Firm Foundations

The case for cheap and reliable power

ONWARD

Modelling by

TRANSIRA ENERGY

Ed Hezlet

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About Onward

Onward's mission is to develop bold and practical ideas to boost economic opportunity, build national resilience, and strengthen communities across all parts of the United Kingdom.

We are not affiliated to any party. Our vision is to address the needs of the whole country: young and old, urban and rural, for all communities across the UK – particularly places that have too often felt neglected or ignored.

Thanks

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About the author

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Foreword

In 1977, John Hoskyns wrote the Stepping Stones report for Thatcher's Opposition which set out the steps needed to reboot Britain's economy. It was famous for showing that there was one fundamental problem underpinning all others: the power of the trade unions.

If a similar exercise was carried out today, the consistent stumbling block to Britain's challenges would be our sky-high energy costs. Britain has the highest electricity prices in the developed world. This is not the result of bad luck, but a series of deliberate policy choices to prioritise an electricity grid dominated by wind and solar at any cost.

Britain faces many challenges today. We need to have a growing economy, better living standards, globally competitive manufacturing, and we want to be a power base in the industries of the future like AI and biotech. For all of these things, cheap electricity is the holy grail.

Most people accept this. However, a truth much less acknowledged is that cheap electricity is better for the environment too.

Only a tenth of the UK's emissions come from our electricity grid. The remaining 90% come from transport, heating, and the rest of our economy. If we want those emissions to fall, then we need people to *want* to use electric cars and electric heating – then our priority should be to make electricity cheap.

Instead, our Net Zero legislation has forced us towards the opposite target. The Labour Government's priority is to squeeze out every last drop of carbon from our electricity, making it even more expensive and deterring electrification. This is bad climate policy. Sending our industry overseas to more polluting countries and creating a barrier for consumers to adopt electricity at home is worse for global emissions. The simple truth is this: there is no point in having the cleanest electricity in the world, if nobody can afford to use it.

That's why the detailed analysis in this report by Onward, *Firm Foundations*, comparing an electricity system dominated by wind and solar to one which prioritises cheaper power, matters.

When I became Energy Secretary in 2023, I was astonished to find that the Government had not done this work. The energy policy I had inherited was based on the promise that renewables are cheap, but when I combed through the spreadsheets that officials put in front of me to 'prove' this, I realised they did not have the evidence to back it up. The hidden costs that weather-dependent power creates – backup, balancing, and building extra grid – were not being properly accounted for. What the Department was missing was a *full system cost*.

I promptly commissioned that analysis because our energy policy should be based on facts, not ideology. However, my successor, Ed Miliband, cancelled it when he came into power.

Two years on, Onward has finished the work that I started. This is the most detailed analysis of the cost of our electricity system ever produced in British politics, whether by a think tank or the British Government. I am tremendously grateful to Ed Hezlet and Marlon Dey at Transira Energy for carrying out such important and expert work.

The findings are remarkable. The cheap power pathway saves consumers over £320 billion by 2050 – equivalent to around £540 per household per year. It would make the cost of our electricity a fifth cheaper by 2035, and almost a third cheaper by 2050 – which would be a boon for our economy and the cost of living. Our power in 2050 would still be nearly 80% clean – but the lower cost would make electrification a much more attractive choice for many more consumers.

This is not about turning our back on our duty to provide the next generation with a better environment. The Burkean contract between the living and those yet to be born is a core Conservative principle which we should never abandon. This is the case for an energy policy that works for the climate and our economy.

This much-needed report demonstrates that we can have both economic prosperity and a better environment if we make electricity cheap, let the economy grow, and make consumer choice king.

The Rt Hon Claire Coutinho MP

Shadow Secretary of State for Energy

Executive Summary

The UK's expensive electricity is weighing on the nation. Rising bills are repressing the discretionary income of British households and high industrial electricity prices are discouraging inbound investment. This paper quantifies the logical failures that have led to high prices and how they are defeating the very reason why the costs were incurred in the first place: to meet environmental objectives. Expensive electricity is hampering the electrification of heating, transport and industrial activity, pushing progress in reducing greenhouse gas emissions ever further away.

Government policy has started to recognise that there is an electricity cost problem, but efforts to redistribute costs are mere symptom management. Instead, policymakers must engage with a major cause of high prices - an expensive power system, driven by the wider costs that come with intermittent generation sources.

Onward have commissioned an independent study to quantify the full system costs of continuing with the current policy direction, versus cost savings that can be achieved by taking a new approach. It models a power system that prioritises firm generation capacity, responding to demand, rather than forcing consumers to react to the vagaries of the British weather. This plan includes a diversified mix of nuclear, renewables and gas generation, which builds a much cheaper power system that can be used to electrify and decarbonise more of the economy.

The savings are substantial. The alternative policy pathway saves £320 billion between 2030 and 2050, and reduces system costs by 20% in 2040 versus "business as usual". Savings are made across four major areas:

- £137 billion in network spending, thanks to a higher utilisation firm power system with supply located closer to demand
- £94 billion from lower wholesale prices, thanks to the removal of carbon taxes
- £67 billion in lower spend on balancing and ancillary services
- £22 billion across generation subsidies and the Capacity Market

Realising savings of this scale requires a shift away from the current central planning model, to a system that allocates the costs of intermittent generation to the causative generators, rather than sending a bill to the end consumer. This paper sets out an alternative policy pathway, to build a power system that allows consumers to access affordable electricity when they need it, cutting bills and increasing economic growth. In turn, cheap electricity can drive the adoption of electric vehicles and heat pumps, via consumer preference, and not state mandates. This is a win-win, for growth and the climate.

Introduction

A cruel paradox sits at the heart of Britain's energy and climate policy.

The UK has expensive electricity, higher than its developed nation peers. In 2024, Britain had the highest industrial electricity prices of International Energy Agency member countries, and the second highest domestic prices, just behind Germany.[1] Having made electricity some of the most expensive in the world, policy now tries to push consumers to use more of the UK's expensive power - as electrification is the main lever to drive the decarbonisation of heating and transport.

Two logical flaws have driven the country into this position.

Firstly, the wider system costs that come with building a power system centred on intermittent generation have been overlooked. Building new transmission lines, balancing the grid and retaining a backup power system to deal with still, dark winter days all add to system costs. Those costs are charged to consumer bills, rather than being properly internalised by the generators that cause them.

Secondly, 95% decarbonisation of the power sector has been prioritised *ahead* of electrification. This has driven up electricity costs, making electrification more costly and less attractive than it should be.

The UK can get out of this mess by building the electricity system around a core of reliable generation capacity. The opportunity is material, with the potential for £320 billion of system cost savings from 2030 to 2050.

This approach is not compatible with a dash for Net Zero by 2050, as it retains a 23% role for gas in the electricity system of 2050. But it would reduce emissions in a way that the British public could actually get behind, rather than have forced upon them. An electric vehicle or heat pump powered by such a generation mix will reduce emissions by over 80% relative to a combustion engine or gas boiler.[2] Cut electricity prices, and those technologies will become the rational choices for consumers.

The proposition is simple. Fix the electrical foundations first. Build a diverse generation mix around nuclear, renewables and gas that allows consumers to access affordable electricity when they need it. Cut systems costs and let consumers adopt electrification technologies on their own terms.

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[1] Comparisons sourced from Department for Energy Security & Net Zero (DESNZ) - Industrial electricity prices in the IEA including taxes and Domestic electricity prices in the IEA including taxes. The UK ranked 25th out of 25 countries for industrial prices and 26th out of 27 countries for domestic prices in 2024.

[2] Assumes average electricity system carbon intensity of 92g CO2/kWh from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026). Onward analysis includes technology assumptions of 8% losses in transmission and distribution, 40 miles per gallon for a petrol vehicle using normal biofuel blend (2.069 kg of CO2e/litre - DESNZ, Greenhouse gas reporting: conversion factors 2025) vs. 3.5 miles per kWh for an EV, heat pump seasonal performance of 3.0 vs. gas boiler efficiency of 85%.

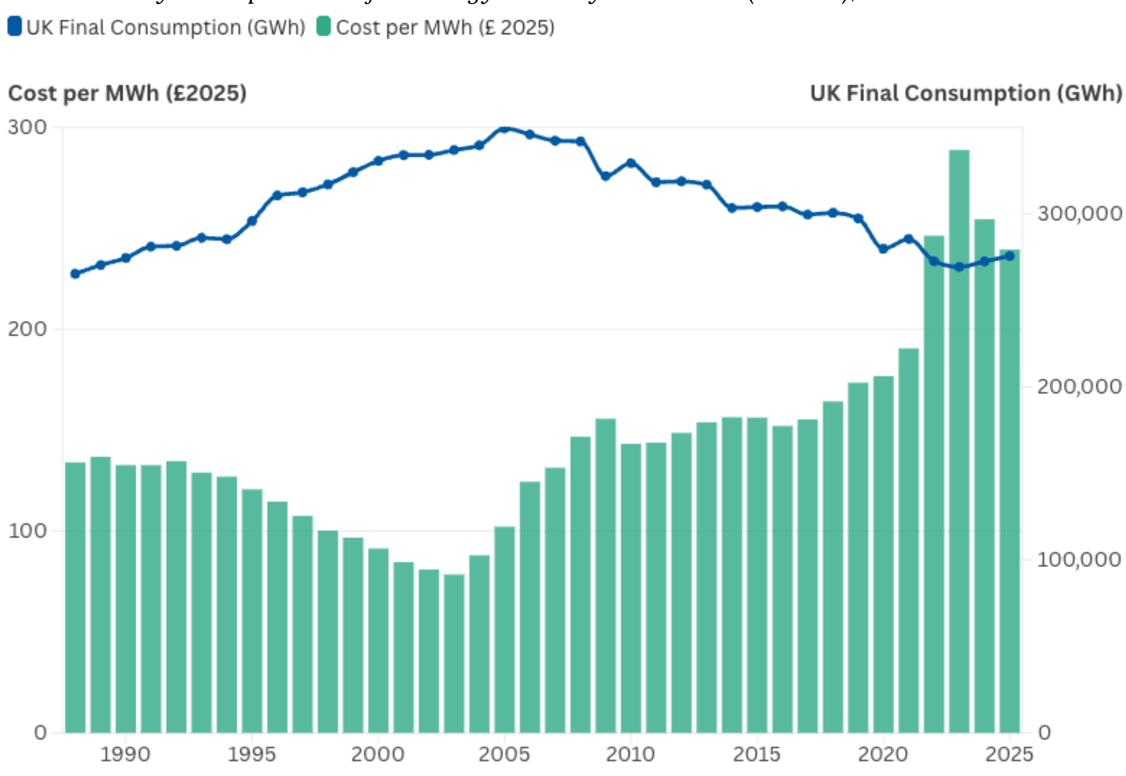
Electricity Costs: Escaping a doom loop

UK electricity consumption has fallen by 21% since the 2005 peak, with declines across domestic, commercial and industrial use.[3] In other markets, weak consumption volumes might lead to lower prices and a self-correcting system. This is not the case in the UK electricity market.

Fixed costs have become more dominant, as a greater proportion of the system is financed by inflation-linked contracts, secured against consumer bills. This has been true for electricity networks since privatisation but now extends to generation assets too. As contracted costs grew faster than electricity volumes, unit prices rose. In turn, higher prices discouraged electricity use, leaving fixed costs to be recovered over fewer units of consumption. This is an inflationary feedback loop that must be broken.

Electricity prices have risen and consumption has fallen

Figure 1: UK electricity final consumption (GWh) & costs per MWh (2025 prices) 1988- 2025
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ), ONS.[4]



Source: Onward Analysis. DESNZ. Final electricity consumption from Historical electricity data: 1920 to 2025. Electricity expenditure from DUKES table 1.1.6. Prices adjusted to 2025 values using CPI (ONS)

[3] DESNZ, DUKES table 5.1. 21% decline refers to the change in final electricity consumption from 2005 to 2025.
[4] Onward Analysis. DESNZ. Electricity consumption from Historical electricity data: 1920 to 2025. Electricity expenditure from DUKES table 1.1.6. Prices adjusted to 2025 values using UK CPI (ONS)

Electricity Costs: Treating symptoms rather than fixing the problem

Government policy has started to recognise that there is an electricity cost problem, but the responses have treated the symptoms, not the underlying cause. Costs have been re-allocated between different groups, but the expensive underlying system has not been addressed.

- In June 2025, the Government announced the expansion of the Warm Home Discount (WHD) to a further 2.7 million households.[5] The WHD is a £150 energy bill discount for households in receipt of means-tested benefits and is funded by a levy of around £40 on a typical dual fuel customer's household bills, including those in receipt of the discount.[6]
- The November 2025 Budget scrapped the Energy Company Obligation scheme (ECO) and moved 75% of domestic Renewable Obligation (RO) costs into general taxation for three years. This helped reduce the price cap just before the 2026 local elections.[7]
- The expanded British Industry Supercharger (BIS) and the new British Industrial Competitiveness Scheme (BICS) have increased support for energy intensive businesses. Funding for the BIS is recovered via non-eligible consumer bills.[8]
- The January 2026 Warm Homes Plan promised bill reductions via the installation of rooftop solar, heat pumps, insulation and batteries. It is funded by £15 billion of public spending.
- In July 2026, the new Prime Minister announced the removal of VAT from domestic electricity bills from the 1st of October 2026.[9] Funding this measure will require spending cuts, higher borrowing or offsetting tax rises elsewhere.

Rather than fixing the underlying causes of the UK's expensive electricity, policymakers are engaging in elaborate shell games. Industrial electricity costs are shifted onto households, low income households have their costs alleviated at the expense of their neighbours, and eventually costs have to be shifted on to the billpayer of last resort - the taxation system.

Similarly, encouraging consumers to adopt rooftop solar to cut their bills is partly financial engineering, allowing households to avoid electricity levies that are then left with their neighbours. It is akin to standing up in a football stadium to get a better view - the strategy will not scale effectively. If rooftop solar is pursued at significant scale, it is likely that suppliers or policymakers

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[5] UK Government press release, 19th June 2025. Millions more families to get £150 off energy bills this winter.
[6] Levy calculation from Ofgem policy cost allowance methodology Annex 4 (July to September 2026). Calculation based on Ofgem typical domestic consumption values of 2,700 kWh electricity and 11,500 kWh of gas.
[7] Ofgem, Summary of changes to energy price cap 1 April to 30 June 2026 (announced 25th February 2026)
[8] The BIS scheme is funded via the Network Charging Compensation Scheme levy. The BICS scheme is being funded by a combination of changes to the indexation for generators under the RO and FIT schemes, the removal of the Carbon Price Support from April 2028 and Exchequer funding.
[9] UK Government press release, 21st July 2026. New PM cuts tax on household electricity bills to give breathing space on cost of living.

will respond, by cutting export tariff rates, or increasing standing charges on bills. The UK must end its approach of managing symptoms, and start to fix the underlying cause.

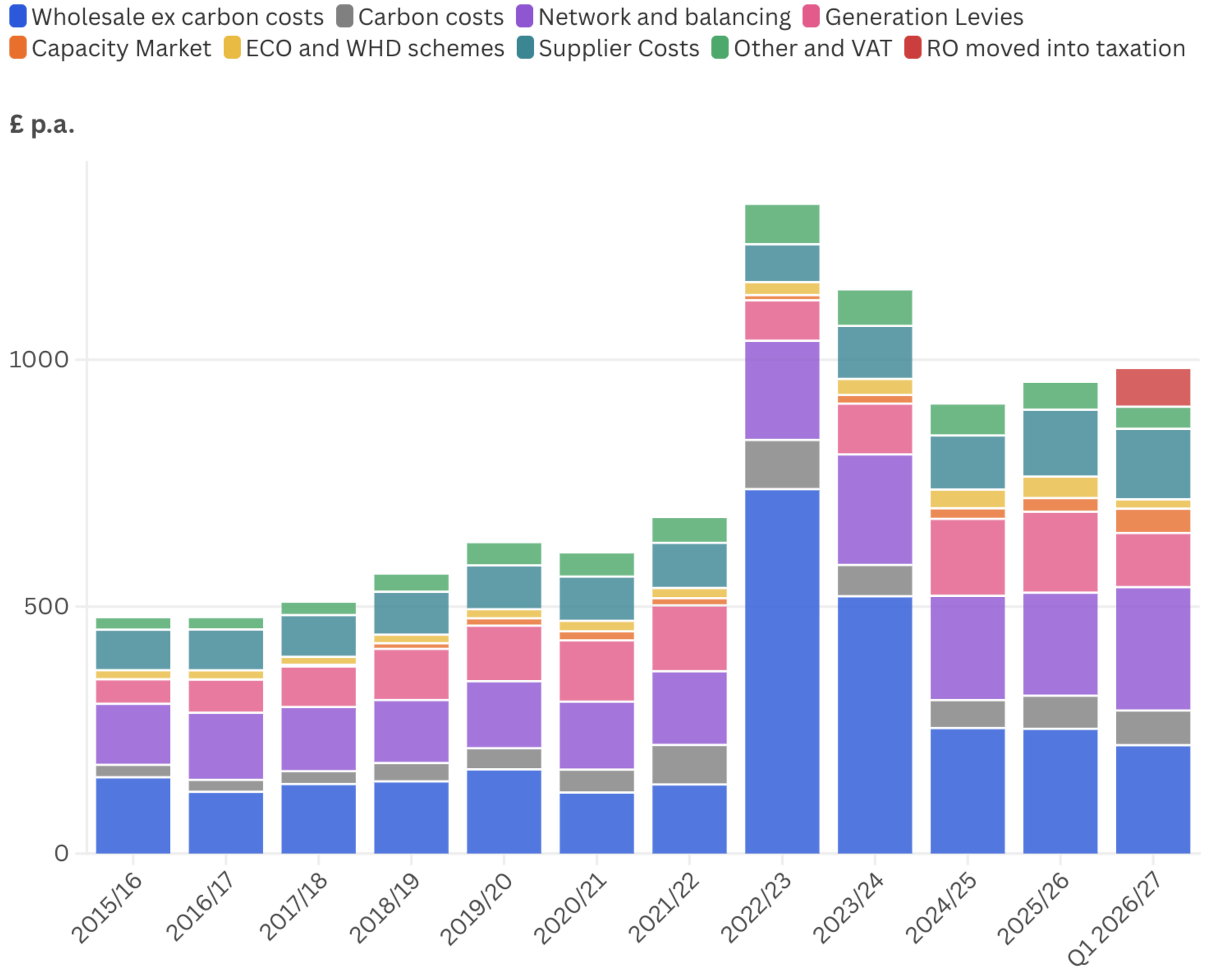
Electricity Costs: An expensive electricity system

The real cause is that the UK is building an expensive electricity system. One that requires massive investment in not just generation assets, but transmission, storage and interconnectors too.

Much has occurred to disguise this reality. Expensive subsidy schemes for early renewable generators, alongside carbon taxes, drove cost increases in the 2010s. Extreme gas price spikes were responsible for rising bills in 2022 and 2023. But a new set of inflationary pressures are just starting to reveal themselves: rising costs to pay for transmission, balancing and underutilised gas power stations. This final group of costs can be largely attributed to a system built around intermittent generation.

Electricity bills have been driven higher by carbon taxes, generation levies and network costs - as well as high gas prices

Figure 2: GB household electricity costs (£ p.a. nominal) assuming 3.1 MWh of consumption.
Source: Onward analysis of data from electricitybills.uk[10]



Source: Onward analysis of data from electricitybills.uk. Onward have adapted the data to include the estimated impact of carbon costs in wholesale price formation, based on carbon costs from the Carbon Price Support and EU/UK ETS schemes. Gas is assumed to set the wholesale price 95% of the time from FY15 to FY23, falling to 90% in FY23-24 and 85% from FY24-25 onwards. Data has also been adapted for Q1 FY26-27 to include the element of the Renewable Obligation (RO) scheme that was moved into general taxation.

These inflationary pressures could be downplayed when the costs of new intermittent generation appeared to be declining, inexorably, year after year. Contract-for-difference (CfD) strike prices awarded for offshore wind fell by 72% between 2014 and 2019, but have since risen materially.[11]

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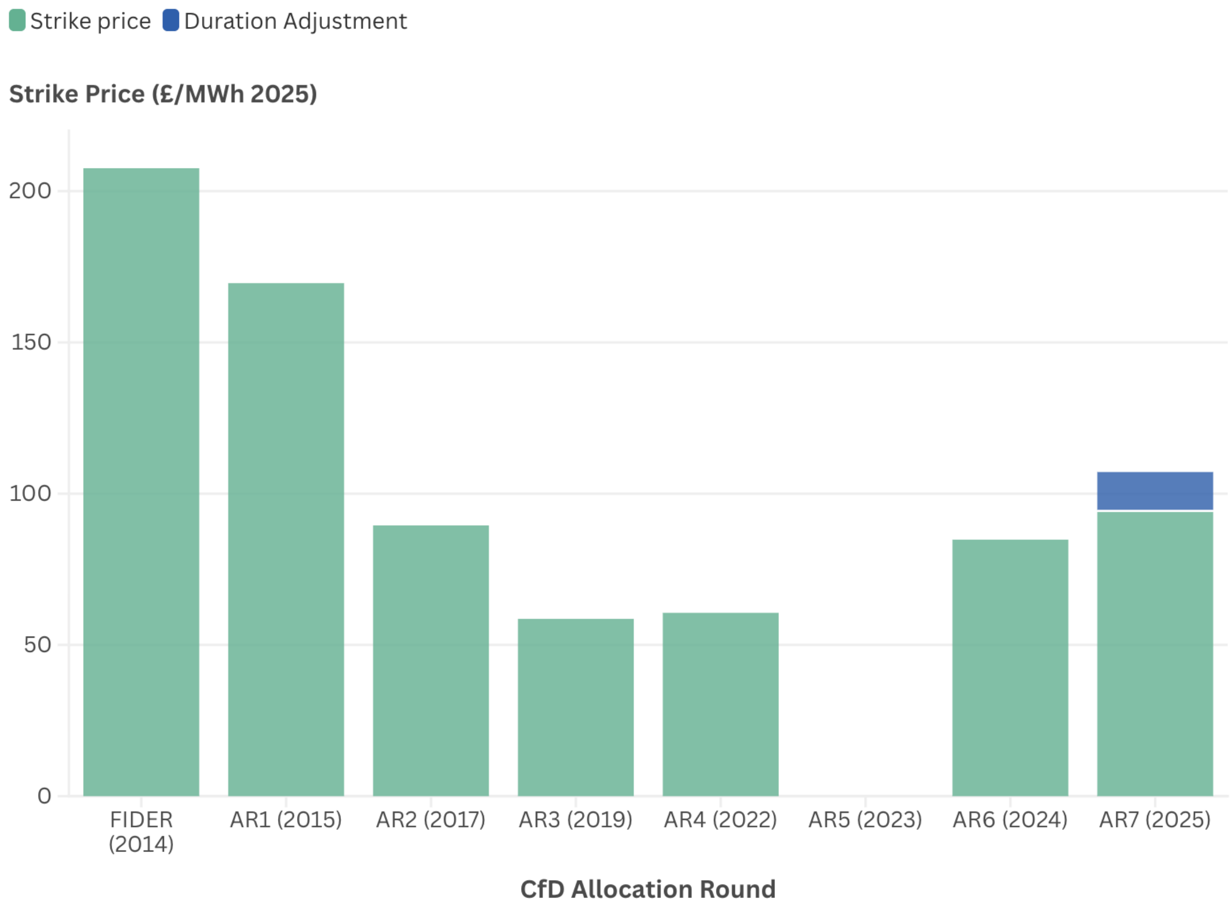
[10] Onward analysis of data from electricitybills.uk, data and methodology section.
[11] 72% reduction refers to the difference between the weighted average strike price for the FIDER round in 2014 and the weighted average strike price for AR5, awarded in 2019 (National Audit Office and DESNZ)

Offshore wind CfD strike prices have started to rise

Figure 3: Historic CfD strike prices for fixed bottom offshore wind (£2025/MWh)
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ), ONS.[12]



Source: Strike price data sourced from DESNZ CfD round announcements and adjusted to 2025 prices using UK CPI (ONS) AR4 contracts have been adjusted for permitted reductions that were awarded in AR6. No offshore wind CfDs were awaded in AR5. Duration adjustment applied to the AR7 strike price to account for CfD length increasing from 15 to 20 years. This was assumed to have reduced headline prices by 12%, according to the Consultation on further amendments to the Contracts for Difference scheme for Allocation Round 7 (DESNZ, 3rd July 2025)

Policymakers must adapt to the inescapable reality that the bet on becoming the "Saudi Arabia of wind" has not paid off as once hoped.[13] The signs of a reaction to new information are mixed. In January 2026, the Department for Energy Security and Net Zero (DESNZ) increased their 2040

[12] Onward analysis. FIDER round data from the National Audit Office and CfD rounds 1-7 from the respective DESNZ allocation round results. Calculations are weighted average strike prices and adjusted to 2025 values using UK CPI (ONS). Upward price adjustment to AR7 is based on DESNZ, link.
[13] Prime Minister Boris Johnson's speech at the Global Investment Summit 2021 in the Science Museum, link.

levelised cost forecasts for offshore wind from £51/MWh (2025) to £96/MWh.[14] However, the Climate Change Committee assumes costs of just £37/MWh for the same technology.[15]

Availability: Power when consumers need it

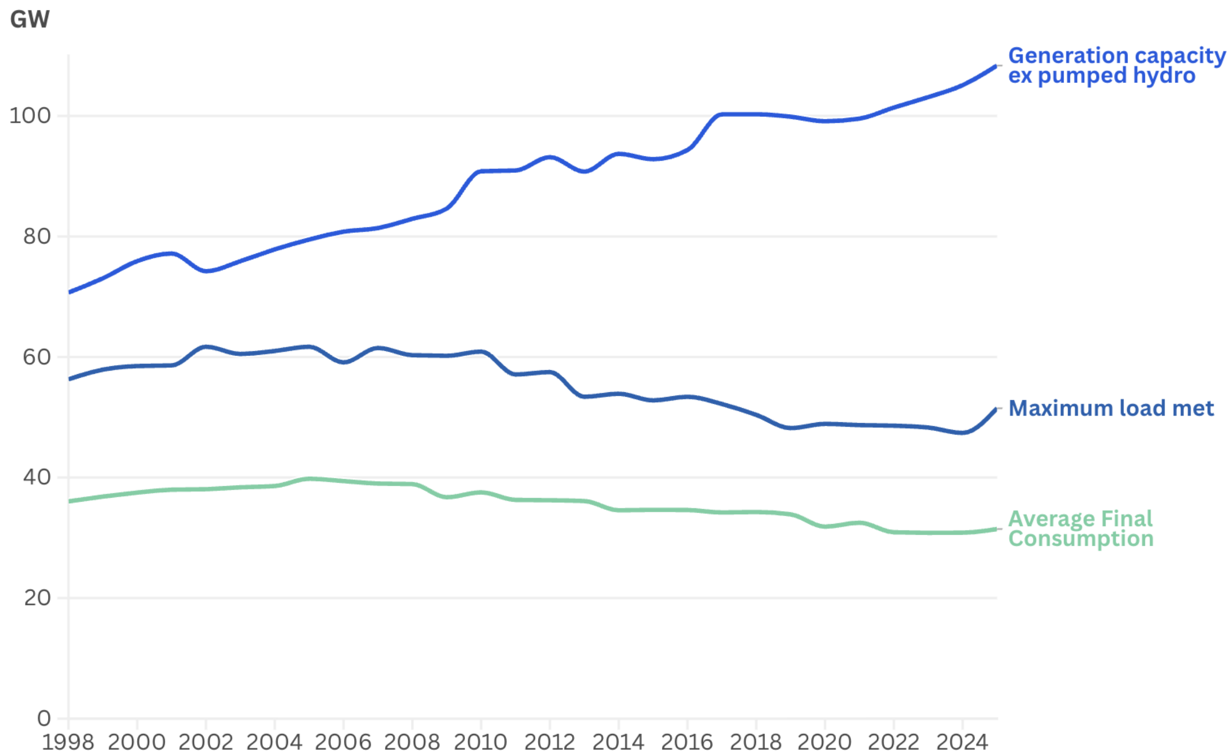
At the start of the 21st century, the UK had 76 GW of generation capacity that fulfilled average consumption of 38 GW and met winter peak load of about 58 GW.[16] This was a system of firm generation capacity that could supply electricity on demand, composed of coal, gas and nuclear power. The system was built with a sensible buffer of spare capacity to reliably meet peak load in winter, allowing for station outages and the risk of particularly cold winters.

By 2025, UK generation capacity had risen materially, to around 108 GW, but average final consumption and peak demand had fallen by 16% and 12% respectively. A huge amount of extra generation capacity had been connected but was less able to do useful work.

[14] DESNZ, Electricity generation costs 2023 and Electricity generation costs 2025. Levelised costs reflect offshore wind projects commissioning in 2040 have been adjusted to 2025 values using UK CPI (ONS)
[15] The Climate Change Committee, The Seventh Carbon Budget: Advice for the UK Government, February 2025, page 208. 2040 levelised costs adjusted to 2025 values using UK CPI (ONS)
[16] Onward analysis. Generation capacity for the year 2000 sourced from DESNZ, DUKES table 5.7 and excludes pumped hydro storage capacity. Average electricity consumption and maximum load met are calculated from DESNZ, DUKES, Historical electricity data: 1920 to 2025, and refer to the year 2000.

Generation capacity has increased, but consumption and peak load have fallen

Figure 4: UK generation capacity, average final consumption & peak load, 1998-2025 (GW)
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ) [17]



Source: Generation capacity sourced from DUKES table 5.7 (DESNZ). Calculation excludes pumped hydro storage and re-rates wind and solar to reverse the applied de-rating factors. Average final consumption sourced from DUKES 5.1 and adjusted to account for leap years. Simultaneous maximum load met sourced from DUKES - Historical electricity data 1920 to 2025.

The type of generation capacity has changed materially. Firm capacity is defined as power stations that can meet peak demand with a high degree of reliability and where output is controllable by a plant operator. By contrast, the output of intermittent generation (such as wind and solar) is driven by weather conditions, over which the operator has little control.

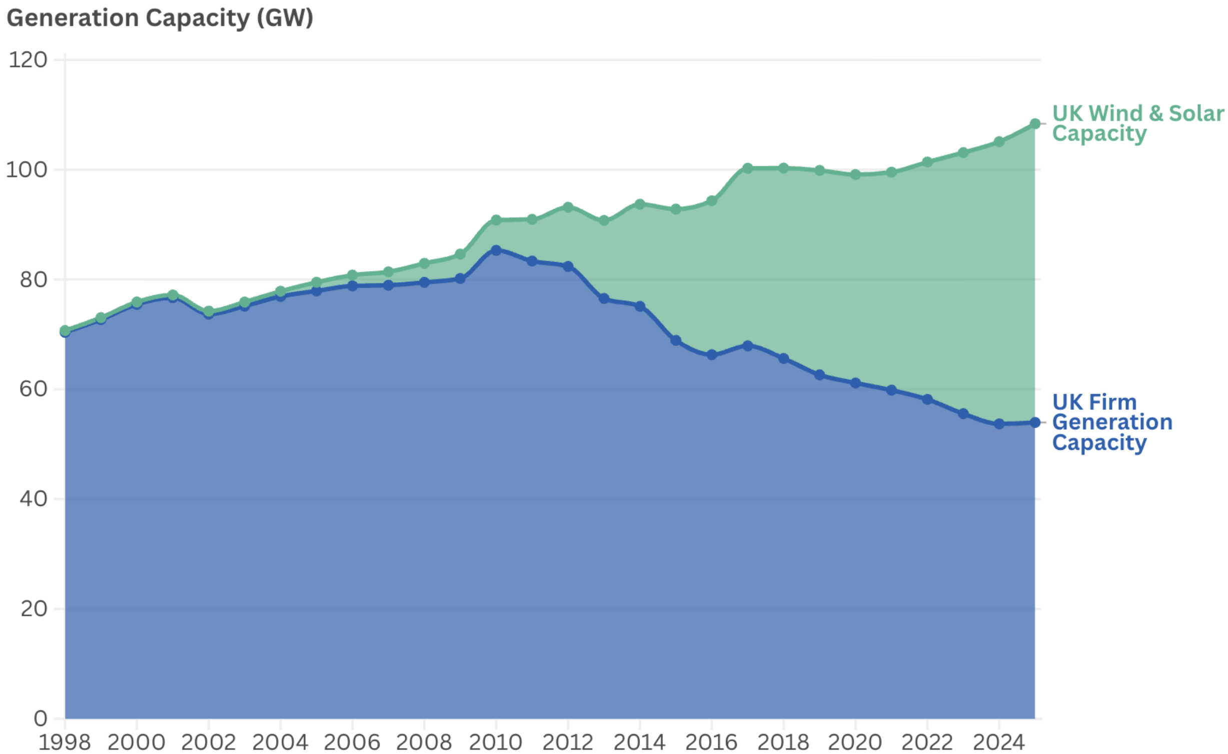
The UK's firm capacity, including coal, gas, nuclear, hydro and biomass, has fallen by nearly 40% since the 2010 peak. It is unlikely that this trend will reverse anytime soon. 80% of the UK's existing nuclear capacity is scheduled to close by March 2030.[18] 63% of the UK's combined cycle gas power station capacity was commissioned over 20 years ago.[19]

[17] Onward analysis, DESNZ. Generation capacity sourced from DUKES table 5.7. Calculation excludes pumped hydro storage and re-rates wind and solar to reverse the applied de-rating factors. Average final consumption from DUKES 5.1, maximum load from DUKES Historical electricity data 1920 to 2025.
[18] World Nuclear Association, Nuclear power in the United Kingdom. The UK has 5.9 GW of existing nuclear capacity and the calculation assumes that only Sizewell B (1.2 GW) operates past March 2030.
[19] Onward analysis. DESNZ, DUKES table 5.11. Calculation refers to combined cycle gas turbine (CCGT) station capacity commissioned before 2006.

The UK has lost firm generation capacity

Figure 5: UK electricity generation capacity 1998 to 2024, by category (GW)

Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ) [20]



Source: Generation capacity sourced from DUKES table 5.7 (DESNZ). Firm generation capacity excludes pumped hydro storage and groups hydrocarbon based generation, nuclear, hydro, bioenergy and waste. Intermittent generation calculations re-rate wind and solar to reverse the de-rating factors within the table.

The loss of firm generation capacity creates two major risks.

[20] Onward analysis, data from DESNZ, DUKES table 5.7. Firm generation capacity excludes pumped hydro storage and groups hydrocarbon based generation, nuclear, hydro, bioenergy and waste. Intermittent generation calculations re-rate wind and solar to reverse the de-rating factors within the table.

Availability: turning away investment

Firstly, it turns away inbound investment, because the UK lacks the generation capacity or grid connections to power new projects. Whilst some new industries may be able to flex their power demand up and down with the weather, most are looking to invest millions in capital equipment and will want to get full utilisation of their investment. The UK can neither deliver initial grid connections in a timely fashion nor ensure stable long term supply, so international investors look to countries that can, like the USA or China.

It is unclear whether the Department for Energy Security and Net Zero even want this investment. Adding a firm source of demand that seeks to run on a consistent basis will imperil a 95% clean power target. The head of 'Mission Control' for the UK's Clean Power 2030 ambition recently stated:

"*I want that increase in electricity demand, but I also want it to be of a particular type*" - matching the profile of wind and solar generation as much as possible.[21] While demand flexibility is an important technology and offers major opportunities to improve the utilisation of network infrastructure, that is not the same as shaping demand to suit intermittent generation patterns. It is undesirable to build an economy that is dictated by the vagaries of the weather. Britain had such a society three hundred years ago and it was much poorer.

If factories or data centres want firm power and the UK cannot provide it, investment will take place overseas. GDP per capita has risen by just 0.4% per annum since 2007.[22] The UK cannot afford to forgo the investment opportunities of the 21st century.

Availability: hampering electrification

The second risk is to consumer acceptance of electrification, and thus, to long-term progress on decarbonisation. The requirement for reliable electricity has increased over the last fifty years. An energy vector that used to power our lighting and domestic appliances now powers the internet, access to financial services, and AI.

Consumers are being pressured to go further than ever, by electrifying their transport and heating systems too. That proposition will meet resistance if households are unable, or cannot afford to turn on their heating on cold, still, dark winter days.

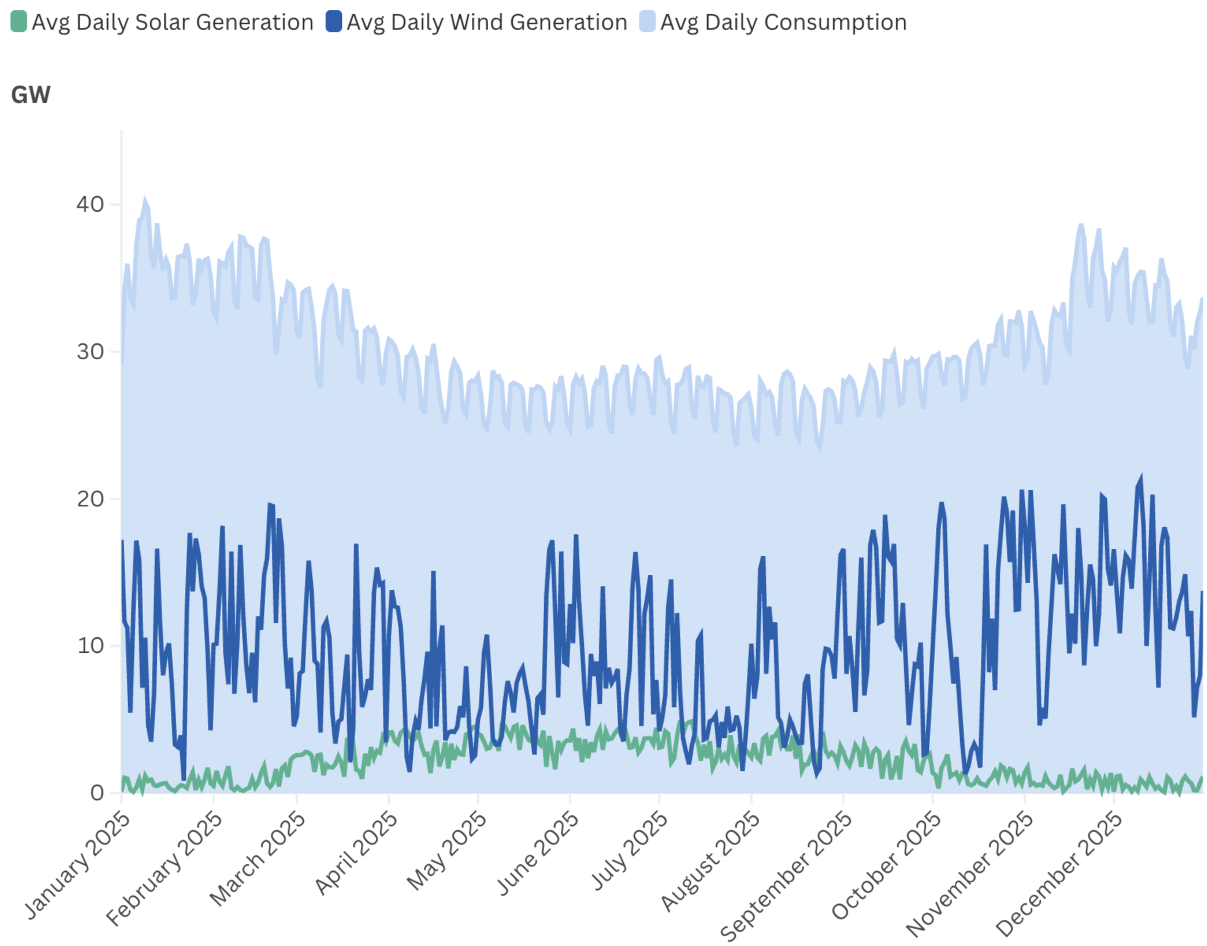
British electricity consumption already peaks in the winter months, before the arrival of widespread electrified heating. But solar power delivers most of its output in summer, and wind generation suffers from multi-day lulls. The country must retain firm generation capacity to keep

[21] Youtube, The Carbon Brief Interview: Head of UK "mission" for clean power. Relevant quote from 7 minutes 48 seconds.
[22] ONS, Gross domestic product per head. Cumulative increase from 2007 to 2025 expressed as a compounded annual growth rate.

the lights on and its homes warm, even as demand from electric cars and new uses like datacentres rises.

Britain's electricity consumption peaks in winter

Figure 6: 2025 GB daily average electricity consumption, wind and solar generation (GW)
Source: Onward analysis. National Energy System Operator (NESO) [23]



Source: Wind and solar generation from National Energy System Operator (NESO) - Historic GB Generation Mix. Consumption data sourced from NESO Historic Demand Data 2025 - consumption is proxied by the sum of national demand, embedded wind generation and embedded solar generation.

[23] Onward analysis. Wind and solar generation from NESO, [Historic GB Generation Mix](). Consumption data sourced from NESO, [Historic Demand Data 2025](), and is calculated by the sum of national demand and embedded wind and solar generation.

Two logical failures

There are two major logical failures at the heart of Britain's electricity policy malaise. The first has been to treat the direct production costs of intermittent renewables as reflective of the costs they impose on the wider electricity system. The second has been to prioritise the near-complete decarbonisation of the electricity system as a *precursor* to wider electrification.

Logical failure 1: Generation versus system costs

The true cost of intermittent generation is poorly understood. Political debate often compares levelised costs: a metric that captures the average cost of generating electricity over the lifetime of a generation asset. This ignores the cost of intermittency, and treats each MWh of electricity as if it were a jar of marmalade, that can easily be stored in a cupboard for consumption later in the year. In reality, the value of electricity is not fungible through time and space.

The physical reality of the electricity system is much more constrained. Supply and demand must be in constant balance, and the potential for storage, on current technology, is limited. Britain currently has enough storage capacity for around one hour of electricity demand.[24] Even if all 16 of Ofgem's shortlisted long duration storage projects get built, the total would increase to around five and a half hours.[25] This is not enough to make it through a winter spell of low wind and sun.

Adding intermittent renewable capacity does not displace the need for reliable generation to ensure security of supply. In the end, this means that two generation systems are required, not one. Clean Power 2030 is only 95% clean for a reason - a reliable gas backbone is still needed to step in at times of scarce wind and solar. The 95% Clean Power 2030 target still requires 35 GW of unabated gas capacity to stay online, and assumes those power stations run at a capacity factor of just 5%.[26] Gas power stations still need to recover their fixed costs, meaning higher prices via the Capacity Market or through scarcity pricing in periods of tight supply.

The National Energy System Operator (NESO) calculates the extent to which different generation technologies contribute to reliable supply. For conventional generation, this is based on historic availability during winter peak demand periods.[27] For wind and solar, NESO uses an incremental equivalent firm capacity model.[28] Hydro and gas turbines sit above 90%, whereas wind and solar are rated below 10%.

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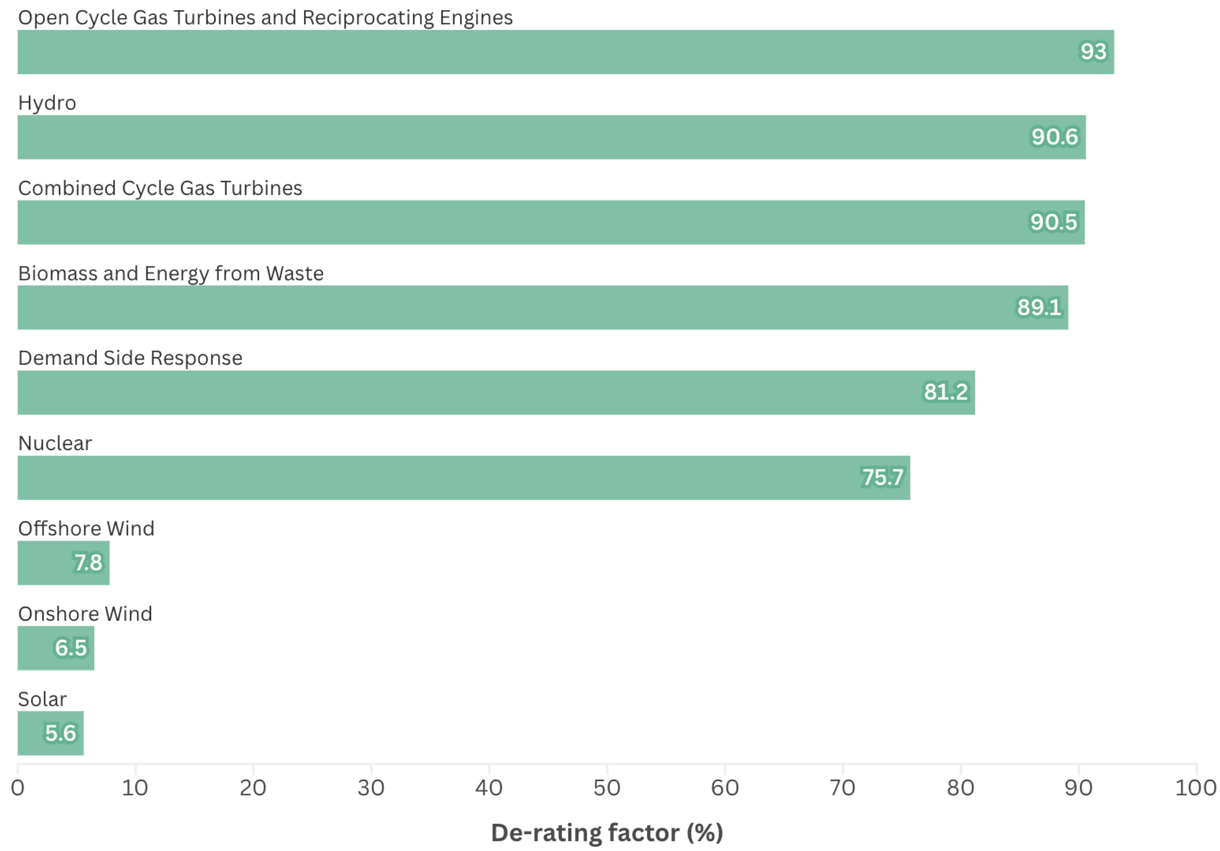
[24] Battery data sourced from Modo Energy GB BESS buildout Q1 2026, with a total of 11.8 GWh. UK pumped hydro storage capacity assumed to total 24.5 GWh across four sites. Combined total of 36.3 GWh.
[25] Refers to projects listed under Ofgem Window 1: Minded-to decisions - long duration electricity storage published 26th June 2026. 16 projects assumed to total an additional 137 GWh of storage.
[26] NESO, Clean Power 2030 Data Workbook. 35 GW of gas capacity is referenced on tab CP.17 and tab CP.06 references a generation range of 14.5 to 15.1 TWh p.a. - which implies a capacity factor of c. 5%.
[27] NESO, Electricity Capacity Report 2026 (May 2026)
[28] Energy System Operator, Storage & Renewables De-Rating Factors (2023)

Some generation technologies are more reliable than others

Figure 7: Technology specific de-rating factors (%)
Source: National Energy System Operator (NESO) [29]



Source: National Energy System Operator - Electricity Capacity Report 2026. De-rating factors for wind and solar refer to the T-4 auction for delivery in 2030/31.

The costs of an intermittent-first, low carbon electricity system are material and are discussed in turn:

- **Overbuilding capacity relative to demand:** 95% Clean Power 2030 assumes building 115 to 126 GW of wind and solar capacity.[30] This is to meet average electricity demand of around 36 GW.[31] The overbuild is needed in the plan to restrain unabated gas to 5% of electricity generation, because wind and solar have low capacity factors and volatile generation profiles.
- **Transmission costs and losses:** The best wind resources are located far away from demand centres, requiring extensive transmission buildout across Scotland and the East of England.

[29] NESO, Electricity Capacity Report 2026 (May 2026)
[30] DESNZ, Clean Power 2030: Action Plan: A new era of clean electricity, December 2024 (page 32)
[31] Onward analysis. Data sourced from NESO, Clean Power 2030 Data Workbook, tab CP. 28. 36 GW of average consumption is based on customer load plus network losses.

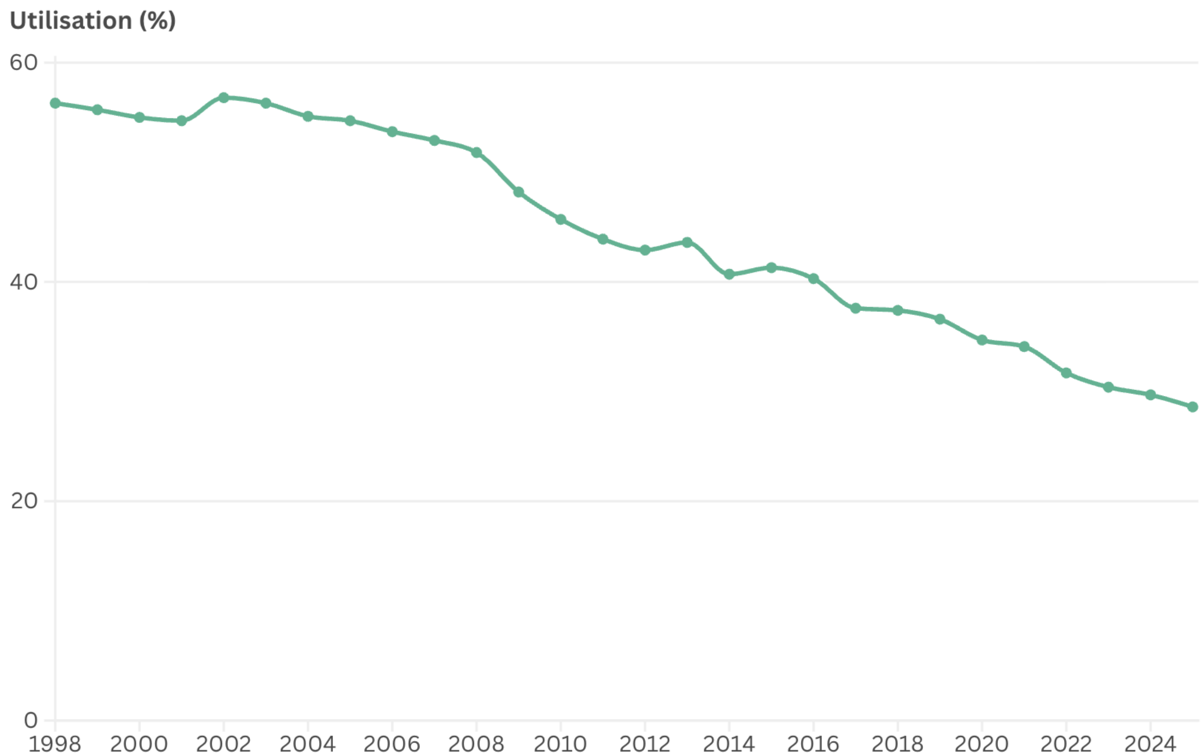
Firm generation capacity still needs to remain connected to the grid, so very little is 'freed up' by the new wind projects. Generation located far away from demand also means greater electricity losses through the UK's network infrastructure.

- **More storage:** Volatile renewables need to be buffered by a storage system to reduce unabated gas use. Long duration electricity storage projects are being financed by 'cap and floor' subsidy support and hydrogen projects are very heavily subsidised.
- **Firming costs:** Intermittent-led electricity systems still need firm generation capacity to cover periods of high demand and low renewable output. This means that firm generation stations will run at low utilisation levels. These costs will be paid for one way or another; either via subsidies for new build firm power projects, via the Capacity Market to keep existing gas plants online, or by extreme prices at moments of scarce supply.
- **Balancing costs:** Intermittent renewables tend to have greater uncertainty over their short term output than firm technologies. This means that more has to be spent on short term balancing services to match supply and demand. Gas and nuclear power stations also provide inertia to the grid, thanks to the large rotating mass of their turbines and alternators, which are synchronised with the frequency of the electricity system. This helps stabilise the grid if a large power source drops, giving the system operator time to react. Wind and solar generators provide little effective inertia, meaning that new investment must be made to compensate for this loss, for example, by building synchronous condensers.

The list above is not a tirade against intermittent renewables, but the country has to face reality. If the UK builds an intermittent-first electricity system, then a lot of generation, storage and interconnection infrastructure will be needed, whilst maintaining a core of firm generation capacity. This can be observed via the utilisation rate of the UK's electricity generation, transfer and storage infrastructure, which has fallen materially since 1998.

Utilisation of the UK's electricity system has fallen

Figure 8: Utilisation of UK generation, storage and interconnector assets, 1998-2025 (%)
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ) [32]



Source: Utilisation calculated by: (electricity supplied) / (sum of generation, storage and interconnector capacity multiplied by 8,760 hours per year) Generation capacity sourced from DUKES table 5.7 (DESNZ) and re-rates wind and solar to reverse the de-rating factors within the table. Grid scale battery storage capacity sourced from DUKES table 5.16. Interconnector capacity from DUKES table 5.13 and excludes Moyle (Northern Ireland to Scotland) Electricity supply sourced from DUKES table 5.1

The costs of building out the transmission network are a good example of rising infrastructure costs. NESO's latest update on transmission spending recommends £64 billion of investment by 2030, and a further £89 billion into the 2030's.[33] On a combined basis, over £150 billion is being spent on assets that do not generate any power.

Solar power in particular will change the world, but less so Britain than brighter countries. The technology has collapsed in cost, and countries close to the equator have more consistent sunlight throughout the year. Those countries will often have high electricity demand on the sunniest days, due to air conditioning use, a helpful alignment between supply and demand.

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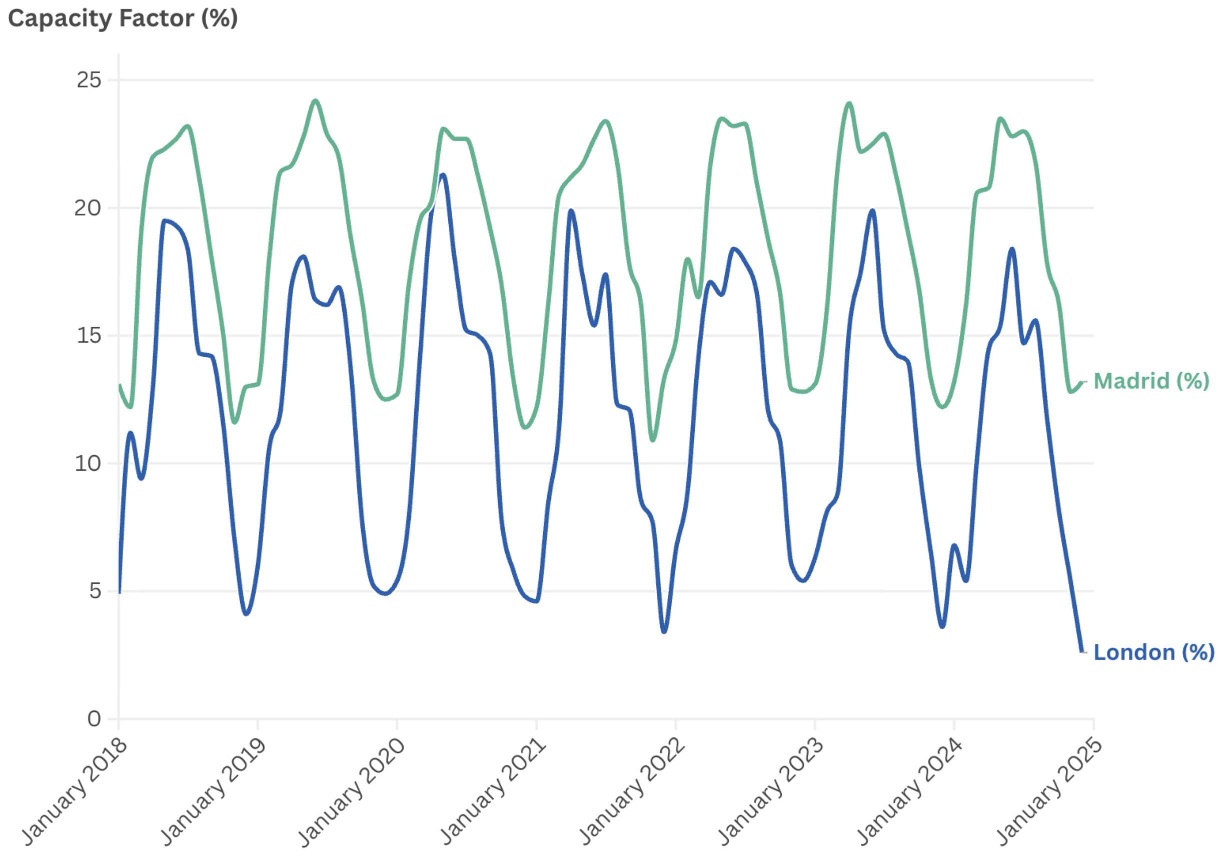
[32] Onward analysis, DESNZ. Utilisation calculated by: (electricity supplied) / (sum of generation, storage and interconnector capacity multiplied by 8,760 hours per year) Generation capacity from DUKES table 5.7 and re-rates wind and solar to reverse the applied de-rating factors. Grid scale battery storage capacity from DUKES table 5.16. Interconnector capacity from DUKES table 5.13 and excludes Moyle (Northern Ireland to Scotland) Electricity supply from DUKES table 5.1.
[33] NESO, Beyond 2030 - Electricity Transmission Update June 2026.

The UK sits much further north and was ranked by the World Bank as the second worst country in the world for solar potential.[34] The British priority is to build an electricity system that provides reliable power in winter. Solar may save gas use in summer but does little to alleviate the need for firm capacity in the winter months. Wind and solar generators are valuable to the extent that they save variable costs in our electricity system - the value of displaced gas and carbon.

UK winters are very poor for solar generation

Figure 9: Estimated monthly solar capacity factor for London and Madrid (2018-2024) (%)
Source: Onward analysis. Convexity power system modelling from Bayesian.energy [35]



Source: Convexity power system modelling from Bayesian.energy. Data collected using Renewables Vision feature, generic solar 2018-2024.

Intermittent renewables are more than welcome in the UK market. But they should not be built under CfDs that treat each MWh as equally valuable. They should internalise the system costs that they create, and then compete in the wholesale and capacity markets, or secure their own power purchase agreements with corporate customers.

[34] World Bank, Energy Sector Management Assistance Program, Global photovoltaic power potential by country (June 2020)
[35] Convexity power system modelling from Bayesian.energy. Data collecting using Renewables Vision feature, assuming generic solar, for London and Madrid, 2018-2024. Data aggregated into monthly averages by Onward.

The distinction between the costs of generating individual megawatt hours of electricity, and the cost of delivering an electricity service that can reliably power the country are not new. Ten years ago, the Department for Energy and Climate Change (DECC) commissioned Frontier Economics to build a theoretical framework that encompassed the full system costs of different technologies.[36]

In 2017, Dieter Helm's *Cost of Energy Review* noted that neither wind or solar paid the full cost of their intermittency.[37] The Review recommended the adoption of an 'equivalent firm power' capacity auction, so that the costs of intermittency would rest with those who caused them.[38]

In August 2020, the Department for Business, Energy and Industrial Strategy (BEIS) published the 2020 edition of the electricity generation costs publication. It included 'enhanced levelised costs' that tried to capture some of the system impact of adding a marginal unit of a given generation technology.[39]

Under the previous government, the now Shadow Secretary of State for Energy, Claire Coutinho, started a full systems cost review of generation technologies.[40] There is no evidence of this analysis ever emerging from DESNZ.

It is clear that UK energy policy was starting to engage with a system level cost analysis, but it appears that this foray into rationality has since been sidelined. Politicians promising lower electricity bills on the basis of low levelised cost forecasts for wind and solar are either unaware of this prior analysis, or deliberately avoiding bringing the true costs to light, knowing that it will conflict with their preferred public narrative.

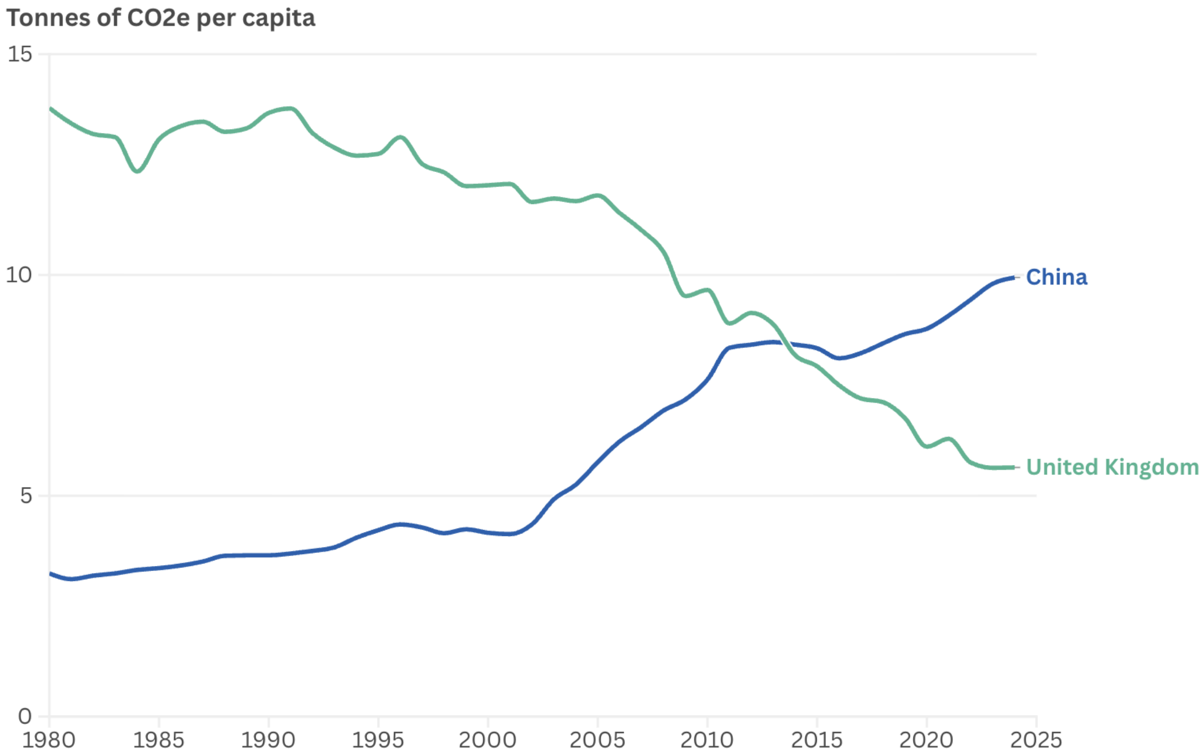
Logical failure 2: 95% decarbonisation of the electricity sector ahead of electrification

Territorial emissions are a flawed metric for a global emissions problem. The 2050 Net Zero target encourages the offshoring of any economic activity that comes with a local footprint - from growing food to refining crude oil. If the UK's targets were in keeping with a concern for global climate change, they would be based on consumption rather than territorial emissions, recognising the trends in the graph below.

[36] Frontier Economics, Whole power system impacts of electricity generation technologies - a report prepared for the Department of Energy and Climate Change (February 2016)
[37] Dieter Helm, Cost of Energy Review, 25th October 2017, page 109.
[38] Dieter Helm, Cost of Energy Review, 25th October 2017, page viii.
[39] Department for Business, Energy and Industrial Strategy, Electricity Generation Costs 2020, (August 2020)
[40] Hansard, Offshore Wind, Volume 778: debated on Wednesday 14 January 2026.

UK per capita emissions have declined, as China's have risen

Figure 10: Greenhouse gas emissions per capita (tonnes) for UK and China (1980-2024)
Source: Jones et al. (2025), processing by Our World in Data.[41]



Source: Jones et al. (2025) Population based on various sources (2024) – with major processing by Our World in Data.

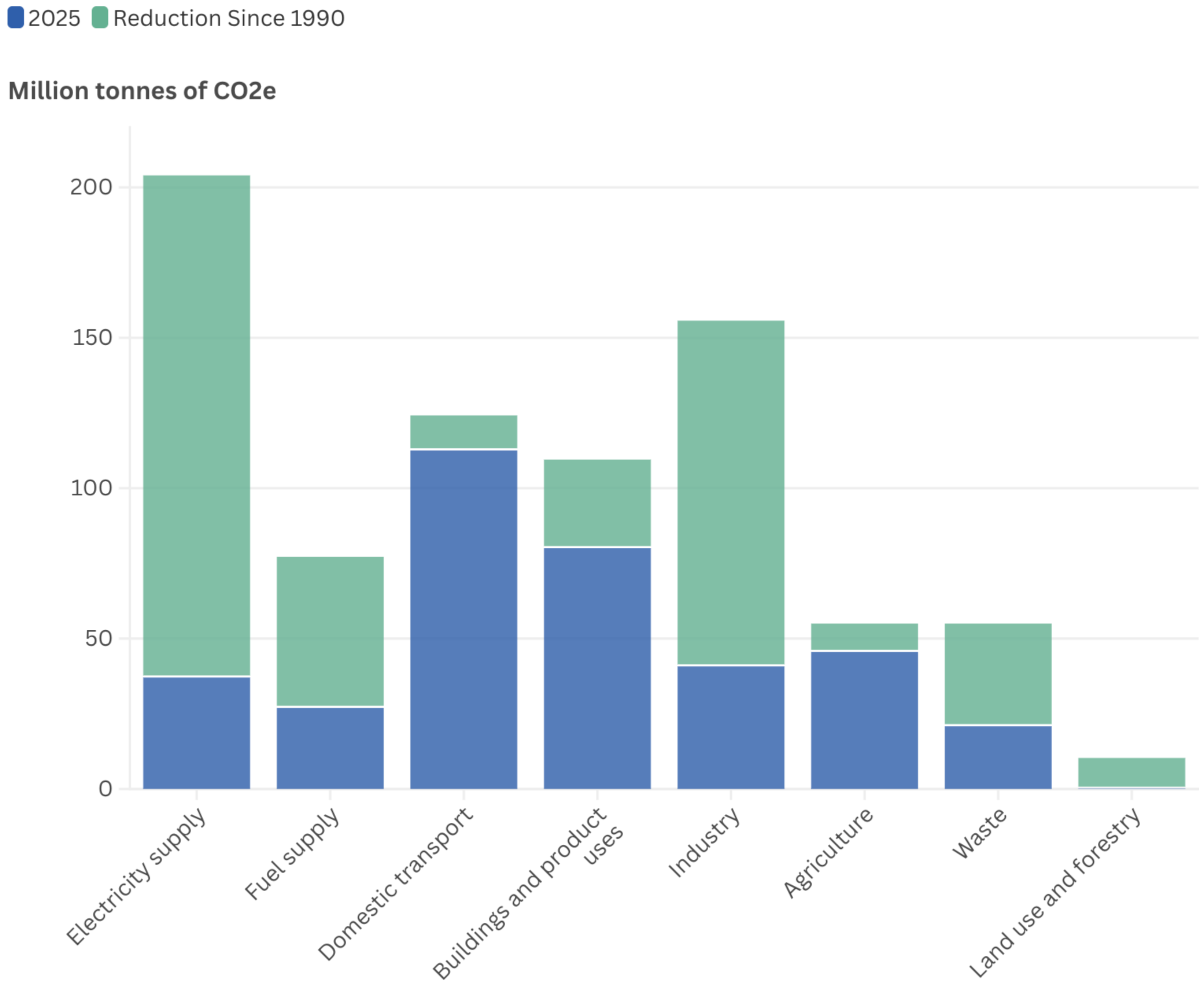
In the interests of brevity, let us accept the territorial framework, in line with data published by DESNZ.

In 1990, the electricity supply sector was the single largest contributor to UK territorial emissions, responsible for over a quarter of the total. By 2025, absolute emissions from the electricity sector had fallen by 82%, and made up just 10% of the total.[42]

[41] Jones et al. (2025); Population based on various sources (2024) – with major processing by Our World in Data.
[42] DESNZ, Provisional UK greenhouse gas emissions statistics 2025, data tables, Table 1a: Territorial greenhouse gas emissions by source sector, in million tonnes carbon dioxide equivalent (MtCO2e), UK 1990-2025.

UK electricity has made significant progress in reducing emissions

Figure 11: UK territorial emissions by sector: 1990 vs. 2025 (million tonnes of CO2e)
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ) [43]



Source; Source: DESNZ - Provisional UK greenhouse gas emissions statistics 2025, data tables, table 1a.

Driving the last 10% out of the electricity supply sector is no longer the lowest hanging fruit. If driving gas use down to 5% to hit a 2030 target increases electricity costs, it then makes it more difficult to electrify (and decarbonise) domestic transport and heating buildings. These two sectors make up around half of the UK's remaining territorial emissions.[44]

Policies focussed on rapidly decarbonising the electricity system and inflating electricity costs, are damaging the cause of electrification. The policy problem can be observed through the lens of heat

[43] Onward analysis. DESNZ, Provisional UK greenhouse gas emissions statistics 2025, data tables, Table 1a: Territorial greenhouse gas emissions by source sector, in million tonnes carbon dioxide equivalent (MtCO2e), UK 1990-2025.
[44] Onward analysis. DESNZ, Provisional UK greenhouse gas emissions statistics 2025, data tables, Table 1a. Domestic transport comprised 30.8% of territorial emissions in 2025. Residential, commercial and public sector buildings collectively account for 20.6% of territorial emissions and are largely driven by space and water heating.

pumps, which offer a promising opportunity to decarbonise the heating of buildings, which makes up around 18% of UK territorial emissions.[45]

An electric heat pump is an amazing piece of technology. A real-world study from 2020-2022, based on British homes, recorded a median seasonal performance factor of 2.8, which means that heat pumps in the study transformed one unit of electricity into 2.8 units of useful heat.[46] This would make a heat pump 3.3x as efficient as an 85% efficient gas boiler.

Even if the UK's grid was 100% powered by gas, heating via a heat pump would reduce carbon emissions by around a third relative to a gas boiler. Using the carbon intensity of British generation in 2025, the emissions reduction would be nearly 80%.[47]

But the economics of buying an air-to-water heat pump system do not stack up for ordinary families. The capital costs are around £10,000 higher than a gas boiler, or an extra £2,500 after a £7,500 government grant.[48] But even without the capital cost headwind, UK electricity prices are currently 3.6x to 4.1x those of gas.[49] This ratio of electricity to gas prices is known as the 'spark gap' - and the UK is a major outlier relative to Europe.[50]

A technology that is 3.3x as efficient as a gas boiler is up against an electricity price around four times as expensive as gas. The result is low heat pump uptake, despite a grant value equivalent to nearly 8 years of free domestic heating.[51]

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[45] Onward analysis. Breakdown estimated from 2023 greenhouse gas emissions data from the UK National Atmospheric Emissions Inventory.

[46] DESNZ & Energy Systems Catapult, Electrification of Heat Demonstration Project, Interim Insights from Heat Pump Performance Data.

[47] Onward analysis. Assumes carbon intensity of 130g/CO2/kWh based on the weighted average 2025 data from NESO Historic GB Generation Mix. Onward technology assumptions are for a heat pump seasonal performance factor of 3.0 versus 85% gas boiler efficiency and 8% power losses in transmission and distribution.

[48] Assumes £3300 for a new gas boiler plus installation (Checkatrade cost guide, updated March 2026) Air-to-water heat pump cost assumed at £13,300 (MCS data dashboard 2025 average installation cost for an air source heat pump) £7500 grant relates to the Boiler Upgrade Scheme.

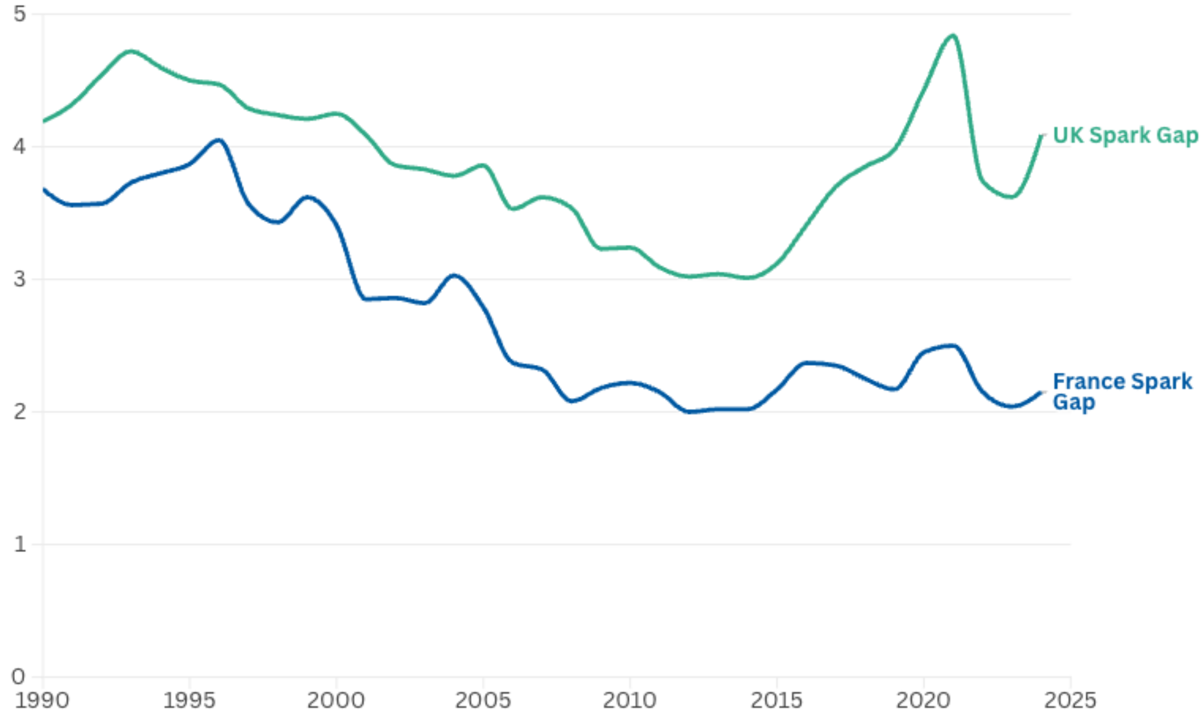
[49] Onward analysis, Ofgem. 3.6x spark gap refers to the unit price difference between electricity and gas under the Ofgem energy price cap from 1st July to 30th September 2026. 4.1x refers to the price difference when both unit rates and standing charges are taken into account.

[50] European Heat Pump Association, 2025 European heat pump market report (The UK had the highest electricity to gas price ratio of 18 European countries)

[51] £7500 BUS grant compared to Q3 2026 Ofgem price cap. Assumes 11,500 kWh of annual gas consumption at 7.33 p/kWh and a daily standing charge of 29.04p, which equates to 7.9 years of gas bills.

Electrified heating makes sense in France, but not in the UK

Figure 12: Domestic electricity to gas price ratio (spark gap), UK and France (1990-2024)
Source: Onward analysis. Department for Energy Security & Net Zero (DESNZ) [52]



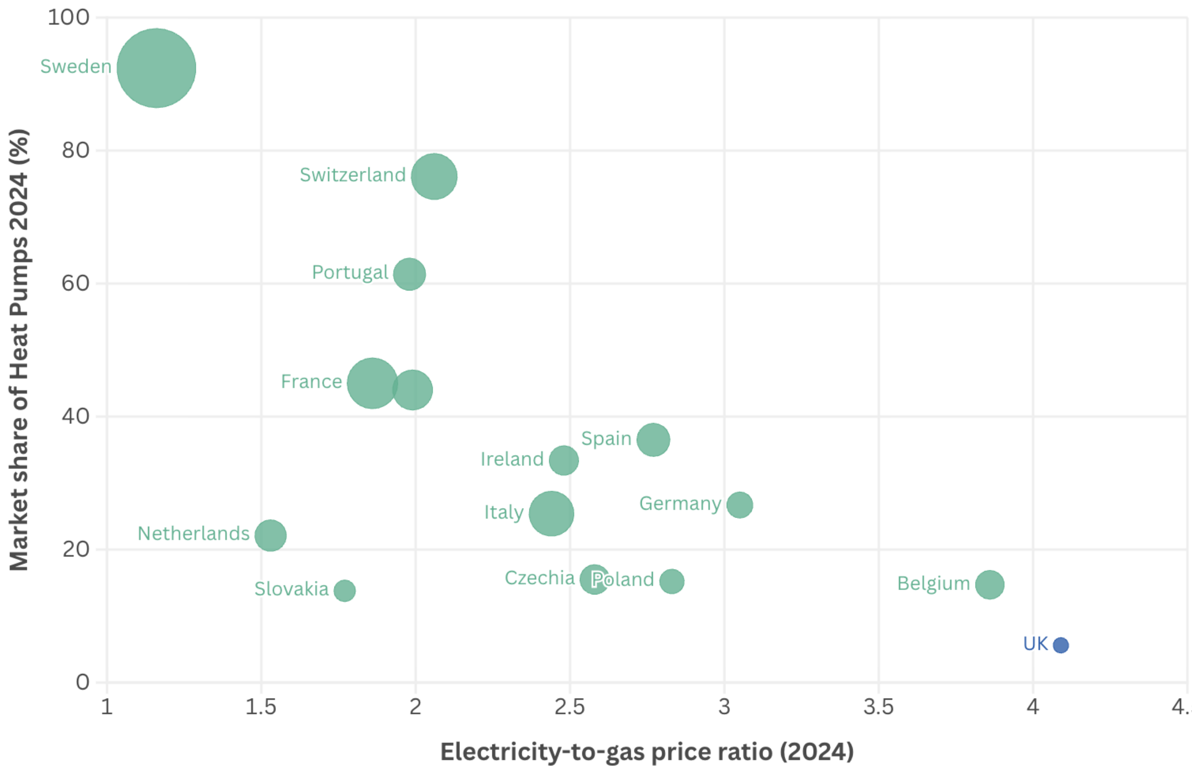
Source: DESNZ - International domestic energy prices. Spark gap is calculated from Table 5.5.1 (Domestic electricity prices in the IEA including taxes) and Table 5.9.1 (Domestic gas prices in the IEA including taxes)

The logic is borne out in the data. Alongside a high spark gap, the UK had the lowest stock and sales rates of heat pumps per household out of 15 major European countries. UK consumers are responding rationally to an expensive electricity system.

[52] Onward analysis. DESNZ, International domestic energy prices. Spark gap is calculated from Table 5.5.1 (Domestic electricity prices in the IEA including taxes) and Table 5.9.1 (Domestic gas prices in the IEA including taxes)

The UK has expensive electricity relative to gas - and low heat pump uptake

Figure 13: Heat pump market share vs. electricity-to-gas price ratios for 15 European countries (2024)
Source: The Climate Change Committee. [53]



Source: Climate Change Committee - Progress in reducing emissions, 2026 report to Parliament (June 2026) Data taken from Charts and Data, tab ES4. Bubble size represents the stock of heat pumps per 1000 households.

Adoption should be consumer driven, if it is to maintain broad political consent. Lower electricity costs and a greater range of technology options (including the benefits of cooling) will be far more powerful in the long term than a hectoring state mandate.

Cheap electricity will allow continued progress on decarbonising transport and heating, without the political backlash or economic damage. It is the pro-consumer response to the challenge of decarbonisation, that can sustain political support over the decades ahead.

[53] The Climate Change Committee, [Progress in reducing emissions, 2026 report to Parliament] (June 2026) Data taken from Charts and Data, tab ES4. Bubble size represents the stock of heat pumps per 1000 households.

Full system costs modelling

Onward commissioned a system cost analysis to bring much needed clarity to the real costs of the British electricity system. Transira Energy, an independent energy advisory practice, have modelled the system cost of two different power systems and explained the differences between them. The two scenarios are named **"Business as Usual"** and the **"Alternative Policy Pathway"**. Each scenario is introduced in turn, with further details available in the Transira Energy report.[54]

Business as Usual (BAU)

BAU has been produced by Transira, to reflect the likely evolution of the power system under the current policy framework, taking account of real-world delivery constraints. Key assumptions and results include:

- **Decarbonisation:**
  - Emissions in the power sector continue on trend to hit zero in 2045, but the wider economy falls short of the 2050 net zero target
  - Removal of the Carbon Price Support from April 2028, but electricity generators remain covered by the UK Emissions Trading Scheme (UK ETS)
- **Generation technologies:**
  - Continued policy support for the expansion of wind and solar generation under CfDs
  - Deployment of flexible low carbon technologies such as gas and bioenergy, both fitted with carbon capture and storage (CCS) technology. (Hereafter Gas CCS and BECCS)
  - Continued policy support for storage, interconnectors and hydrogen
  - 13.3 GW of nuclear by 2050 (2.2x current capacity) financed under the Regulated Asset Base (RAB) model
- **Electrification:**
  - Support and mandates for wider electrification continue - such as the ban on internal combustion engine cars by 2030, and support for heat pump deployment via the Boiler Upgrade Scheme and the Clean Heat Market Mechanism.

[54] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

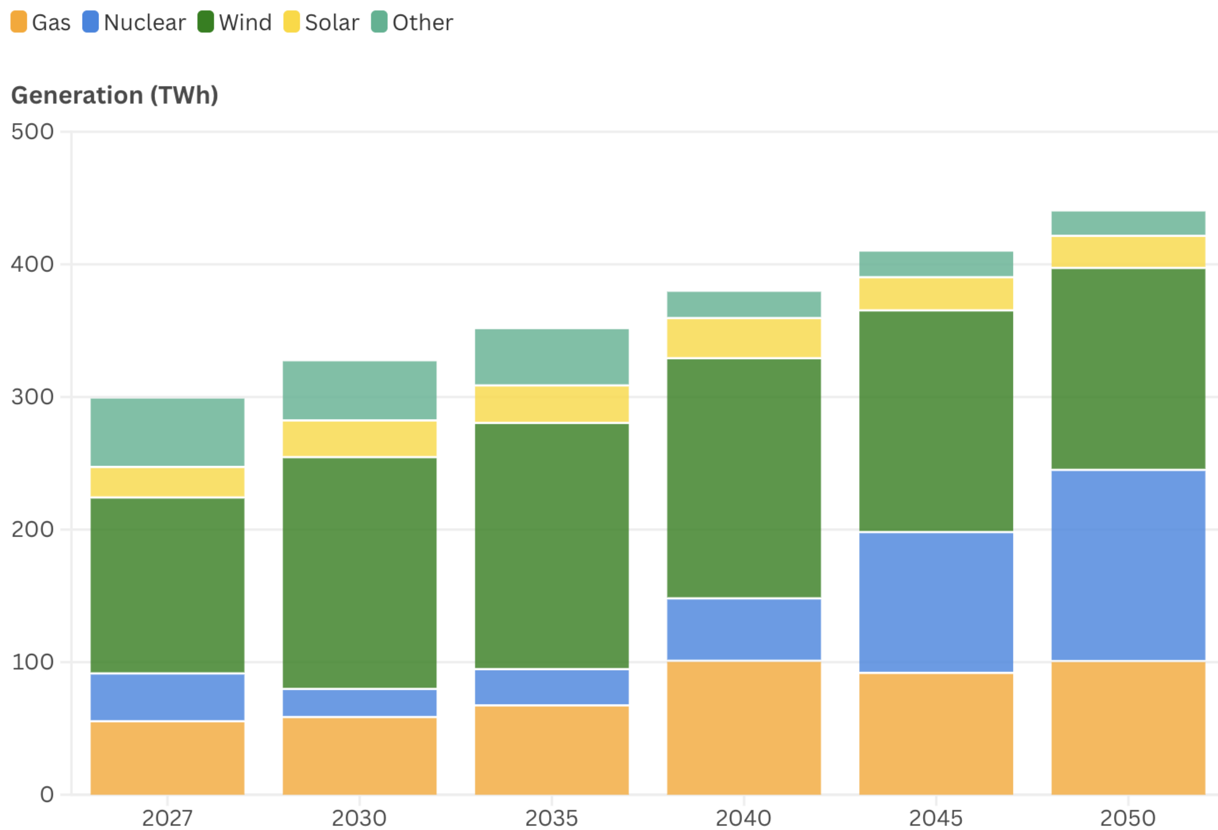
Alternative Policy Pathway (APP)

APP has been developed by Onward. It assumes that a new government wins a general election in 2029, and shifts policy to focus on reducing costs in the electricity system. Cheap and reliable electricity is prioritised, with further decarbonisation of the electricity system relegated to third place in the energy trilemma. It assumes:

- **Decarbonisation:**
    - The Climate Change Act 2008 is repealed, removing the need to hit carbon budgets.
    - The Carbon Price Support ends in April 2028 and electricity generators are removed from the UK Emissions Trading Scheme (UK ETS) from 2031.
    - There is no coal present on the system. Emissions intensity in the power generation sector remains similar to 2027 levels, and remains just below 100g CO_2/kWh in 2050, with unabated gas providing 23% of the generation mix.
- **Generation Technologies:**
    - Renewable Obligation payments for existing wind and solar cease from 2033.
    - Policy support for new renewable, carbon capture, hydrogen, energy storage and interconnector projects ceases from 2030.
    - No changes are made to pre-existing CfD contracts.
    - 20 GW of nuclear capacity by 2050 (3.4x current capacity) financed under the RAB model. Reducing nuclear construction costs and timelines becomes the core energy priority of the UK government, with measures to improve the availability of sites and grid connections.
    - 45 GW of gas capacity remains on the system in 2050. New build capacity market contracts are extended to 20 years to support new gas-fired technologies.
- **Electrification:**
    - Subsidies and mandates for electrification cease, with adoption being driven by lower electricity prices and greater range of consumer choice, for example, encouraging air-to-air heat pumps with cooling functionality.
    - Electricity use from data centres grows faster than in BAU, thanks to improved connection availability and lower electricity prices.

APP has a balanced mix of nuclear, renewable and gas generation

Figure 14: Alternative Policy Pathway: Generation mix from 2027 to 2050 (TWh)
Source: Transira Energy. [55]



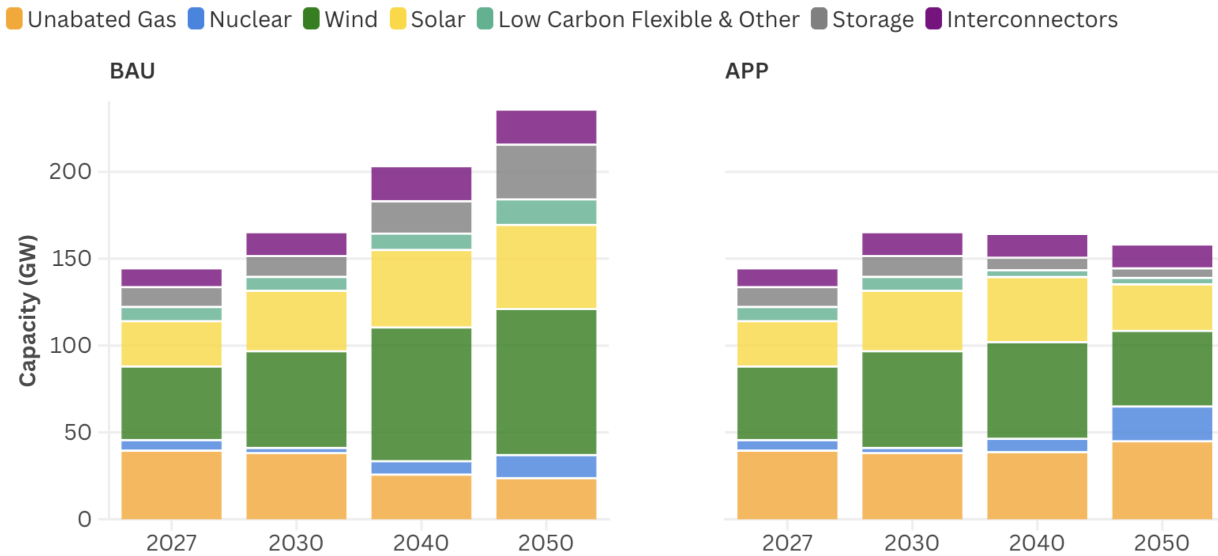
Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

The central premise behind the APP system is a greater proportion of firm generation capacity, located closer to demand and existing transmission infrastructure. This saves billions of expenditure on network expansion and balancing costs.

[55] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

APP doesn't need to connect as much generation capacity as BAU

Figure 15: Generation capacity under APP and BAU (2027-2050, GW)
Source: Transira Energy. [56]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

[56] [Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)]

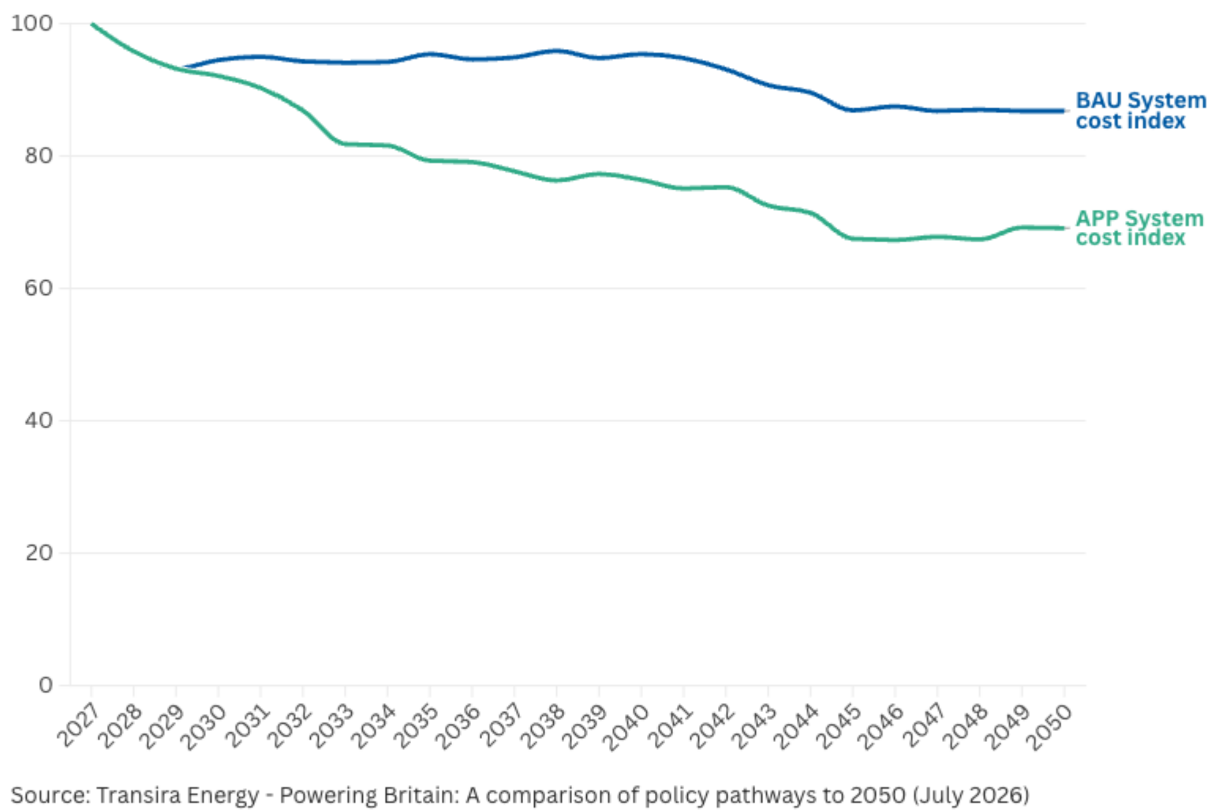
System Costs: APP vs. BAU

System costs refer to the total cost of the electricity system, excluding the costs and profit margins of electricity suppliers.[57] The APP scenario reduces system costs substantially relative to BAU, saving a cumulative total of £320 billion over 2030-2050, adjusted for lower electricity generation under APP.[58] This results in APP system costs falling 17% below BAU by 2035 and 20% below BAU by 2040.

Relative to 2027 system costs, APP saves 21% by 2035 and 31% by 2050.

APP has lower system costs than BAU, with a 17% saving by 2035

Figure 16: Electricity system cost index under BAU and APP (£ per MWh, 2027 =100)
Source: Transira Energy. [59]



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[57] Suppliers costs and margin typically encompass around 15% of a household bill - electricitybills.uk
[58] [Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026).]() £320bn of cumulative system cost savings are expressed in 2025 real values and have been pro-rated for 7% lower cumulative electricity consumption under APP.
[59] [Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026).]()

For a household with average electricity consumption, Onward estimates that APP would drive a real term electricity system cost reduction of c. £200 between 2027 and 2035.[60]

Savings could be increased by a further £90, via a series of further policy measures:

- **Warm Home Discount:** Moving the costs of the Warm Home Discount out of the energy sector and into general taxation would reduce electricity costs by c. £20 p.a. for an average use household.
- **Addressing debt related costs:** A domestic customer with average electricity consumption pays around £32 p.a. in debt related costs. Halving the cost of debt by improving the home moving process and enabling utilities to remotely move non-paying customers to smart prepayment meters, could save £16 p.a. [61]
- **Feed-in-tariff:** Moving the remaining costs of the Feed-in-tariff into general taxation in 2035 would reduce electricity bills by about £10 p.a.[62]
- **VAT:** Zero rating VAT on domestic electricity in 2035 would cut costs by a further £44 p.a.

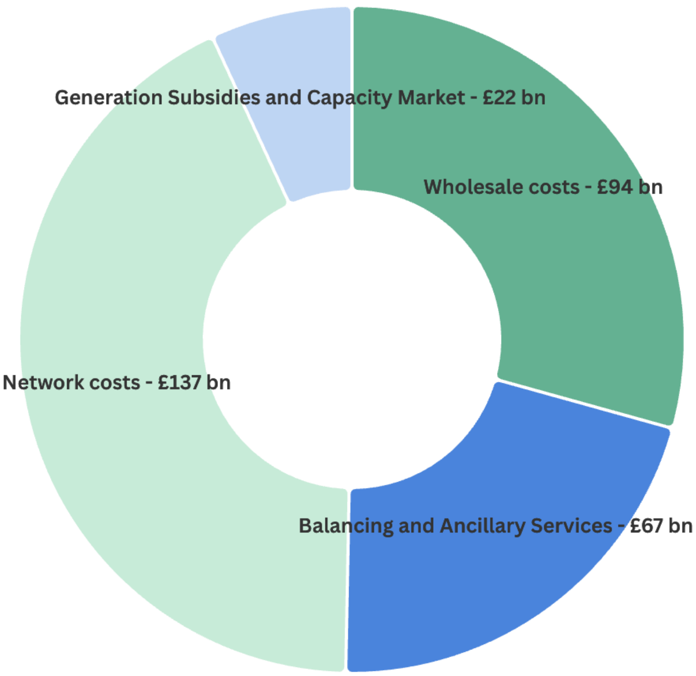
[60] Onward analysis. Real system cost saving in 2035 is relative to a 2027 base cost assumption. 2027 base cost is assumed to be the Q3 2026 Ofgem price cap assuming 3.3MWh of UK average domestic consumption, with two upward adjustments. 2027 base costs are adjusted upwards by £14 to account for increased transmission cost in 2027 vs. 2026 and by £81 to account for RO costs that are paid for out of taxation. A 20.7% system cost reduction is then applied to all bill cost components excluding supplier costs, debt related costs and supplier profit. Applying the same analysis to BAU would result in a system cost saving of around £50 by 2035.
[61] Ofgem, Ofgem Interim Chief Executive Tim Jarvis' keynote speech at Utility Week Live on 20 May 2026. Debt cost estimates derived from Ofgem price cap (Annex 9): 1 July to 30 September 2026.
[62] Onward analysis. Assumes £1.0bn scheme cost (24/25 prices) in 2035/6 based on DESNZ, Feed-In Tariffs analytical annex: Impact of indexation options (Option 1, CPI) Total scheme costs assumed to be one third recovered from domestic consumption and recovered over 29 million households.

Why are APP system costs lower?

There are four major drivers of the £320 billion cumulative saving that APP enjoys relative to BAU from 2030 to 2050. Each driver is discussed in turn.

APP saves £320bn in cumulative system costs between 2030 and 2050

Figure 17: Categorised system cost savings from 2030 to 2050 under APP vs. BAU (2025 £bn)
Source: Transira Energy. [63]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Cumulative system cost savings have been pro-rated for 7% lower cumulative electricity consumption under APP.

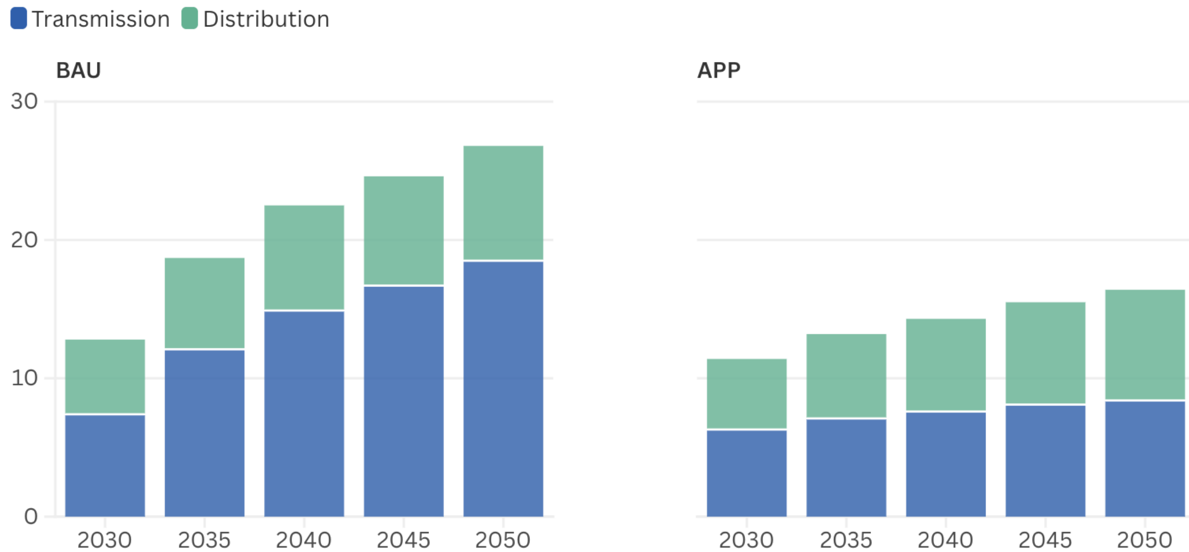
1. **Networks: £137 billion of savings (43% of the total)**

The total network savings figure is driven by lower transmission costs, making up the vast majority of cumulative network savings. There are also small savings on the lower voltage distribution network, as domestic electrification of transport and heating proceeds more slowly in APP than under BAU.

[63] [Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)] Cumulative system cost savings have been pro-rated for 7% lower cumulative electricity consumption under APP.

APP makes material savings on network spending vs. BAU

Figure 18: Annual allowed network revenues under BAU and APP (2025 £bn)
Source: Transira Energy. [64]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Annual cost differences have NOT been pro-rated for 7% lower cumulative electricity consumption under APP.

The higher costs in BAU are driven by the investment that is needed to connect geographically dispersed generation assets (e.g. wind farms). By contrast, APP benefits from a more centralised generation system that connects up firm power stations located near existing transmission infrastructure.

Put differently, APP avoids the need to connect 78 GW of generation, storage and interconnector assets relative to BAU, thanks to its higher proportion of firm generation capacity.[65]

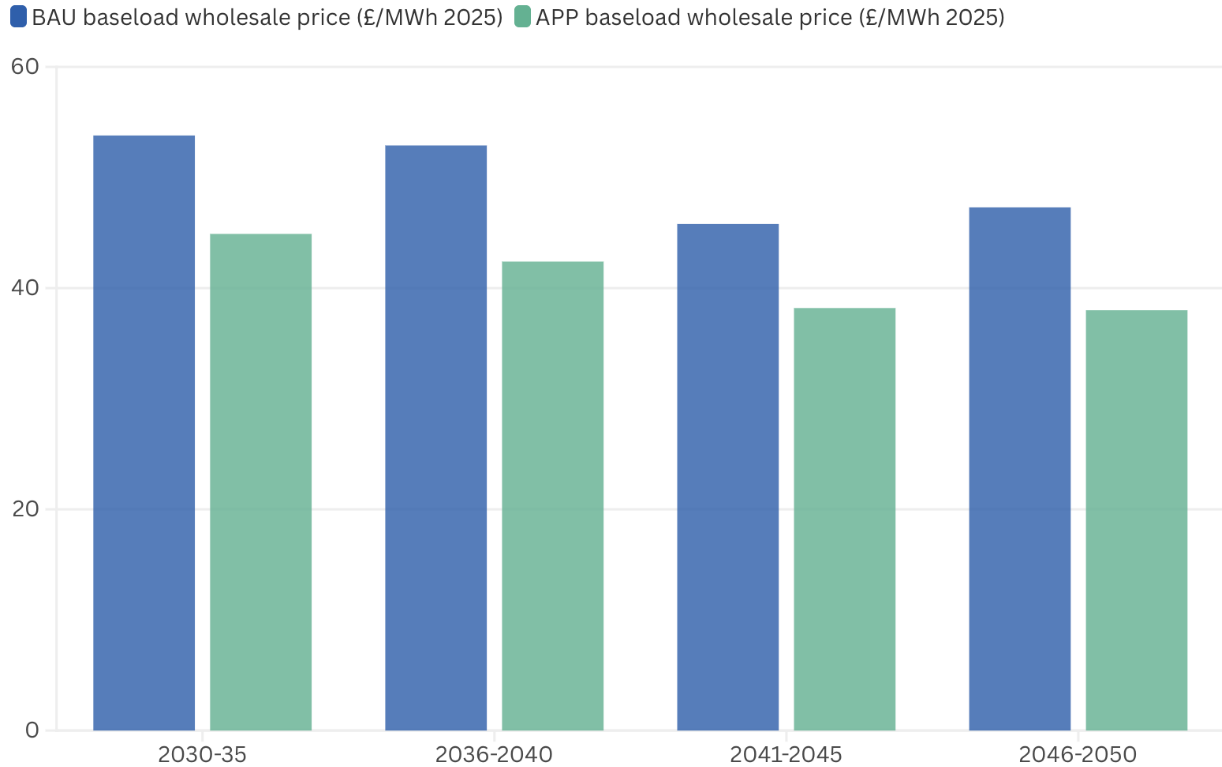
2. **Wholesale prices: £94 billion of savings (29% of the total)**

There are two major drivers of wholesale price differences between the two scenarios. BAU benefits from greater renewable capacity, which has a depressing effect on wholesale prices. However, APP benefits from taking electricity generators out of the UK ETS (a carbon pricing mechanism) from 2031, which reduces the marginal costs of gas generation. This in turn reduces the wholesale price whenever gas is the marginal price setting technology.

[64] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[65] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026). 78 GW refers to the capacity difference for generation, storage and interconnector assets between BAU and APP in 2050.

Removing carbon taxes reduces wholesale costs for APP

Figure 19: Baseload wholesale power prices under BAU and APP (£ per MWh, 2025)
Source: Transira Energy. [66]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

In the early years, the removal of electricity generators from the UK ETS outweighs the price depressing effects of greater renewable capacity, leading to lower wholesale prices under APP.

APP retains a large proportion of existing renewable capacity but extends no further policy support to new projects. This is a pragmatic stance that recognises that the capex has been sunk, and the renewable generation will displace gas costs and reduce carbon emissions.

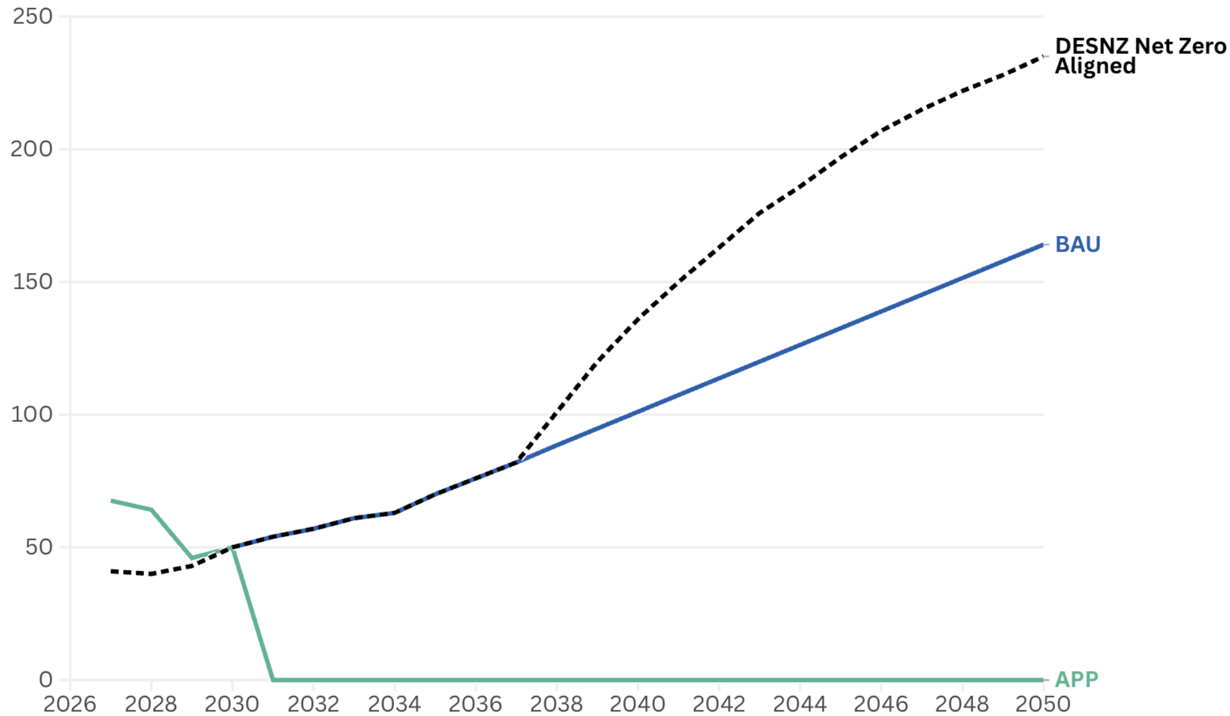
In the outer years, APP is assumed to maintain a wholesale cost advantage over BAU. APP has greater firm capacity, meaning fewer periods of very tight supply relative to demand, and also enjoys the advantage of lower marginal cost flexible generation, driven by greater unabated gas capacity rather than using hydrogen, Gas CCS or BECCs.

Real carbon prices in the BAU scenario are assumed to increase by 6.1% per annum from 2030 to 2050, reaching a level of £164/tonne by 2050. This is appreciably lower than the DESNZ net zero aligned strategy forward curve, which reaches a level of £235/tonne in 2050.[67] In APP, the cost of carbon is reduced to zero from the start of 2031, as generators no longer pay the UK ETS.

[66] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[67] DESNZ, Traded carbon values used for modelling purposes, 2025.

Carbon price assumptions for BAU and APP

Figure 20: Carbon price assumptions for BAU and APP (£ per tonne, 2025)
Source: Transira Energy. [68]



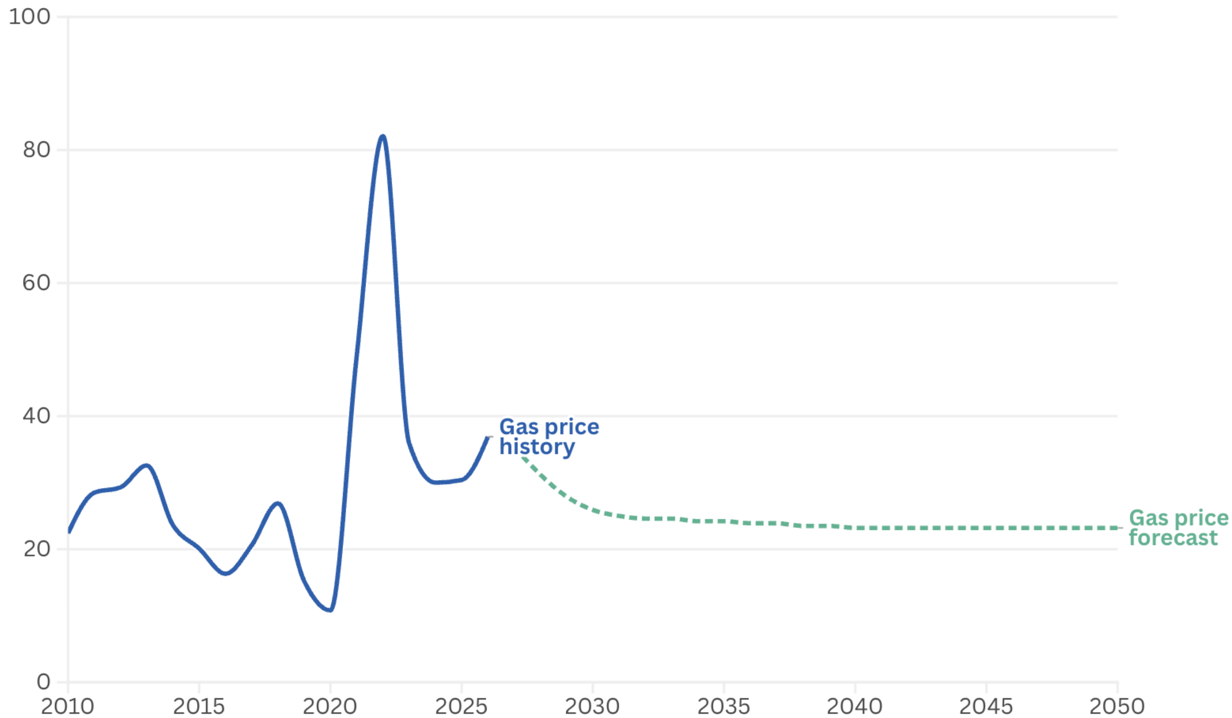
Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) and DESNZ - Traded carbon values used for modelling purposes, 2025.

Both scenarios use the same gas price assumptions, with prices starting at c. £35 per MWh (th) in 2027, falling to c. £23/MWh by 2050. The forward looking price assumptions are based on a blend of futures pricing and DESNZ forecasts out to 2030, and then uses the DESNZ central gas price scenario out to 2050.[69]

[68] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) and DESNZ - Traded carbon values used for modelling purposes, 2025.
[69] Forward looking assumptions from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) and are based on a blend of market futures (as of May 2026) and DESNZ - Fossil fuel price assumptions: 2025 (Scenario B) - adjusted to 2025 values using UK CPI (ONS)

Gas price history and forward looking assumptions

Figure 21: Gas price history and forward looking assumptions (£ per MWh thermal, 2025)
Source: Onward analysis, Transira Energy, Ofgem, DESNZ, ONS. [70]



Source: Gas price history from 2010-2025 derived from Ofgem monthly wholesale market indicators and adjusted to 2025 values using UK CPI (ONS) 2026 data covers January to July 2026 and is sourced from ONS, system average price of gas. Forward looking assumptions from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) and are based on a blend of market futures (as of May 2026) and DESNZ - Fossil fuel price assumptions: 2025 (Scenario B) - adjusted to 2025 values using UK CPI (ONS)

APP would be more exposed to a future gas price shock than BAU. However, the impact on consumer electricity prices would be significantly smaller than the events surrounding the Russian invasion of Ukraine. In 2022, virtually all of Britain's electricity generation was linked to the wholesale market. CfD generation made up just 20 TWh, or around 8% of British electricity demand.[71] Under APP, greater consumer price stability relative to 2022 comes from two sources.

Firstly, pre-existing CfDs contracts will be honoured, which will provide a meaningful price hedge out to 2040 and beyond. Secondly, all nuclear power projects from Sizewell C onwards are assumed to be built under the RAB model, where revenues are dictated by a pre-agreed return on capital,

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[70] Onward analysis. Gas price history from 2010-2025 derived from Ofgem monthly wholesale market indicators and adjusted to 2025 values using UK CPI (ONS) 2026 data covers January to July 2026 and is sourced from ONS, System Average Price (SAP) of gas. Forward looking assumptions from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) based on a blend of market futures (as of May 2026) and DESNZ - Fossil fuel price assumptions: 2025 (Scenario B), adjusted to 2025 values using UK CPI (ONS)

[71] Onward analysis. 2022 CfD generation sourced from Low Carbon Contracts Company, CfD Historical Data dashboard. British electricity demand sourced from NESO, Historic Demand Data 2022.

rather than being driven by wholesale electricity prices. Nuclear power is anticipated to deliver a third of the APP generation mix in 2050.[72]

For context, Onward estimates that a 250% increase in gas prices in 2040 (akin to 2022 prices in real terms) would increase fuel costs for APP by about £6 billion relative to BAU.[73] Policymakers would then have to decide the extent to which inframarginal returns for merchant generators are recovered by windfall taxes such as the Electricity Generator Levy.

3. **Balancing and ancillary services: £67 billion of savings (21% of the total)**

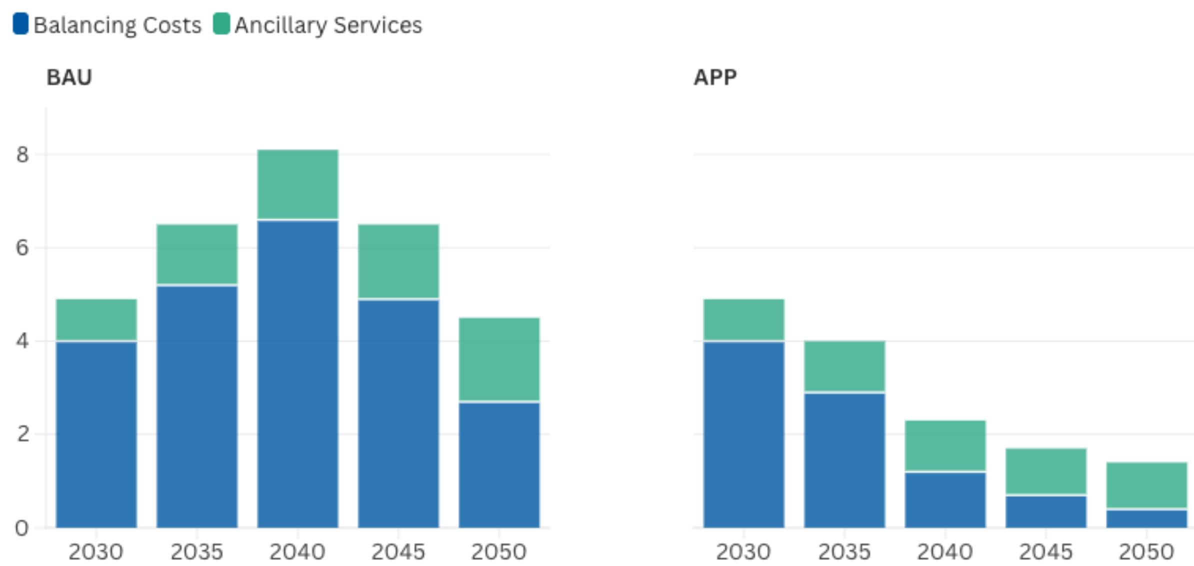
Balancing costs represent the cost of real-time actions taken by NESO to manage network congestion, demand and supply fluctuations, as well as other critical conditions such as frequency and voltage. Ancillary services are costs paid for ahead of time, for services such as frequency response, which help manage the stability of the electricity system. Of the £67 billion of total category savings, £59 billion are from lower balancing costs and £8 billion are from savings on ancillary services.[74]

In the BAU scenario, balancing costs continue to rise out to 2040, as upgrades to the transmission network are assumed to take longer than the buildout of new wind generation capacity. This is in keeping with the findings of the Winser review, which noted that strategic transmission projects can take twelve to fourteen years, between identification and final commissioning.[75] Balancing costs in both scenarios start to decline once transmission upgrades catch up with wind capacity buildout. This occurs earlier for APP, due to lower future wind capacity.

[72] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[73] Onward analysis. Calculation estimates gas consumption difference between APP and BAU in 2040 based on unabated gas and CCUS electricity generation for both scenarios in 2040. Gas price spike relative to 2040 forecast price is based on average gas price for 2022 (ONS System Average Price of Gas) adjusted to 2025 values using UK CPI (ONS).
[74] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[75] DESNZ, Accelerating electricity transmission network deployment: Electricity Networks Commissioner's recommendations, principal areas of recommendation.

APP makes material savings on balancing and ancillary services vs. BAU

Figure 22: Annual system cost expenditure on balancing & ancillary services under APP and BAU (2025 £bn)
Source: Transira Energy. [76]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Annual cost differences have NOT been pro-rated for 7% lower cumulative electricity consumption under APP.

Balancing costs under APP also benefit from the removal of the UK ETS. This is because the gas 'turn up' required to replace wind generation that is curtailed behind transmission bottlenecks, is achieved at a lower price, thanks to the removal of carbon costs. The APP generation mix is also more predictable, thanks to a greater proportion of firm generation capacity, reducing the need for last-minute balancing actions from the NESO control room.

The savings in ancillary services are much smaller, but still significant, totalling £8 billion from 2030 to 2050. BAU requires a greater level of spend to manage system voltage, inertia and frequency, due to a greater generation share from non-synchronous and intermittent renewable technologies.

By contrast, APP has a higher share of generation from gas and nuclear, both of which provide inertia to the electricity system and can be controlled. This reduces the need to procure standalone services to manage the stability of the electricity system.

4. **Generation subsidies and Capacity Market costs: £22 billion of savings (7% of the total)**

The final cost category consists of subsidies for low carbon generation, as well as Capacity Market costs that are required to keep varying amounts of gas capacity online.

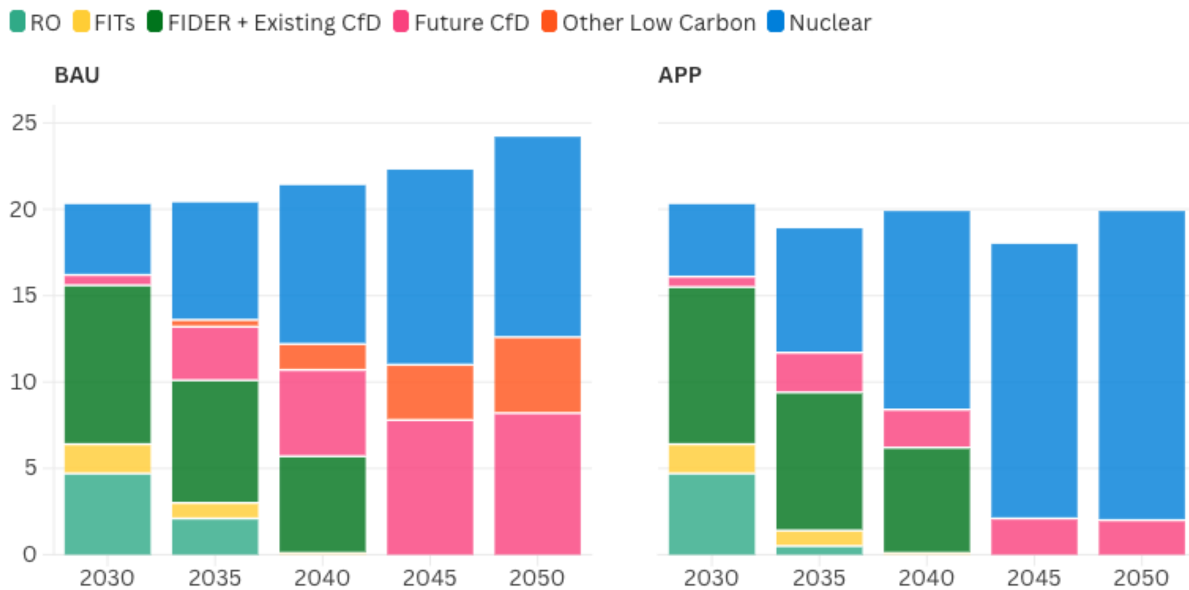
[76] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)

The first graph presents traditional subsidies, excluding the costs of the Capacity Market. APP has lower generation subsidy costs, saving £43 billion by 2050. APP benefits from the early retirement of the Renewable Obligation scheme for wind and solar projects from 2033, and from ending support for new low carbon generation (other than nuclear) from 2030. Nuclear subsidy costs are higher for APP in the later years, due to greater nuclear generation capacity.

In an ideal world, large scale nuclear projects would be built under competitive markets. But the scale of up-front investment required, operating lives of at least sixty years, and the risk from changes to political attitudes in future make this an unrealistic expectation.[77]

APP spends less on generation subsidies

Figure 23: Annual system cost spending on generation subsidies for APP & BAU (2025 £bn)
Source: Transira Energy. [78]



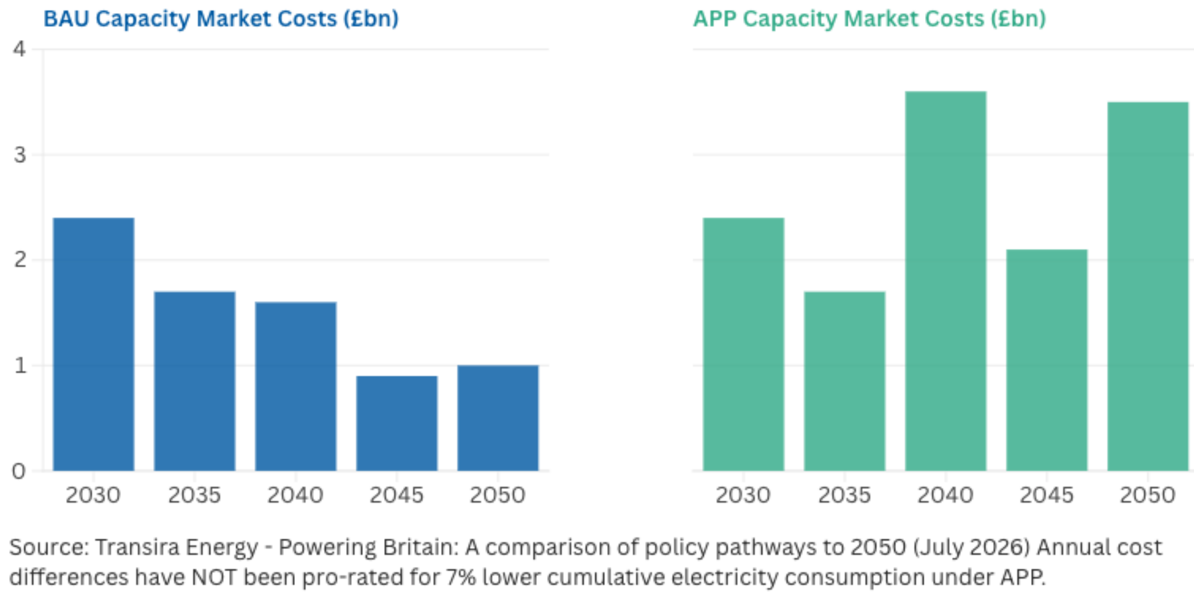
Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Annual cost differences have NOT been pro-rated for 7% lower cumulative electricity consumption under APP.

Whilst APP spends less on low carbon generation subsidies, it ends up spending more in the Capacity Market, as the pathway assumes a greater build out of new combined cycle gas power stations.

[77] Dieter Helm, Cost of Energy Review, 25th October 2017, page 47.
[78] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Annual cost differences have not been pro-rated for 7% lower cumulative electricity consumption under APP.

But APP spends more in the Capacity Market

Figure 24: Annual Capacity Market costs under APP and BAU (2025 £bn)
Source: Transira Energy. [79]



Capacity Market agreements for new build gas are assumed to extend to 20 years in APP, rather than the 15 years under BAU. This is to incentivise the construction of new gas-fired capacity and to overcome the political risk associated with future net zero targets. BAU has a greater reliance on life extensions for unabated gas, and procures more firm capacity via direct subsidies for Gas CCS, hydrogen power stations and BECCS.

The allocation of system costs

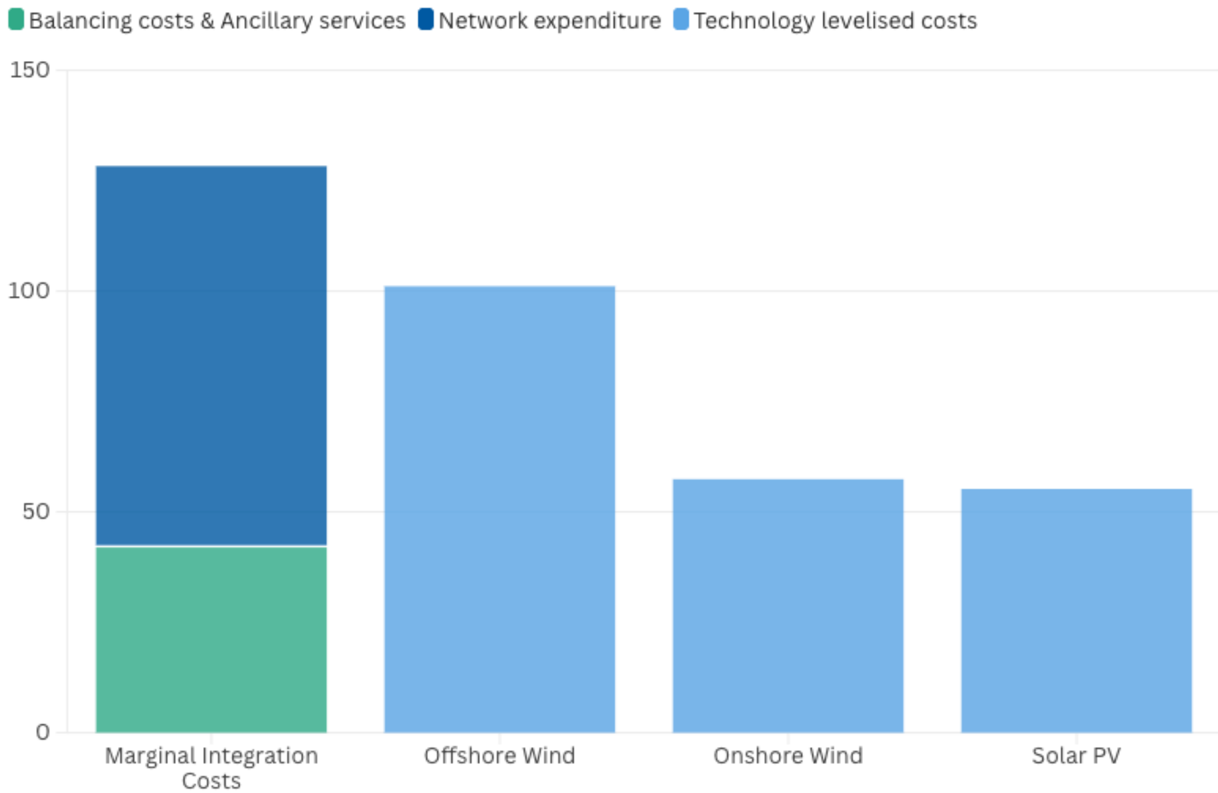
Models and forecasts of the future are not policy prescriptions, but they can provide valuable learnings. In this case, building a power system that retains a larger role for firm generation capacity (nuclear and gas) drives large cost reductions, via lower transmission build-out and lower balancing costs.

If the incremental costs of network investment, balancing and ancillary services are allocated to the increased wind and solar generation under BAU, then the marginal system integration costs of those technologies are revealed to be much higher than their individual levelised costs.

[79] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Annual cost differences have not been pro-rated for 7% lower cumulative electricity consumption under APP.

Intermittent generation is expensive to integrate into the electricity system

Figure 25: Marginal system integration costs attributed to wind and solar generation vs. levelised cost assumptions (£ per MWh 2025)
Source: Transira Energy. [80]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Marginal system integration costs calculated as the difference in cumulative network, balancing and ancillary services system costs between BAU and APP, divided by the difference in wind and solar generation between the two scenarios. System cost categories have been pro-rated for 7% lower cumulative electricity consumption under APP. Levelised cost assumptions are based on DESNZ - Electricity generation costs 2025 and refer to averages from 2030 to 2050. Offshore wind levelised costs assume an 85% / 15% mix of fixed-bottom and floating offshore wind.

These system integration costs are not being properly revealed in CfD auctions, or captured in levelised cost estimates, for three major reasons.

- **Transmission cost recovery:** The costs of paying for the onshore transmission system are largely recovered from demand customers. Wider transmission charges on generation (in aggregate) are restricted to the limiting regulation of 2.50 EUR per MWh.[81]

[80] Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) Marginal system integration costs calculated as the difference in cumulative network, balancing and ancillary services system costs between BAU and APP, divided by the difference in cumulative wind and solar generation between the two scenarios. System cost categories have been pro-rated for 7% lower cumulative electricity consumption under APP. Levelised cost assumptions are based on DESNZ - Electricity generation costs 2025 and refer to averages from 2030 to 2050. Offshore wind levelised costs assume an 85% / 15% mix of fixed-bottom and floating offshore wind.
[81] NESO, Calculation of the Generator TNUoS Adjustment Tariff for the purposes of the Limiting Regulation (May 2026)

- **Curtailment protection:** In May 2009, Ofgem introduced an interim 'connect and manage' regime, which allowed generators to connect to the network ahead of the transmission investment that would be required to accommodate the new power flows.[82] Connection gives firm access rights, which means generators are compensated for electricity flows that the grid can't handle. This policy socialised the costs of curtailment through balancing charges, rather than billing the causative generator, which would occur under a 'polluter pays' principle.
- **Balancing cost recovery:** Prior to April 2023, balancing cost recovery was split evenly between generators and consumers. Balancing costs are now recovered from the demand side only, removing any scope for generators to internalise the costs that they create.

Market design has significant potential to improve cost outcomes for consumers. If prospective generators are forced to internalise the integration costs that they impose upon the wider electricity system, then behaviour will change. New generation projects might be built in areas with lower network constraints, or built alongside battery storage to allow greater control over dispatch.

Driving further improvement for APP:

APP is not an idealised view of the world. The pathway faces significant cost headwinds from expensive nuclear capacity, with incremental large scale nuclear power stations built in the 2040's costing £122-£138/MWh in 2025 terms.[83]

For a scenario like APP to succeed to its full potential, and reduce system costs by more than the assumed 31% between 2027 and 2050, nuclear construction costs must fall. The recommendations of the Fingleton Review must be implemented in full, and the incentives to deliver new projects on time and budget must be improved.

In 1995, Sizewell B (the UK's first and only operating pressurised water reactor) was completed on time and on budget.[84] Brian George, the project manager at Sizewell B, delivered an incredible piece of infrastructure that will supply clean electricity for at least sixty years.[85] This excellence in nuclear construction must be rediscovered.

Reducing the cost of nuclear delivery is not just critical to economic growth. If costs can be cut faster, then heat pumps and electric vehicles will become a much more attractive proposition for consumers, helping decarbonise more of the economy, without the political friction of today. Furthermore, speeding up the rate of nuclear delivery would displace gas generation faster than assumed under APP, driving down the remaining emissions in the electricity sector.

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[82] Ofgem, Derogations to facilitate earlier connection of generation – decision on interim approach (8th May 2009)
[83] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[84] The Royal Academy of Engineering, Nuclear Lessons Learned (October 2010), page 13.
[85] DESNZ, Press release, Sizewell B power plant given lifetime extension to 2055 (8th July 2026)

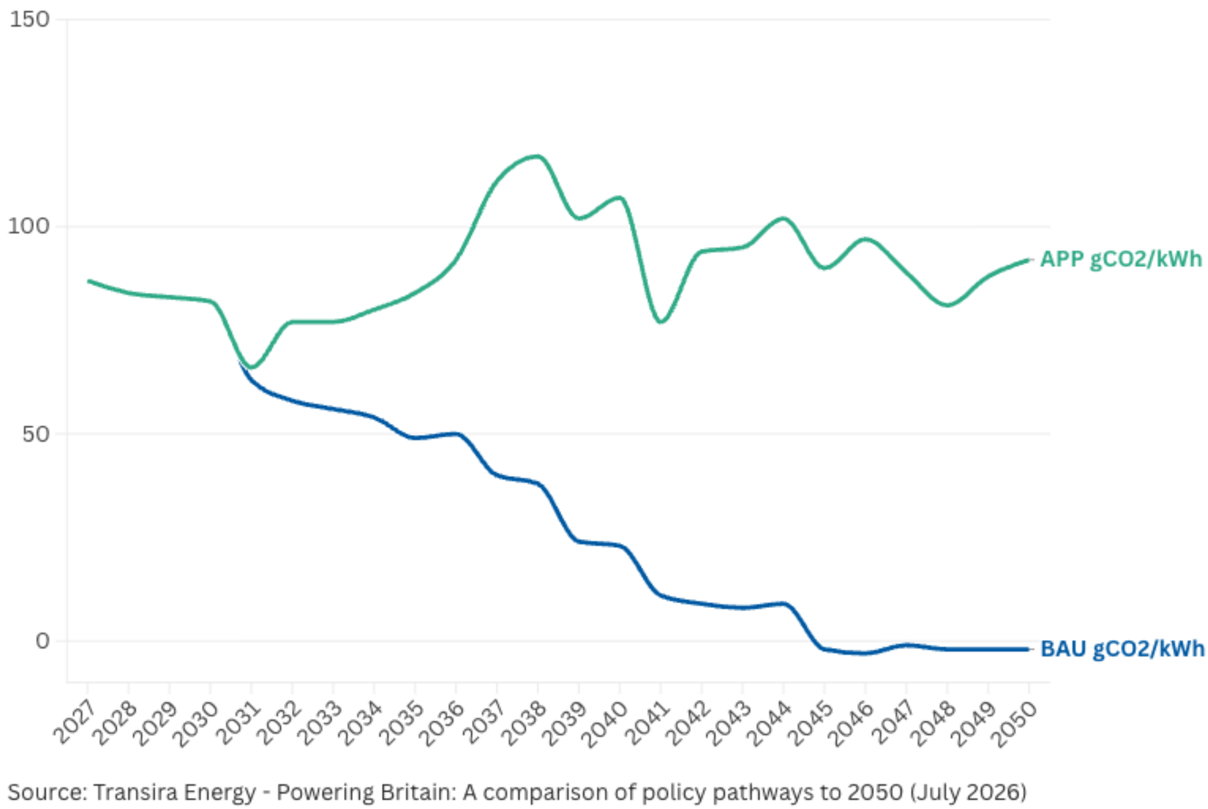
Carbon emissions: APP vs. BAU

The APP scenario has a higher emissions intensity than BAU. Under APP, unabated gas retains a 23% role in the generation mix of 2050, versus under 3% for BAU. APP also precludes any investment in BECCS, foregoing the ‘benefits’ of negative emissions accounting.

APP is not a highly carbon intensive electricity system. Emissions intensity increases only very marginally vs the 2027 start point, and remains below 100g/CO2/kWh in 2050.[86]

Power sector carbon intensity (2027-2050)

Figure 26: Power sector carbon intensity under BAU and APP (g of CO2 per kWh)
Source: Transira Energy. [87]



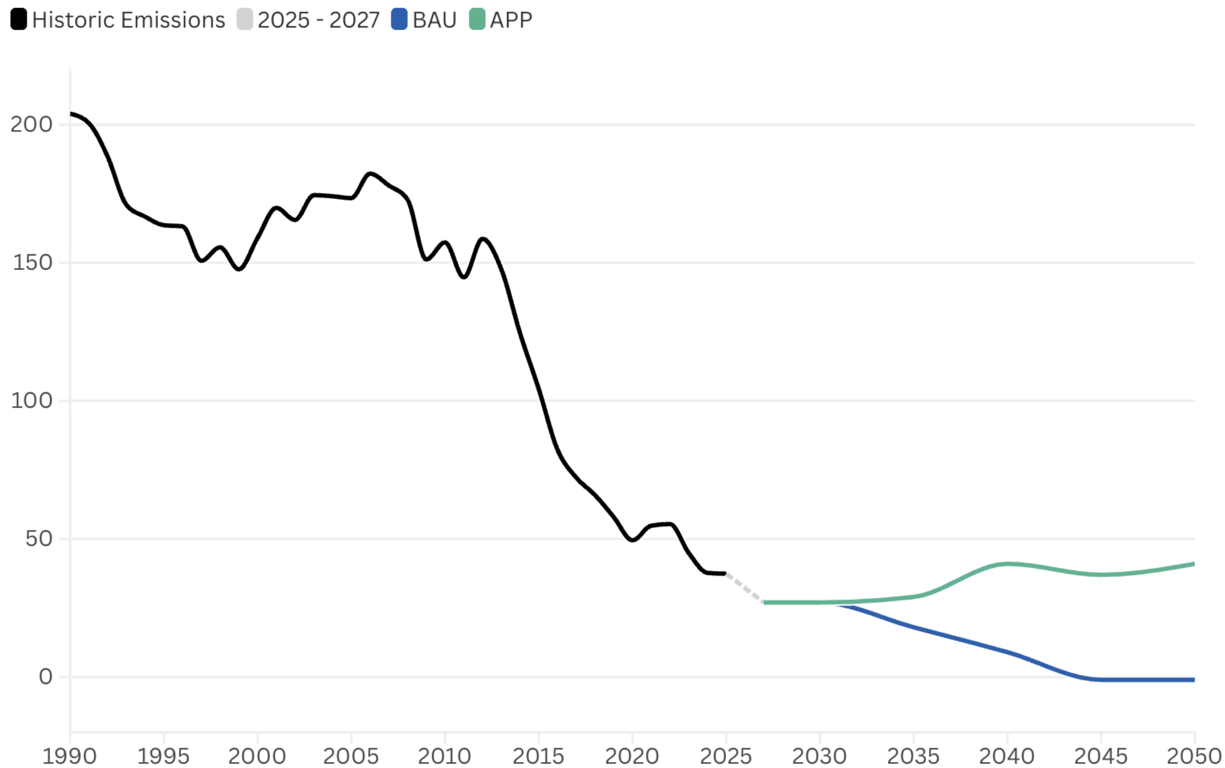
On a cumulative basis, APP generates 524 million tonnes of increased emissions relative to BAU, but saves £320 billion between 2030 and 2050. Put differently, driving the last 23% of unabated gas off the system comes at a cost of over £600 per tonne of CO2. This is more than twice the highest value that DESNZ models for carbon prices by 2050.[88]

[86] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[87] Transira Energy, Powering Britain: A comparison of policy pathways to 2050 (July 2026)
[88] DESNZ, Traded carbon values used for modelling purposes, 2025.

Even though emissions from the power sector rise in aggregate, driven mainly by growth in electricity consumption, APP is building a robust and affordable electricity system that will allow emissions reductions in other areas of the economy.

Power sector emissions remain low under both scenarios

Figure 27: Historic and forecast emissions from the electricity sector (Mt CO2e)
Source: Onward analysis. DESNZ and Transira Energy. [89]



Source: Onward analysis. Historic data (1990-2025) from DESNZ - Provisional UK greenhouse gas emissions statistics 2025 - data tables - Table 1a. Forecast emissions under BAU and APP from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) 2025 to 2027 data based on linear extrapolation.

Mandating net zero territorial emissions by 2050, via the Climate Change Act 2008 (2050 Target Amendment) Order 2019, was not a measured policy decision. It was rushed through at the end of Theresa May's premiership after ninety minutes of debate in the House of Commons.[90] No government impact assessment was laid before Parliament.[91]

The level of parliamentary scrutiny applied was not in keeping with legislation that would not only constrain the UK's economy, but mark a radical curtailment in the free choices of its citizens.

[89] Onward analysis. Historic data (1990-2025) from DESNZ, Provisional UK greenhouse gas emissions statistics 2025 - data tables - Table 1a. Forecast emissions under BAU and APP from Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026) 2025 to 2027 data based on linear extrapolation from Onward.
[90] Hansard, Climate Change, Volume 662 debated on Monday 24 June 2019.
[91] The Climate Change Act 2008 (2050 Target Amendment) Order 2019 - Explanatory Note

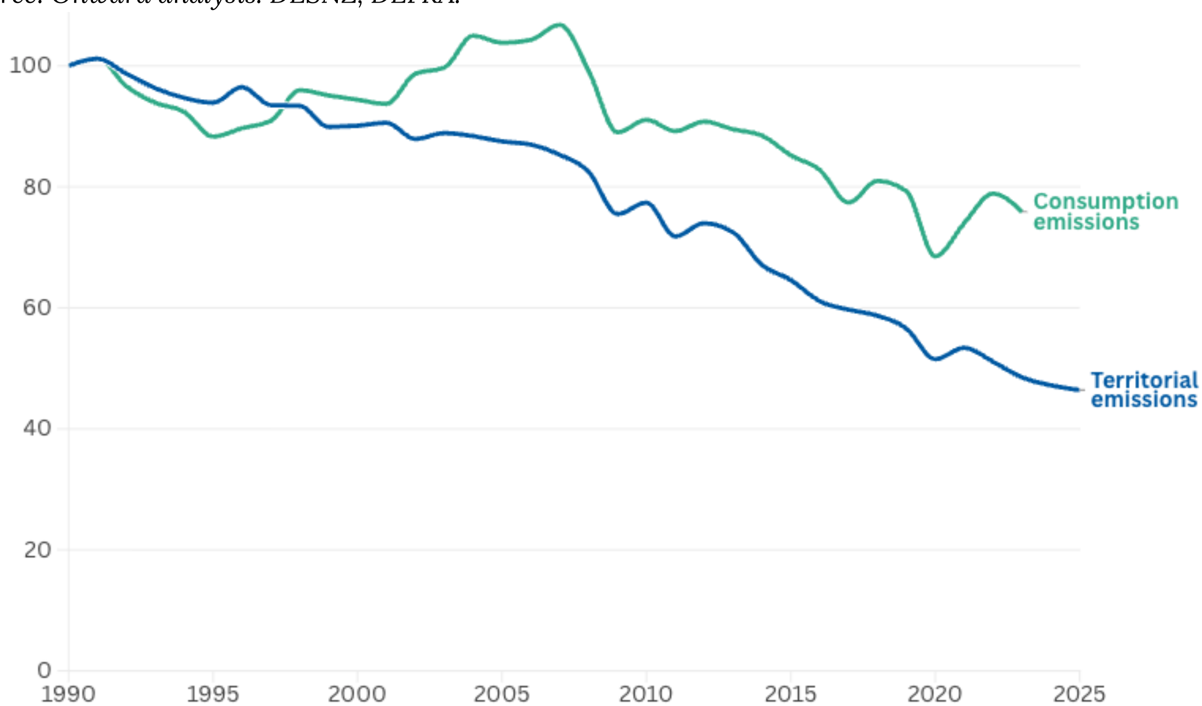
Efforts to meet the target have involved effectively dictating how people should travel, warm their homes and what foods they should eat.[92]

The metrics against which the UK has measured climate progress are also flawed, as the Climate Change Act 2008 uses territorial accounting, covering emissions that occur within the UK's borders.[93] Consumption emissions (sometimes referred to as a 'carbon footprint') covers the emissions associated with the consumption of goods and services in the UK.

2023 is the most recent year for which we have data covering both territorial and consumption measures. From 1990 to 2023, territorial emissions are estimated to have declined by 51%. On a consumption basis, the decline was a more limited 24%.

UK consumption emissions have fallen more slowly than territorial emissions

Figure 28: UK consumption and territorial emissions since 1990 (Indexed to 1990 = 100)
Source: Onward analysis. DESNZ, DEFRA. [94]



Source: Onward analysis. Territorial emissions sourced from DESNZ - Provisional UK greenhouse gas emissions statistics 2025 - data tables - Table 1a. Consumption emissions sourced from the Department for Environment, Food & Rural Affairs (DEFRA), Carbon footprint for the UK dataset, 1990 to 2023. Both datasets are indexed so that 1990 levels equate to 100.

[92] The Climate Change Committee, The Seventh Carbon Budget, Advice for the UK Government (February 2025). Page 300 assumes that 25% of meat and 20% of dairy is replaced by lower carbon foods by 2040. It is stated that "This reduction in meat and dairy goes beyond the existing long-term consumption trend"

[93] Section 29 of the Climate Change Act 2008 defines UK emissions on a territorial basis - as emissions of a greenhouse gas "from sources in the United Kingdom"

[94] Onward analysis. Territorial emissions sourced from DESNZ, Provisional UK greenhouse gas emissions statistics 2025 - data tables - Table 1a. Consumption emissions sourced from the Department for Environment, Food & Rural Affairs (DEFRA), Carbon footprint for the UK dataset, 1990 to 2023. Both datasets are indexed so that 1990 levels equate to 100.

The promise of electrification, via carrots, not sticks

There are major aspects of the decarbonisation agenda, which can make sense for the UK economy, its citizens and the global climate. Electrification sits at the top of this list. APP is designed to provide a stable, affordable and relatively clean power sector that enables long term electrification of heating and transport.

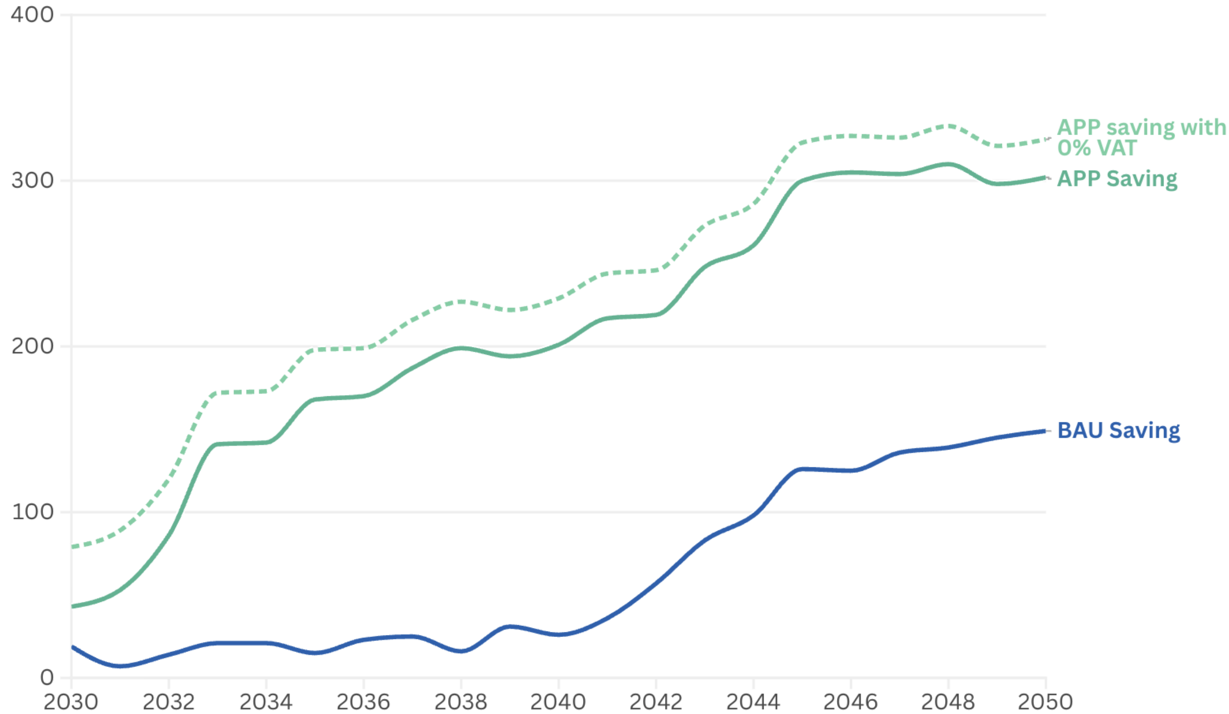
A heat pump, if powered by the APP grid of 2050, would reduce carbon emissions by about 85% relative to a gas boiler.[95] An electric vehicle would have around 88% lower emissions per incremental mile driven.[96] These dramatic improvements are driven by a combination of the high energy efficiency of many electrified technologies, and a largely clean power sector.

Reducing the cost of electricity relative to gas or petrol will make these technologies more attractive. By way of example, Onward have modelled the annual running cost savings a household could expect from switching from a gas boiler to a heat pump under BAU and APP.

[95] Onward analysis. Assumes average electricity system carbon intensity of 92g CO2/kWh in 2050 (Transira Energy - Powering Britain: A comparison of policy pathways to 2050) and Onward technology assumptions of 8% losses in transmission and distribution, heat pump seasonal performance of 3.0 vs. gas boiler efficiency of 85%.
[96] Onward analysis. Assumes average electricity system carbon intensity of 92g CO2/kWh in 2050 (Transira Energy - Powering Britain: A comparison of policy pathways to 2050) Onward technology assumptions of 8% losses in transmission and distribution, 40 miles per gallon for a petrol vehicle using normal biofuel blend (2.069 kg of CO2e/litre - DESNZ, Greenhouse gas reporting: conversion factors 2025) and EV efficiency of 3.5 miles per kWh.

Heat pumps save households more money under APP

Figure 29: Estimated annual savings from heat pump adoption under BAU and APP (£ p.a.)
Source: Onward analysis. Ofgem, NESO, Transira Energy. [97]



Source: Onward modelling. 2027 base system costs are established for electricity and gas based on the Q3 2026 Ofgem price cap. Electricity 2027 base system costs reflect the price cap, with £14 of transmission cost increases and the full cost of the Renewable Obligation added back. Gas bills are modelled to decline by applying the Transira modelled gas price curve to the direct fuel cost proportion of the Ofgem price cap. Electricity bill forecasts apply the Transira system cost index for BAU and APP to 2027 base system costs, with no impact assumed on supplier costs, supplier profit or debt related costs. Heat pump savings assume 85% gas boiler efficiency, and heat pump seasonal performance factor of 3.0 in 2027, rising to 3.5 by 2050. Electricity standing charge is assumed at 75p/day in real terms and savings assume disconnection from the gas system. Charging VAT at 0% for domestic electricity is not a policy assumption and is shown for illustration purposes only.

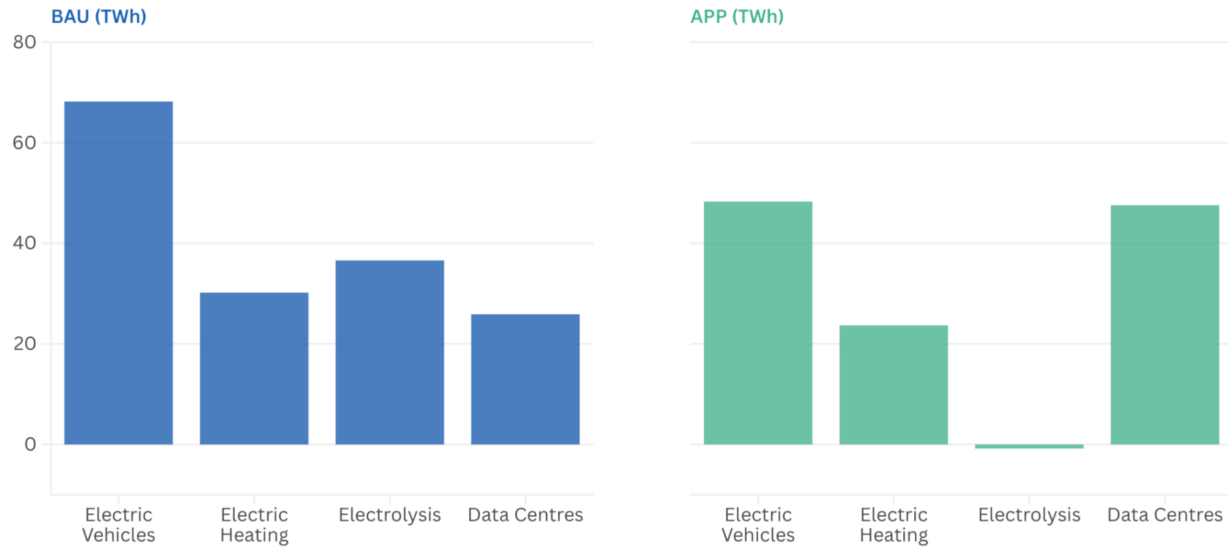
Whilst BAU assumes faster growth in the adoption of electric vehicles and heating, this is driven by large subsidies and state mandates, not free choice. APP prioritises cheap electricity, consumer choice and long term political consent.

[97] Onward modelling. 2027 base system costs are established for electricity and gas based on the Q3 2026 Ofgem price cap. Electricity 2027 base system costs reflect the price cap, with £14 of transmission cost increases and the full cost of the Renewable Obligation added back. Gas bills are modelled to decline by applying the Transira modelled gas price curve (Transira Energy - Powering Britain: A comparison of policy pathways to 2050) to the direct fuel cost proportion of the Ofgem price cap. Electricity bill forecasts apply the Transira system cost index for BAU and APP to 2027 base system costs, with no impact assumed on supplier costs, supplier profit or debt related costs. Heat pump savings assume 85% gas boiler efficiency, heat pump seasonal performance factor of 3.0 in 2027, rising to 3.5 by 2050. Electricity standing charge is assumed at 75p/day in real terms and savings assume disconnection from the gas system. Charging VAT at 0% for domestic electricity is not a policy assumption and is shown for illustration purposes only.

Demand for electrolysis (hydrogen production) under APP is assumed to fall to zero, due to the removal of subsidies. Demand from data centres rises materially, attracted by the UK's more competitive electricity prices and greater availability.

Growth in electricity use under APP is driven by affordable prices, not mandates

Figure 30: Forecast increase in electricity use between 2027 and 2050 (TWh)
Source: Transira Energy. [98]



Source: Transira Energy - Powering Britain: A comparison of policy pathways to 2050 (July 2026)

The forecast electrification of transport and heating are still very substantial under APP. Onward estimate that the 48.3 TWh of EV demand growth by 2050 is the equivalent to electrifying nearly 23 million cars, or over 60% of the UK's existing car fleet.[99] 23.7 TWh of demand growth for electrified heating would be equivalent to displacing 6.7m gas boilers, or nearly 30% of the UK's existing domestic gas heating.[100]

Those two initiatives alone would reduce territorial carbon emissions by nearly 51 million tonnes, or c. 14% of 2025 levels.[101] Further improvements would also be captured via lower emissions in the fuel supply chain.

[98] Transira Energy - Powering Britain: A comparison of policy pathways to 2050
[99] Onward analysis. Onward assumes 8% power losses in transmission and distribution, 3.5 miles per kWh for an EV and 6900 average annual mileage per ICE car, assuming 35:65 diesel to petrol ICE fleet mix. (2024 National Travel Survey, Department for Transport statistics, table NTS0901a) Existing base assumed to be 36.7m registered UK cars (SMMT data)
[100] Onward analysis. Assumes 9.8 MWh of thermal heating demand per household, derived from 85% efficient gas boiler and 11.5 MWh of gas consumption (Ofgem typical consumption values prior to July 2026). Heat pump seasonal performance factor of 3.0 and 8% power losses in transmission and distribution and 23 million gas boilers in the UK (Uswitch, UK boiler statistics 2023)
[101] Onward analysis. Assumes 2.069 kg of CO2e per litre of petrol and 0.18296 kg of CO2e per kWh of natural gas (DESNZ, Greenhouse gas reporting: conversion factors 2025) 2025 territorial greenhouse gas emissions of 366.6 million tonnes of CO2e (DESNZ, 2025 UK greenhouse gas emissions: provisional figures - data tables, Table 1a)

Building electrification from a firm foundation

The APP scenario quantifies the scale of savings that could be made if electrification is built from firm foundations. A robust electricity system will give British businesses and the British public confidence that electricity will be available when they need it, with a long term commitment to affordable prices. It is up to the manufacturers and retailers in the heating and transportation industries to take advantage of this foundation.

Technology providers will compete to provide products that consumers want. Perhaps cars with greater range and faster charging, or new electric heating systems with lower installation costs and embedded cooling. Innovators and entrepreneurs must rise to the challenge and create products and services that are better than the fossil fuel incumbents.

If future governments want to accelerate the adoption of electrification technologies, and move faster on climate targets, they can reintroduce subsidy support further down the line, perhaps according to a standardised carbon value across technologies. The sums required to encourage adoption will be much lower if power is affordable and technology providers have made their products more attractive to consumers, via real competition.

Electrification has much wider potential than just helping decarbonise cars, vans and space heating. With the right innovation, heavy goods vehicles and medium temperature industrial processes will have the potential to electrify too, driving further emission reductions. If the UK can make its electricity affordable and available, those innovations can be pioneered in Britain, and exported to the rest of the world.

Conclusion

The Government's approach to the electricity sector is incoherent. It is rushing to decarbonise the power sector with intermittent renewables, whilst ignoring many of the extra system costs that this entails, particularly the costs of building extra transmission and balancing the grid.

This approach is driving up electricity prices. The government is simultaneously pushing consumers and businesses to adopt electrification technologies, whilst making the electrical input more expensive.

Instead of addressing a major cause of expensive electricity (rising system costs) the Government is engaging in shell games - subsidising selected groups of businesses and consumers, and moving electricity costs into general taxation. In a fiscally constrained environment, this is fraught with risk. Consumers will not welcome a cocktail of high prices, state electrification mandates and rising taxation.

The UK must change course

The APP scenario from Transira's report has a balanced mix of generation of nuclear, wind, solar and gas. It can reduce the cost of Britain's electricity system by over 20% by 3035 and by over 30% by 2050.

It assumes nuclear capacity is rebuilt under the RAB model and is run as a baseload power source. The rest of the electricity generation sector is left to fight it out in the market. Renewables will be awarded no more CfDs, and will have to compete directly with gas power stations, newly unencumbered by carbon taxes.

If the UK can drive down electricity costs over the course of a parliament, and signal long term intent to continue doing so, two important flywheels can start to kick in.

Firstly, electricity consumption will return to robust growth - from domestic consumers, the existing commercial base and new inbound investment. This will unleash a positive flywheel, where the UK starts improving the utilisation of its electricity system, and drives down average costs. In the long run, the economics of the cheap power system win out, and take market share from oil and gas.

Secondly, the UK becomes a more credible international investment proposition. Inflation falls, growth picks up and investors become more confident that the UK is an attractive long term bet. In turn, this reduces the cost of financing future generation assets, whether renewables, nuclear or gas. This in turn drives down the cost, and drives up the availability of the electricity system, powering the British economy through the 21st century.

Future research

The Alternative Policy Pathway is not a blueprint or mandate for the UK's future generation mix. Using it as such would simply replace one form of central planning with another. However, the research exercise has highlighted three policy areas that will guide Onward's future analysis.

1. **Electricity market reform:** Intermittent renewables impose significant system costs that aren't internalised by the causative generators. Transmission charging reform, via removing the Limiting Regulation, would expose generators to their true grid build-out costs. Nodal pricing or changes to the Balancing Mechanism could similarly expose generators to the balancing costs that they create. It is vital that these costs are internalised and the system costs of different generation technologies are revealed up front, rather than being hidden in consumer levies.

2. **Reducing infrastructure costs**: The UK is set to spend extortionate sums of money on the build out of the transmission system. As well as casting a critical eye on the planned levels of transmission investment, there are major opportunities to achieve greater value for money. This could be achieved by improving the incentives on cost effective infrastructure delivery, or incentivising network companies to use new technologies (such as batteries and dynamic line rating) to improve the utilisation of their assets. Equally, the build costs and timelines for new nuclear projects are too high in the UK. Britain must rediscover the ability to build nuclear power on time and budget, if it is serious about delivering affordable power and deep decarbonisation of its energy system.

3. **Encouraging electrification:** Cheaper electricity will be a formidable driver of electrification and decarbonisation, but there are ways to encourage adoption without relying on large subsidies and mandates. As an example, UK demand for one type of heat pump (portable air conditioning) overwhelmed supply this summer.[102] A cost effective policy to decarbonise heating should tap into this existing demand, and encourage the installation of air-to-air heat pumps that can provide both summer cooling and winter heating.

[102] The Times, Rush to buy portable air conditioner units in heatwave empties shelves (10th July 2026)

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