

Focus on: **UK Energy Supply**

How the UK sources and
generates gas and power –
and how this impacts price



**Business
Solutions**

powered by **e-on**

Introduction

With wholesale gas and electricity prices increasing by as much as 700% over the past year, consumers are understandably keen to understand more about where the UK's energy comes from – and what can be done to support a return to more affordable prices.

In this report, we explore:

- The changing mix of energy generation in the UK
- The shift from fossil fuels to renewables
- Why our dependency on gas remains
- The rise of renewables
- Heading for a shortfall in low-carbon nuclear
- The growing role of interconnectors
- Why, despite the growth in renewables, are energy prices so high?



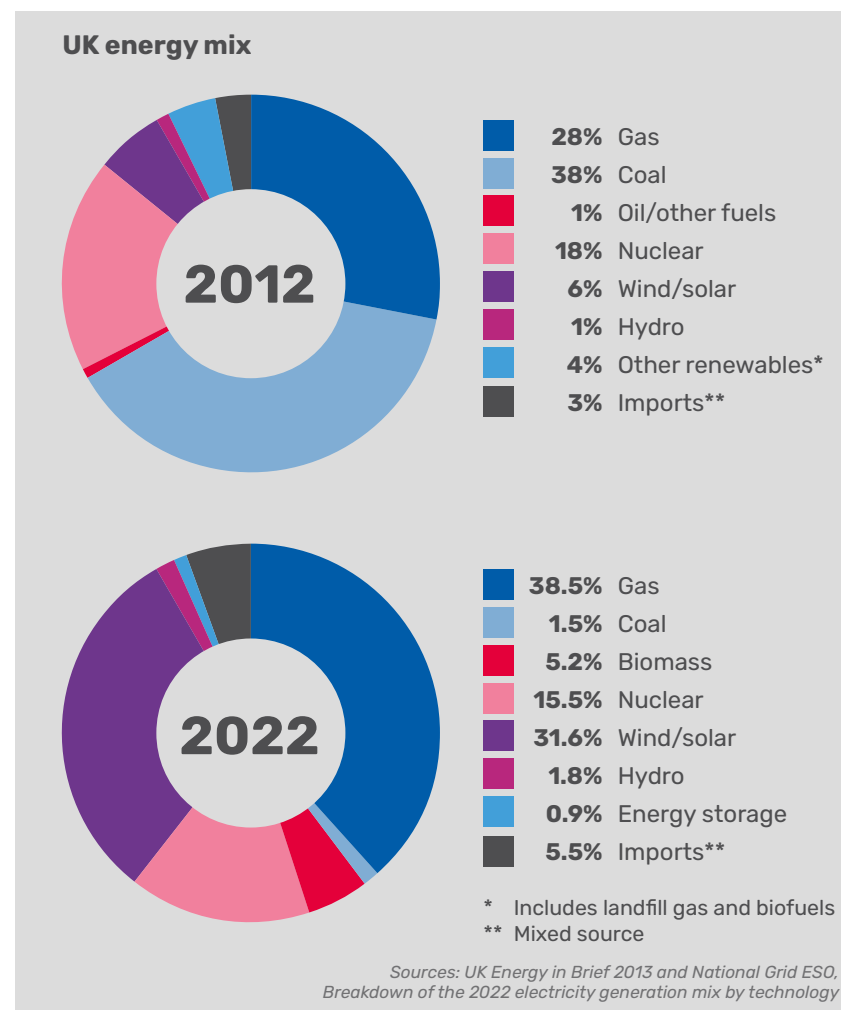
The changing mix of energy generation in the UK

Over the past 15 years, the UK has dramatically transformed its electricity supply.

Back in 2008, as the Climate Change Act came into law, around 80% of the UK's electricity came from fossil fuels. The majority of this was generated by large power stations burning coal, gas and oil. A further 13% was supplied by nuclear power. Renewable generation was only just starting to emerge, accounting for just 6% of supply.

By 2012, the share of electricity generated by fossil fuels had dropped to 67%, while renewables had almost doubled to 11%.

Fast forward to 2022, and the largest share of our electricity – almost 55% – came from low-carbon sources, while large power stations burning mostly natural gas accounted for just 40%. And the 5.5% we imported via our growing number of undersea interconnectors came mostly from low-carbon sources (e.g. Norwegian hydro and French nuclear).





The shift from fossil fuels to renewables

From being one of the world's earliest adopters and leading producers of the most polluting of fossil fuels – coal, the UK has now committed to phasing out its use completely by 1 October 2024. (Although it's likely coal plant will remain operational to supply back-up power as needed.)

We started mining coal in 1770, with output climbing year-on-year to peak at 292 million tonnes in 1913. Coal supplied fuel for everything – electricity, industry, heating – even British Rail used coal to power trains until 1968.

But the discovery of North Sea gas and oil, and cheaper imports from abroad, meant our coal production started to rapidly decline from the 1960s, although it still fuelled many of the UK's existing coal-fired power stations. Indeed, up until 2011, 35% of the UK's electricity was generated by coal.

But by 2016, coal supplied less electricity than wind energy – and the first coal-free generation days, weeks and months started emerging in the following years. By 2019, just 2.1% of UK electricity was generated from coal.

The decline of coal

Coal production in the UK from 1913 to 2022



Source: GOV.UK; UK Department for Business, Energy and Industrial Strategy (BEIS)

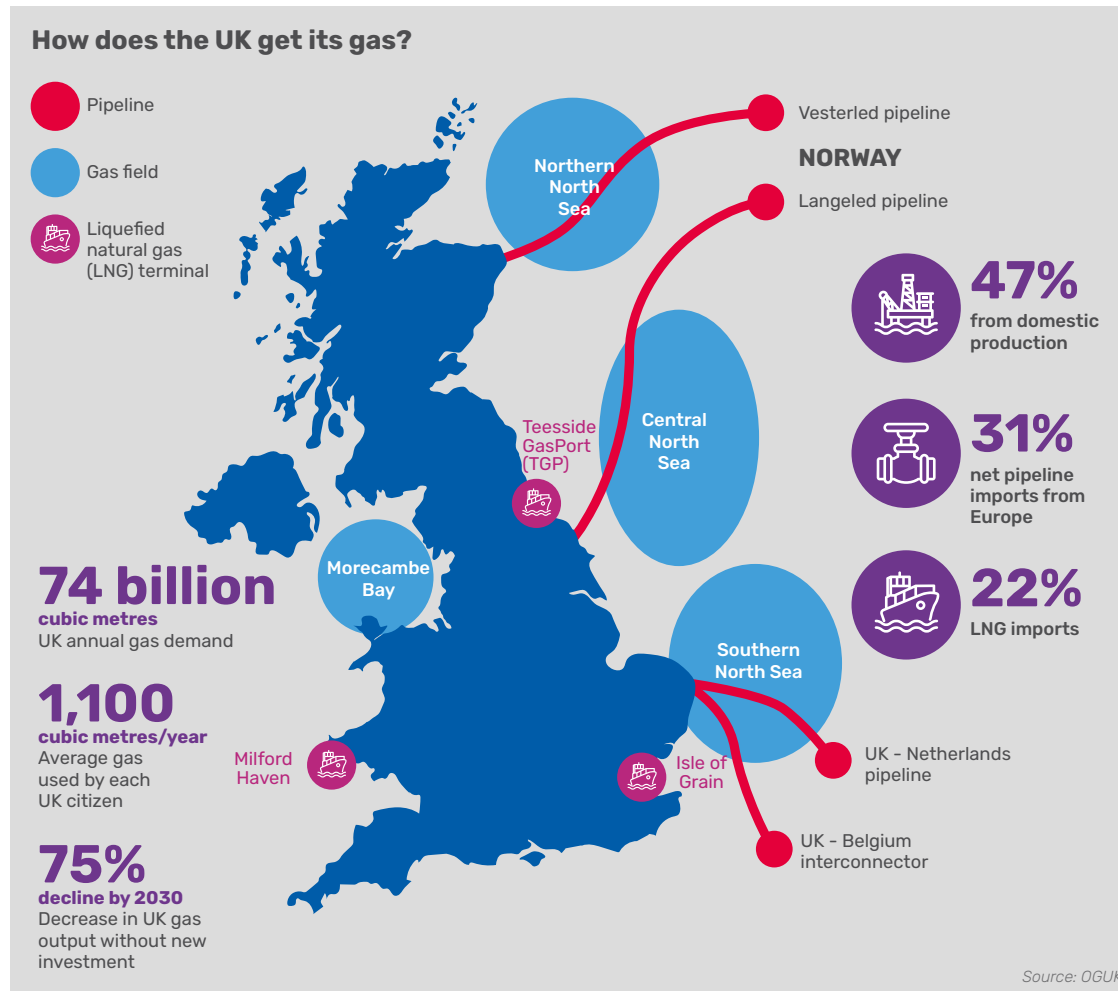
Why our dependency on gas remains

Despite the shift to gas, the amount of electricity it generates is also declining, supplying 38.5% in 2022, down from 46% in 2010, as the share of renewable power increases.

However, unlike for power generation, there isn't yet a low-carbon commercial substitute for the many direct uses for gas. More than 22 million households still rely on it for home heating. And industry is still dependent on gas for heat and a range of industrial processes, such as the manufacture of steel, iron, paper, chemicals and glass. So it's unlikely our requirement for gas is set to reduce any time soon.

The volume of gas we extract from our North Sea reserves is also falling, leaving us more exposed to international prices for the growing share we import. With flows of Russian gas into Europe now close to zero as a result of the Russia/Ukraine conflict, competition for gas from other regions – and particularly the liquefied natural gas (LNG) transported via sea tanker – is fiercer than ever.

It's these dependencies that are predominantly behind the high energy costs we are currently paying (see more on this on page 9).



The rise of renewables

Over the last 15 years, renewable generation has expanded exponentially. Compared to a 6% contribution in 2008, renewable technologies today account for a larger share of our total electricity generation than fossil fuels.

This shift really started ramping up after 2009, when the government launched its low-carbon transition plan to move the UK towards generating 40% of our electricity from low-carbon sources by 2020. As a result, more wind energy, solar and bioenergies (energy derived from burning biological matter such as wood, plants and animal materials) began to emerge.

By 2013, the number of large renewable energy schemes topped the 1,000 mark, more than double the number in 2008, along with more than 500,000 small sites (mostly solar rooftops). With nuclear, this meant a third of UK power generation came from low-carbon sources.

When it comes to large-scale renewable generation, the biggest growth area is offshore wind. By 2020, the UK's offshore wind farms provided more than 10 GW of power capacity to the grid. In 2022, this increased by a third. And by 2030, the UK government is aiming for 40 GW, which would provide the equivalent energy to meet the power demands of every UK home today.

But while this will deliver more sustainable, home-grown – and cheaper – power, the issue we need to overcome is how best to fill the gap when the wind doesn't blow. Currently, fossil-fuel power supply does this. But to move away from our reliance on gas – and the dominating impact this has on overall energy prices – we need to find alternatives (this will be explored in a forthcoming report).

Plummeting carbon intensity of UK electricity

2008
495g of CO₂
for every kWh
generated

63%

2022
182g of CO₂
for every kWh
generated

Sources: Carbon Brief and National Grid ESO



Heading for a shortfall in low-carbon nuclear

Nuclear plays a key role in the UK's low-carbon generation mix. And unlike renewable energy, it provides continuous, predictable energy.

However, the UK's nuclear fleet is ageing, and electricity from nuclear generation is falling. From supplying around 25% of our energy needs in the 1990s, this dropped to 16% by 2020.

As many of the current reactors reach their scheduled retirement – with all except Sizewell B in Suffolk due to close by 2030 – nuclear generation is set to decrease further.

The government has set a target to increase generation from 7 GW to 24 GW (25% of UK generation) by 2050, as part of its Energy Security Strategy.

But despite plans to maintain current output, the only new plant under construction (at Hinkley Point C in Somerset) is not due to be completed until 2027, two years later than planned and 45% over budget.

Meanwhile, plans to replace the retired Sizewell A plant with a new Sizewell C power station are still awaiting approval.

The growing role of interconnectors

As well as importing gas and coal, we also import ready-made electricity directly from neighbouring countries via undersea cables. These 'interconnectors' work both ways, so we can export electricity too. For example, if we have excess renewable energy being generated.

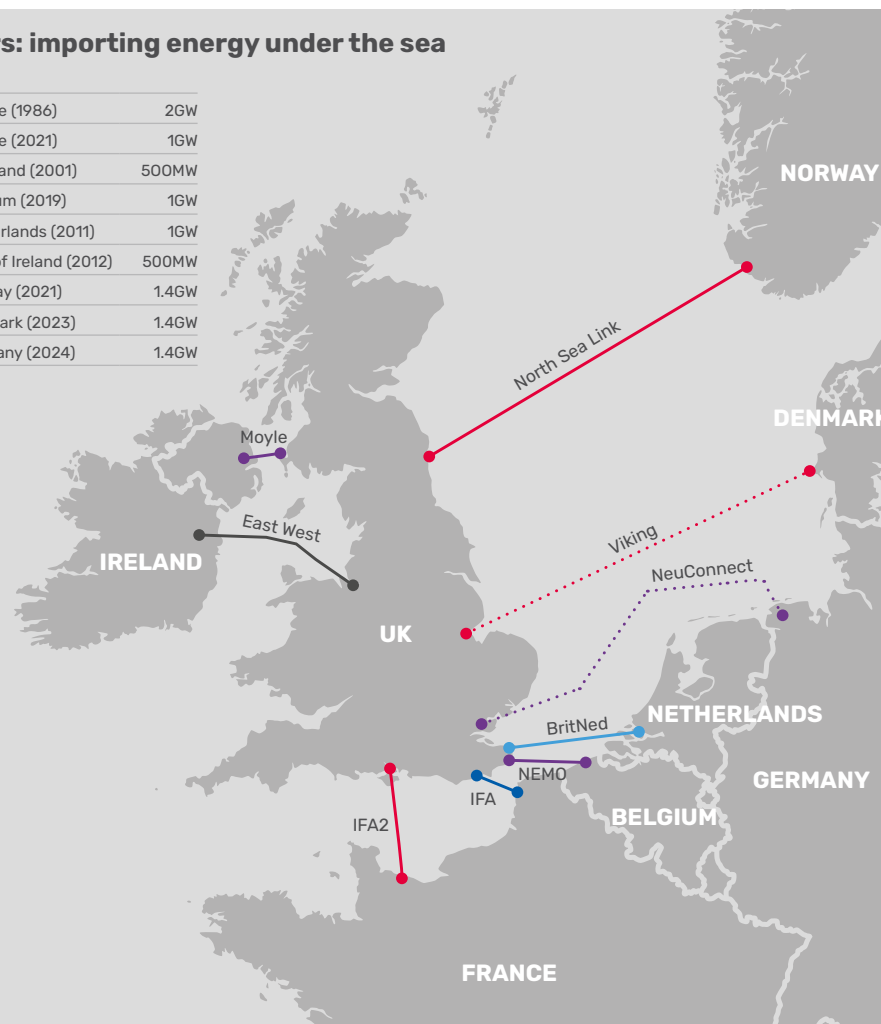
As of 2022, we have seven interconnectors with 8.4 GW capacity linking us to neighbouring countries. And between 2010 and 2021, the volume of electricity we imported each year increased almost ten-fold to 28.7 TWh – or just over 9% of the UK's overall energy supply. The volume we exported remained broadly level with the 4.2 TWh we exported in 2021.

But in 2022, due to problems with French nuclear output (our primary source of imports) and a bumper year for UK wind output, this trend was reversed for the first time. We imported far less (just 7.3 TWh) and exported more (10 TWh) than in previous years, so giving us a net export total of 2.7 TWh.

Whether or not this replicates in future years depends on many factors. But with two new interconnectors to Germany and Denmark under construction, adding another 2.8 GW by 2023-24, there will be capacity to import as much as 25% of our annual electricity requirements if we need to.

Interconnectors: importing energy under the sea

IFA	France (1986)	2GW
IFA2	France (2021)	1GW
Moyle	N. Ireland (2001)	500MW
Nemo	Belgium (2019)	1GW
BritNed	Netherlands (2011)	1GW
East West	Rep. of Ireland (2012)	500MW
North Sea Link	Norway (2021)	1.4GW
Viking	Denmark (2023)	1.4GW
NeuConn	Germany (2024)	1.4GW



Sources: National Grid ESO, Statista and Electrical Review

Why, despite the growth in renewables, are energy prices so high?

Despite having a broad mix of energy sources to draw on – and an increasing volume of domestic renewable generation – one of the most commonly asked questions asked during the ongoing energy crisis is: why are energy prices still so high in the UK?

In one word, the answer is: gas.

Due to the move away from coal, gas has become our dominant fuel. As well as supplying heat for 87% of UK homes, almost 40% of our electricity is still generated from natural gas.

There's a similar reliance across Europe. And globally, there's strong demand for gas, especially as economies pick up speed again after the slow-down caused by the pandemic. So gas is a hot commodity.

It's this dominance that allows the value of gas to influence the price of power. As so much power generation relies on gas, power markets therefore closely track gas markets.

Oil remains the other main global fuel commodity, so changes to oil prices also impact both the gas and power markets.

This is despite almost half the UK's electricity now being supplied by low-cost renewables – where the resources they run on, i.e. wind and sunshine, are free.

And rather than having separate markets to trade each energy technology separately, or having a combined market that's adjusted for the wider range of generation types we see today, all generation – regardless of source – is instead bundled together and traded as units of energy (MWh), with gas values influencing the price.

Many in the industry believe this system is in need of reform. For example, adopting a market that bases the price of electricity on its actual generation cost, not on the cost of the most expensive fuel at any point in time.

The government is now looking at the best way to reform the market via a Review of Electricity Market Arrangements (REMA), which was instigated in July 2022. But these things tend to move incredibly slowly. So while change will come, it's unlikely to happen any time soon.

Look out for our next report, which explores the drivers that determine the wholesale market cost of gas and electricity.



How we can help

Contact us:



0800 622 6966



npowerbusinesssolutions.com

Follow us:



@npower_nbs



npower Business Solutions



npower Business Solutions

Phone calls: We may monitor and/or record calls for security, quality or training purposes. Call charges to numbers beginning with 0800 should be free if you are calling from a business mobile or landline but this will depend on your contract. Please check with your operator for exact charges.

npower and npower Business Solutions are the trading names of Npower Commercial Gas Limited (Registered No. 3768856).

Registered Office: Westwood Way, Westwood Business Park, Coventry, CV4 8LG.

npm15841/MM22084/02.23



**Business
Solutions**

powered by **e-on**