used or at the same rate it is being used. Either way it is one that will not run out.

A non-renewable energy resource: one that is being used at a faster rate than it is being produced. Meaning it will one day run out.

Let's look at the renewable energy resources first 😊

Biomass

What is it? It is fuel made from biological sources. So that includes wood, straw and manure.

How is it used? Biomass is burned to generate electricity.

Advantages:

- Relatively cheap as it is from or composed of waste products.
- There is quite a lot of it and renewable.
- Easy to use.

Disadvantages:

- Produces carbon dioxide which contributes to global warming.
- Produces other pollutants.
- Not very efficient.



One example of biomass – wood and wood pellets.

Solar

What is it? Light from the sun directly turned into electricity.

Advantages:

- It can be put in remote locations.
- It is renewable.
- No carbon dioxide is produced once it is up and running

Disadvantages:

- They are expensive. Solar panels are not very efficient.
- They are unreliable (and only work during the day).
- Carbon dioxide is produced in making and transporting them.



A solar farm.

Wind

What is it? Wind is used to directly turn a turbine to generate electricity.

Advantages:

- It can be put in remote locations. It is renewable.
- No carbon dioxide is produced once it is up and running

Disadvantages:

- They are expensive.
- Dependant on wind speeds, so are therefore unreliable.
- Carbon dioxide is produced in making and transporting them.



A wind farm.

Hydroelectric

What is it? Uses moving and falling water to generate electricity.

Advantages:

- It can be put in remote locations.
- It is renewable.
- No carbon dioxide is produced once it is up and running.

Disadvantages:

- They are very expensive.
- They are unreliable as they depend on rainfall.
- Carbon dioxide is produced in construction.
- Building a dam involves flooding a large valley. This destroys the existing habitat for land animals and plants, which is a major environmental impact.



A hydroelectric dam.

Geothermal

What is it? Geothermal power uses hot rocks, under the Earth's crust.

Advantages:

- It can be put in remote locations.
- It is renewable.
- Geothermal power is quite efficient.
- No carbon dioxide is produced once it is up and running.

Disadvantages:

- They are very expensive.
- Carbon dioxide is produced in construction.
- Can only be built in some limited areas. It is not very common.



A geothermal power station.

You may have noticed that renewable energy sources have quite similar advantages and disadvantages. This makes learning these quite straightforward 😊

Now, let's look at non-renewable energy resources.

Coal, Oil and Gas

What is it? Formed from plant and animal fossils exposed to high pressure and temperatures over millions of years.

How is it used? Coal is burned to generate electricity.

Advantages:

- Coal, oil and gas are relatively cheap.
- There is quite a lot of them.
- They are easy to use.

Disadvantages:

- Produces carbon dioxide which contributes to global warming.
- Produces other pollutants such as sulphur dioxide which can lead to acid rain.
- Not very efficient.



A coal burning power station.

Nuclear Power – yes, it's a non-renewable source

What is it? Nuclear materials, usually uranium or plutonium, which are formed from supernovae.

How is it used? Nuclear fission (splitting an atom's nucleus).

Advantages:

- There is a large supply of uranium and plutonium.
- A huge amount of energy can be generated from a tiny amount of fuel so nuclear power stations are cheap to run.

Disadvantages:

- Nuclear power stations are very expensive to build.
- It can take a long time to get the reaction going and to shut it down.
- There are risks associated with radioactive waste materials.
- It is non-renewable.



A nuclear power station.

Tidal Power

What is it? The kinetic energy of the sea's tides to generate electricity. This usually involves building a barrage (a type of dam) across a river estuary.

How is it used? Moving water turns a turbine.

Advantages:

- It is renewable.
- No carbon dioxide is produced once it is up and running.
- It is very reliable (tides happen twice a day at predictable times).
- Can generate large amounts of electricity.



A tidal power station

Disadvantages:

- They are very expensive to build.
- Building a barrage destroys existing habitats for wading birds and marine life.
- It restricts access for boats and ships.
- Carbon dioxide is produced in construction.

Wave Power

What is it? A system that uses the kinetic energy of ocean waves to push air through a turbine to generate electricity.

How is it used? Moving water turns a turbine.

Advantages:

- It is renewable.
- No carbon dioxide is produced once it is up and running.
- Can be very useful for small, isolated islands.



A wave power system

Disadvantages:

- They are unreliable (waves die down when the wind drops).
- Equipment has to withstand very harsh weather and can be damaged by storms.
- They can be a hazard to boats.
- Carbon dioxide is produced in making and transporting them.

Energy Trends

We could be asked to describe how our use of energy resources has changed over time. Here's the things to mention

😊 Talk about the past, the present and what the future holds.

The past: the UK and the world relied heavily on coal for electricity and heating, and oil for transport.

The present: the use of coal has decreased massively. We now rely heavily on natural gas (which produces less CO₂ than coal) and are rapidly increasing our use of renewables (especially wind and solar power).

The future: world governments are trying to phase out fossil fuels to meet climate change targets. However, this transition is slow because building renewable power stations and new infrastructure is very expensive, and renewable sources like wind and solar are not always reliable.