

A background image showing a coal power plant with several large cooling towers and a tall chimney, situated behind a residential area with many houses. The scene is captured in a hazy, atmospheric setting.

# The UK's journey to a coal power phase-out

The UK's era of coal-free power begins on the 1st October 2024, following a rapid decline over the last 12 years which has seen power sector emissions plummet by three quarters.

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## About

This report provides an overview of the UK coal power phase-out, looking at changes in electricity generation since 2012 when coal began to rapidly decline. It provides context on how phase-out was achieved through a mix of initiatives and policy frameworks, and considers how this can inform the next chapter of UK power sector decarbonisation.

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Data visualisation by Chelsea Bruce-Lockhart. Thanks to the authors of the previous Ember report on [clean power in 2030](#) for their input.

## Disclaimer

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# The UK's era of coal-free electricity begins

The closure of the final coal plant in the UK, Ratcliffe-on-Soar, at midnight on 30th September 2024, marks the beginning of a new era.

1st October 2024 marks a historic moment: the first day of the UK coal-free power era. Looking back at the last decade shows the astonishing pace at which the UK achieved this milestone. UK policies have incentivised the rapid deployment of renewable energy over the last decade, while simultaneously tightening restrictions on high polluting coal power plants. These policies have delivered a large drop in carbon emissions from electricity generation, from 160 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e) in 2012 to 41 MtCO<sub>2</sub>e in 2023.

As the UK now targets another ambitious decarbonisation goal – clean power by 2030 – keeping the lessons of coal phase-out in mind will be critical, as well as preparing for the unique challenges that will be faced as the UK targets economy-wide decarbonisation.

## 01

### UK coal power reaches zero

With Ratcliffe power plant shutting, the era of UK coal-free power begins on 1st October 2024. This follows a rapid decline over the last 12 years. Coal power provided almost 40% of UK generation in 2012, shrinking to 2% by 2019, and finally falling to zero by October 2024. In 2012, coal generated 143 TWh of electricity, equivalent to Sweden's total power demand in 2023.

## 02

### Power sector emissions fall three quarters since 2012

Altogether, 15 coal power plants closed or switched fuels in the UK since coal began its rapid decline in 2012. In that time, power sector emissions have plummeted by 74% from 160 MtCO<sub>2</sub>e to 41 MtCO<sub>2</sub>e in 2023. The rapid decline in coal power from 2012 to 2023 avoided 880 MtCO<sub>2</sub>e, equivalent to more than double the UK's total annual greenhouse gas emissions in 2023.

## 03

**Wind and solar generation quadruple to displace coal**

Coal power was predominantly replaced by wind and solar growth without increasing reliance on gas. As coal generation fell, wind and solar generation increased from 6% to 34% of UK generation, whereas the share of gas grew only from 28% to 34% in the same period. The driving force behind this was wind power, which grew 315% (62 TWh) from 2012 to 2023. Wind and solar grew by 75 TWh during that period, displacing 28 million tonnes of coal and avoiding an estimated £2.9bn in costs based on 2023 coal prices.

“The era of coal-free power begins. The UK has achieved something massive, shifting its power system from a huge polluter to one where renewables are thriving, in an astonishingly short period of time. But the work to build a clean power system will continue – to cut the need for expensive imported gas, to lower energy bills and to generate the clean electricity which will enable the rest of the economy to transition too.”

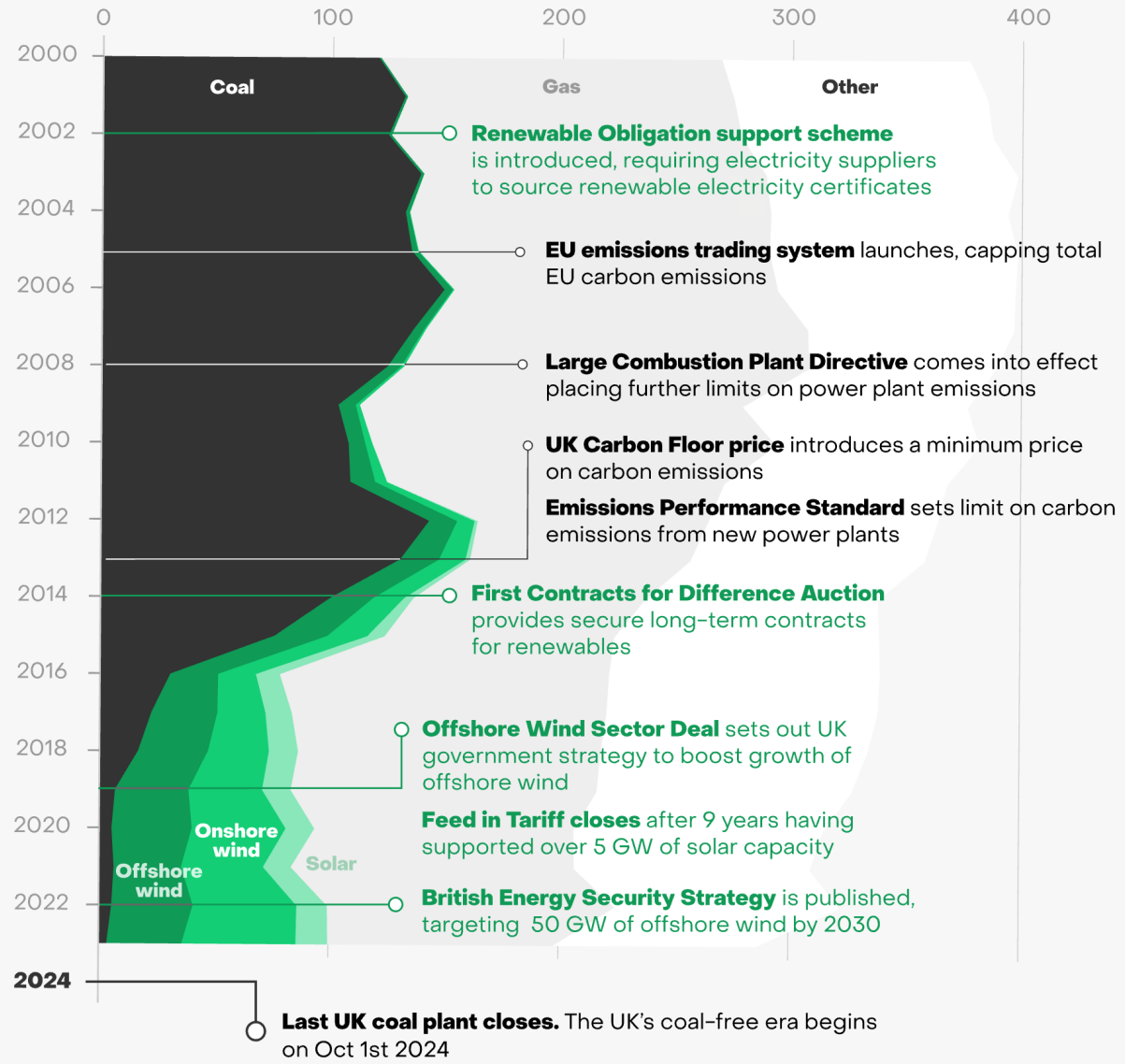
**Frankie Mayo**

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## Coal to clean: how the UK displaced coal power from its electricity supply

Electricity generation (TWh)



Source: Yearly electricity data, Ember

The end of UK coal power

# Coal power reaches zero, replaced by renewables

The final coal power plant in the UK, Ratcliffe-on-Soar, shuts at midnight on 30th September 2024. This is the final chapter of a remarkably swift downfall from what was once a major power source.

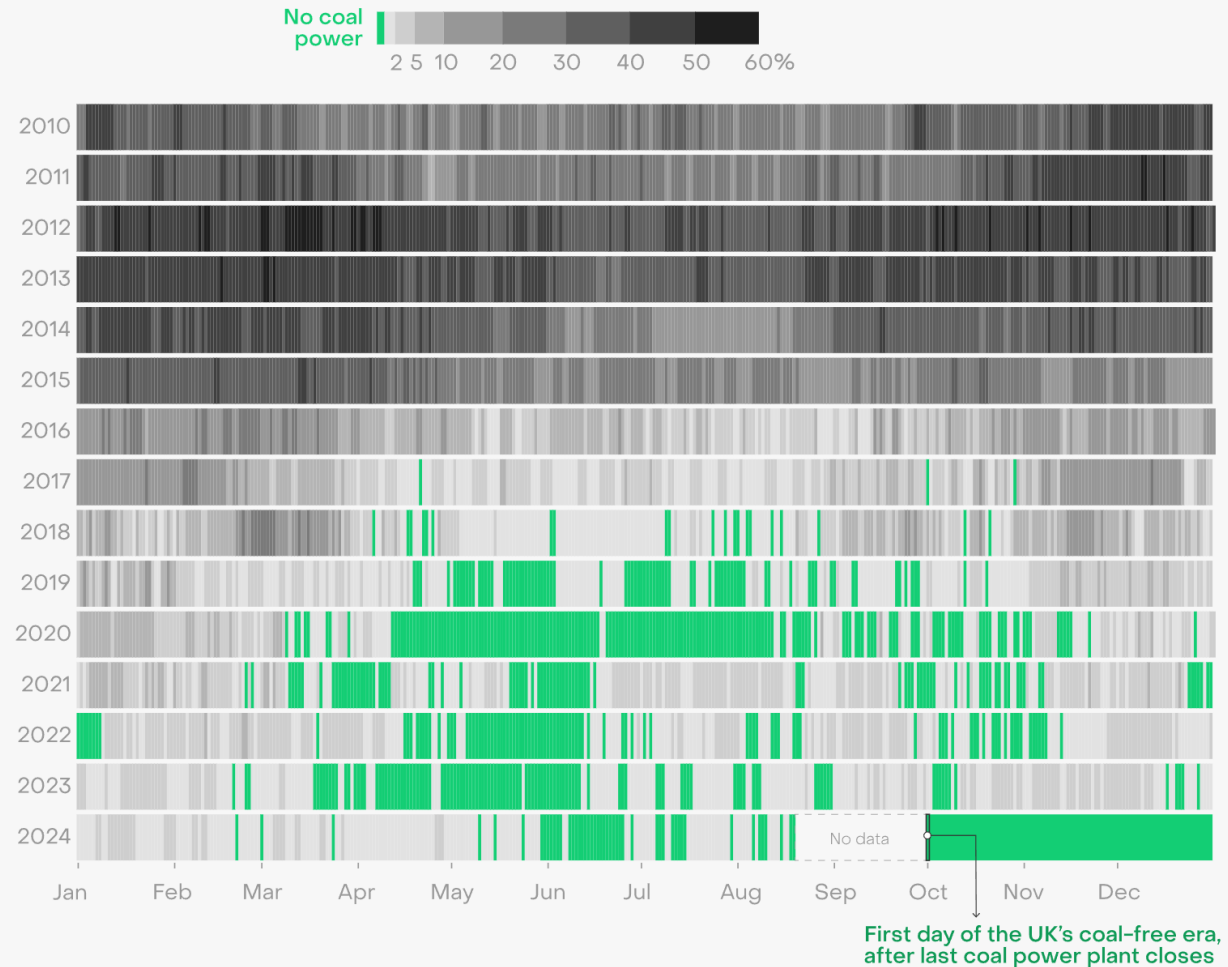
The world's first coal-fired power station, the Edison Electric Light Station, was built in London in 1882. The UK National Grid was founded 53 years later in 1935, and ever since coal has played a core role in national electricity supply. Although the proportion of electricity from coal fell in the 1990s, it was then relatively stable until 2012 when coal power made up 39% of electricity generation in the UK. This quickly dropped to around 7% just five years later in 2017, remaining at 2% of power since 2020, and now falls to zero with the closure of Ratcliffe. This marks an absolute fall of 140 TWh from 2012 to 2024.

Coal's displacement from the UK power sector happened extraordinarily rapidly. Since 2000, [25 coal plants have closed](#) or switched to other fuels, 15 of those since 2012.

The combination of policy and financial incentives since the early 2000s meant that the role of coal began to dwindle long before the closure of Ratcliffe power plant. The UK has seen an increasing number of coal-free power days after the first in 2017. This trend did not reverse in recent years, even as gas prices spiked in the wake of Russia's invasion of Ukraine. As of 1st October 2024, coal-free days are set to stay.

## The UK's coal-free days are now set to stay

Share of electricity generation from coal (%)



Source: Energy Informatics Group, University of Birmingham

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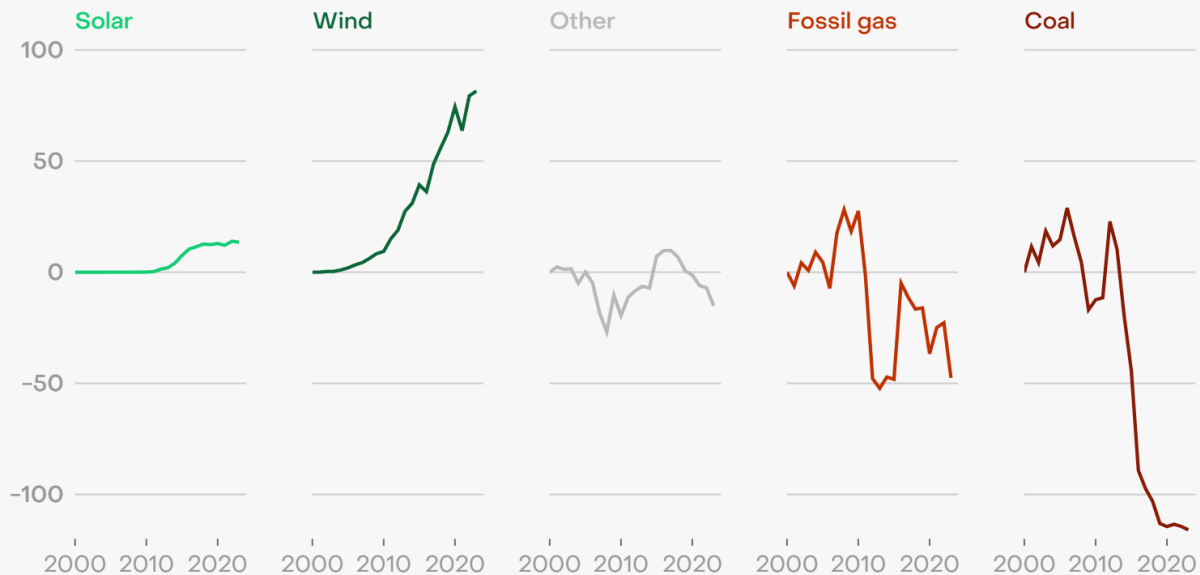
## As coal fell, renewables grew rapidly

Coal's decline was achieved without switching to gas, driven instead by renewables and a drop in demand. Wind and solar experienced massive growth as coal entered terminal decline.



## Renewables have now displaced UK coal without increasing gas use

Cumulative change in electricity generation since 2000 (TWh)



Source: Yearly electricity data, Ember  
'Other' includes bioenergy, nuclear, hydropower, other fossil, and other renewables

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Wind and solar quadrupled their power generation since 2012 when coal's rapid decline began, rising from 21 TWh in 2012 to 96 TWh by the end of 2023. As coal generation fell from 39% of British power in 2012 to 1% in 2023, the share of wind and solar electricity increased from 6% to 34%. This was driven by wind power, which alone grew 315% (+62 TWh) in the same period. Wind and solar's growth of 75 TWh since 2012 displaced an estimated 28 million tonnes of coal, and avoided £2.9bn in coal costs.

There was a brief spike in gas power from 2015 to 2016, rising from 100 TWh to 143 TWh, as an increase in the Carbon Price Support meant that producing electricity using coal became more expensive. Since then, however, gas generation has declined. By last year it had sunk back to around 2012 levels, generating 101 TWh.

Over the same period, a fall in electricity demand also reduced the need for coal. UK electricity demand has fallen by 16% since 2012 due to various factors including [a rise in power prices](#) and increasingly efficient homes, which now use less power for heating and [appliances](#).

### Coal phase-out brings a much cleaner power sector

The replacement of coal power with wind and solar has had a major impact on the UK's [power sector emissions](#), which fell by three quarters (-74%) from 158 MtCO<sub>2</sub>e in 2012 to 41 MtCO<sub>2</sub>e in 2023. The rapid decline in coal power since 2012 avoided 880 million tonnes of emissions, which is equivalent to more than double the UK's total economy-wide emissions in 2023.

Lessons learned from the coal phase-out

# Five policy lessons from the UK's coal-to-clean story

The journey away from coal dependency can be [attributed to five main factors](#): ambitious short-term decarbonisation targets, the introduction of a rising minimum carbon price which made the economics of coal less favourable, policy support for wind power, market reforms and investments and innovations in the grid. The combined effect of these five factors has seen coal power capacity in the UK fall from 32 GW in 2010 to 0 GW by the end of 2024.

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## 1. Tightening decarbonisation targets

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### **The UK set a clear direction of travel with increasingly stringent decarbonisation targets**

The UK Climate Change Act (2008, updated 2019) made clear to decision makers that the use of unabated coal was incompatible with achieving a net zero economy. In combination with the worsening economics of coal, this act underpinned [the 2025 coal phase-out target set in 2015](#).

Though in 2012 coal generated 39% of UK electricity generation, it fell more rapidly than expected to just 2% in 2019, and in 2021 the phase-out date was brought forward to 2024.

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## 2. Raising the cost of coal

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### Revealing hidden costs meant that coal power was no longer economically viable

In 2013 the UK government set a rising minimum carbon price, adding to the EU carbon price paid by power generators. From 2015 this significantly affected UK coal power prices. For the first time since 2010 coal power was more expensive than gas and significantly more costly than renewable power.

In 2016 an Industrial Emissions Directive set tighter limits on air pollution from large power plants. Compliance would have required costly upgrades to the ageing UK coal fleet, so it became uneconomic for these older plants to continue running.

In 2013 the UK set limits for CO<sub>2</sub> emissions at 450g/KWh for all new fossil fuel power plants built after 18th February 2014. This meant that new coal-fired power stations could only be built if they were equipped with expensive carbon capture and storage, effectively ruling out investment in new coal power plants.

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## 3. Support for offshore wind

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### Stable policy support for offshore wind power helped displace coal power

The 2019 [Offshore Wind Sector Deal](#) identified offshore wind as one of the UK's leading industries and provided a roadmap for how government action would coordinate with and further support industry growth. Government commitments to the sector included assurances of long-term funding through the Contracts for Difference scheme and investment into research and development.

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## 4. Market reforms for renewables

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### Market reforms incentivised investment in wind and solar, ensuring security of supply

From 2013, the UK Capacity Market availability payments funded new capacity in fossil gas as well as interconnectors, demand response and storage. This has ensured security of power supply as old coal power plants have come offline alongside an increase in the share of variable renewables in the power mix.

The UK implemented a Contracts for Difference price support scheme in 2014 for new generators, providing confidence to investors through a competitive auction, which led to rapid price reductions. There have been six auction rounds in total, supporting a [35 GW](#) pipeline of wind and solar power projects, with almost 8 GW already developed through the scheme.

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## 5. Electricity grid investment

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### Investment and innovation in the grid sped up the deployment of renewable energy

In 2010, a new method of transmission upgrades for new power plants reduced lead times to just a few years and hugely increased the pace of deployment. New clean power could replace coal and gas power generation faster, although grid issues still remain. Since 2015, the UK's National Grid Electricity System Operator has used an annual process to review grid upgrade recommendations.

In 2022, National Grid ESO announced its intention to introduce a new holistic strategic process to bring centralised planning to long-term grid upgrades. In 2024, it published an interim [Beyond 2030](#) network upgrades report, recommending upgrades to facilitate connecting an additional 21 GW of clean power generating capacity. Regular, flexible and whole-system planning across the medium and long-term means that new development can be expedited to displace coal and, in the future, fossil gas too.

Towards clean power

# A clean power system is the next milestone

The UK's coal phase-out offers lessons in how to taper down fossil fuels effectively, but reaching a fully decarbonised power system will bring new challenges.

## The next milestone is clean power

With the closure of its final coal power plant, the UK enters a coal-free era for power, demonstrating an international example for coal phase-out. The UK government is now aiming for a [clean power system by 2030](#), five years earlier than the target set by the previous government. This target [includes pledges](#) to double onshore wind, triple solar power and quadruple offshore wind. With large increases in renewables deployment, gas will be progressively displaced from the majority of supply, maintained only for critical reserve capacity.

The UK can displace gas generation down to 2% of the electricity mix by 2030, based on [previous modelling](#) by Ember. This reduces UK gas imports, improving national energy security by developing homegrown power generation. To achieve this, learning the lessons from the coal phase-out as well as preparing for additional challenges will be necessary. Support for clean power is critical, including both market reform and solutions for longer-term issues such as network connection delays.

With the deployment of wind and solar power, batteries and other clean technologies, the residual role of gas is only as a critical reserve. This fossil fuel capacity represents a very low level of annual generation (<2%) and, therefore, near-zero carbon emissions, meaning the grid is effectively decarbonised by this point.

## From coal phase-out to clean power

Some of the lessons from the coal phase-out can be applied to the final stage of decarbonising the power sector, which will require the displacement of gas generation. Gas generated 34% of UK power in 2023, a slight increase from 28% in 2012. Since 2004, the UK has been a net importer of natural gas, as production has declined faster than demand. Rapidly reducing gas will require some of the same approaches that were applied with the coal phase-out, such as long-term policy clarity and support for renewable deployment, but there are key differences. There is no single low-carbon source that can replace the current functions of gas plants

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in the power system due to their role in balancing supply and demand at scale, so the next phase of decarbonisation will need more of a whole-systems approach than was in play with the UK's coal phase-out.

## Keeping a laser eye on clean growth

Similar to the phase-out of coal, displacing gas use will require long-term policies to encourage the deployment of new clean power. While the government is targeting a 2030 clean power sector through large increases in wind and solar capacity, achieving this ambitious target means increasing the number of projects in development, reducing development delays and ensuring community support. Some of these requirements are covered in a current major government consultation on electricity markets, known as [REMA](#). This approach of long-term planning and support will also need to be employed to enable the future clean power grid.

For a power system to be reliable and stable, it must be balanced through constant adjustments to supply and demand. This is one of the functions certain gas power plants [currently provide](#), by changing generation output to help match demand. As more variable renewable generation is deployed, the importance of this function is [forecast to increase](#). Therefore, competitively priced and low-carbon alternatives will be necessary to continue to reduce gas use. Batteries will need to be particularly quick to grow, with all pathways to achieving low-carbon power in the [National Grid Future Energy Scenarios](#) analysis showing an increase of over 14 GW in battery storage capacity between 2025 and 2035.

In 2023 batteries played only a minor role in balancing supply and demand on the grid, with gas peaking plants far more dominant. As gas is displaced, this will need to change. There is already some forward planning in place to support that shift, with the recent introduction of the National Grid ESO 'Open Balancing Portal', which has [increased the use of battery storage](#). Government [strategies](#) lay out an expectation for 10 GWh of battery energy storage by 2030, which will provide important signals to the market. The government also [consulted this year](#) on introducing support for longer duration energy storage – which will help further displace fossil fuel use – using a similar policy mechanism to the support for offshore wind that allowed it to grow rapidly over the past decade.

## Investing in the grid reduces costs and constraints

There will be new challenges heading into the next chapter of decarbonisation, as renewables continue to rapidly scale up. Although critical to a clean power system, new [renewable projects are increasingly delayed](#) by a lack of available connection capacity. Investing in new or expanded electricity networks will maximise the benefits of renewable energy, but these large infrastructure projects can take many years. A new Ofgem [fast-track scheme](#) has recently announced the first in a series of major projects: a £3.4 billion offshore connection between Scotland and England. In total, National Grid is planning to [invest around £10 billion](#) in grid expansion, supported by faster approvals.

Likewise, introducing more interconnection will be vital to reduce congestion on the network. Interconnectors, which are grid connections across borders, facilitate cheap

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electricity imports and allow excess power to be exported. National Grid currently operates six interconnectors with Europe, most recently connecting the UK to Denmark in 2023 via the Viking Link, with a maximum capacity of 1.4 GW. Investment in the grid can accelerate renewable development and [reduce consumer costs](#) in the long term.

## Electrification will displace oil for transport and gas for heat

The next chapter of decarbonisation will also mean thinking beyond the power system. Weaning off fossil fuel power generation is part of a larger decarbonisation effort across multiple sectors, part of which will be achieved through the electrification of current fossil fuel heat and transport use. As with the coal phase-out, stable support for electrified alternatives and a clear direction of travel away from polluting technologies will be needed to decarbonise the whole economy.

There are real challenges of increased electricity demand, meaning that the deployment of renewable power will need to continue after the 2030 clean power target is achieved as other sectors are electrified. While gas use is being displaced in the power sector, it is still used to heat [around 80% of UK homes](#) and [10 million gas boilers](#) will be installed between 2025 and 2035. Electrifying heat with heat pumps and transport with electric vehicles will increase power demand but also has the potential to create [new sources of flexible demand](#).

Although the use of coal has fallen quickly, the UK still relies on fuel imports for power, heating and transport fuels. Coal demand [fell to 3.1 million tonnes of oil equivalent \(Mtoe\)](#) in 2023, less than a tenth of coal demand in 2010 (32.6 Mtoe). The three largest fuel supply requirements remaining in the UK are gas, oil and bioenergy imports. Alongside emissions reductions, a further benefit of electrification is reduced dependence on energy fuel imports. Recent gas price spikes have shown the benefits of a more efficient and low-carbon energy system. Economy-wide energy resilience will be improved as these high-carbon fuels are phased out.

## The coal-free power sector era begins

With the closure of Ratcliffe and the rise of renewable power, the UK is already on the path to a clean power system. Recent volatility demonstrates that there are cost, carbon and security reasons to continue to reduce gas use. This displacement will be supported by many of the lessons of the coal phase-out and also by new technologies and markets. The coal-free UK power sector will continue to rely less and less on all fossil fuels, and in time it will be far less exposed to future risks and price spikes.

# Acknowledgements

## Contributors

Lead author Frankie Mayo, data visualisation by Chelsea Bruce-Lockhart. Thanks to the authors of the previous Ember report on [clean power in 2030](#) for their input.

## Methodology

- The data on electricity generation in the UK is available in Ember's [open dataset](#).
- The estimate of £2.9bn of coal displaced is based on 2023 coal prices.
- The calculation of avoided emissions is based on the assumption that UK power sector emissions remained at 2012 levels when coal power provided 39% of UK electricity.





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