ECONOMIC REPORT 2023

OFFSHORE ENERGIES UK

Unlocking our energy future

OEUK OFFSHORE ENERGIES UK

An integrating offshore energy industry which safely provides cleaner fuel, power and products for everyone in the UK.

Working together, we are a driving force of the UK's energy security and net zero ambitions. Our innovative companies, people and communities add value to the UK economy.

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ECONOMIC REPORT 2023

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Foreword

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With war in Ukraine, an ongoing cost of living crisis and the increasingly evident impacts of climate change, energy policy remains firmly at the centre of the political debate. How do we successfully tackle the energy trilemma of affordability, security and delivering on our climate goals, while also creating high value jobs in communities up and down the country?

Our *Economic Report 2023* sets out the framework for the UK offshore energy sector to answer this question; and shows that the UK must think globally and act on unlocking energy investment – and we must act fast.

The independent Office for Budgetary Responsibility (OBR) shows the cost of reaching net zero in the UK to be £1.4 trillion, with £1 trillion coming from the private sector. Make no mistake, the UK is in a global race for energy investment, and we need to be successful.

Our report highlights that total offshore energy spend could reach £200bn this decade in oil and gas, offshore wind, carbon transport and storage and low carbon hydrogen, but about half of it is in planning or waiting on company and government approvals. There is £35bn of potential oil and gas capital investment over the next 10 years, but most of this investment is yet to be secured, and there is much more in the form of oil and gas operating and decommissioning spend, and in wind, carbon capture and storage and hydrogen.

The opportunity is clear: the challenge for the UK is to unlock it at a time when the demands on government finances are huge and households are struggling.

The UK must harness its homegrown offshore energy industry, our geography, and skilled people. Today the offshore oil and gas industry supports around 220,000 jobs and in 2022 generated almost £30bn in gross value added, representing around 1.5% of the total UK economy. This is the bedrock on which we can build future energy infrastructure for the benefit of everyone in the UK.

Our sector recognises that our energy mix must change and it shares the UK's climate goal ambitions. As we look to successfully manage the transition, there is no simple choice between oil and gas and renewables: we need both as we cut emissions and decarbonise the economy. Many of the companies investing in opportunities like CCS, hydrogen, and offshore wind will require the cashflow from a stable and predictable oil and gas business to fund these opportunities. Globally, this is the lesson other countries have learnt. In the US, the

Inflation Reduction Act is channelling many billions of dollars' worth of incentives into the next generation of energy infrastructure, leveraging a position as the world's leading largest oil and gas producer. In Asia and the EU similar programmes have been put in place. We must not get left behind.

Our integrating industry has been an engine of growth for over five decades. Critical to success has been collaboration with policy makers and other sectors, coupled with investment in strategic infrastructure, and this can be the bedrock to future success.

The UK has established itself as a world leader in offshore wind, with over 90 GW of capacity but only one-third of this is approved or operational. We need to ensure that our progress does not stall, and the lessons learnt so far from the growth of fixed offshore wind are applied to floating wind, carbon transport and storage, and hydrogen. To provide project developers and supply chain companies with greater surety, we must streamline our regulatory consenting and approval processes.

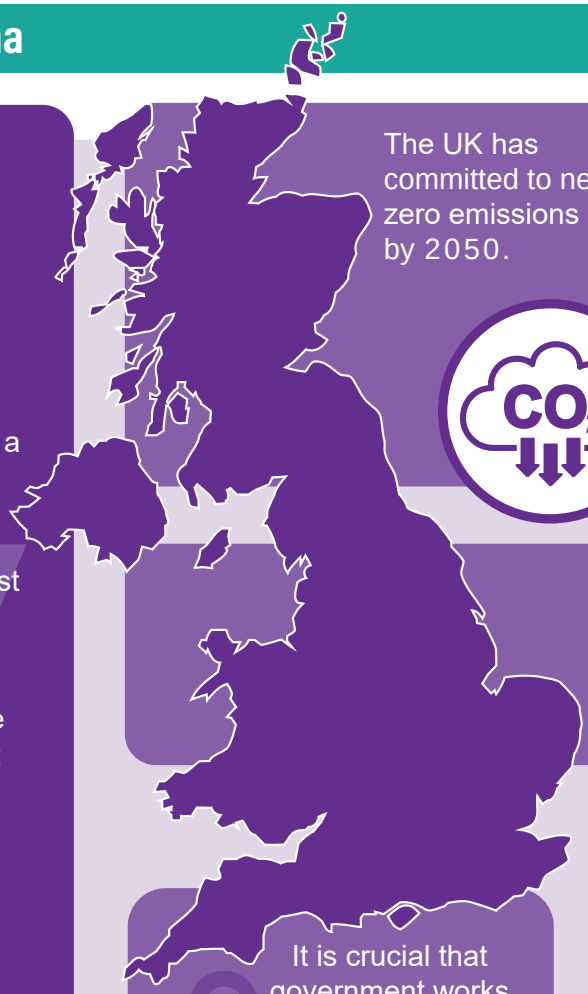
At the same time, we need to ensure that we engage with the public on the journey. Broad public and political consensus on the critical steps to net zero is critical. The Climate Change Committee has outlined how a huge scale up in electricity consumption will be required on the path to net zero. By 2050 electricity use in the UK may need to be around double current levels, which means a transformation of our energy infrastructure, and our behaviour as consumers.

So, the UK must not simply become a good place to do energy business, it must become irresistible. I remain convinced that the knowledge, experience, and capital of our expanding sector, in partnership with pragmatic policy, will turn shared ambition into action and delivery.

Unlock the potential and we create skilled jobs up and down the country, we deliver sustainable long-term economic growth, we manage our energy security, and we deliver on our climate goals. Our *Economic Report* sets this agenda.

The energy trilemma

- The UK needs to boost energy security, improve energy affordability and reduce emissions – the offshore energy sector is supporting all of these.
- The UK's energy resources provide it with a great foundation to solve these challenges:
  - the world's second-largest offshore wind capacity and project outlook;
  - Europe's largest offshore carbon storage potential;
  - significant hydrogen potential; and
  - enough oil and gas resources to supply over half the UK's needs.



The UK has committed to net zero emissions by 2050.

Interim targets to reduce emissions levels by 68% by 2030 and 78% by 2035.

CO_2

2022 UK emissions were half the levels in 1990.

The next wave of reductions will cost more, be harder to achieve and will lead to societal disruption and changes for consumers.

It is crucial that government works closely with industry to unlock this investment.

The total cost of emissions abatements could be in the region of £1.4 trillion, with £1 trillion coming from private sector investment.

£1.4 trillion

Economic contribution and gross value-added

Domestic oil and gas activity **supports around 220,000 jobs** in the UK.

Oil and gas activity supports jobs in every region of the country.

The oil and gas sector is a major contributor to the economy, generating almost £30bn in GVA in 2022.

£30 bn

Every £1.00 of oil and gas expenditure leads to £2.30 in value-added across the economy.

Over £400bn in production taxes in the last 50 years.
- Estimated £13.6bn in taxes since 2021.
- Forecast £40bn 2023-28.

£40 bn

OEUK members are leading projects in offshore wind, carbon capture and storage and low carbon hydrogen.

50 years of oil and gas experience are key to realising the **benefits** of these growing sectors.

How the UK uses energy

The UK requires around 170mn tonnes of oil equivalent (toe)/ year, or around 2,000 terawatt hours (TWh) – just over 1% of global energy use.

Energy use is down 28% since 2000.

Three quarters of the country's energy came in the form of oil and gas last year (39% gas and 36% oil).

3/4

Oil and gas will provide about half of the energy through to 2050, but this falls to **a fifth** by 2050.

Around a quarter of UK fuel was used to generate electricity last year.

Electricity consumption could become the largest energy source by 2035. Its use will need to double by 2050.

UK energy supply

Domestic energy production was just over 110mn toe (around 1,300 TWh) in 2022.

This means the UK has to import 1/3 of its energy.

1/3

UK oil and gas production is in long-term decline and has fallen by 70% since 2000 to 1.34mn boe/d.

70%

There is around £35bn of potential oil and gas capital investment this decade, with £70bn in potential operating expenditure and over £20bn on decommissioning.

The UK's offshore oil and gas production comes from **283 producing fields** of widely varying sizes. More than 180 of these are due to close by 2030.

A **competitive fiscal regime** and government support for licensing are needed for field development and infrastructure upgrades.

The UK NBP day-ahead gas price averaged 102p/th in the first seven months of the year – 88p/th less than the same period in 2022.

Brent crude oil prices averaged just under $80/b to end July this year, compared with $108/b in the first seven months of 2022.

$80/b

70% and 90% of existing oil and gas capabilities map well to offshore wind and carbon transport and storage, respectively.

Carbon storage could reach 30mn tonnes/yr by 2030 enabled by four CCS clusters.

Low carbon hydrogen could grow to over 200 TWh by 2050 (17% of total energy).

OEUK estimates that by 2030 the offshore sector could spend around £200bn, of which only half is committed to projects.

- Achieving this could see supply chain opportunity grow by 50% by 2030.
- By 2030 two thirds of annual offshore energy spend could be on low carbon sources, compared with one third now.

3. The energy trilemma in its economic and social context

The UK government has set out an ambitious agenda to boost energy security and improve consumer affordability, while cutting emissions. Achieving all three goals while still growing the economy is possible, and would bring huge economic and environmental benefits.

But the UK is in a global race for the investment that will be needed to drive these forward and other countries and regions including the US, European Union and Asia have put in place large packages to attract investment.

In this context, it is more important than ever that the government works with the offshore energy sector and wider industry to ensure the country is competitive, otherwise it will lose out on these opportunities.

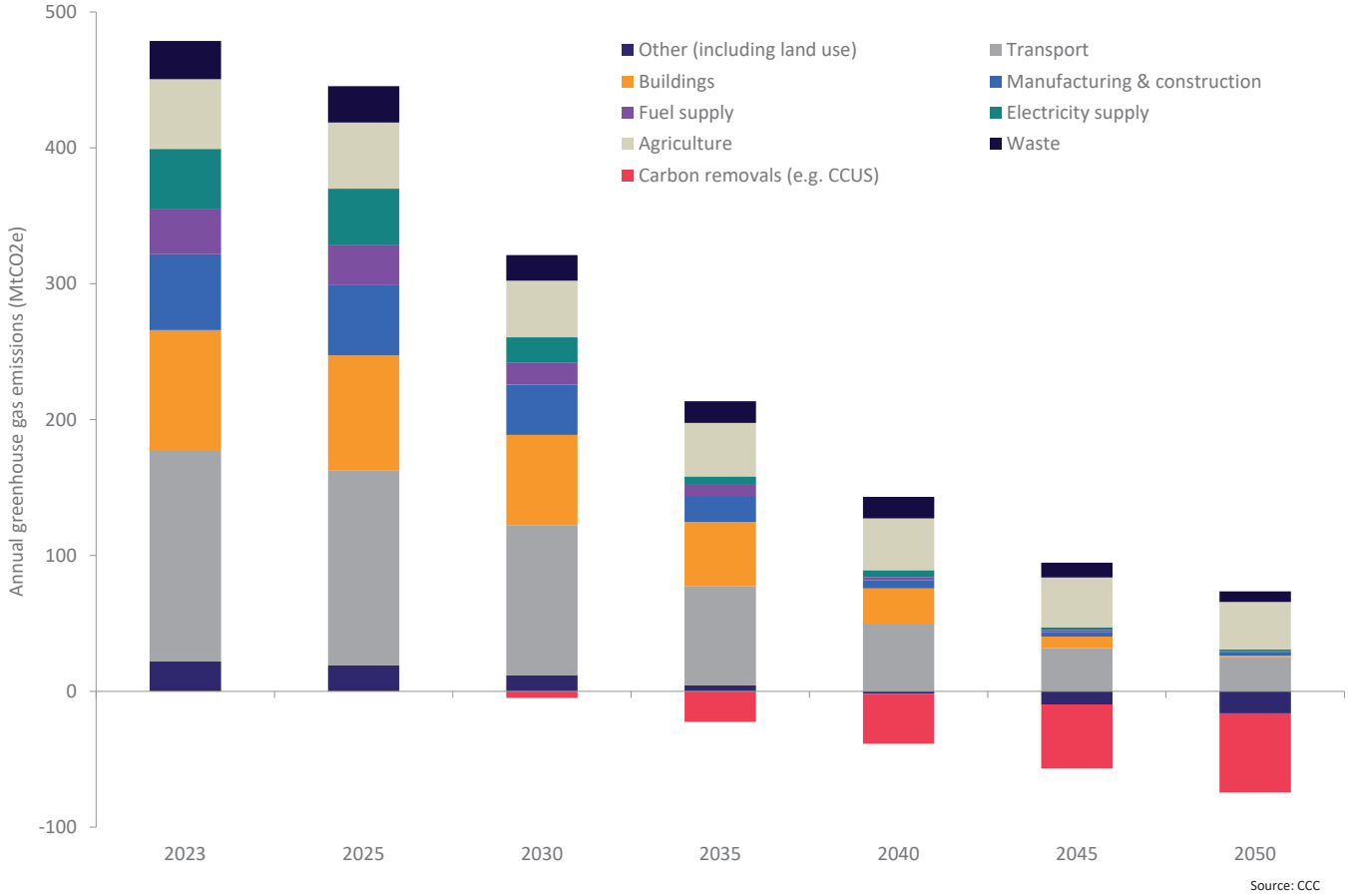
The UK has committed to achieving net zero emissions by 2050, with interim targets to reduce levels by 68% by 2030 and 78% by 2035 relative to the baseline of 1990. The emissions targets in Scotland are even more ambitious than this, with a net zero requirement by 2045, following the 75% reduction in 2030 and 90% in 2040.

The offshore energy sector is fully committed to net zero. It can also have a huge impact on the outcome, cutting its own emissions while providing crucial oil and gas supplies, underpinning the scale-up of offshore wind farms and establishing carbon storage and low carbon hydrogen industries.

This will also help improve energy security as more of our energy is produced in the UK. It will also offer protection against supply failures and help limit price shocks.

Scenarios from the Climate Change Committee (CCC) show the positive impact of meeting the emissions reduction commitments, with its Balanced Pathway profile cutting 10bn tonnes CO_2e between 2023 and 2050 compared with their baseline (no action) profile. This emissions saving is equivalent to all the UK's greenhouse gas emissions from 2004 to 2021. Most of the remaining emissions will come from fuel use in transport and heating buildings (40%) and agriculture, with 12% from fuel supply and electricity generation.

Figure 1
CCC Balanced Pathway UK: emissions reduction profile



Good progress has been made over the last 30 years, with emissions at the end of 2021 being almost half what they were in 1990. But the next phase will be far more costly and technically difficult. The CCC says more than 60% of the actions needed to achieve net zero will require behavioural and societal change.

It is important that the future emissions reductions are achieved alongside continued economic growth, new job opportunities, more energy security, and affordable prices.

The UK can only achieve all this by stepping up investment to realise its offshore energy resource potential and to build on its existing supply chain capability, while also changing the way the country uses energy. If done right, its energy system will become more resilient and more affordable with lower emissions and less exposure to international market shocks and hostile actions by other countries.

Neither government nor industry can address these challenges in isolation. In 2021, the Office of Budget Responsibility (OBR)[1] estimated that the total cost of emissions abatement could be in the region of £1.4 trillion, with £1 trillion of this coming from the private sector. This is from supplying and using energy differently as well as other emissions reductions opportunities. In its July 2023 Fiscal Risks and Sustainability Report[2] it notes that this is still the most reasonable estimate. The report also shows that the cost of achieving the emissions reductions could be the equivalent of adding 21% of GDP to government debt by 2050 – with fewer petrol and diesel cars on the road meaning

[1] Fiscal risks report (obr.uk)
[2] Fiscal risks and sustainability, July 2023 – CP 870 (obr.uk)

The **North Sea Transition Deal** provides a framework for industry and government **partnerships**

12% of future emissions reductions will come from **changes to energy supplies**

£1.4 trillion: the total cost of emissions abatement – with most coming from the private sector, according to the OBR

lower tax receipts; while householders will also need help decarbonising their heating.

Delayed action to reduce emissions will increase the overall costs of achieving net zero, owing to the failure to effectively develop supply chain opportunities. It is also more likely that assets with a higher carbon intensity will need to be written off. This is noted by OBR as being one of the UK's greatest risks to fiscal sustainability, but short-term government spending is lagging requirements.

Announced government net zero funding through to 2025 is almost £3bn less than what OBR estimates is required in a central case and over £11bn less than their high case. Most of this shortfall comes from lower spending on transforming heating in buildings. Linked to this, analysis from the CCC[3], the Skidmore Review[4] and others show that the UK is not on track to meet its initial 2030 commitments.

The reality is that public finances are constrained. Government debt levels are now equivalent to 100% of GDP, which is the highest ratio in 60 years. The interest rate on that debt is now the highest in the G7 and it is forecast that the government will spend over £110bn this year on debt interest payments. The long-term challenges facing public finances mean that in 50 years, the debt to GBP ratio could reach 300%. Both the Labour and Conservative parties have committed to reducing this ratio over time. The only way to do so is through strong economic growth and tight spending control. But the UK economy is smaller than it was in 2019, with Brexit and Covid having enduring negative effects.

Future progress also has to come at the lowest possible cost to consumers. High levels of inflation and the highest tax burden on record will all make it difficult for households to invest in decarbonisation technologies such as low-emissions vehicles and heat pumps.

This is why securing private investment into the net zero transition and maintaining and growing a wide range of energy supplies are so important. The levers of policy, regulation and tax must all be pulled. The North Sea Transition Deal (NSTD) provides a good model upon which to build a lasting and solid government-industry partnership.

[3] 2023 Progress Report to Parliament - Climate Change Committee (theccc.org.uk)
[4] Net Zero Review: UK could do more to reap economic benefits of green growth - GOV.UK (www.gov.uk)

4. Economic contribution

The offshore energy sector is a crucial part of the UK's economy, supporting hundreds of thousands of jobs, driving economic growth, and helping secure energy supplies. This contribution will become even more important in the decades to come as companies provide more net zero solutions alongside their critical energy supplies.

Since the oil and gas sector is long established in the UK and is very important to the economy, there are extensive data that outline its positive contribution. At present economic data for carbon transport and storage and low-carbon hydrogen production are limited because they are so new but estimates are included that outline the potential of these sectors, alongside the ongoing growth opportunities from offshore wind.

4.1. Oil and gas

Employment

Domestic oil and gas activity supported around 220,000 jobs in the UK last year.

Around 133,000 of these were direct and indirect jobs in oil and gas companies and the supply chain. The scale and complexity of oil and gas production make it reliant on the goods and services provided by a wide range of industries, with 36 sectors tracked by OEUK.

These sectors, ranging from construction and steel manufacturing to transport, catering and professional services, are the source of indirect jobs. The sector's impact extends far beyond the regional hubs of Scotland and the east of England. A further 86,000 jobs are induced in these regional economies that are only viable because of the benefits of the oil and gas sector in their community. This includes businesses and trades such as hospitality, shops and hotels.

A lower investment outlook will mean less supported employment, which would also impact the build-out of wind, low carbon hydrogen and carbon capture and storage projects.

Figure 2
UK-wide employment supported by oil and gas production

Gross Value Added

Alongside supporting around 220,000 jobs, the oil and gas sector is also a major contributor to the strength of the UK economy, generating almost £30bn in the gross value added (GVA) in 2022 or around 1.5% of the total economy.[5]

Over £23bn of this is generated directly and indirectly by oil and gas companies and the wider supply chain. More than £6bn is induced by activity in communities across the country that is only viable thanks to the direct and indirect benefits of the oil and gas sector.

Data from Office of National Statistics (ONS) and modelling the indirect and induced GVA contribution show that every £1.00 of oil and gas expenditure leads to £2.30 in value-added across the economy, on average. This contribution makes the sector one of the most productive in the economy and shows how investment helps stimulate wider economic growth, benefiting every area of the UK.

Figure 3
UK wide GVA supported by oil and gas production

[5] Note that these figures are expressed in 2019 chained volume measures to account for the impact of inflation and high commodity prices.

GVA from oil and gas

£30 bn Oil and gas production generates almost £30bn of GVA across the economy.

Upstream oil and gas is one of the country's most economically productive sectors.

£+ Every £1.00 of oil and gas spend creates a further £2.30 in economic value.

Oil & gas production tax contribution

Over the last 50 years the industry has paid over £400bn in direct production taxes (in real terms). This includes over £160bn in payments since 2000. As part of this, the OBR estimates that £13.6bn will be paid in production taxes 2021-23,[6] including £11bn in 2022-23 as higher commodity prices and Energy Profits Levy (EPL) increased the expected payments. This is equal to 15% of total UK corporation tax payments in 2022-23. OBR estimates that another £40bn will be paid in taxes between 2023-28. But the out-turn for this will depend on several factors including investment, production rates and wholesale oil and gas prices.

The government is reviewing the future of the UK's oil and gas fiscal regime. OEUK is actively participating in this process, with a focus on the stability, predictability and competitiveness of the tax rates and the treatment of capital (*see section 6.1*).

Oil & gas production taxes

£400 bn Over £400bn paid in production taxes in last 50 years.

OBR estimates £13.6bn paid in taxes since 2021.

£40 bn Estimated £40bn paid in production taxes 2023-28

[6] Economic and fiscal outlook - March 2023 - Office for Budget Responsibility (obr.uk)

Figure 4
Examples of OEUK members' projects in offshore wind, CCS and hydrogen

4.2. Opportunities across the offshore energy sector

OEUK members are continuing to lead projects in offshore wind, carbon capture and storage and low carbon hydrogen, alongside oil and gas projects.

The investment, skills, capabilities and technologies that have been developed through oil and gas production are key to securing the economic benefits that these growing sectors create.

170mn tonnes of oil equivalent (2,000TWh)
current UK energy consumption

Over 75%
of all energy consumed is from oil and gas

5. How the UK uses energy

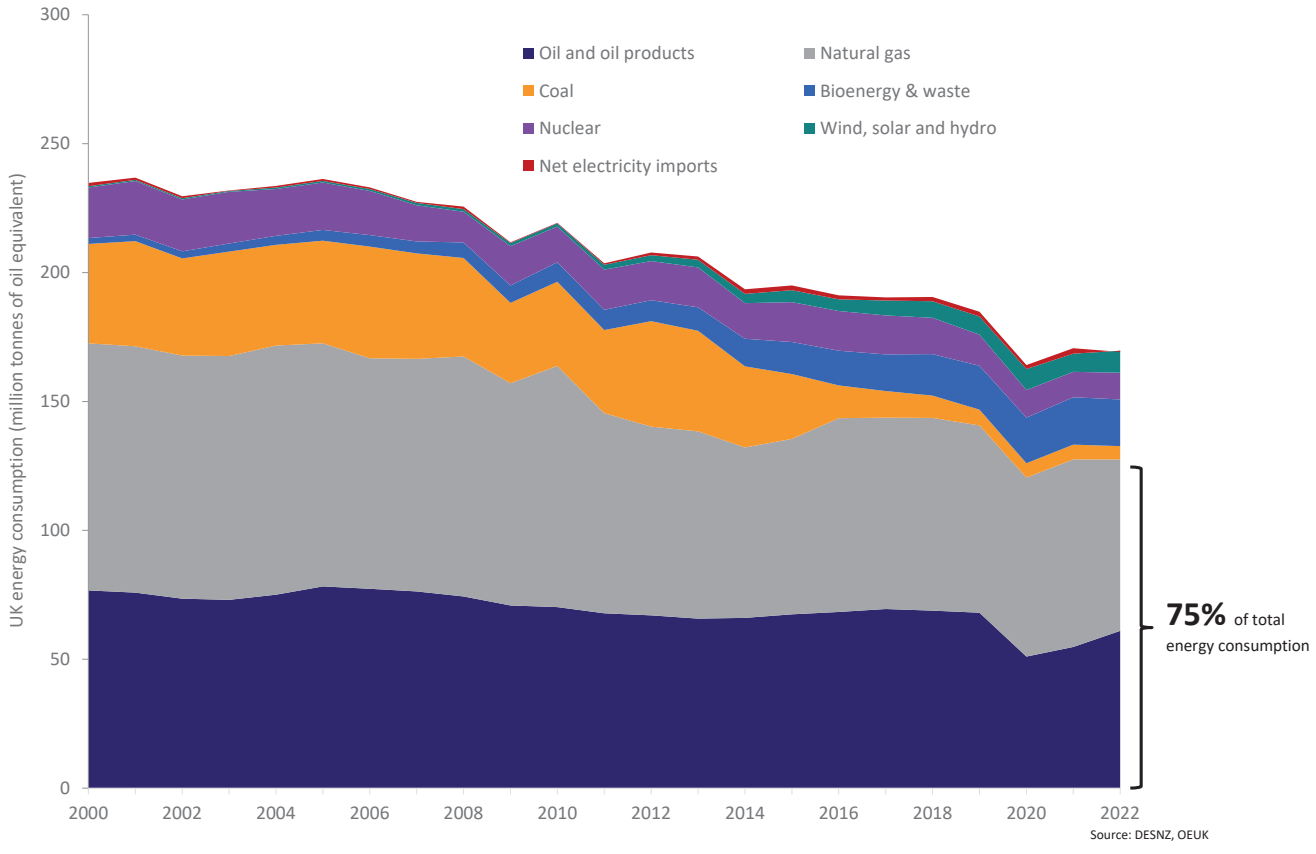
5.1. Long-term evolution of the UK's energy supply

The UK requires around 170mn tonnes of oil equivalent (toe), or around 2,000 terawatt hours (TWh) annually. This represents just over 1% of global energy use and just under 10% of Europe's total. The country's energy use has been falling and has dropped 28% since 2000, mainly as the UK economy has become more energy efficient and lost a lot of its heavy industry to overseas suppliers.

These energy needs are met from a range of sources, with oil and gas still the biggest owing to its extensive use in heating, transport and electricity. Three quarters of the country's energy came in the form of oil and gas last year (39% gas and 36% oil). Although there has been some variation in annual proportions, this overall contribution has remained relatively unchanged over the last two decades and has continued in 2023.

In the first five months of 2023 the use of oil and petroleum products increased slightly (by 4%) and the use of gas fell by 9%, relative to the same period in 2022. The rise in oil products was due to road and air transport, whereas the fall in gas use was due to less gas-fired electricity and warmer weather. This drop in gas is despite the year-on-year fall in prices.

Figure 5
UK energy consumption by fuel



Source: DESNZ, OEUK

Although its proportion of the mix has remained relatively consistent over time, the amount of oil and gas being used in the UK has fallen at around the same rate as overall energy use. The UK used around 45mn toe (over 500 TWh) less oil and gas last year than in 2000. Gas use has fallen by around 30%, whereas oil has fallen by 20%.

Around a quarter of UK fuel went towards power generation last year (primary electricity generation from renewables, alongside nuclear and gas, predominantly). The actual amount of electricity that is available to the consumer is lower because of losses in generation and distribution.

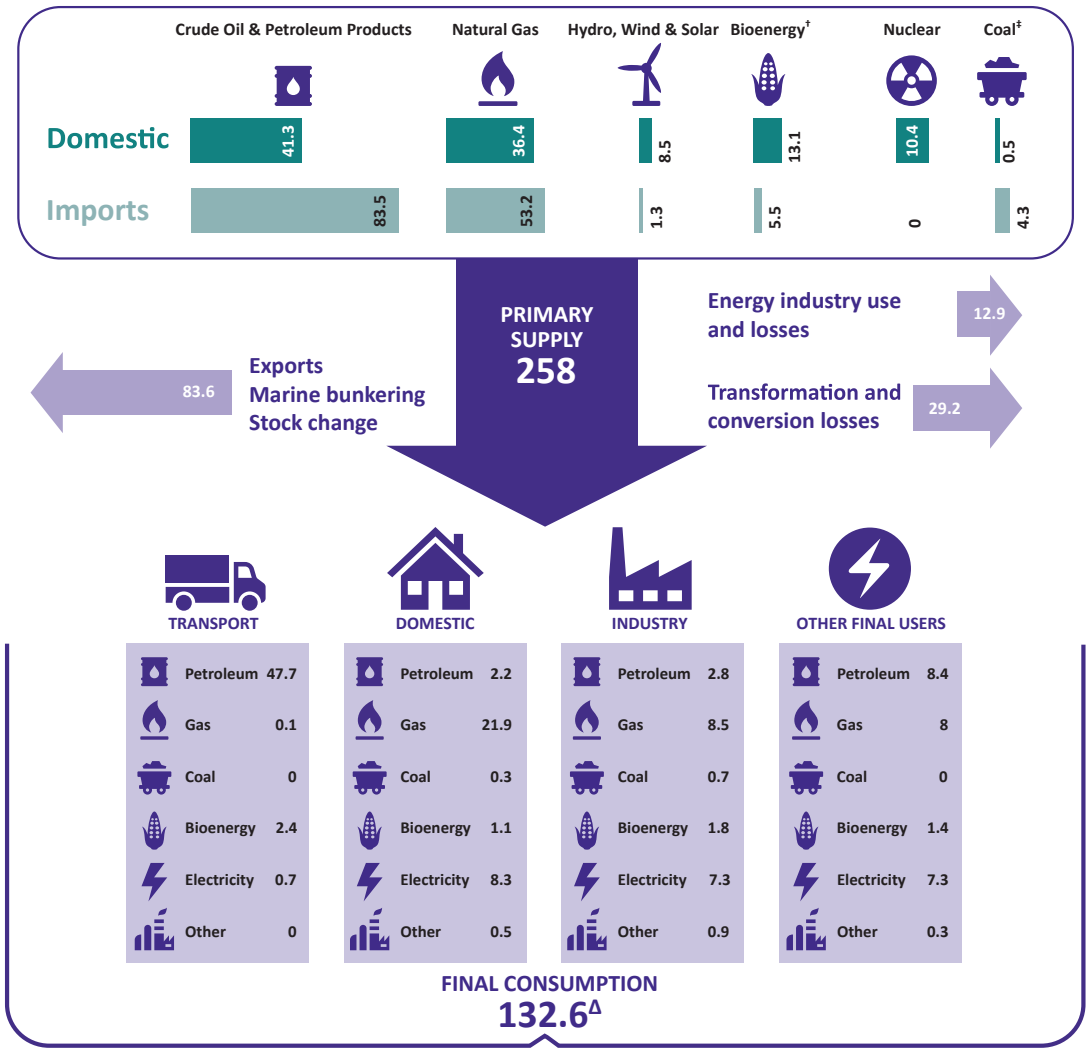
Renewables (wind, solar and hydro) supplied more electricity than gas last year but gas remained the largest single source of generation by some margin – providing around 40% of average consumption and far greater than this at times of low wind speed and/or high electricity demand. Although there has been fast growth in renewable sources, their overall contribution to the UK's energy mix is only around 5%. This is because they only affect electricity. The UK uses 15 times more energy produced from oil and gas than from renewable power, reinforcing the scale of the challenge in transforming the energy system.

5.2. Energy consumption

Most energy is used in transport and heating homes, business and offices. This means that much of the country's economic, industrial and societal infrastructure is built on oil and gas.

UK energy use will continue to change over decades with increasing policy intervention.

Figure 6
How the UK uses energy



*all values in million tonnes of oil equivalent (mtoe)
†Includes geothermal and solar heat ‡Includes manufactured fuels, benzole, tars, coke oven gas and blast furnace gas
ΔTotal does not equal sum of the sources due to statistical difference, stock changes, marine bunkering and rounding

Source: DESNZ

This will take significant investment by industry, supported by government, and mean costs and changes for consumers too.

The UK has 38mn petrol and diesel vehicles and 23mn homes (85%) have gas boilers. Its industries use around 100 TWh/yr of gas and process over 57mn tonnes of oil.

The downward trend of petrol and diesel cars is clear: they now comprise two-thirds of new sales (over 1mn/yr) and new ones will not be sold after 2030. There were 32% fewer petrol registrations and 85% fewer diesel registrations in 2021 compared with 2016.[7]

At the same time, plug-in electric vehicle sales increased 18-fold and hybrid registrations increased fivefold.

This progress is ahead of trends outlined in the CCC scenarios but there are concerns about the rate of continued growth later in the decade. Any delays to policies, like the Zero Emissions Vehicle Policy (which mandates a proportion of manufacturer sales must be zero emissions) would impact on scale up of these vehicles by limiting the size of the market. It also vital that charging infrastructure continues to scale up and is appropriately distributed across the country. There are around 45,000 public charging points, but that will need to reach at least 300,000 by 2030.

There are also plans to stop the installation of gas boilers in new homes by 2025, with existing gas boilers being replaceable only until 2035. Around 1.75mn new or replacement gas boilers are installed each year.

The OBR estimates the government will need to provide some £43bn this decade alone to help decarbonise UK buildings – with this covering government buildings, the full costs of the lowest income households[8] and half of the costs of the middle 70% of households. However, government commitments are falling short of this level of support. Further, the new low carbon heating and energy efficiency installations that the government does support are less than the CCC's recommendations.[9] Funding is not the only barrier. There are also not enough trained engineers and technicians to retrofit home heating systems at the scale required.

5.3. The future energy system

Within the CCC's Balanced Pathway energy use continues to fall, by a further one-third by 2050, as the way we use energy continues to become more efficient. Many parts of the economy will become electrified or fuelled by hydrogen.

However, there are some sectors which the UK needs and which cannot be electrified and where there is a lack of realistic alternative fuels. In these cases, oil and gas will continue to have an important role, increasingly supported by CCS. Oil and gas are also needed for other purposes than energy, such as plastics. Non energy use is projected to be a fifth of future demand[10].

About half of the energy from today until 2050 is likely to come from oil and gas, tapering off to a fifth by the end. In 2035 gas is likely to still be supplying 30% of energy and oil products 22%.

Much of the reduction in oil and gas will be offset by more use of electricity – mainly supplied by renewables. In the Balanced Pathway scenario electricity use almost doubles by 2050 and increases by around one-third by 2035. Low carbon hydrogen also has an important role – growing from nothing now to around 100 TWh by 2035 (7% of energy) and over 200 TWh by 2050 (17% of energy). Alongside this the UK will need to capture and store 20mn-30mn tonnes/yr CO_2 by 2030 and possibly over 100mn tonnes/year by 2050.

Some other scenarios show an even greater take-up of hydrogen and CCS.

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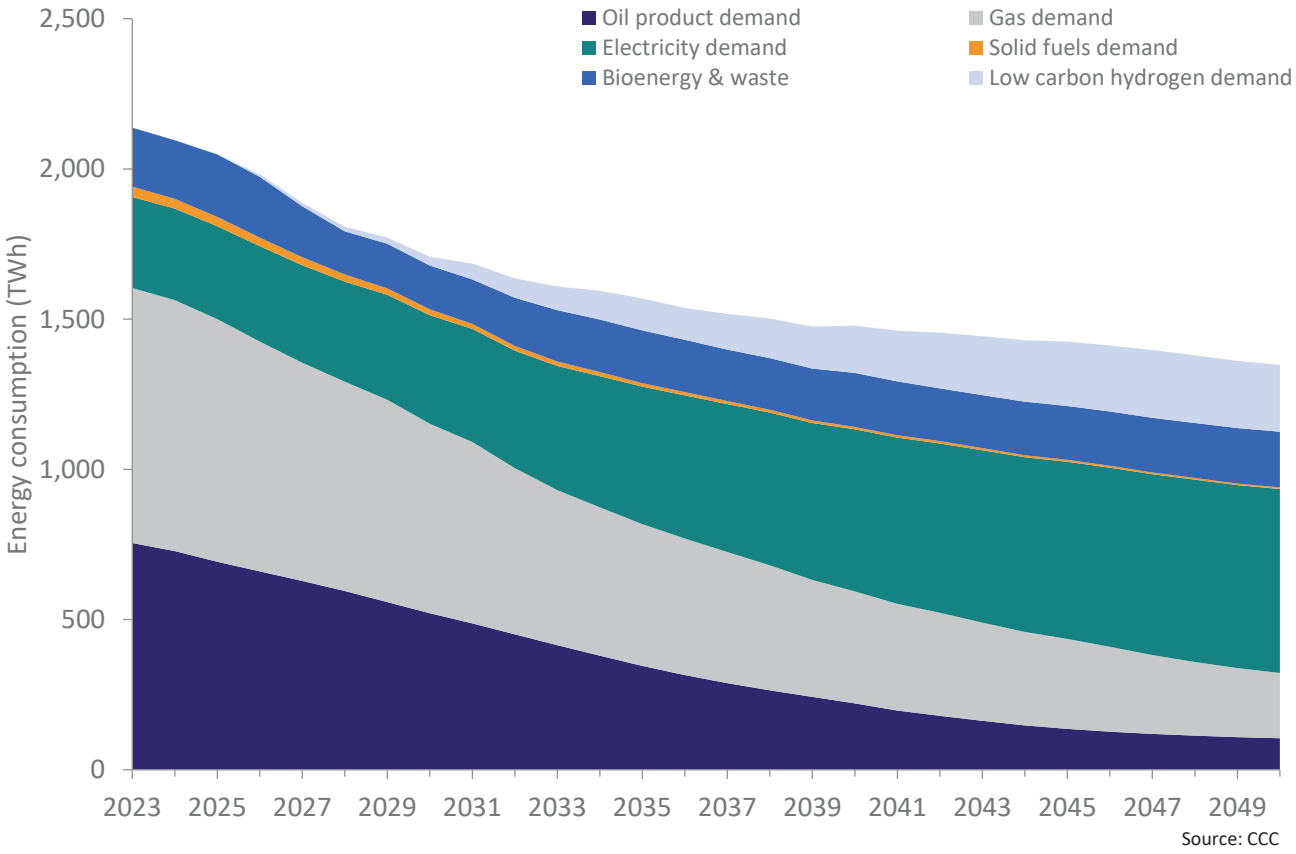
[7] Vehicle licensing statistics: 2021 - GOV.UK (www.gov.uk)

[8] Defined as the lowest 15% of households by income.

[9] Progress-in-reducing-UK-emissions-2023-Report-to-Parliament.pdf

[10] https://www.nstauthority.co.uk/media/9083/nsta-february-2023-production-projections-plus-ccc-and-desnz-demand-projections-v4-1.xlsx

Figure 7
Climate Change Committee Balanced Pathway energy scenario



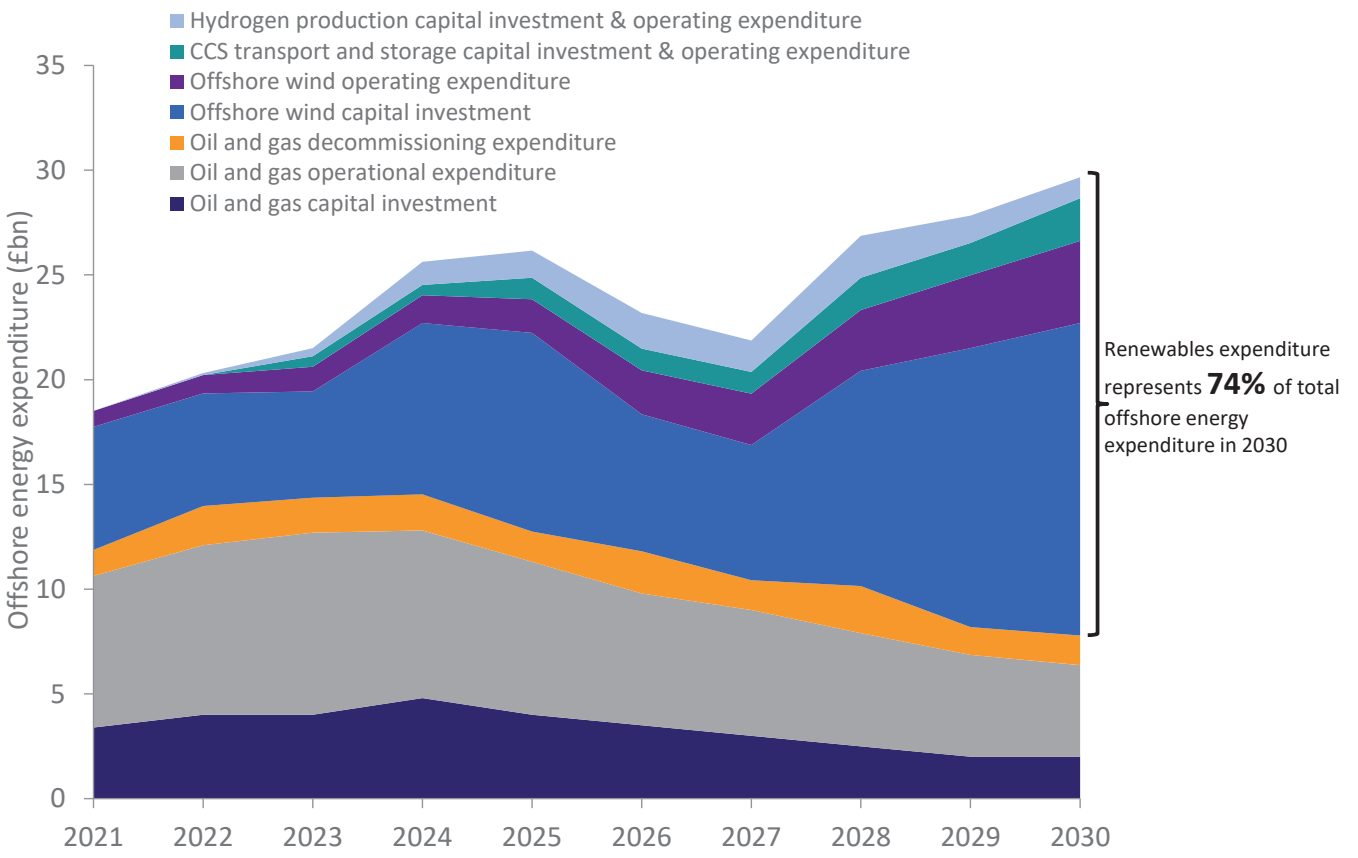
Source: CCC

Transforming energy production and consumption along the above lines will take huge investment. OEUK estimates that the offshore energy sector could spend around £200bn in the remainder of the decade on the effective management of oil and gas production and decommissioning, expanding the country's offshore wind capacity and establishing large-scale low carbon hydrogen production and carbon transport and storage industries. However half of this, £100bn, is associated with projects still awaiting final investment decision. Moving these projects forward is crucial in helping to build increased energy security, reducing emissions and providing new economic growth and employment opportunities.

The offshore energy supply chain and its technology and people will be at the heart of making this happen. It has expertise in offshore operations and project development that will be vital for building new offshore wind farms, storing carbon and producing hydrogen.

OEUK estimated, in its July *Harnessing the Potential* report on the supply chain, that up to 70% of the supply chain demand

Figure 8
UK offshore energy expenditure



Source: NSTA, Rystad, OEUK

from offshore wind projects is likely to be accessible to, and reliant on, the same capabilities that exist now. It also found that 90% of existing oil and gas capabilities map well to carbon transport and storage.

This provides a huge advantage for the development of projects and for the wider economy. OEUK estimates that the supply chain opportunity from these areas could be worth almost £100bn this decade if they progress in line with government targets, which would mark a 50% annual revenue increase on current levels.

However the supply chain must have the confidence to expand capacity as demand rises.

Concerted policy support, stable and competitive fiscal conditions and improved planning and regulatory timelines are all key parts of realising this energy supply and economic opportunity.

6. UK energy production

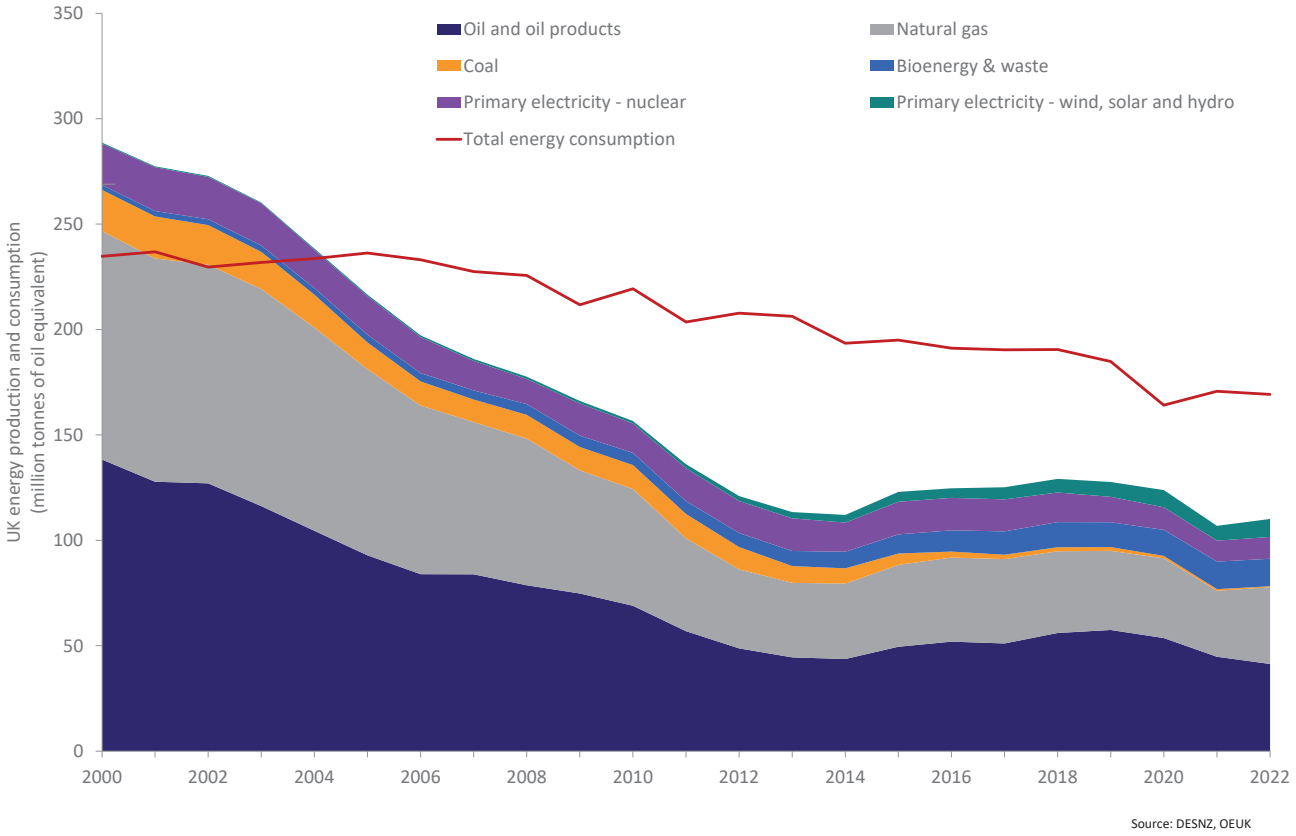
The UK benefits from diverse energy resources but domestic energy production has fallen 62% since 2000. This marks a much greater decline than consumption, which has fallen by 28% since then. These trends moved the UK from being a net exporter of energy, to a significant net importer.

Domestic energy production was just over 110mn toe (around 1,250 TWh) in 2022 compared with 170mn toe, so the UK only produced around two-thirds of its own energy last year.

The bulk of that is oil and gas, accounting for around 70% of UK production, with the remainder mainly being related to primary electricity from renewables, nuclear, bioenergy and waste.

Declines in domestic oil and gas production mean that almost all the imports are made up of these, from countries around the world. This gap will continue to widen in the years to come, as production rates fall faster than consumption and electricity use is not growing fast enough to replace oil and gas.

Figure 9
Energy production by source since 2000

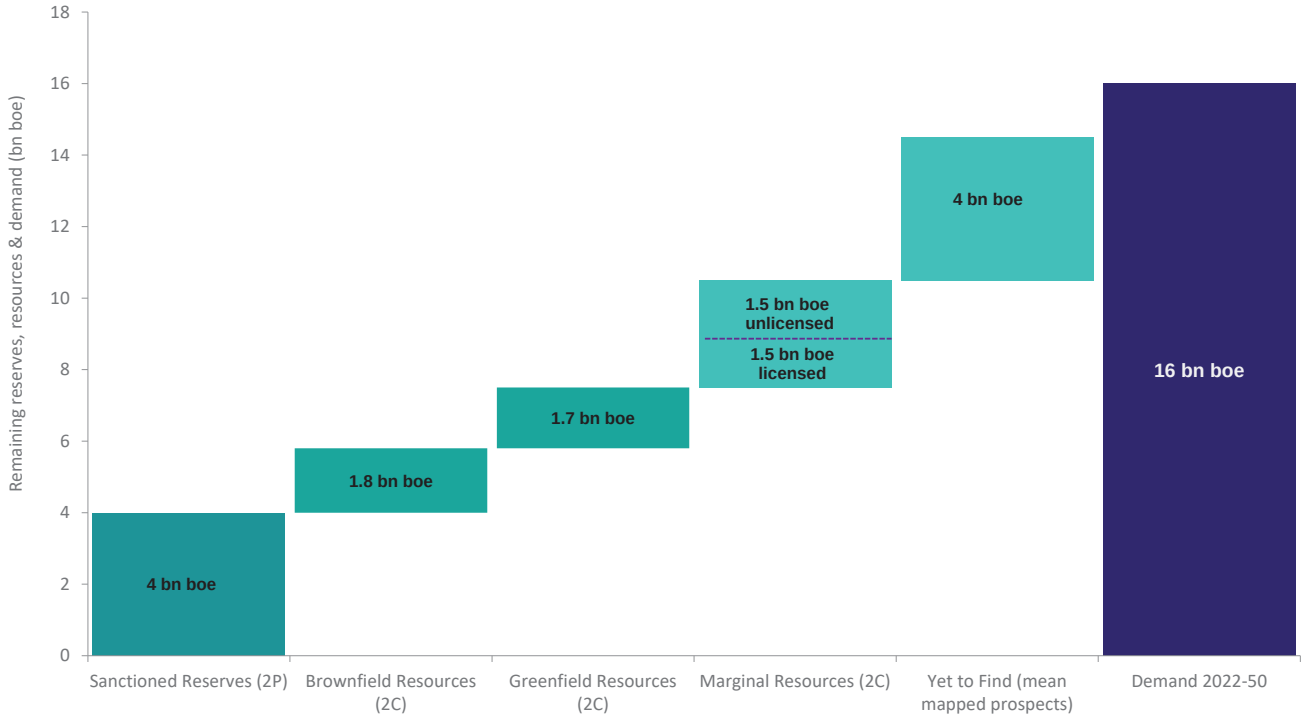


Source: DESNZ, OEUK

6.1. Oil and gas supplies

The UK has produced over 45bn boe since 1975 and NSTA estimates that there could still be 10-15bn boe potential left. However, it is likely that the final tally will be lower than this. The NSTA production projections show recovery of a further 8bn boe, but this requires new investment and exploration. A widespread loss of investor confidence could result in capital moving to other basins and less than 4bn boe more being realised. This is only equivalent to one-quarter of likely enduring demand through to 2050.

Figure 10
UKCS remaining resource potential



Source: OEUK, NSTA, CCC

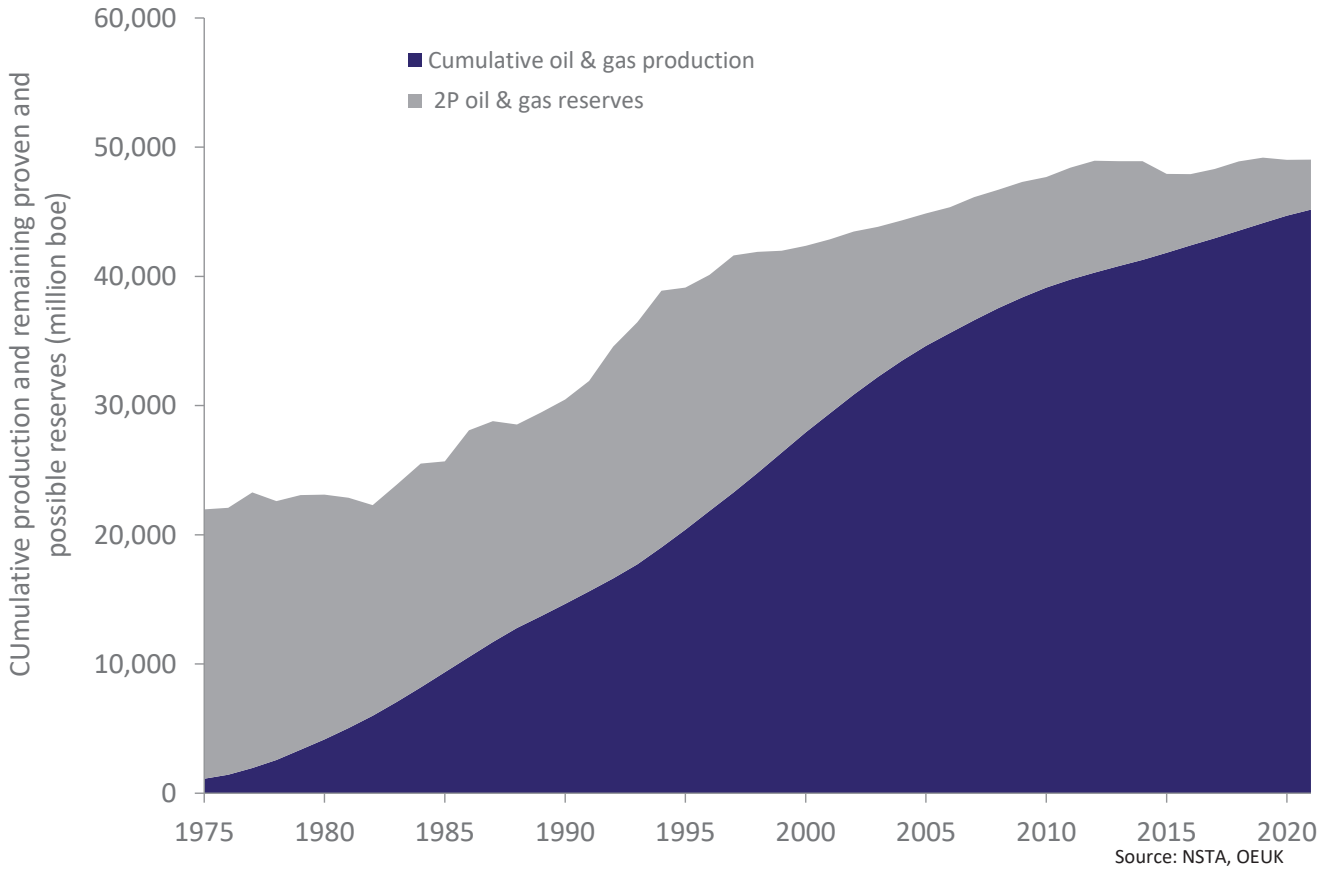
Production is in long term decline and has fallen by 70% since 2000 (from 4.4mn boe/d to 1.34mn boe/d), whereas consumption has fallen by 26%. Other energy sources, such as renewables[11], have grown 17-fold during the same time frame, but they still provide only a ninth of energy that oil and gas bring to the UK, despite their decline.

It takes significant investment to limit the rate of decline, with these reductions in output coming despite the more-than £180bn spent upstream since 2000. This reinforces the importance of continually investing in new projects.

Over the last two decades the industry has produced around 14.5bn boe, but only 6.5bn boe in new field developments have been approved, or 45% of reserves. This rate is only 14% since 2019, and has resulted in the gap between total recovery and remaining reserves closing significantly (*see Figure 11*).

[11] Wind, solar and hydro

Figure 11
Historic oil and gas production and proven & probable (2P) reserves

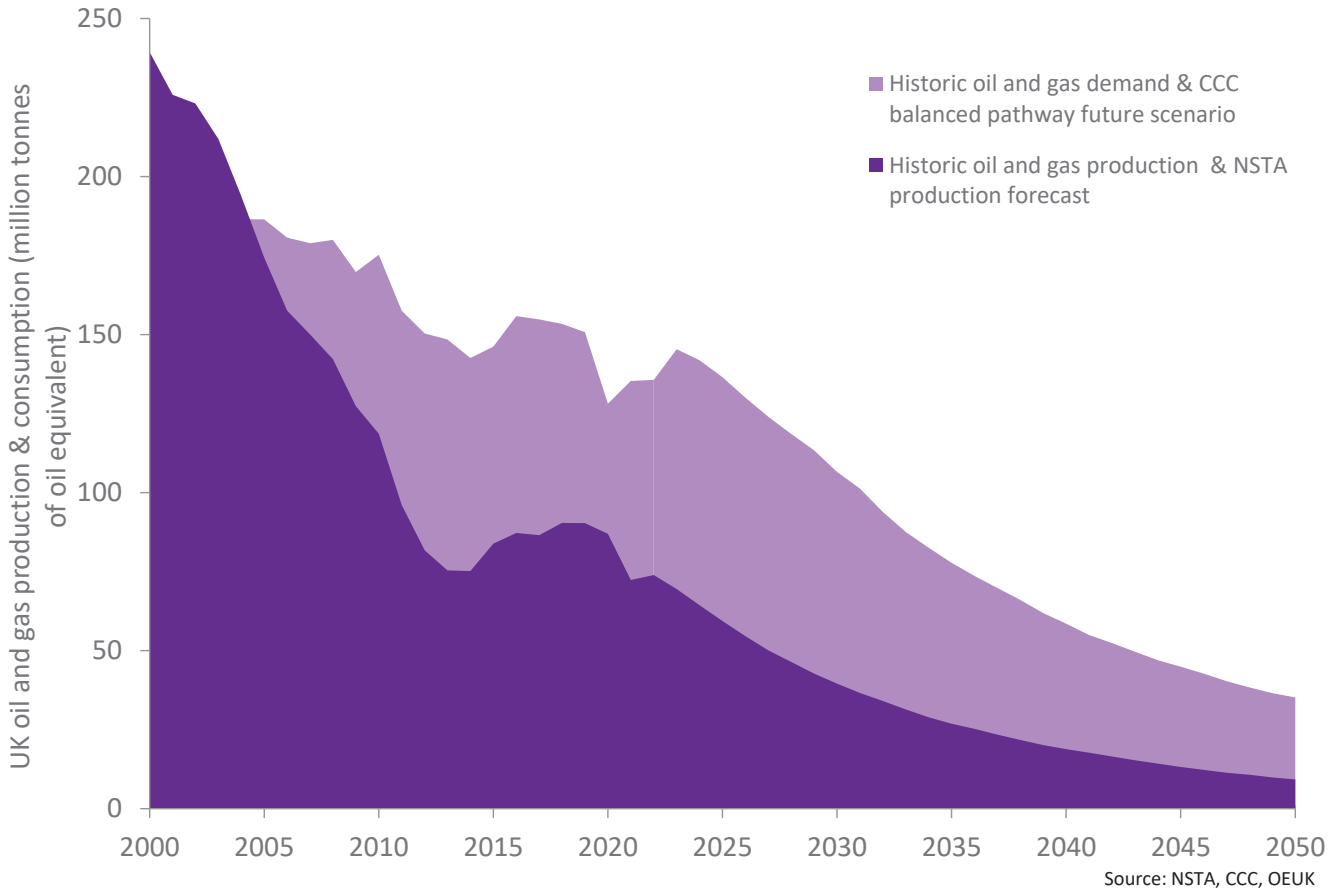


The UK's offshore production comes from 283 producing fields of widely varying sizes holding different ratios of oil to gas. Of these, over 180 are expected to stop producing this decade. These specific fields produced 45% of UK oil and gas output last year. At least 20 fields will stop producing this year alone and only two fields will start up.

The impacts of these trends are already being seen in production. Output in the first five months of this year was down by a tenth from the same period last year (6% decline in gas production and 12% for oil) and down by a fifth from 2018. This is double the rate of decline in oil and gas consumption, leaving the country relying on net imports for around one-third for oil and just over half for gas.

This gap will grow in the years to come and could reach 80% in 10 years, without timely new investment. This would leave the UK more exposed to price shocks and volatility, along with increased potential for supply disruptions. It would also have a negative impact on the outlook for the supply chain and its vital contribution to the growth of new energy and emissions solutions.

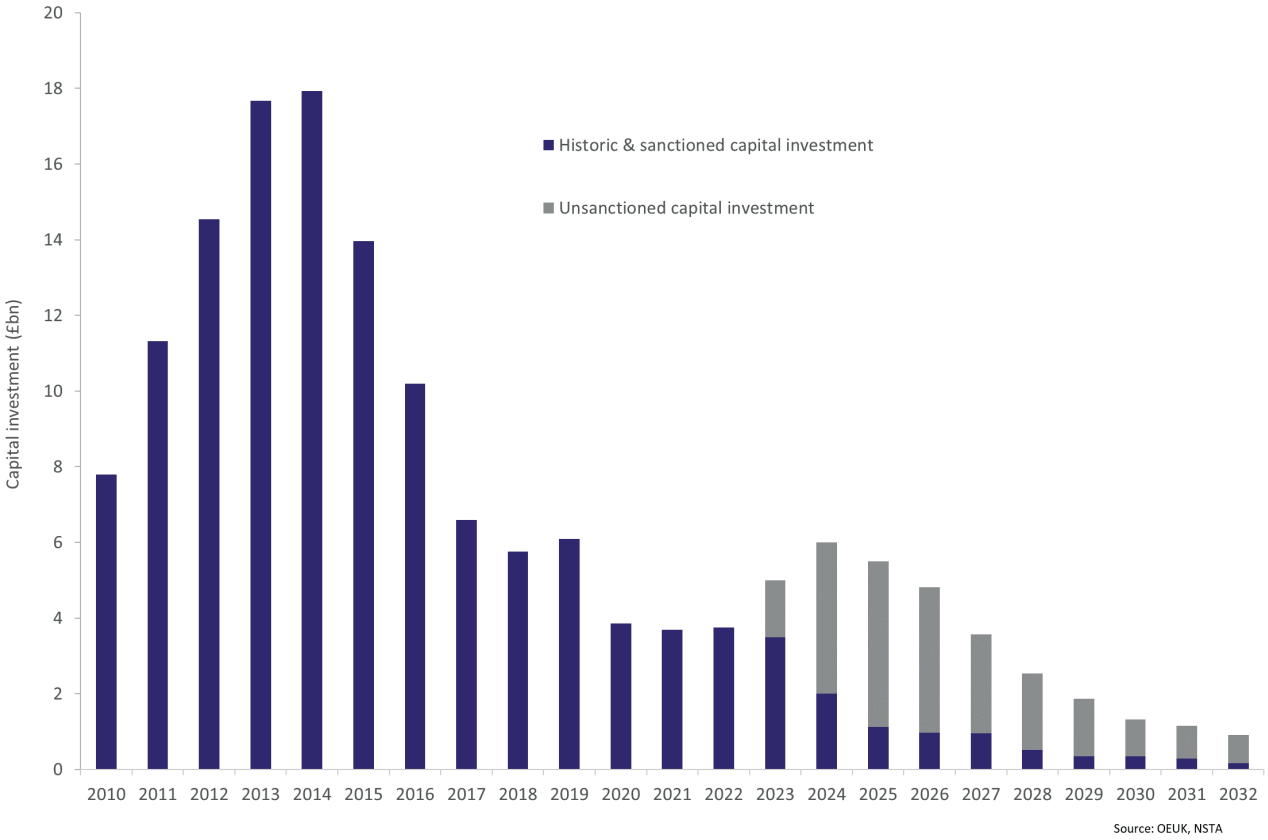
Figure 12
UK oil and gas production and demand



Source: NSTA, CCC, OEUK

The rate of decline might be slowed so that around half the remaining oil and gas needs could be met with equivalent domestic production. However, this will only be realised if efforts to attract investment to new and existing fields are successful. This requires a more competitive, stable and predictable tax regime, as well as support for continued licensing and exploration. Otherwise, net oil and gas imports will increase significantly, even though a lot of UK crude is refined initially overseas. And without new investment it is possible that the industry will be spending more on decommissioning than it invests in production by 2025. Even in a high investment case, decommissioning spend is likely to overtake production investment by the end of the decade, during which period it is likely that decommissioning will average around £2bn/yr.

Figure 13
UKCS capital investment outlook



It is likely that there will be in the region of £3.5bn-4.0bn of capital investment in the basin this year, which is lower than may have been expected at the beginning of the year as new field approvals have remained slow. Although this is a similar level to previous years the impact of this investment will be less owing to inflationary effects.

There is £35bn of potential oil and gas capital investment over the next 10 years, of which about half will go on projects in producing fields and half on new fields. However, most of this investment (almost 70%) is yet to be secured. Without it, the UK will produce 1.2bn boe less over that period, and the loss will get larger over time. There is also up to £70bn to be spent on operations and over £20bn on decommissioning during the same period.

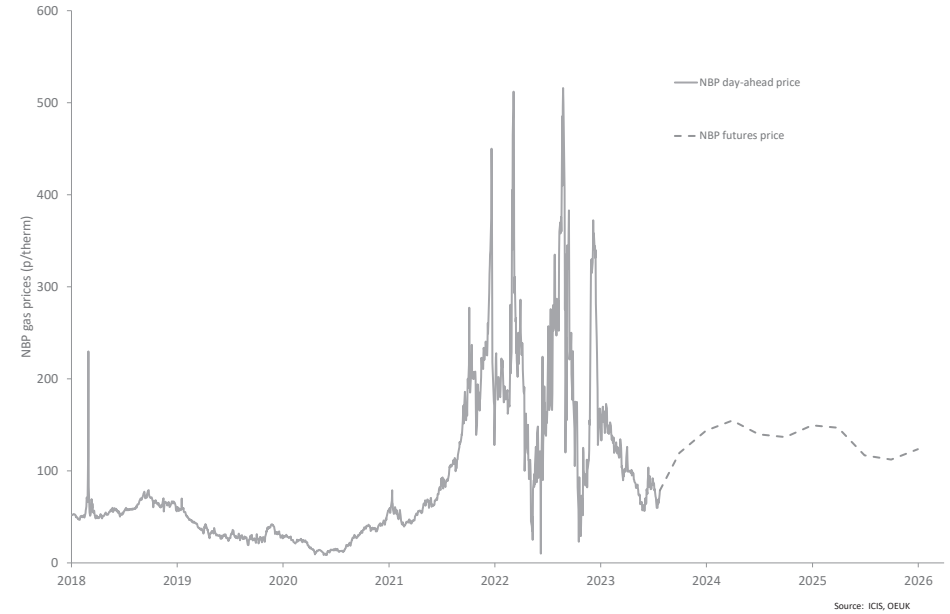
Achieving this depends on several factors which impact on investor sentiment and project economics – such as the competitiveness and stability of the fiscal regime, the cost environment, commodity prices and, importantly, government support for new licensing and exploration.

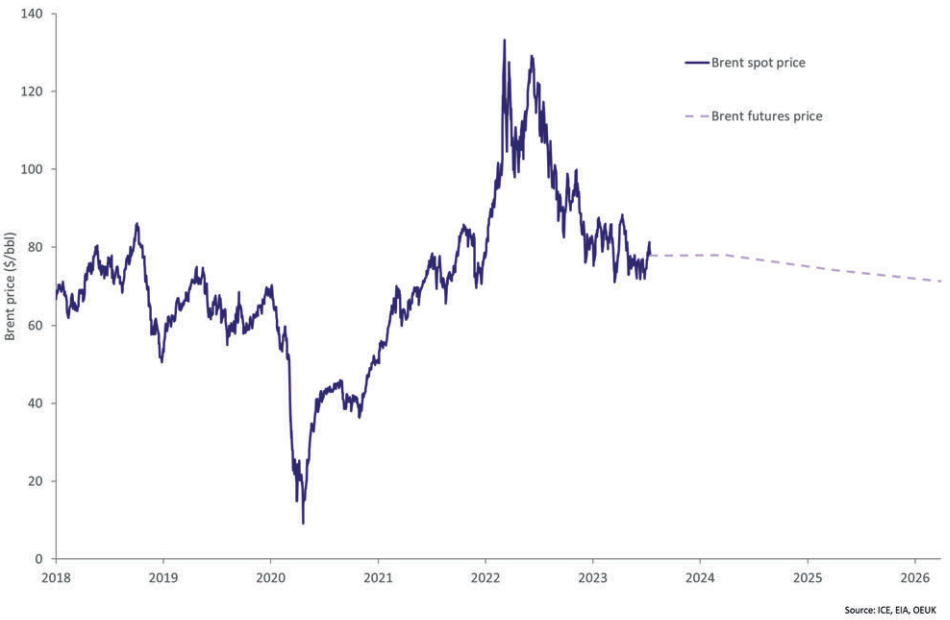
The oil and gas industry in the next 10 years

Fiscal stability and competitiveness

A competitive and predictable fiscal regime is fundamental for investors, with the changes since May 2022 significantly damaging their confidence in the UK and their ability to access finance. OEUK recognises the drive from Treasury (HMT) to support consumers and target a reduction in inflation, while delivering long-term economic growth. While the principle of a windfall tax in extraordinary circumstances is acknowledged, it is critical that when the windfall goes, so does the tax, if the UK is to deliver energy security, the energy transition and economic growth.

Figure 14a & 14b
Oil and gas prices





The UK NBP day-ahead gas price averaged 102p/th in the first seven months of the year, which is almost half what it was in the same period last year (190p/th). Similarly, the forward prices have also fallen, with contracts for Q4 2023 and Q1 2024 specifically falling by two-thirds compared with October last year. The trend is similar for Brent, which averaged just under $80/b to end July this year – more than one-quarter lower than the same period in 2022 ($108/b) and 21% lower than the 2022 full year average ($101/b).

The introduction of the Energy Security Investment Mechanism to the EPL in June was a first step towards rebuilding investor confidence. This set a price level of $71.40/b for oil and 54p/th for gas (the nominal average for the last 20 years) at which the 75% tax reverts to 40% if prices are on average below these for a rolling six-month period.

But further action is needed to unlock borrowing capacity and deliver the projects required to support energy security. They will also create a launch pad for further net zero emissions opportunities.

Alongside certainty around a competitive long-term rate that appropriately shares risk and reward between industry and government, the long-term treatment of capital expenditure, including on decarbonisation projects, within the fiscal regime is also a critical pillar to deliver the sector's potential.

OEUK is actively engaged in the government's review of the fiscal regime, and it looks forward to continuing to work with HMT on both the unwinding of the EPL and the development of a long-term fiscal regime to attract investment and generate economic growth.

Oil and gas licensing

Recent technological advances and the scale of the infrastructure network means new discoveries can now be matured through to production much faster than in the past. Over the last decade, on average, new fields have moved from discovery to production in five years. Some have moved through the process in even less than 18 months. So, although new licences and new exploration will not provide new volumes immediately, they will help in the years to come. Having this longer-term focus is important given that oil and gas demand will continue to exceed domestic production.

Exploration activity remains around all-time lows. Six wells have started drilling so far this year and at least one more is expected, meaning that levels will remain similar to last year. There have, however, been some notable recent successes. Early estimates from the Deltic Energy, Shell and ONE well, Pensacola, which started drilling in late 2022, show potential recoverable resources of almost 100mn boe. Ithaca Energy and Dana Petroleum have announced a discovery at the K2 prospect that had similar pre-drill resource estimates.

As well as access to new resources, licensing policy is an important driver of the way companies view the future of their businesses in the UK. A snapshot survey of OEUK members conducted in May showed that a presumption against new licensing and exploration would have a significant negative impact on the way around 70% of companies view their UK business – with sentiment from supply chain companies being slightly more negative than operators.

OEUK estimates that 70% of demand on the offshore energy supply chain is servicing oil and gas activity – and it is likely to be the largest source of activity until at least 2026/27, the point when offshore wind and carbon storage project activity could ramp up significantly. Policies that end new licensing will constrain UK business opportunities at the same time as other countries are opening new oil and gas resources at pace. This is putting the UK's position as a centre of supply chain excellence at risk as countries move people and equipment to areas where there is greater activity and a more positive outlook.

These trends are already being seen, especially in the drilling sector as rigs are actively being marketed out of the UK to other regions around the globe, as far afield as Australia. The North Sea is the only basin where the outlook is for a surplus of high specification drilling rigs, meaning other regions are more competitive for business – with longer work durations and higher rates on offer. Once these units leave the UK it is increasingly unlikely that they will return.

OEUK estimates that, by the end of the decade, 70% of the demand from offshore wind activity and 90% of carbon transport and storage requirements are likely to be dependent on the same supply chain capabilities that already service oil and gas. So policies that constrain oil and gas licensing and development activity put the UKs low carbon energy expansion at threat as they lead to the premature loss of this supply chain, as well as threatening the early closure of infrastructure that could be repurposed.

Without action to encourage oil and gas project investment alongside that in offshore wind, CCS and hydrogen, it is likely that the size of the UK energy supply chain will be about the same, or smaller, than now by 2030.

However as outlined in OEUK's *Harnessing the Potential* report in July on the supply chain, with concerted action it could increase by 50% this decade. This would provide significant incentive for supply chain companies to grow their UK presence, bringing further economic opportunity.

In focus – UK gas supply

Gas is the UK's largest source of energy, and central scenarios from both government and CCC show it will likely remain so until at least the mid-2030s – even on pathways consistent with achieving net zero. It has an important role in heating buildings, fuelling industry and power generation, and in the future will be a key enabler of low carbon hydrogen when combined with CCS.

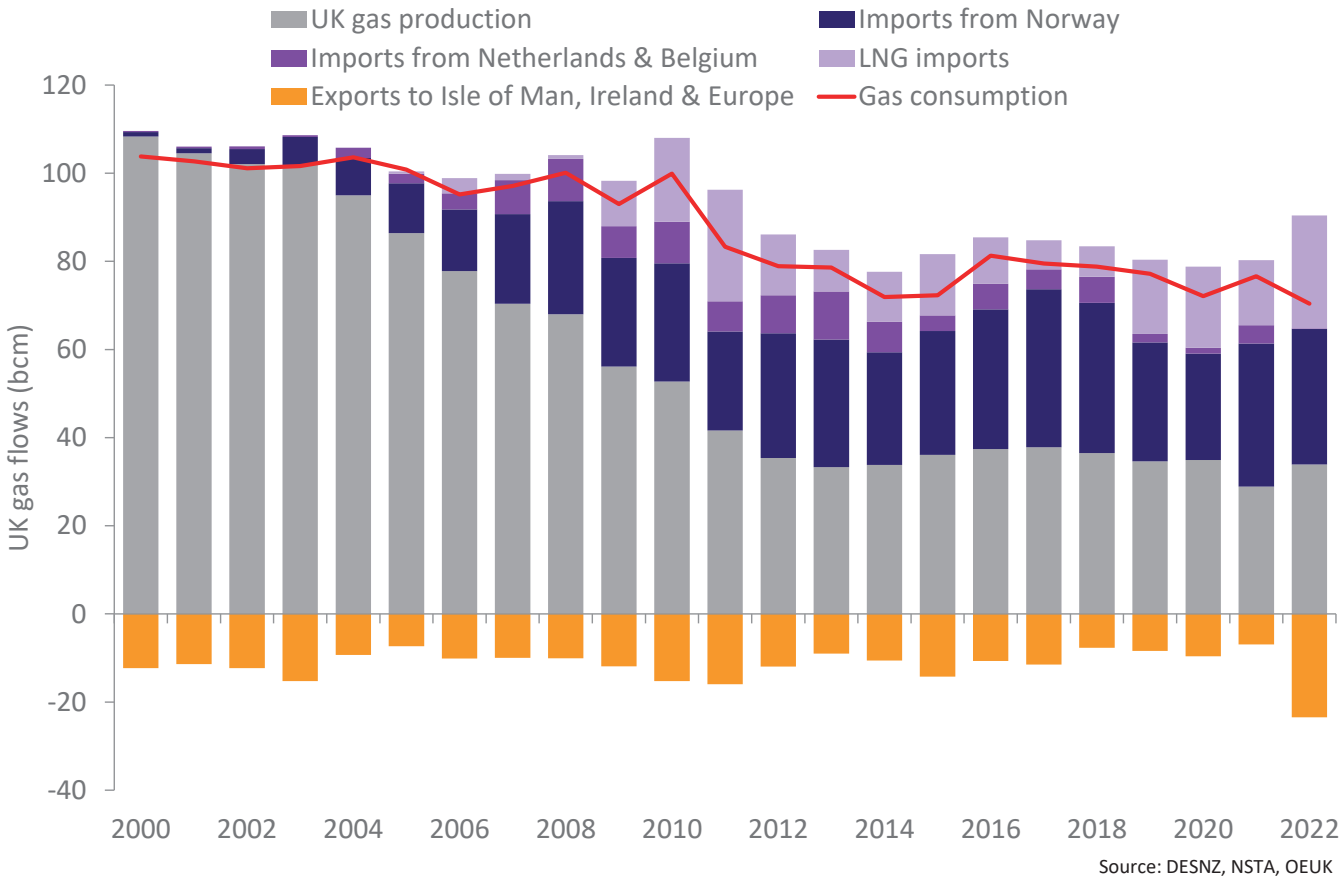
It is crucial that there is a clear focus on supplying these needs in the most secure, affordable, and sustainable way possible. In this context the UK must aim to prioritise domestic production, with residual needs met through imports.

Although the UK remains a significant net importer of gas, it is able to play an increasingly important role in supporting European energy security. This is through increased use of the UK's large LNG import and regasification capacity, with this and European interconnectors being used to bring additional volumes to continental Europe. As well as supporting domestic needs, the UK's gas infrastructure supplies 70% of consumption in Ireland[12] and 5% of continental Europe (equivalent to more than half of France's consumption last year).

This important contribution would not be possible without domestic production as the UK would need to use all its LNG capacity for domestic demand.

[12] Winter-Outlook-2022.pdf (gasnetworks.ie)

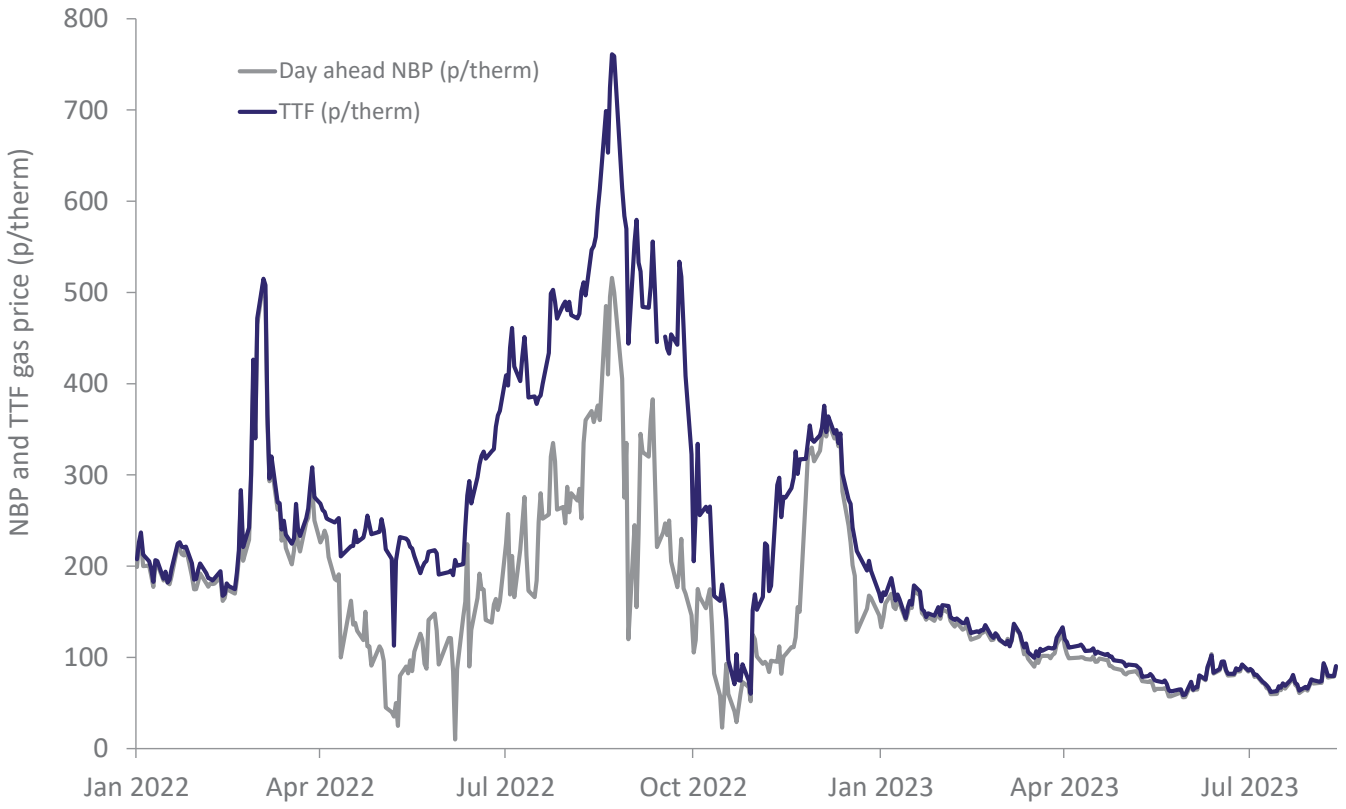
Figure 15
UK gas supply



Source: DESNZ, NSTA, OEUK

As international gas markets become more tightly linked through LNG supplies, UK and European prices are increasingly being impacted by events around the world. This was evidenced this summer when prices in Europe rose sharply then fell again on fears of lower Australian LNG supply: a threatened strike – looking less likely in late August – would squeeze global supplies in the absence of Russian exports. As well as providing reliable supplies, the UK's domestic production has helped insulate the country from the impact of external price shocks. Wholesale prices have consistently been lower – especially during periods of significant price spikes and volatility in Europe. UK NBP prices were almost 20% lower than the European TTF last year and have been 5% lower this year.

Figure 16
NBP and TTF wholesale gas prices

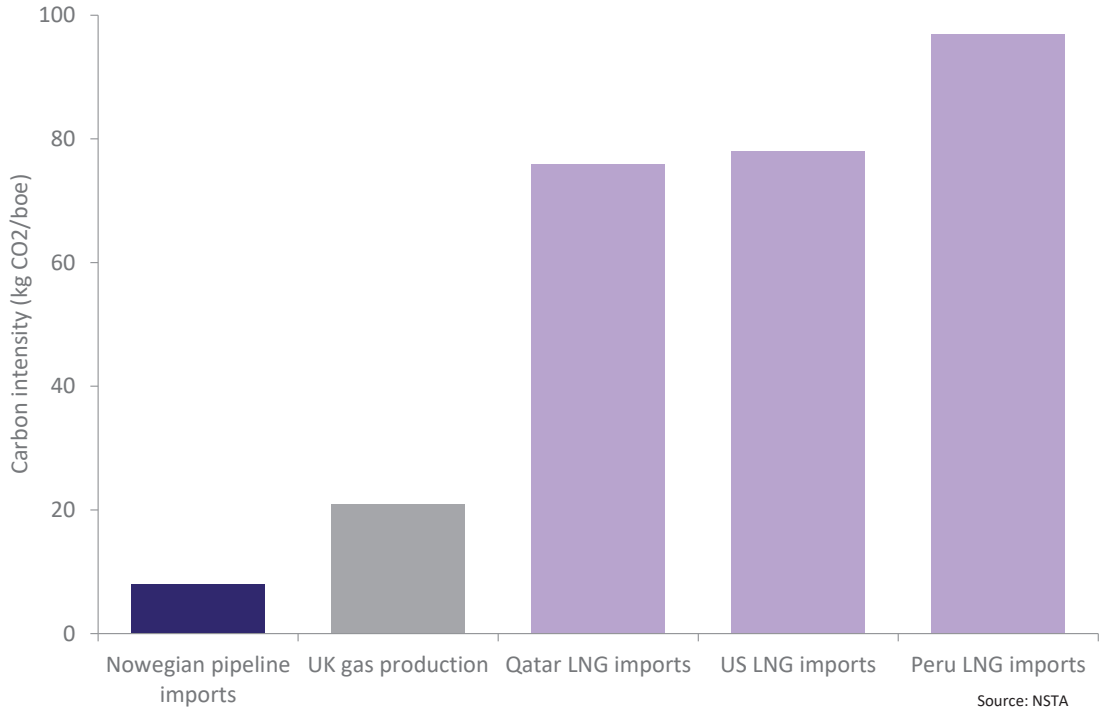


Sources: ICIS, OEUK

Maximising the contribution of domestic production also helps reduce the overall carbon footprint of the UK's gas supply. With pipeline capacity being constrained, any reduction in UK production will need to be offset through an increased dependence on LNG, which has a far higher average carbon intensity. Data from NSTA[13] outlines how average LNG imports have almost four times higher carbon intensity of production than UK gas (79 kg CO_2/boe compared with 21 kg CO_2/boe).

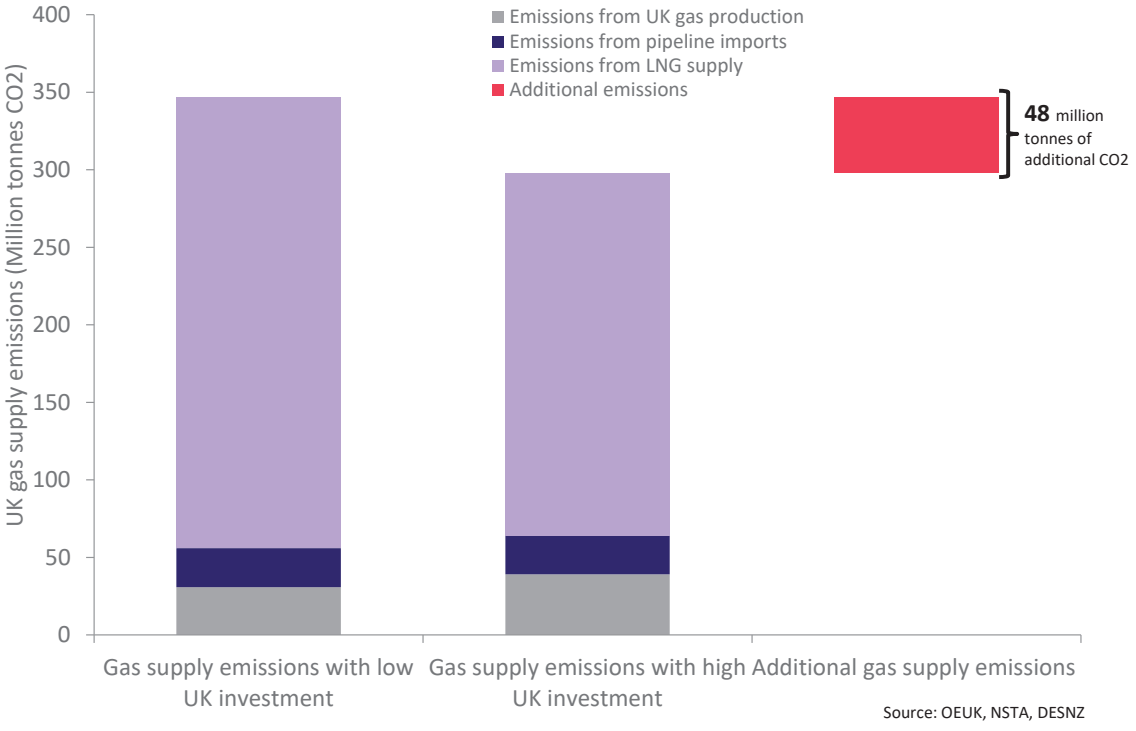
[13] North Sea Transition Authority (NSTA): Natural gas carbon footprint analysis - Net zero benchmarking and analysis - The move to net zero (nstauthority.co.uk)

Figure 17
Carbon intensity of UK gas supplies



Analysis of the UK's future energy consumption and domestic production shows that supporting ongoing investment will help reduce the emissions associated with the country's gas supply. LNG is the marginal source of gas imports, meaning that less UK production will lead to more LNG being used in the country, and therefore higher overall emissions. Prioritising investment in UK production could reduce emissions from the UK's gas supply by 50mn tonnes CO_2 between 2023-50, based on current carbon intensities. This is equivalent to taking almost 30mn cars off the road for a year.

Figure 18
UK gas supply emissions 2023-50



Oil and gas

Opportunities / broader benefits

- 10-15bn boe of remaining resource potential.
- Opportunity to meet over half of remaining UK oil and gas demand.
- North Sea Transition Deal remains core to the future of the sector.
- Continuing cuts in emissions:
  - down 20% since 2018
  - 50% reduction by 2030
  - 90% by 2040
  - Net zero 2050.

- Zero routine flaring by 2030.
- Electrification of assets.
- Providing clear pathways for expansion into CCUS, hydrogen and offshore wind for people and companies.
- Infrastructure-led exploration
  - Extension of asset lifecycles
  - Lower costs for new fields
  - Lower carbon intensity of new assets
  - Shorter field development time

Needs & enablers

What do we need to make it happen?

1. Responsible government policy

- Commitment to continued licensing, enabled by the Climate Compatibility Checkpoint and the obligations it imposes;
- Ongoing exploration, with a focus on areas close to infrastructure which can be developed quickly, efficiently and sustainably;
- Government support of future licensing rounds is key to access to resources and the way companies view the future of their UK businesses.

2. Access to capital

- Energy Profits Levy (EPL) must be unwound as the windfall goes. Fiscal predictability, stability and competitiveness are critical for ongoing operations.

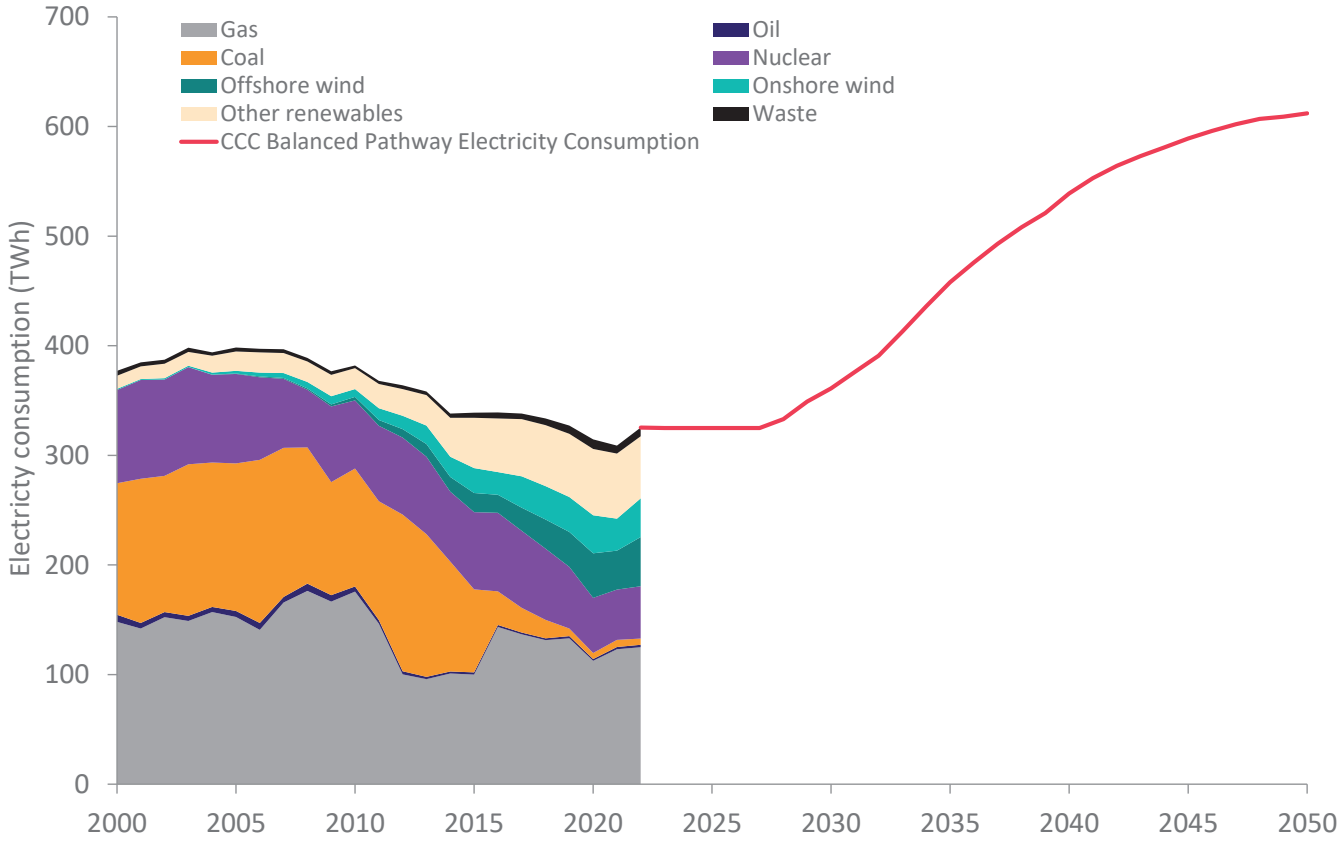
3. Progressive reduction of emissions from existing UKCS assets aligned with the commitments of the North Sea Transition Deal through:-

- Continued operational improvements by industry;
- Ongoing reductions in flaring and venting by industry;
- Electrification of UKCS assets requiring integrated solutions based on access to the onshore power grid.

4. Harnessing oil and gas experience to make the most of opportunities in the energy transition.

- The industry's five decades of experience are crucial assets which can help the UK to develop and operate future energy resources across the UKCS and offer experience in progressively reducing emissions.
- Currently 70% of offshore energy supply chain demand comes from oil and gas – it is crucial this baseload of work is maintained whilst new energy opportunities ramp up later in the decade.
- Insufficient oil and gas activity in the short term risks capital flight. Companies will move assets to more competitive areas overseas and put long term supply chain capacity in the UK at risk. This in turn threatens delivery of the UK's net zero target.

Figure 19
UK electricity supply



Source: DESNZ, CCC, OEUK

6.2. Growing low carbon energy

Power supply

The UK used around 320 TWh of electricity last year, with this being supplied by an extensive network of power generation infrastructure which has a capacity of almost 77 GW. This includes 32 gas power stations, 2,700 offshore wind turbines, 8,600 onshore wind turbines, five nuclear power stations, two coal power stations and a series of solar and hydroelectric projects of varying scales; several biomass and waste power stations and tens of thousands of kilometres of distribution networks.

Gas fired generation supplied just under 40% of total electricity last year and a lot more (over 60%) during periods of low wind speeds and peak demand. Nuclear and offshore wind both provided around 15% and onshore wind another 11%.

However overall consumption of electricity has been declining – down almost 4% compared with 2021 and over 20% since its peak in 2005. Industry has been a large part of this, with its use down by around 27% during this time.

The CCC and others show a huge scale up in electricity consumption will be required on the path to net zero, with transport and domestic heating the key drivers.

By 2050 electricity use in the UK may need to double, which implies a transformation of rates of consumption, and hence of supply and distribution.

Government has focused on expanding the role of nuclear power and offshore wind to help meet the country's future increased electricity needs. Nuclear is planned to meet a quarter

of national needs in 2050, reaching 25 GW capacity which is more than four times the current installed capacity. The UK may also need to expand offshore wind capacity to 125 GW, which is around nine times higher than today. It is also crucial though that there is the required investment to upgrade the UK's distribution networks in tandem, otherwise the additional power generation in the future will not be able to get where it is needed.

In 2022 the government commissioned ex-National Grid CEO Nick Winser as Electricity Networks Commissioner to report on the strategic deployment of electricity transmission infrastructure. His report[14] had 18 key recommendations, which are aimed at speeding up the time for delivering new transmission infrastructure to seven years from the current 12-13 years. This will be key to scaling up the country's low carbon electricity generation, with the lack of grid access and transmission capacity being a key constraint to project development.

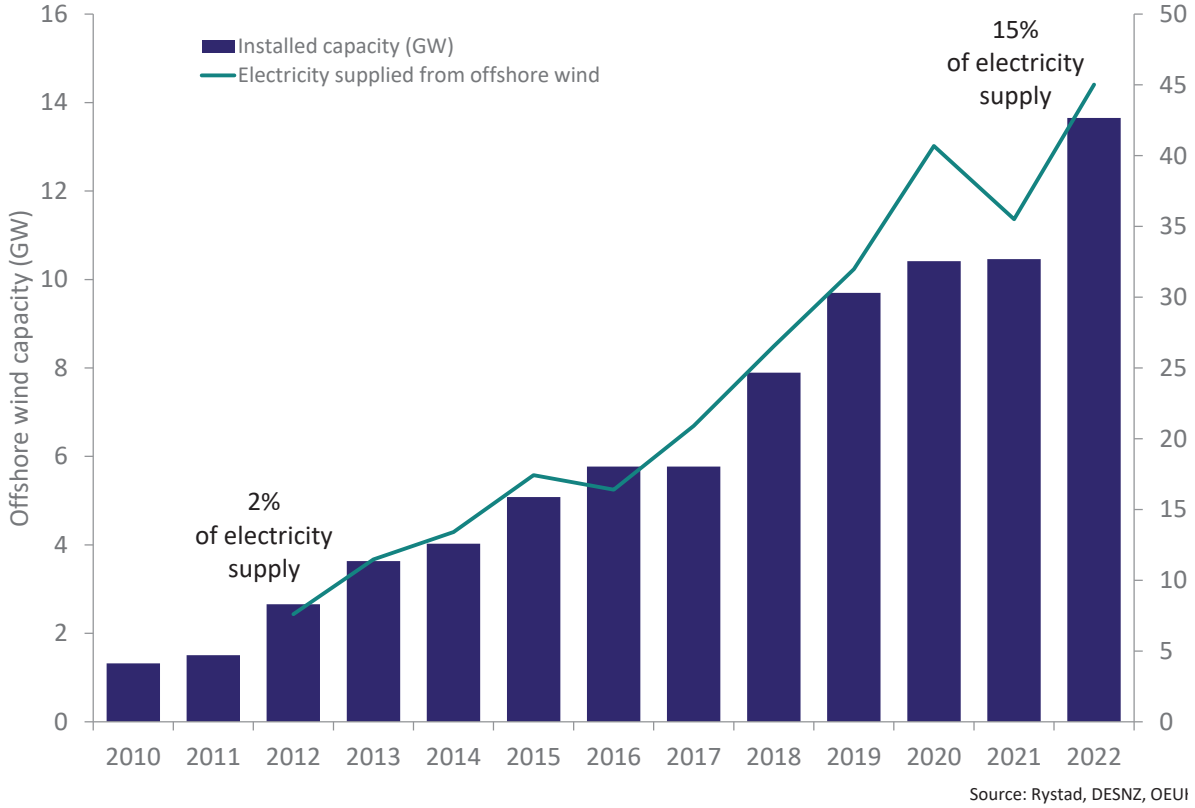
Offshore wind

The UK has seen large growth in its offshore wind generation capacity over the last decade and now has the world's second largest capacity at almost 14 GW. This includes some of the largest and most technically complex projects, such as Hornsea, Dogger Bank and Seagreen.

This capacity build means that offshore wind now has almost the same generating capacity of onshore wind (15 GW) and means that it plays an increasingly important role in the UK's electricity system, and a growing role in its overall energy system.

Around 45 TWh of electricity came from offshore wind last year, almost six times more than 10 years ago and working out at 15% of the average electricity supply. There are large swings in terms of output throughout the year as weather conditions vary – it represented 11% of supply between July and September last year and 20% between October and December, for example.

Figure 20
UK offshore wind generation capacity and electricity generated



Source: Rystad, DESNZ, OEUI

[14] Accelerating electricity transmission network deployment: Electricity Networks Commissioner's recommendations - GOV.UK (www.gov.uk)

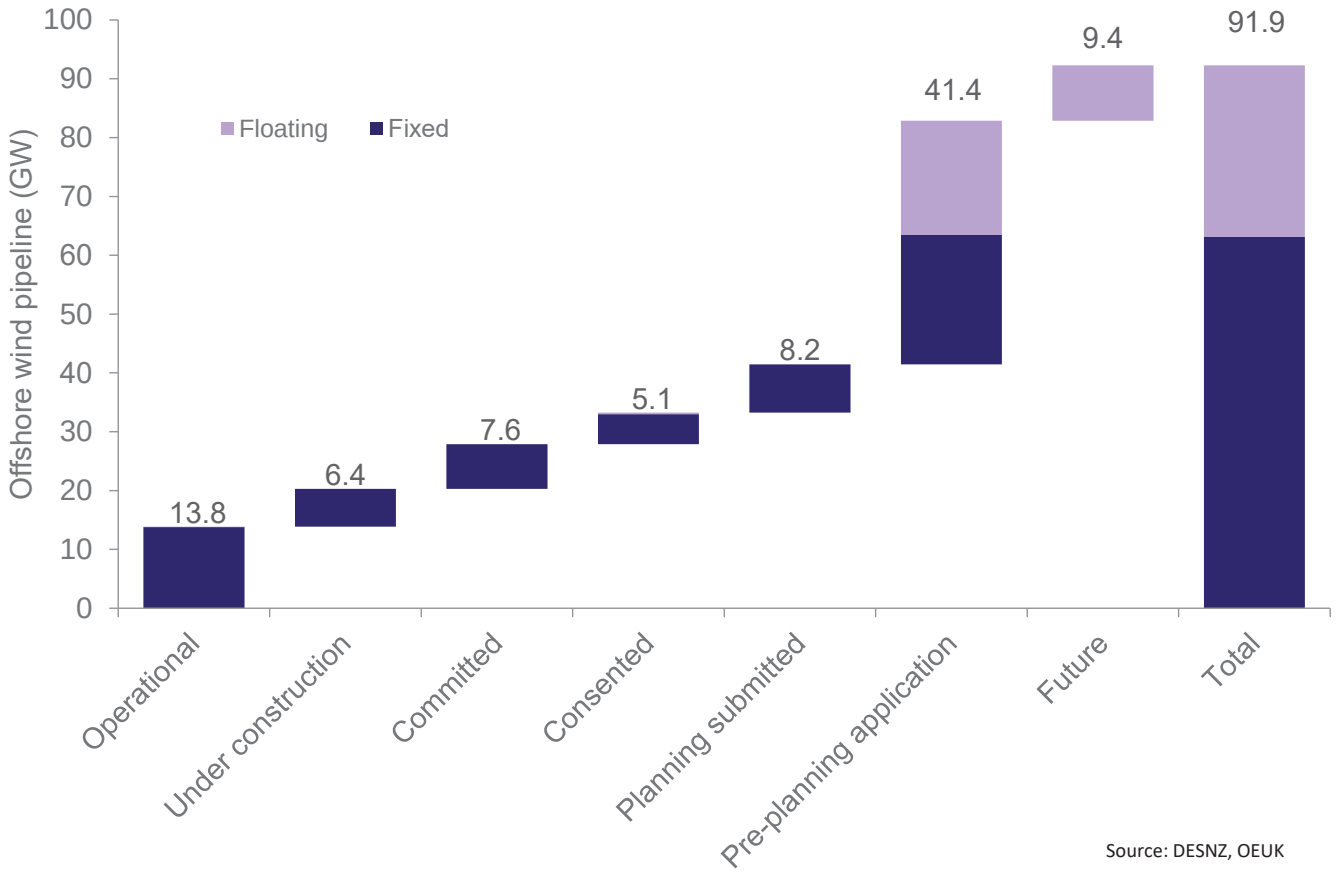
Offshore wind offers a huge growth opportunity for reducing emissions from power generation, offshore oil and gas and the country's energy supply chain. It is estimated that the UK has a total capacity pipeline of over 90 GW, of which just 15% is operational and a further 7% is in construction.

Looking specifically at this decade there could be almost £80bn of capital investment on offshore wind projects, but over 60% of this (almost £50bn) is yet to be committed.

Rising costs, global supply chain constraints and tax measures such as the Electricity Generators Levy are all having a significant impact on project outlooks. Vattenfall has suspended work on the Norfolk Boreas wind farm, which would have had a capacity of 1.4 GW, as a 40% increase in costs made the project unviable at the agreed contract for difference (CfD) strike price of £37.35/MWh. Similar challenges are also being seen across the supply chain where the need to drive down project costs has hit the economic viability of many companies.

This has led to doubts about the potential that will be unlocked in the upcoming CfD fifth allocation round. It is likely that agreed strike prices will need to increase – meaning a reversal of the trend of continued reduction.

Figure 21
UK offshore wind capacity pipeline



Source: DESNZ, OEUK

Wind

The UKCS is home to almost 14 GW of offshore wind capacity, second globally to China, and aims to increase its capacity to 50 GW by 2030. OEUK's current members are helping to develop 13 GW of the offshore wind pipeline capacity by 2030, with these projects alone requiring almost £30bn, or 60% more than the Elizabeth Line in London. Within the 50 GW 2030 capacity target, floating wind is set to account for at least 5 GW.

In the coming years, OEUK will work to help the North Sea maintain its world-leading position in wind deployment and champion this developing industry as a core component of the UK's evolving energy mix. We have an energy supply chain with over 50 years of expertise in large-scale offshore projects and a workforce with the skills to deliver the UK's ambitious offshore wind plans. Through the NSTD and the Supply Chain Roadmap, OEUK aims to enable the transformation of the existing supply chain to meet 2030 offshore wind targets. The opportunity is huge, yet challenges remain. The scale and pace of capacity installation must grow very fast, particularly given that the current time from licence award to delivery is around seven-ten years. Meeting these targets will require streamlining and halving the permitting and regulatory process time.

Targets – Short-term / long-term

2030

- 45 GW fixed offshore wind
- 5 GW floating offshore wind

Opportunities / broader benefits

• 100,000 direct and indirect jobs by 2030

- A threefold increase in employment in the offshore wind sector

• Production capacity by 2030
- Sanctioned, or already operational - 30 GW
- Probable - 40 GW
- Possible - 50 GW

• Floating wind
- Up to 5 GW production capacity by 2030
- Potential for floating wind capacity to become four times the fixed wind capacity

• By 2030 an average investment of £12bn/yr in offshore wind will be required

Needs & enablers
What do we need to make it happen?

1. Streamlining and halving of the permitting and regulatory process time

- **Enabler:** timely access to the national grid
- **Enabler:** the "Future System Operator" (FSO) should be established quickly as recommended by the Electricity Networks Commissioner by adopting a strategic planning role within the energy system to enable Net Zero and maintaining energy security
- **Enabler:** reducing the overall proposal to operation process time down to five years could see the UK hit its 50 GW capacity target by 2030
- **Constraint:** it takes seven-ten years for a project to proceed from licence award to delivery

2. Supply chain transformation

- **Enabler:** to meet the scale of demand, the industrialisation of the UK supply chain is needed, investing early in yards, ports and companies to give it the opportunity to bid competitively for and win high value work
- **Enabler:** build on existing capabilities and strengths of the offshore energy supply chain which are relevant to wind - eg in design, construction and operations, specialist services such as anchor handling and deployment, and environmental assessments.
- **Enabler:** three quarters of offshore oil and gas workers have core skills that are transferrable to offshore wind.
- **Constraint:** missing economies of scale with the ever-increasing size of turbines

3. Access to markets

- **Enabler:** market reform with CfD's that are competitive over the long term yet recognise cost trends and support local content and hydrogen growth strategy
- **Enabler:** power to X, generate fuels for end-user (hydrogen, methanol, ammonia) from wind energy.
- **Enabler:** government commitment to deliver the required reform of the regulatory and planning process. The government is set to back plans intended to halve the 14 years it currently takes to deliver big electricity transmission projects

Carbon capture and storage & low carbon hydrogen

Low-carbon hydrogen has the potential to become one of the UK's largest sources of energy by 2050. It offers flexibility as a means of storing energy in periods of excess renewable power generation and can help decarbonise the UK's heating sector. The UK is not yet at a stage where low-carbon hydrogen can play a significant role in the energy system, but with the progression of CCS clusters and demand-side policies, there could be an acceleration of the fuel by the end of the decade.

The British Energy Security Strategy set the ambition of developing 10 GW of low-carbon hydrogen production capacity in the UK by 2030. At least half of this will be from electrolysis and the rest from CCS using gas as the feedstock. The aim is to have a minimum of 1 GW of electrolytic hydrogen in construction or operational by 2025, with a scale up in the reminder of the decade.

By 2050 the CCC envisages hydrogen playing a significant role in the UK, with consumption of over 200 TWh and reaching towards 400 TWh in some scenarios. These scenarios are heavily reliant on the use of hydrogen as an option for decarbonising heat in buildings as well as blending hydrogen into the UK's domestic gas supply. Strategic decisions to scale up hydrogen production need to be taken in the early 2020s if the 2030 production target is to be met.

The government's Hydrogen Strategy update identifies many of the measures being taken to develop the resource and grow the market in the UK. The scale-up of CCS will be important for both energy security and wider emissions reductions from industry.

CCS will help enable the scale up of low carbon hydrogen as it is crucial to the production of blue hydrogen, and will help to decarbonise the wider power sector. The CCC estimates that CCS-enabled power plants could contribute to as much as 9% of total UK energy consumption by 2050 and help provide baseload power when so required, complementing renewable generation.

Alongside this it is crucial for the continued decarbonisation of industry, supporting the UK industrial sector transition to net zero and supporting economic growth through the energy transition. This includes sectors like steel and cement production, which create significant emissions, but lack the means to displace oil and gas.

The government has committed to supporting the development of four carbon transport and storage hubs by 2030. The first two of these, the Hynet and the East Coast Cluster, were announced in October 2021 as "Track 1" projects; more recently, the Acorn project at St Fergus and the Viking project on Humberside were in August confirmed as "Track 2" projects. These clusters will provide the infrastructure required for the large-scale transportation and storage of up to 30mn tonnes of CO_2 by the end of the decade. These facilities will transport and store CO_2 in depleted gas reservoirs or saline aquifers under the UKCS. The first wave of industrial emitter projects has been selected to provide the carbon that will be stored offshore.

Other CCS hubs are rapidly emerging and will need to be progressively developed including the South Wales Cluster, the Solent cluster serving Southampton, and the Bacton cluster serving the southeast. The inaugural carbon storage licensing round awarded 21 licence offers to 12 companies, with the first injections expected to come in the mid-2020s.

The CCS sector could generate up to 50,000 new jobs by 2030, many of which will require the skills and expertise of the UK's oil and gas sector. OEUK's *Harnessing the Potential* report in July on the supply chain highlighted that 90% of the UK's offshore oil and gas workforce have core skills transferable to this sector. Crucially, CCS projects could also help protect over 100,000 jobs across other

sectors that would be unable to achieve net zero by 2050 without emissions abatement, such as industrial carbon capture, e.g. for steel and cement, waste processing and hydrogen production.

Role of carbon markets

Carbon markets will have a significant role in supporting the drive to net zero while growing the economy. The total value of these markets continue to grow annually as mandatory, regional, voluntary and international regimes have grown to regulate and to facilitate trade of carbon allowances. OEUK sees the markets continuing to grow at scale over the coming years as the price in compliance markets increase in line with governments' intervention and, separately, as new technologies increase, the voluntary market should mirror this.

- A compliance carbon market is created and regulated by a mandatory carbon reduction regime in certain countries. Examples include the EU and UK Emission Trading Schemes, formerly one market.

- A voluntary carbon market is where carbon credits are purchased voluntarily and is not bound by legal requirements.

There is a role for both compliance and voluntary markets reflecting their opportunity to offer some downside risk and transition risk protection. Voluntary markets should be seen as a complement to compliance markets. Consideration is required around how to maximise the opportunity of the voluntary market to boost investment in new technologies. Compliance markets tread a fine line between reducing greenhouse gas and avoiding carbon leakage from the economy. They have an important role in carbon reduction and downward management.

Key requirements

1. Liquidity and depth

Carbon markets are fundamental to achieving net zero targets and governments should consider ways to make them more tradeable, including the relinking of UK and EU emission trading schemes post Brexit.

The advantages of linkage are clear in terms of liquidity, price discovery, and the ability to attract abatement from across Europe rather than just the UK. It would also create a level playing field in terms of carbon pricing, avoiding competitive distortions, and leading to aligned cost implications for industry across the UK and the European Economic Area.

2. Robust carbon border adjustment mechanism and carbon leakage policy

It is important to avoid decarbonisation by deindustrialisation and the subsequent offshoring of emissions and vital well-paid jobs to other regions. The growing carbon leakage risk associated with manufacturing sectors is of concern.

New energies will heavily rely on these sectors, such as steel manufacturing, and this could have consequences on the wider value chain and consumer. Carbon border adjustment mechanisms and carbon leakage policies are highly complex instruments, with numerous design elements that impact their overall effectiveness in addressing carbon leakage risks, as well as their legal and political viability in global trade agreements.

3. An energy strategy conducive to low-carbon technology

To incentivise inward investment into new energies, including supporting the growth of the voluntary market, clear long-term strategies will be fundamental. This will in turn ensure growth across the sector.

Hydrogen

Targets – Short-term / long-term

2025
- 1 GW electrolytic hydrogen, in construction or operation.

2030
- 10 GW of low carbon hydrogen production, at least half to be green.

Opportunities / broader benefits

- 12,000 jobs by 2030
- Leverage up to £11bn in private investment in hydrogen production, distribution and storage by 2030 from the 10 GW of hydrogen targeted.
- Blending hydrogen (up to 20%) into the domestic gas supply.
  - Decision to be made by the end of 2023.
- First electrolytic allocation round expected to award up to 250 MW of low carbon hydrogen in 2023.
- Second electrolytic allocation round for hydrogen offering up to 750 MW of low carbon hydrogen by 2025.
  - Taking UK's total up to around 1 GW hydrogen capacity in construction by 2025.
- Two CCS-enabled blue hydrogen production projects have been allocated in the track-1 cluster sequencing process.

Needs & enablers

1. A funding mechanism that addresses near and long-term supply, minimising the costs to consumers and providing certainty to investors.

- **Enabler:** the Net Zero Hydrogen Fund, up to £240mn to support commercial deployment of new low-carbon hydrogen in the 2020s.
- **Enabler:** a shift to price-based competitive allocation of low-carbon hydrogen from 2025.
- **Constraint:** there is uncertainty about the current long-term funding mechanism for hydrogen business models.

2. An update of the hydrogen strategy to develop a mature hydrogen market in the UK addressing demand as well as supply.

- **Enabler:** further hydrogen allocation rounds beyond the two already released to grow supplies post 2025.
- **Constraint:** decisions still to come on the role hydrogen will have in heating (expected in 2026) and blending into the national grid gas system (expected end-2023).

3. Supply chain development and growth

- **Enabler:** NSTD is targeting 50% local content across the lifecycle for all related new energy technology projects by 2030.
- **Constraint:** UK faces competition for the supply of electrolysis technologies from mainland Europe.

CCS

Targets – Short-term / long-term

Short-term (2030)
- 4 CCS clusters
- 20mn-30mn tonnes/year CO2.

Long-term (2050)
- 70mn tonnes/year CO2.

Opportunities / broader benefits

- 50,000 jobs by 2030.
- 90% of the offshore oil and gas workforce have core skills directly transferable to CCS.
- Up to 100 storage sites needed by 2050.
- Potential for UK CO_2 export market given the limited storage in Europe.
- The Skidmore Review highlighted this as a key area of development.
- Government's CCS strategy to be released at the end of the year.
- Unlocking low carbon hydrogen production at scale.
- Target: 10 GW/yr of low carbon hydrogen production (of which half from CCS).

Needs & enablers

1. Robust long-term business models are required to be operational to make CCS an investable technology.

- Announcing the track 2 clusters is but one step, the industrial emitter projects serving the track 2 clusters need to be agreed and the economic licenses put in place to secure investment.
- **Enabler:** The Energy Bill providing the appropriate economic regulation and legal framework for CCS needs to be enacted.
- **Enabler:** £20bn in government funding to support the deployment of CCS (a clear timeline for the deployment of this funding is required).
- **Constraint:** Carbon prices are too low and capture, transportation, and storage costs still too high to make CCS profitable at present.

2. Develop the foundations for a self-sustaining CCS sector beyond the initial clusters.

- **Enabler:** the government 's CCS vision to provide clarity on the long-term direction of the industry.
- **Constraint:** Cluster sequencing process needs to be accelerated to avoid further delays and ensure emitters that were unsuccessful have a route to market.
- **Enabler:** the UK has one of the largest CO_2 storage capacities in Europe (over 78bn tonnes).
- **Constraint:** a framework to allow non-pipeline transportation of CO_2 must be developed to provide a route to storage for emitters with no other decarbonisation alternatives.
- **Constraint:** there is no framework to maximise our storage potential by allowing imported CO_2 to be stored in the UK.

3. Supply chain development and growth

- **Enabler:** 90% of the offshore oil and gas workforce have core skills directly transferrable to CCS.
- **Enabler:** the UK has recognised strengths in Engineering design, construction and operations based on its oil and gas heritage.
- **Enabler:** support from investors in the hubs in: UK fabrication capacity, including the manufacture of process vessels, columns and process control systems.
- **Constraint:** little standardisation across CCS projects and limited UK manufacturing capacity.

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