

Renewable and Non-Renewable Energy

All life on Earth is sustained by energy from the Sun. Plants and animals can store energy and some of this energy remains with them when they die. It is the remains of these ancient animals and plants that make up fossil fuels.

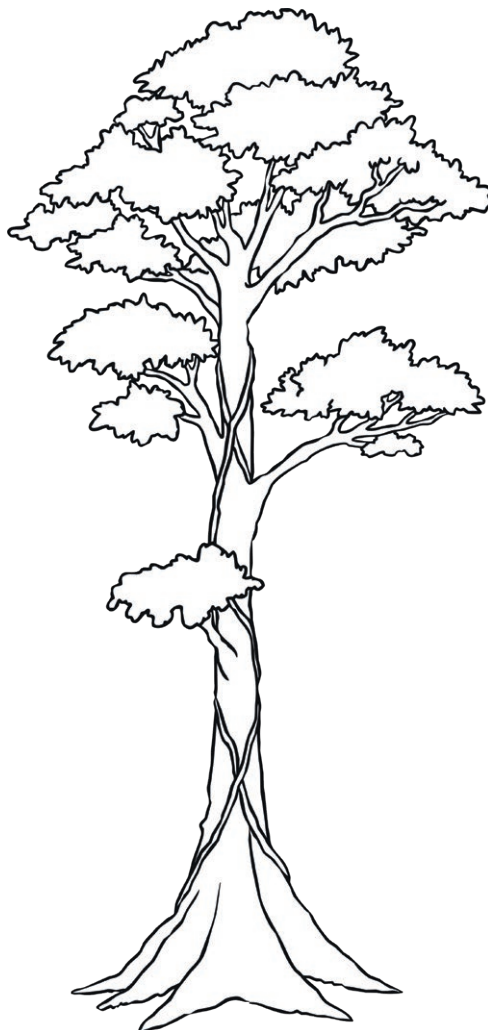
Fossil fuels are non-renewable because they will run out one day. Burning fossil fuels generates greenhouse gases and relying on them for energy is unsustainable. This is why we need to find more renewable, sustainable ways of generating energy.

Renewable, or infinite, energy resources are sources of power that quickly replenish themselves and can be used indefinitely.

Some resources can be thought of as both renewable and non-renewable, for example:

Wood can be used for fuel and is renewable if trees are replanted.

Biomass, which is material from living things, can be renewable if plants are replanted.



Non-Renewable Energy Resources

Type of Fuel	Where It Is From	Advantages	Disadvantages
Coal	<p>Formed from fossilised plants and consisting of carbon with various other compounds added.</p> <p>Mined from seams of coal, found sandwiched between layers of rock in the earth. Burnt to provide heat or electricity.</p>	<p>Ready-made fuel.</p> <p>It is relatively cheap to mine and to convert into energy.</p> <p>Coal supplies will last longer than oil or gas.</p>	<p>When burned, coal gives off atmospheric pollutants, including greenhouse gases.</p> <p>There is only a limited supply.</p>
Oil	<p>A carbon-based liquid formed from fossilised animals, widely used in industry and transport.</p> <p>Lakes of oil are sandwiched between seams of rock in the earth.</p> <p>Pipes are sunk down to the reservoirs to pump the oil out.</p>	<p>Oil is a ready-made fuel.</p> <p>It is relatively cheap to extract and to convert into energy.</p>	<p>When burned, it gives off atmospheric pollutants, including greenhouse gases.</p> <p>There is only a limited supply.</p>
Natural gas	<p>Methane and some other gases trapped between seams of rock under the Earth's surface.</p> <p>Pipes are sunk into the ground to release the gas.</p> <p>Often used in houses for heating and cooking.</p>	<p>Gas is a ready-made fuel.</p> <p>It is a relatively cheap form of energy.</p> <p>It's a slightly cleaner fuel than coal and oil.</p>	<p>When burned, it gives off pollutants, including greenhouse gases.</p> <p>There is only limited supply of gas.</p>

Type of Fuel	Where It Is From	Advantages	Disadvantages
Nuclear	<p>Radioactive minerals such as uranium are mined.</p> <p>Electricity is generated from the energy that is released when the atoms of these minerals are split in nuclear reactors.</p>	<p>A small amount of radioactive material produces a lot of energy.</p> <p>Raw materials are relatively cheap and can last quite a long time.</p> <p>It doesn't give off atmospheric pollutants.</p>	<p>Nuclear reactors are expensive to run.</p> <p>Nuclear waste is highly toxic, and needs to be safely stored for hundreds or thousands of years and storage is very expensive.</p> <p>If nuclear materials leak they can have a devastating impact on people and the environment.</p>
Biomass	<p>Biomass energy is generated from decaying plant or animal waste.</p> <p>It can also be an organic material which is burned to provide energy, e.g. heat or electricity.</p> <p>An example of biomass energy is oilseed rape (yellow flowers you see in the UK in summer), which produces oil.</p> <p>After treatment with chemicals it can be used as a fuel in diesel engines.</p>	<p>It is a cheap and readily available source of energy.</p> <p>If the crops are replaced, biomass can be a long-term, sustainable energy source.</p>	<p>When burned, it gives off atmospheric pollutants, including greenhouse gases.</p> <p>If crops are not replanted, biomass is a non-renewable resource.</p>
Natural gas	<p>Methane and some other gases trapped between seams of rock under the Earth's surface.</p> <p>Pipes are sunk into the ground to release the gas.</p> <p>Often used in houses for heating and cooking.</p>	<p>Gas is a ready-made fuel.</p> <p>It is a relatively cheap form of energy.</p> <p>It's a slightly cleaner fuel than coal and oil.</p>	<p>When burned, it gives off pollutants, including greenhouse gases.</p> <p>There is only limited supply of gas.</p>

Type of Fuel	Where It Is From	Advantages	Disadvantages
Wood	Obtained from felling trees, burned to generate heat and light.	A cheap and readily available source of energy. If the trees are replaced, wood burning can be a long-term, sustainable energy source.	When burned it gives off atmospheric pollutants, including greenhouse gases. If trees are not replanted, wood is a non-renewable resource.
Biomass	Biomass energy is generated from decaying plant or animal waste. It can also be an organic material which is burned to provide energy, e.g. heat or electricity. An example of biomass energy is oilseed rape (yellow flowers you see in the UK in summer), which produces oil. After treatment with chemicals it can be used as a fuel in diesel engines.	It is a cheap and readily available source of energy. If the crops are replaced, biomass can be a long-term, sustainable energy source.	When burned, it gives off atmospheric pollutants, including greenhouse gases. If crops are not replanted, biomass is a non-renewable resource.
Natural gas	Methane and some other gases trapped between seams of rock under the Earth's surface. Pipes are sunk into the ground to release the gas. Often used in houses for heating and cooking.	Gas is a ready-made fuel. It is a relatively cheap form of energy. It's a slightly cleaner fuel than coal and oil.	When burned, it gives off pollutants, including greenhouse gases. There is only limited supply of gas.

Renewable Energy Resources

Type of Fuel	Where It Is From	Advantages	Disadvantages
Solar energy	<p>Energy is generated by the Sun.</p> <p>The sunlight is converted into electricity.</p>	<p>It is a powerful source of energy.</p> <p>It can be used as a heat source and an energy source.</p>	<p>A large area is required to collect it at a useful rate.</p> <p>The irregular nature of how it arrives at the Earth's surface.</p>
Hydropower	<p>Falling water creates energy that can be turned into electricity.</p>	<p>It is clean and reliable.</p>	<p>The reservoir of water needed for hydroelectric power releases a large amount of carbon dioxide and methane into the air - this is pollution.</p>
Wind	<p>Air in motion is used to generate power.</p> <p>Wind turbines convert kinetic energy into mechanical power.</p>	<p>It is clean and economical.</p>	<p>There is a negative impact on wild bird populations.</p> <p>Wind turbines have a visual impact on the landscape.</p>
Geothermal	<p>Heat from the Earth.</p> <p>Geothermal energy can come from shallow ground or from miles beneath the Earth's surface.</p>	<p>It is clean, affordable and sustainable.</p>	<p>There are high installation costs.</p> <p>Geothermal sites can run out of steam.</p>

Type of Fuel	Where It Is From	Advantages	Disadvantages
Biomass	<p>Organic material which has stored sunlight.</p> <p>Biomass fuels include wood, wood waste, straw, manure, sugar cane, and many other by-products from a variety of agricultural processes.</p>	<p>It is cheap and always available.</p> <p>It can be renewable if the trees are replaced.</p>	<p>In burning biomass, much of the energy is wasted.</p> <p>Some pollution is produced.</p>
Ocean	<p>Energy can be derived from wave power and tidal power.</p> <p>Movement of water can be used to generate electricity.</p>	<p>It is efficient.</p> <p>It won't run out.</p>	<p>A tidal station can have a negative effect on animals and plants in the estuaries.</p>

Energy Sources and Scotland

North Sea Oil and Gas

Scotland is estimated to have the largest oil reserves in the European Union, accounting for nearly 60 per cent of total EU reserves.

Since the 1970s, over 40 billion barrels of oil equivalent (BOE) have been extracted from the UK Continental Shelf (UKCS). Oil and Gas UK estimate that up to 24 billion barrels of oil and gas equivalent can still be recovered from the UKCS as a whole.

The North Sea still produces 1.5 million barrels of oil a day. In 2011, Scotland accounted for over 60% of EU oil production.

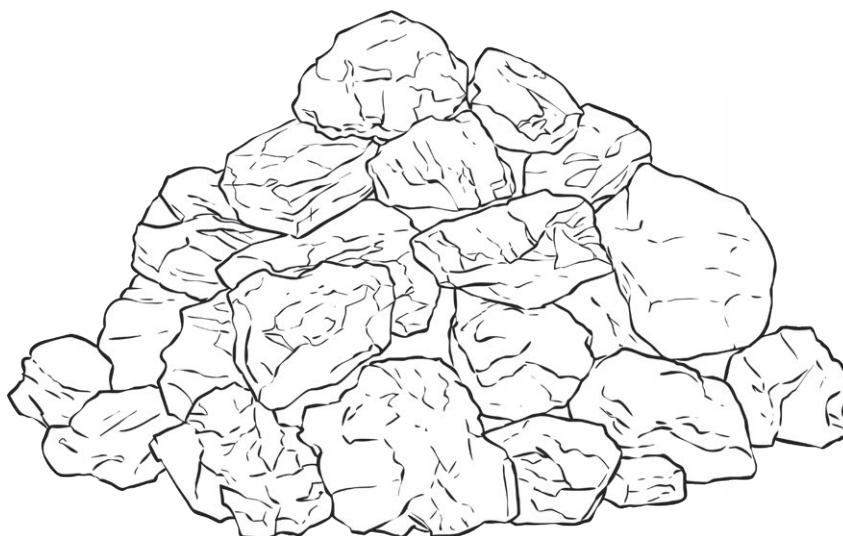
Oil and gas production is estimated to have contributed around £22 billion to Scottish GDP in 2012 – making it the largest industrial sector in Scotland.

Since 1976, the UK Government has raised approximately £180 billion in direct tax revenue from oil and gas production.

The oil and gas industry provides employment for around 200,000 people across Scotland, both directly in the industry and by supporting jobs in other sectors of the economy.

Scotland currently uses a mix of coal, gas, nuclear and renewable energy sources.

It has been moving away from burning fossil fuels (coal, gas and oil) to generate electricity. The Scottish government, which is opposed to the construction of new nuclear power stations in Scotland, is focusing on developing wind, wave, tidal and hydropower energy generation. The natural resource base in Scotland for renewable energy is extraordinary by European, and even global standards, with the most important potential sources being wind, wave, and tide.



Scottish Power Stations

Peterhead, Aberdeenshire	The SSE owned gas-fired power station has been operating since 1982. In 2013, the Perth-based firm announced plans to scale back output, blaming uncertainty around planned reforms to the UK electricity market.
Hunterston, Bayrshire	The nuclear power station has been generating electricity since 1976. It is operated by EDF and has two advanced gas-cooled reactors. It is due to be decommissioned in 2023.
Torness, East Lothian	It has been operating since 1988 and has two advanced gas-cooled reactors. Like Hunterston, it is owned by EDF. It is due to be decommissioned in 2023 but its working life is expected to be extended.
Cruachan, Oban	The pumped storage hydropower station, built inside Ben Cruachan, is known as 'the hollow mountain'. The station uses electricity from the grid at times of low demand to pump water from Loch Awe to its storage reservoir partway up the mountain.

Scottish companies and some visionary Scots are leading research into many renewable energy technologies. The European Marine Energy Centre in Orkney is conducting world-leading research into marine renewables. Renewable energy currently supports over 11,000 jobs in Scotland and could potentially create more jobs if these technologies are successful.

In addition to the many onshore wind farms that currently exist across Scotland, studies are currently underway to investigate whether it would be possible to build the largest offshore wind farm in the world, off the coast of Scotland. If it goes ahead, this wind farm, called The Argyll Array, will be located close to the Island of Tiree and could produce enough energy to power 1 million homes.

The Scottish government wants the country to generate the equivalent of 100% of its annual electricity demand using only renewable sources by 2020. Scotland has already met the 2015 50% interim target. However, that does not mean that Scotland would only use renewable energy. Coal, gas, and nuclear energy will still be part of Scotland's energy mix by 2020.