

The Report

Energy Security in the Balance Net zero and reliable supply

Power by numbers

What the data says about our energy mix

Carbon capture and storage

The sector's next innovation milestone

The government & industry views

Michael Shanks & Emma Pinchbeck

Sponsored by

VPI

Infographic

Power by numbers: the data behind the UK's energy mix



Number of direct and indirect jobs to be created through clean energy commitments by 2030, according to Labour's clean energy mission document:

500,000

Year by which the government aspires to achieve its target, and clean power mission, of a net zero electricity grid:

2030

Amount of CO₂ stored by carbon capture and storage projects in the UK per annum by 2030:

20-30 million tonnes

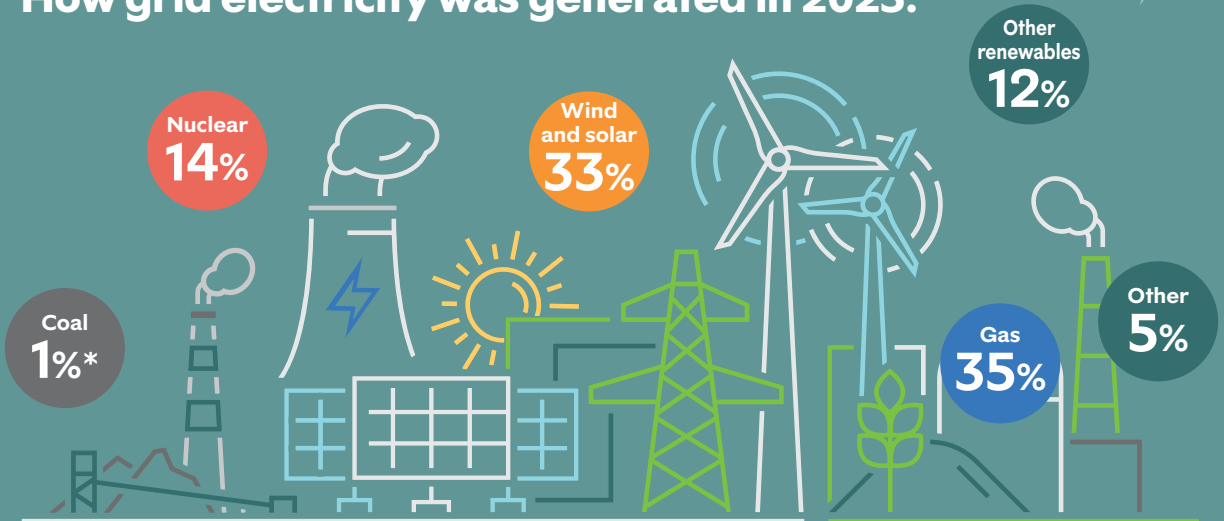
Number of people employed directly or indirectly in the energy sector in the UK:

743,000

Last year-on-year increase in the number of worldwide carbon capture and storage facilities in the development pipeline:

102%

How grid electricity was generated in 2023:



* In 1990, less than 10 per cent of the UK's energy came from renewables. Over three quarters came from oil and gas. Around 45 per cent comes from renewables today, and coal, the dirtiest fuel, has been almost totally phased out.

Sources: "UK Energy in Brief 2024", the Department for Energy Security and Net Zero; "Overall Energy Consumption in the UK since 1970", the Department of Energy and Climate Change; Energy UK; "Global Status of CCS 2023", "Scaling Up through 2030", Global CCS Institute; "Make Britain a Clean Energy Superpower", the Labour Party, 2024

Introduction



Jorge Pikunic
Chief executive at VPI

“There’s no silver bullet for energy security as we move to net zero”

Nearly a year since Cop29, which set the global agenda to triple the level of renewables, we have seen a continued growth of renewables coming onto the electricity grid in the UK. The new government has put clean energy at the centre of its manifesto. Public policy agendas are moving quickly around renewable generation and grid upgrades, with the government establishing new bodies such as Great British Energy to drive the agenda forward.

With more renewables comes the challenges of intermittency and short-term energy gaps when the weather doesn’t provide the power we need. At the same time, meeting increased demand will become increasingly challenging as sectors such as transport electrify, data centres and AI increase power demand, and as many of our existing power assets reach end of life.

A key question – which we sometimes forget to talk about – is how do we ensure that we have the power we need as we make the net zero transition?

MARTA SIGNORI

The operability of the grid is critical. Second by second, we need to deliver a system that is instantly available when renewables are not there, but one that allows them to come back on when they return.

Today batteries and demand-side response play an important role but are mostly short term (hours or minutes). For longer periods – those days or weeks of unfavourable weather that in Germany are referred to as *Dunkelflaute* – we also need to ensure the system remains resilient.

In the future, more low-carbon options, such as hydrogen, small modular reactors, and long-duration storage technologies, could become available to meet these challenges. But today they are not yet technically or economically ready to be rolled out at scale. That’s why a third of the UK’s power generation remains gas-fired.

But the energy transition should not wait for new technologies to become technically and economically viable. If we have opportunities to decarbonise gas-fired power generation and extend the life of existing assets cost effectively while kickstarting the abatement of industry and generating growth, why wouldn’t we?

That’s why we have been pioneering one of the leading carbon capture and storage (CCS) power projects in the world at our largest site, based in the Humber region. As a carbon capture retrofit, this project is significantly cheaper than building a new gas-fired generation plant from scratch with carbon capture.

It also provides a huge growth opportunity for the UK, with the potential to unlock investment and drive economic growth. Our project is part of the Viking CCS carbon cluster, which economic analysis has shown could unlock up to £7bn of investment across the value chain from 2025 to 2035, and provide an estimated £4bn of gross value added to the Humber region. Our project would generate 1,500 jobs during the construction phase alone with some high-value permanent jobs created when operational. Most importantly, it is technically advanced, which means it could be up and running within this parliament.

There is no silver bullet to solve the challenges that emerge every day in energy security as we transition to net zero. But the good news is that new solutions are also emerging every day, and what’s available today might look different in the future. The key is to seize the opportunities that are presented to us, so we continue to make headway. ●

The next milestone

Carbon capture and storage will facilitate a net zero economy

The Humber region is home to one of the most important industrial clusters in the UK. Steel, chemicals, manufacturing, refining, shipping and, crucially, energy generation, all provide thousands of high-productivity, high-skilled, high-wage jobs.

The Humber estuary, dividing the East Riding of Yorkshire and North Lincolnshire in the north of England, has a long industrial heritage that continues today, contributing £18bn to the UK economy every year. It acts as a gateway to Europe and overseas

trade with the continent. But while it is essential, it is also a carbon-intensive economy. Its emissions are larger than any other UK region – totalling a full 50 per cent more than the second-largest-emitting region.

But if the emissions of one of Britain's most active and strategically essential industrial regions presents itself as a challenge – particularly if we are to meet the climate targets we have committed to under the Paris Agreement – then there is also an opportunity. That's because a solution that facilitates the transition to a new era of lower

emissions in the Humber region could catalyse a wave of investment, preserving and creating jobs, and helping to make the UK a world leader in the innovations and technology that drive a lower-carbon economy.

Carbon capture and storage (CCS) will not only be central to that local, lower-carbon mission at one of the arteries of Britain's industrial north, but it is also central to the broader mission of reaching net zero by 2050. Viking CCS, a proposed carbon capture and storage network in Immingham, which is centred around a depleted gas field in the North Sea known as Viking, has been awarded Track 2 status by the government. That means it is being supported for deployment by 2030 as one of four carbon stores, the others in Scotland and the north of England.

The Viking CCS network aims to transport and store ten metric tonnes of carbon a year by 2030, equivalent to all the emissions of the industrial Humber combined. VPI's combined heat and power plant in Immingham is the largest of its kind in Europe, providing critical power and steam to nearby industry as well as enough electricity to the grid to power one million homes. It has been selected by Harbour Energy, the operator of Viking CCS, as one of the first proposed anchor emitter projects for the network and is awaiting the green light from government. Carbon dioxide from two of the plant's gas turbine exhausts and the two auxiliary boiler exhausts will be captured then compressed and conditioned for transport in the Viking CCS pipeline and injected into the depleted Viking gas field.

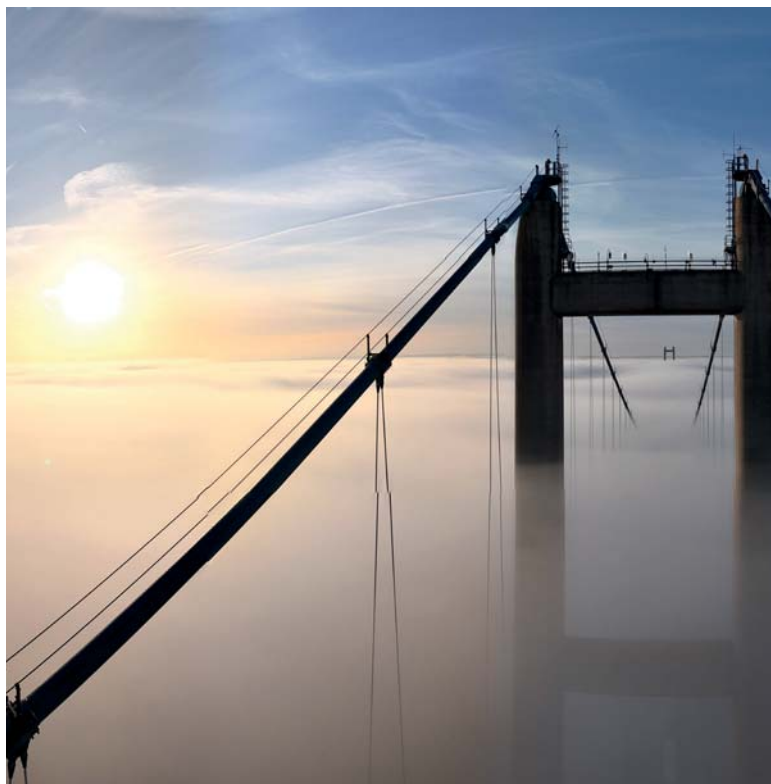
A few elements set VPI apart. Firstly, cost. As a carbon capture retrofit – which means retrofitting carbon capture technology to an existing power plant, VPI is significantly cheaper than building a power plant from scratch with carbon capture. According to some studies, this could lead to 40 per cent savings, and in other estimates even higher.

Secondly, readiness. The front-

end engineering and design has been completed and the project is ready to go. This means it could capture up to 3.3 million tonnes of carbon dioxide per year by 2029 – which would be within this parliament if emitters are selected for Track 2 soon. Thirdly, materiality. When combined with the emissions captured by the neighbouring Phillips 66 Limited's Humber Refinery, the second proposed emitter for Viking CCS, total carbon captured would increase to up to 3.8 million tonnes per annum. This would make up nearly 40 per cent of the Viking CCS 2030 carbon capture target, bringing the scale to make the network feasible and kickstart the abatement of the industrial cluster's carbon emissions. It would also significantly contribute to the targets set by the previous government which remain unchanged – delivering nearly 20 per cent of the 20 million tonnes per annum of carbon dioxide to be captured by 2030.

Lastly, proximity. The Viking CCS network is already largely built, as the gas pipeline under the sea exists from the depleted gas store. A relatively small pipeline – 55km – onshore needs to be built to complete the network. VPI's combined heat and power plant and Phillips 66 Limited's Humber Refinery are on the doorstep of this pipeline. CCS has complex ecosystems – from emitters to transport and storage operators to government – but compared to other projects, Viking CCS is relatively simple.

The multiplier effect of getting Viking CCS off the ground is significant. Viking CCS could help create around 10,000 extra jobs and draw in up to £7bn of investment over the next ten years. Most importantly, around 20,000 high-value industrial jobs would be safeguarded through the provision of lower carbon and secure energy. VPI's project would create 1,500 jobs in construction alone, with hundreds more from other services such as consulting and project management, and some high-value



The Humber is home to one of the UK's most crucial industrial clusters

permanent jobs would be created once operational.

CCS is key to maintaining the industrial economy and propelling it into a low-carbon future. It could take years for green hydrogen, small modular reactors, and advances in energy storage to come online or become viable. CCS, however, is waiting to go, now.

The UK will still be reliant on gas for many years: even as new connections for solar and wind projects proliferate over the coming years, the grid will still need gas as a stop-gap to solve issues with intermittency and provide reliable, secure energy for our advanced, industrial economy. This is especially true as energy demand and pressures on the system grow fast, not least because of the electrification of domestic heating and private vehicles. Decarbonising gas-fired generation and setting up the infrastructure to kickstart the abatement of industrial carbon emissions at the same time is a no-brainer.

VPI has invested £400m over the last five years into providing

secure, flexible, dispatchable power. The company plans to spend more than treble this to make its carbon capture project a reality – but it needs swift decision-making, with the details of the revenue-model frameworks in place. Over time CCS will benefit from economies of scale as its adoption becomes more widespread and as the carbon price increases. But today government clarity and support are needed to launch this first-of-a-kind industry, in which the UK has a real opportunity to become a globally recognised model of best practice.

The UK has already made enormous strides in reducing its fossil-fuel dependency by spearheading the adoption of offshore wind in recent years, providing a range of market actors with dependable and stable financial incentives through the world-leading contracts-for-difference auctions. The same success story is within our grasp if we seize the moment on CCS, helping us play a critical role in getting to net zero in time. ●

View from industry



Emma Pinchbeck
Chief executive at Energy UK

“The transition needs careful management if it is to succeed”

The energy sector is undergoing an exciting transition with low-carbon records being broken each year. While significant progress is being made with the rollout of renewables, we will need other kinds of flexible generation, including gas, to smooth the transition to clean power by 2030.

The displacement of coal with renewables has allowed the UK's electricity sector to reduce its emissions by two-thirds in just over a decade, while the gas generation remaining on the system has adapted to provide different services to the system to help manage this change. Last year gas was the single largest source of electricity.

Currently, there are significant periods when wind and solar (alongside nuclear, biomass and stored and imported electricity) can provide almost all of the electricity we need, resulting in some gas power plants being idle for at least part of the time. But when there hasn't been enough electricity generated by the wind and sun, gas plants have come online to make up the difference we need to keep the lights on.

We know clean power by 2030 will require

reducing the overall usage of unabated gas compared to today. Renewables have become more efficient over the previous decade, capable of generating on dim days and with lower wind speeds. The UK also has a mixed system, with interconnectors, nuclear power, and a range of storage options from pumped hydropower stations to all kinds of batteries. The investment in smart technologies and electrification like electric vehicles and heat pumps also gives us options for managing the system end-to-end more flexibly and efficiently.

However, even with all of these measures to reduce gas, every credible and cost-effective model for the UK's power system still includes some decarbonised or abated gas (using hydrogen and carbon capture technology). The Climate Change Committee, the government's formal adviser for net zero, has said that the state should keep some unabated gas on the system for emergencies. All of this means that the government needs a carefully managed plan for gas, as it will be essential to its energy mission.

The government has taken some action. The strategic spatial plans commissioned by the National Energy System Operator (Neso) should identify which gas plants need to be decarbonised, or provide emergency back-up. The government is also expected to publish plans to invest in the next round of carbon capture projects and there is some work on how to procure and finance flexible generation for the long term. But this is not comprehensive, and clean power by 2030 needs a transition plan for gas that is as clear and bold as the plan for the future of UK renewables.

The challenge of managing gas's changing role is the focus of our new series of publications. In partnership with the Carbon Capture and Storage Association (CCSA), *Fuelling the Future* underlines that in order to successfully manage this process we need a mix of technologies. It looks at how to manage this process across power, heating and industry, by supporting the development and rollout of low-carbon alternatives and technologies like hydrogen, nuclear, carbon capture, storage and heat pumps – including having the necessary supply chains and skills in place.

This energy industry is undergoing a huge transition. But it's decisions and plans from government that will govern how quickly we change. ●

Energy UK is the trade association for the UK energy industry

Energy Security in the Balance | The Report

View from government



Michael Shanks MP
Energy minister

“There’s now an economic and security case for renewables”

Britain’s energy insecurity has been laid bare in recent years. Our country has been left terribly exposed by years of underinvestment in homegrown energy and our over-reliance on volatile fossil fuel markets. Ordinary people have paid the price for this failure in their soaring energy bills.

The solution is clear: clean energy is now the economic choice, the climate choice, and the security choice. As the Climate Change Committee said in its recent progress report, “British-based renewable energy is the cheapest and fastest way to reduce vulnerability to volatile global fossil-fuel markets. The faster we get off fossil fuels, the more secure we become.”

That’s why the Prime Minister, Keir Starmer,

set out one of Labour’s five missions to make Britain a clean energy superpower, with a fully decarbonised grid by 2030 as we accelerate to net zero.

This government has wasted no time in getting to work. The de facto onshore wind ban lasted nine years. We scrapped it in just 72 hours of being in government. We took difficult planning decisions on three solar farms because the years of stasis and delay must end, and that means acting now.

We’ve also established a Mission Control board on clean energy, sitting at the heart of government and bringing together industry, regulators, and Whitehall to collaborate, identify and solve issues as they arise. It will be led by the former chief executive of the Climate Change Committee Chris Stark, and it will help set direction, monitor progress and remove barriers, whether in planning, grid, supply chains or skills.

We have introduced legislation to set up a new, publicly owned energy company, Great British Energy, backed by £8.3bn. It will own, manage and operate clean energy projects, helping create thousands of jobs. We have also announced an unprecedented partnership between Great British Energy and the Crown Estate to build more offshore wind, which could support the leveraging of up to £60bn of private investment.

And we’ve increased the budget for this year’s renewable energy auction by £500m to a record-breaking £1.5bn, helping deliver more new green infrastructure.

I’m excited to be the first energy minister in a long time to bring together all the different strands of this mission: the grid, renewables, oil and gas, energy market reform and security and resilience.

Over the coming months we will continue to drive this work forward at speed to build a flexible, secure, energy system and protect bill-payers for the long term. ●



MARTA SIGNORI / GETTY IMAGES / CHRISTOPHER FURLONG

Power today. Power tomorrow.

VPI is a leading power company in the UK, Ireland and Germany.

We believe that achieving net zero is fundamental to all our futures. Getting there means embracing a new energy reality – operating and evolving the current power system while introducing new energy sources and emerging technologies.

Our portfolio includes reliable thermal power, battery storage, and carbon capture projects to deliver decarbonised, dispatchable, and flexible power generation.

VPI

vpi.co.uk

