

The politics of energy – article extract

This is an extract from the *Education in Chemistry* article **Energy boost**. Summarise the key ideas from the article using the structure strip.

Energy boost

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On 24 February 2022, while we watched in shock as Russia invaded Ukraine, we may not have expected the skyrocketing fossil fuel prices that followed. That day, the price of natural gas rose by more than half in Europe. Crude oil prices rose above \$100 per barrel for the first time since 2014.

The war in Ukraine raised the question of whether moral judgements should be made about where we buy energy from. In 2019 the EU got 43% of its gas and over a quarter of its oil from Russia. Many countries have now imposed sanctions on Russia as financial penalties for invading Ukraine. The US and UK quickly banned Russian oil and gas imports. The resulting energy price crisis might push us towards a cheaper, cleaner, less problematic energy supply.

Fossil fuels come from the fossilised remains of plants and animals that died millions of years ago. Many of us heat our homes and cook our food using natural gas. This is a mixture of small carbon-based molecules, mostly methane, with smaller amounts of other gases, the most common being ethane, propane and butane. We rely on natural gas so much because its cost per unit of energy is just a quarter of that of the electricity we use.

Most vehicles still run on products found in crude oil. Crude oil is a much more complex mixture of hydrocarbons than natural gas. Chemical companies use fractional distillation to separate crude oil into smaller, more useful parts. The process separates fractions based on their different molecular weights and boiling points. Large molecules stay at the bottom of the fractionating column where it is hottest, going into products like heavy fuel oil. Moving upwards, fractions move from diesel, to kerosene, to petrol, each containing progressively smaller molecules with lower boiling points. Some power plants use heavy fuel oil to produce electricity. Burning the molecules releases the energy they have held for millions of years.

From crisis to opportunity

However, burning fossil fuels also produces water vapour and carbon dioxide. Carbon dioxide is a greenhouse gas that acts as an insulating blanket in the Earth's atmosphere. It retains energy that the Earth has absorbed from the Sun and then emitted again as infrared radiation. This warms the planet and is leading to dangerous climate change.

In 2020, the UK and Ireland used 1.3 billion barrels of oil per day. In the same year, they consumed a total of 77.8 billion cubic metres of natural gas, accounting for around one fiftieth of the world's total consumption.

Sanctions on Russia could have long-term positive effects on the move to renewable energy sources. Creating renewable energy infrastructure only leads to small amounts of greenhouse gas emissions. They then generate many times more electricity than is used in their manufacture without any emissions, with a minimal contribution to the greenhouse effect. Recognition of the climate change threat has seen countries increasingly adopt such clean energy sources. For example, on 7 June 2017, for the first time ever, the UK generated more electricity from renewable sources than fossil fuels.

The UK and Ireland have both made promises for their greenhouse gas emissions to reach net zero by 2050. This means that any emissions will be balanced out by efforts to remove greenhouse gases already in the atmosphere. As such, electricity will have to come from renewable, carbon-neutral sources, instead of from oil and gas. UK renewable electricity generation has doubled since 2014. It currently stands at nearly half of overall output, so there is still a way to go.

Realistic solutions

Renewable sites can be built quickly – in months for solar farms and perhaps a year for wind turbines built on land. This has helped the UK build over 11,000 wind turbines, fulfilling around a quarter of the nation's electricity needs. There are enough onshore wind and solar projects with planning permission in the UK to offset more than the gas currently imported from Russia. Renewables are a key part of reducing reliance on gas power.'

Renewable energy sites have also become cheaper than fossil fuel electricity generation plants. In the last decade, renewable costs have plummeted, with onshore wind and solar power now the cheapest forms of energy.

However, it's still more expensive to cook and heat homes with electricity than gas. That's why energy companies are looking to produce methane from biological sources. Microbes turn farm, food and landfill waste into 'green gas' in closed containers called digesters, without air. For this reason, the process is called anaerobic digestion. Green Energy UK puts the gas into the same national grid that fossil-based natural gas flows through. While not much demand can be met using green gas, it is cleaner and less problematic than buying from countries like Russia.

Such renewable energy technologies could solve many of the current energy problems, yet there are some things we can each do to make a difference.

The best way to cut our reliance on expensive fossil fuels is simply to reduce the amount of energy we use. For example, turning down thermostats, working from home more, riding on public transport, walking more and driving slower. UK-based low carbon energy consultants Element Energy found that if everyone in the UK decreased their room temperature by just one degree Celsius, we would prevent 1.18 million tonnes of carbon dioxide emissions annually.

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