Energy Resources
Energy Resources

What are energy resources?

How are energy resources used?

Comparing energy resources

Looking to the future

Summary activities
What are energy resources?

An energy resource is anything that can be used to generate power for human use.

For example:

- **Bio-fuels** – made from organic materials, such as biodiesel which is made from rapeseed oil.

- **Fossil fuels** – carbon-based fuels, such as coal, oil and natural gas, formed over millions of years.

- **Nuclear fuels** – radioactive metals, such as uranium or plutonium.

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coal-powered plant
What are energy resources?

An energy resource is anything that can be used to generate power for human use.

For example:

- **Wind** – turbines can convert the kinetic energy of the wind into electrical energy.
- **Geothermal** – thermal energy stored within the Earth can be captured and used to generate electricity.
- **Hydroelectricity** – electricity generated from the kinetic energy of moving water.
What are energy resources?

An energy resource is anything that can be used to generate power for human use.

For example:

- **The Sun** – solar technology can convert light energy into electrical energy.
- **Tides** – a dam across tidal waters can be used to generate electrical energy.
- **Water waves** – devices known as wave energy converters transfer the kinetic energy of waves into electrical energy.
The energy generated by energy resources is essential to everyday life. It is used to…

...provide heating and light

...power electrical appliances

...transport people and goods.

There is concern about how we can satisfy our energy demands in the future.

Some energy resources are renewable: they can be replenished as they are used. Others are non-renewable: they will eventually run out.
Renewable or non-renewable?
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How are energy resources used?

Energy comes in many forms. Most energy sources are converted into **electrical energy** before they are used, but some are not.

For example:

- in homes, **coal**, **oil** and **gas** are used directly for heating and cooking

- combustion engines in cars, boats and other vehicles make use of **fossil fuels** and, increasingly, **bio-fuels**.
Generating electricity

Different sources of energy **generate** electricity in different ways.

The energy from some energy sources can be converted directly into **electrical energy**. For example, solar cells convert light from the Sun into electrical energy.

For most energy sources, electricity is produced when a **turbine** drives a generator, which uses **electromagnetic induction** to generate electricity.

A turbine can be turned by wind, water (e.g. hydroelectricity) or **steam**, which can be produced from geothermal energy or from burning fuels.
The demand for electricity **varies** depending on the time of day and time of year. Power stations have to be able to meet this demand.

This graph shows electricity demand for England and Wales over the course of one day in January.

**When is demand highest?** Why might this be?
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Advantages and disadvantages

For each type of energy source, there are **advantages** and **disadvantages**.

- **Cost**: energy sources can be expensive to build or maintain, such as a hydroelectric dam.

- **Harm**: many energy sources can be damaging to the environment or wildlife, such as burning fossil fuels, which releases pollutants.

- **Difficulty**: certain types of energy source are hard to locate because they require very specific locations, such as tidal power stations.
Different energy resources have different environmental impacts at different stages in energy production.

- **Harvesting raw materials:** for example, mining for fossil fuels can be environmentally destructive, harmful to wildlife and can pose a high risk to human workers.

- **Site location:** for example, hydroelectric dams can severely disrupt eco-systems and destroy habitats.

- **By-products:** for example, nuclear power stations produce harmful radioactive waste.
Reliability of energy production is important. An energy source is reliable if it supplies energy **consistently** and **predictably**.

A nuclear power station is an example of a reliable energy source. Provided fuel is available, the energy output is stable.

Energy sources that are based on natural phenomena are often less reliable.

For example, wind turbines can be **unreliable** sources of energy because they are dependent on the weather.
Pros and cons of fossil fuels
Pros and cons of nuclear power
Pros and cons of tidal power
Pros and cons of hydroelectric power
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Where do we get our electricity from?

This graph shows global electricity production.

Currently, **fossil fuels** are the most common means of producing electricity. Why?

What do you think this graph will look like in 2040?
Making decisions

Scientific bodies, like the Intergovernmental Panel on Climate Change (IPCC), can give advice and provide information about energy sources to help individuals, groups and countries.

However, whilst science can help to identify what the environmental impact of an energy source might be, it cannot make decisions for us.

There are costs and benefits to most choices. As a society, we have to choose what costs we can afford, and what benefits we value.
Who is right?

People may have different opinions about what the best course of action is.

I think we should build more nuclear power stations! They are reliable sources of cheap energy.

But they produce harmful waste, and nuclear fuel will eventually run out too. We should decommission our existing nuclear power stations and not build new ones.

Both of these opinions are scientifically correct; nuclear power stations are reliable, and nuclear fuels are finite.

What energy source would you recommend investing in?
Using renewable energy sources

The chart below shows the amount of electricity generated by renewable energy sources from 2000 to 2015.

The chart shows a huge increase in the use of renewable energy sources, and renewable energy sources provided 24.6% of the electricity generated in the UK in 2015.

What might have caused this increase?
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Multiple-choice quiz